NAVY

SAFETY AND OCCUPATIONAL HEALTH (SOH)

PROGRAM MANUAL

FOR FORCES AFLOAT

OPNAV INSTRUCTION 5100.19E

VOLUME III
SUBMARINE SAFETY STANDARDS

DEPARTMENT OF THE NAVY

OFFICE OF THE CHIEF OF NAVAL OPERATIONS

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, DC 20350-2000

IN REPLY REFER TO

OPNAVINST 5100.19E
N09F
30 May 07

OPNAV INSTRUCTION 5100.19E, VOLUME III

From: Chief of Naval Operations

Subj: NAVY SAFETY AND OCCUPATIONAL HEALTH (SOH) PROGRAM MANUAL FOR FORCES AFLOAT, VOLUME III

Ref: (a) OPNAVINST 5100.19E, Volume I

Encl: (1) Navy Safety and Occupational Health Program Manual for Forces Afloat, Volume III

1. Purpose. To provide the third volume of the Navy Safety and Occupational Health (SOH) Program for Forces Afloat.

2. Cancellation. OPNAVINST 5100.19D, Volume III

3. Discussion

a. This instruction provides submarine safety standards and precautions necessary to carry out the program established in reference (a). Representatives of the Fleet Commanders and Type Commanders staffs provided significant input to this document.

b. This instruction reflects modifications to regulatory requirements, embodies lessons learned from mishaps, and incorporates changes directed the Navy Executive Safety Board to enhance the SOH Program. Since this document modifies every chapter and most of the paragraphs from OPNAVINST 5100.19D, it does not identify modified, added, or deleted paragraphs.

4. Action

a. Replace the current Volume III of OPNAVINST 5100.19D with enclosure (1).

b. Each command should have sufficient copies of enclosure (a) to ensure that personnel in each work-center have access to the information.

5. Forms and Reports

a. The following forms are available at Navy Forms On-line, https://forms.daps.dla.mil

b. Local reproduction is authorized.

(1) OPNAV 5100/18 (DEC 1993), Used Hazardous Material Identification Label, S/N 0107-LF-127-4700

(2) OPNAV 5100/26 Working Over the Side (For Submarines)

(3) NAVSEA 5090/3, PCB Label 6" x 6", S/N 0116-LF-008-6500

(4) NAVSEA 5090/2, PCB Label 4" x 4", S/N 0116-LF-050-9021

(5) NAVSEA 5090/1, PCB Label 1" x 2", S/N 0116-LF-050-9011

G. E. MAYER
RADM USN
Special Assistant for Safety

Distribution:
Electronic only, via Department of the Navy Issuances Website
http://doni.daps.dla.mil

TABLE OF CONTENTS

VOLUME III
SECTION D

SUBMARINE SAFETY STANDARDS

TABLE OF CONTENTS

VOLUME III
SECTION D

SUBMARINE SAFETY STANDARDS

TABLE OF CONTENTS

VOLUME III
SECTION D

SUBMARINE SAFETY STANDARDS

TABLE OF CONTENTS

VOLUME III
SECTION D

SUBMARINE SAFETY STANDARDS

TABLE OF CONTENTS

VOLUME III
SECTION D

SUBMARINE SAFETY STANDARDS

Chapter D1

BASIC SAFETY

D0101. DISCUSSION

a. Shipboard life is one of the more hazardous working and living environments that exist. The existence of hazardous materials 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 operational risk management (ORM) to plan an evolution, consider assigning a safety observer, whose only responsibility is safety, during any deck or seamanship evolution that could injure personnel or damage equipment. This safety observer should be knowledgeable in the proper performance of the evolution. Examples of deck evolutions include: underway replenishment, operation of boat davits, rigging pilot and accommodation ladders, and handling lines. Reference D1-1 contains additional guidance on ORM.

c. The general safety standards in the following section are applicable to all shipboard operations and spaces. These standards have been adopted from requirements from the Naval Sea Systems Command (NAVSEA), the Occupational Safety and Health Administration (OSHA), USCG Safety of Life at Sea (SOLAS), American National Standards Institute (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.

D0102. 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.

(3) Always ensure exits are not locked or blocked with equipment or any other type of interference.

(4) Do not run in passageways or up or down ladders.

(5) Always be cautious when nearing a "blind" corner or opening doors with no port light or window.

(6) 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, if the opening will be unattended or unguarded at any time.

(7) After opening and prior to passing through a watertight door, hatch, scuttle, or manhole cover, ensure hatch brace pins and/or safety pawls and scuttle/manhole covers are positively locked.

(8) Never dismantle or remove any inclined or vertical ladder without permission of the commanding officer. Such areas shall be secured with temporary lifelines and shall be posted with a warning sign.

(9) Ensure that low overheads above inclined ladders (less than 72 inches (") in height), ladder grab bars, and passageways (less than 75" in height) and obstructions in passageways are padded.

(10) Never lock escape scuttles or other accesses so they cannot be opened from the inside.

b. Damage Control

(1) Know the location and operation of all emergency breathing devices in living and working spaces.

(2) Know the location of all fire stations and other firefighting equipment throughout the ship.

(3) Never tamper with any damage control or rig for dive fittings or equipment.

(4) Never open or enter a tank, void, or manhole 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 void, tank or manhole shall have a safety line attached, wear proper protective equipment, and have a second person tending the safety line outside the tank or void.

(5) If you pass through a watertight door, hatch, or scuttle designated to be closed during normal operations, be certain that it is properly closed and dogged.

c. Stowage and Hazardous Materials

(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 hazardous materials, including cleaners and paints, are properly labeled, safely used, and returned after use, per the ship's procedures.

d. 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 you use.

(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 by the job.

(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 areas that are slippery with a warning sign. Ensure non-skid decking material (non-skid paint or adhesive non-skid strips) is installed at machinery work areas where the operator stands, at

the top and bottom of each ladder, on both sides of doors and arches with a high coaming used for continuous traffic, and both sides of crew messing space doors (may be on exit side only if non-skid tiles are installed in messing spaces).

(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 unless authorized to do so.

e. Ventilation. Always ensure ventilation ducts are free of blockage. Never alter ducts or diffusers without authorization. Know where ventilation controllers are located for your work and living areas.

f. General Space Safety

(1) Keep constantly familiar with the whereabouts of crewmembers in the space where you are working, especially if they are working in tanks, voids or other restricted movement areas.

(2) Smoke only in designated areas.

(3) Use of personal stereo earphones is not authorized throughout the ship except in recreation/study areas, in berthing spaces or other specific ship authorized spaces.

(4) Observe and enforce all personal protective equipment requirements.

(5) Promptly report all unsafe conditions discovered.

(6) Never hesitate to stop a shipmate from doing something that may be hazardous or unsafe, and never leave a worksite in an unsafe condition.

(7) Never straddle or step over lines, wire, and chains under tension.

g. Topside

(1) Only wear sunglasses 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. Use temporary lifelines when possible.

(4) Wear an inherently buoyant life preserver or auto-inflatable utility life preserver (AIULP) and approved topside shoes topside where the potential exists of falling, slipping, being thrown, or carried into the water. Only authorized safety harnesses shall be worn by all personnel on the main deck while underway, except during the maneuvering watch, or unless otherwise specified by the commanding officer.

D0103. TRAINING

a. While most of the standards specified in this chapter are covered during basic training, Submarine School, and at specific training schools, new crew-members, upon reporting on board, shall be given a brief orientation on these standards, their intent and importance, and where specific safety items and personal protective equipment(PPE) can be found aboard ship. This training shall be conducted within 72 hours of the crew member reporting aboard and shall include emergency air breathing (EAB) training.

b. All personnel should be consistently reminded of these safety standards through the use of Plan of the Day notes, divisional training, or quarters.

c. Consider rewards and recognition for those reporting and correcting safety hazards and watching out for their shipmate’s safety.

D0104. EMERGENCY RESPONSE EQUIPMENT

a. Ensure all emergency response equipment is complete and in good repair.

b. Stow emergency response equipment in a location affording quick, easy access.

D0105. SAFETY COLOR CODE AND SIGNS FOR MARKING PHYSICAL HAZARDS

Hazards should be marked as follows, within the constraints of NAVSEA-08 requirements:

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 (see chapter D15). These metal cans shall 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, shall be red.

(4) Guards or barriers enclosing rotating machinery, shafts, or moving parts which could cause death or severe injury if removed.

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" in height), monorails and turntables shall 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 shall be yellow with black lettering, and shall be 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.

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 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 to not enter that operator area. 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.

(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. 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.

(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.

_____

CHAPTER D1

REFERENCES

D1-1. OPNAVINST 3500.39B

Chapter D2

DRY CARGO OPERATIONS/STORES HANDLING/RIGGING

D0201. 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. Stores and dry cargo 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, hazardous material 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.

c. 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.

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. Complete an ORM review, in accordance with reference D2-1, prior to the evolution and mitigate risks as feasible.

f. 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.

D0202. PRECAUTIONS - WORKING PARTIES MOVING STORES

The following precautions 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. See chapter B13 on how to calculate lifting limits.

d. 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 hazardous materials.

D0203. STORES HANDLING PRECAUTIONS

The following precautions should be followed during stores handling operations:

a. When using the ship's davit for stores handling, use correct and well-maintained blocks and sheaves for safe load handling operations. The following procedures and safety precautions shall be observed at all times:

(1) Ensure the SAFE WORKING LOAD is stamped on each block and on the davit. A test label plate showing test data, facility conducting test, and date of test should be located on the davit.

(2) Before use, inspect blocks and sheaves for defects. Sheaves with corrugated grooves, chips, or excessive wear and blocks with damaged shells, straps, swivels, shackles, eyes, or excessive wear shall not be used.

(3) Know the load capacity of hooks and ensure that such capacity is not exceeded. Test all hooks for which no applicable manufacturer's recommendations are available at twice

the intended safe working load before initially putting into use. Maintain a record of the dates and results of such tests. Inspect hooks periodically to see that they have not been bent by overloading. Do not use bent or sprung hooks. Visually inspect hooks before lifting the rated load.

(4) Use safety hooks fitted with a safety latch or mouse the hook.

(5) Keep hands safely away from a hook until clearance is given to hook or unhook. Be especially careful to keep clear of swinging hooks.

(6) Set hooks firmly in place before making a lift. Never carry a load on the point of a hook.

b. When stores are being put aboard ship using a crane:

(1) Always know where the cargo is during a transfer.

(2) Wear a hardhat with chin strap in place under the chin, gloves when handling wire rope or banding material, and safety shoes.

(3) Never walk under suspended cargo.

(4) When stores are being lowered, keep feet and hands clear.

(5) Never put hands **under** cargo during transfer.

c. When loading stores by hand, personnel topside and those forming a chain down the stores loading hatch shall wear approved hard hats and safety shoes.

d. When handling hazardous material stores, refer to paragraph D1504 for additional guidance and requirements.

e. Know firefighting and safety equipment locations.

f. Do not walk backwards.

g. If wearing glasses, ensure they are shatter proof.

h. Never throw anything down a hatch or onto a dock.

i. Do not smoke.

j. Inform supervisors of unsafe conditions.

k. Do not ride on conveyors.

l. 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.

m. Always brace, shore, and lash stores that may shift.

D0204. 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.

_____

CHAPTER D2

REFERENCES

D2-1. OPNAVINST 3500.39B

Chapter D3

WIRE AND FIBER ROPE

D0301. 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/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 have 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 D3-1. Mitigate risks as feasible.

D0302. 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 D3-2 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.

e. Do not stand directly in line with the point where chains, wire, ropes or lines change direction (i.e., 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.

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 with corrugated grooves.

q. Remove the loose ends of splices.

r. Seize all bitter ends.

s. Do not use manila, wire, spring-lay rope, or synthetic line together on the same chock, bitt, or reel.

t. Carefully make up lines not in use.

u. Do not permit rat guards and sharp edges to wear mooring lines. Use chafing gear and lash well.

v. Change mooring lines in accordance with planned maintenance system (PMS) procedures. Failure to make such changes can result in serious injury.

w. Ensure wires, lines, and rigging are not subject to overload.

D0303. SYNTHETIC LINES

In addition to the precautions in paragraph D0302, the following precautions shall 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 shall 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. (The videotape "Synthetic Line Snapback" or SOBT video #4 on "Submarine Line Handling" should be viewed for an appreciation of this phenomenon.)

D0304. WIRE AND SPRING LAY ROPE

In addition to paragraph D0302, the following precautions shall 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 in accordance with 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.

D0305. NATURAL LINES

In addition to the precautions stated in paragraph C0502, also follow these precautions:

a. Do not use natural lines in sheaves and blocks built for wire rope service.

b. Never use manila lines five or more years old.

c. Do not continue to use natural fiber line in which any of the following conditions 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. Do not use frozen lines.

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.

CHAPTER D3

REFERENCES

D3-1. OPNAVINST 3500.39B

D3-2. Naval Ships' Technical Manual (NSTM) 613, Wire and Fiber Ropes and Rigging

CHAPTER D4

WORKING OVER THE SIDE, TOPSIDE, OR ALOFT; VERTICAL TRUNKS, DRYDOCK SAFETY: CONTRACT LIBERTY BOAT SAFETY

D0401. DISCUSSION

a. Since many areas on the exterior of a ship are inaccessible to the crew, it becomes necessary to go "over the side" or "aloft" to reach these areas. "Over the side" shall be defined as anywhere outboard of the lifelines. "Aloft" shall be defined as either work on or within the sail not to include the bridge or bridge trunk.

b. The greatest hazards associated with working over the side, topside, or aloft are the potential for slipping and falling. Other hazards include the dropping of objects on (or by) personnel, chemical exposure and non-ionizing radiation burns from transmitting antenna or radar.

c. When a ship is in drydock, many of the precautions associated with working over the side, topside, or aloft must be followed. This chapter will discuss the hazards and precautions associated with this unique evolution.

d. Additional precautions for working over the side, working topside, working aloft, and drydock safety are found in references D4-1 and D4-2.

e. As a risk control measure, consider assigning a safety observer, whose only responsibility is safety, during any deck or seamanship evolution that could injure personnel or damage equipment. This safety observer should be knowledgeable in the proper performance of the evolution. Examples of deck evolutions include: underway replenishment, rigging pilot and accommodation ladders, and handling lines.

D0402. GENERAL PRECAUTIONS

a. Wear a full body safety harness with safety lanyard, and tending line (as required) with double-locking snap hooks. The harness shall be inspected in accordance with established PMS prior to use. The safety lanyard length shall not exceed six

feet or the distance from the work to six feet above the deck, whichever is shorter.

b. Attach safety lanyards to all tools, if practicable. Never carry tools up and down ladders. Rig a line and raise/lower tools to the work area in a bucket.

c. When underway, the commanding officer's permission is required to work over the side, topside, or aloft.

d. An experienced senior person shall check any rigging or staging prior to use. Never rig lines over sharp edges. Inspect lines for damage, rot, and wear. Secure lanyards to solid structures.

e. The petty officer in charge shall mark off the work area and keep unnecessary personnel clear. He shall also maintain a sharp lookout for anything that would cause an increase in ship's motion. If the slightest chance of collision exists, personnel shall be moved to safety.

f. Read any safety placards posted in the area prior to commencing work. Submarines shall rig temporary safety placards during hazardous evolutions topside.

g. Cranes used to suspend personnel over the side shall be certified and work platforms or baskets shall 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. Precautions must be taken to protect personnel suspended over the side by a crane since they are subject to radiation burn hazards from voltage induced in the hoist wire from transmitting antennas.

D0403. ADDITIONAL PRECAUTIONS FOR WORKING OVER THE SIDE OR TOPSIDE

Complete a checklist that contains all of the elements included in appendix D4-A prior to commencing work aloft.

a. Wear an inherently buoyant life preserver modified with a button hole in the back for concurrent use with the full body safety harness when working over the side.

b. Each person working over the side shall have an assistant to tend lines.

c. Secure the ship's propeller and overboard discharges in the area of personnel working over the side.

d. Only perform work between ships or between a ship and dock with a camel in place.

e. Perform work over the side with the ship in drydock only with the commanding officer's permission.

f. Ensure that a safety lanyard is attached to all power tools (electrical or pneumatic) prior to use topside or over the side.

g. Personnel shall keep clear of all shore power cables and high pressure lines.

D0404. PERSONNEL WORKING ON OR WITHIN THE SAIL

a. Do not go aloft without first obtaining permission from the command duty officer.

b. Prior to commencement of work and every 30 minutes thereafter, pass a verbal warning over the 1 MC, **"THERE ARE MEN WORKING IN THE SAIL. DO NOT RAISE, LOWER, ROTATE OR RADIATE FROM ANY MAST OR ANTENNA, DO NOT SOUND THE SHIP'S WHISTLE. DO NOT CYCLE THE FAIRWATER PLANES; THERE ARE MEN WORKING IN THE SAIL."** Upon completion of the work, pass on the 1 MC, **"THE SAIL IS CLEAR."**

c. All radio transmitters and the radar shall be placed in the STANDBY position.

d. Ensure that a safety line is attached to all tools prior to use on or in the sail.

e. Ensure that the full body safety harness is attached to the sail safety fitting (if provided).

D0405. DRYDOCK SAFETY PRECAUTIONS

a. Personnel working over the side in the drydock shall comply with the precautions indicated in this chapter with the exception that life preservers are not required in drydocks without water. Personnel working over the side in drydock will normally be in a man basket with full body safety harness and

safety lanyard worn. On scaffolding with guard rails, no harness is required.

b. Ensure all staging is adequately constructed and supported.

c. Only enter the dock with a hard hat, steel-toed safety shoes and eye protection.

d. Shift no weight within the ship while in drydock 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 which projects through the hull is operated only with the permission of the commanding officer and then with a safety observer outside the hull.

i. Do not permit horseplay, leaning on lifelines or other negligent practices that could lead to falling over the side.

j. Do not throw anything over the side into the dock, including debris from cleaning or preservation.

k. When carrying fuel of any kind in drydock, do not allow fuel to drain into the dock. Should it be necessary to remove any fuel from tanks or containers while in drydock, take precautions which will prevent any of the fuel from reaching the floor of the dock.

l. Safety nets shall be rigged extending a minimum of six feet on both sides under all access brows between the ship and the dock apron.

D0406. CONTRACT LIBERTY BOAT SAFETY

If a contract liberty boat is required, chapter C4, small boats, in volume 2, Surface Ship Safety Standards, of this manual provides in-depth guidance and safety precautions.

CHAPTER D4

REFERENCES

D4-1. COMNAVSUBFOR Instruction 5400.38, "Standard Submarine Organization and Regulations Manual (SSBN)"

D4-2. COMNAVSUBFOR Instruction 5400.39, "Standard Submarine Organization and Regulations Manual (SSN)"

Appendix D4-A

WORKING OVER THE SIDE CHECK SHEET

USS _____ Time/Date _____

1. Personnel (number) _____ will be going over the side at (location) _____ for accomplishing the following work_____

_____

_____

2. Prior to allowing personnel to work over the side, accomplish the following:

Initials

_____ a. If underway or in dry dock, or working near exhausts that are actively discharging gases, obtain the commanding officer's permission.

_____ b. Ensure that personnel working over the side wear a full body safety harness with safety lanyard, wear an inherently buoyant life preserver modified with a button hole in the back to wear with the full body safety harness, and wear a hard-hat. Appropriate PMS shall be performed on harness, safety lanyard, and life preserver prior to use. (Note: If working from a float or punt in the water, full body safety harness and safety lanyard are not required. Life preservers and hard hat shall be worn. If in a dry dock without water, the life preserver is not required).

_____ c. Each person working over the side has an assistant to tend lines. (Note: If working from a punt or float, at least one assistant shall be provided on the deck or pier.)

_____ d. Ship's propellers are stopped and overboard discharges in the area of personnel working over the side are secured and DANGER tagged.

_____ e. If work is to be accomplished in port between the ship and a pier or between the ship and other ships, a camel is in place.

_____ f. Power tools, if in use, are pneumatic. NO electrical powered tools shall be used.

_____ g. Ensure that an experienced, senior person has checked the rigging of the staging prior to use.

_____ h. Ensure that personnel working over the side are briefed on operational risk management prior to working over the side.

_____ i. Do not permit working over the side, except in an emergency, if wind speed is greater than 30 knots, roll is in excess of 10 degrees, pitch is in excess of five degrees, or if ice or thunder storms threaten.

_____ j. Ensure that a petty officer (PO) in charge of work is stationed at the work site. Ensure PO in charge is alert for anything that

would cause an increase in ship's motion or drastic change in course. Underway maneuvers with other ships are not planned.

_____ k. If in port, notify officers of the deck/command duty officers of ships alongside.

_____ l. If a crane is used to suspend personnel over the side, ensure that the crane has current certification and that the work platform or basket is approved by COMNAVSEASYSCOM for handling personnel.

Conditions have been established to permit personnel working over the side.

_____
Command Duty Officer/Officer of the Deck/Time

Working Over the Side Commenced _____

Working Over the Side Completed _____

Note: Initials certify completion of an item. If an item is not applicable, indicate "NA" on initial line.

CHAPTER D5

ELECTRICAL AND ELECTRONIC SAFETY AND TAG-OUT PRECAUTIONS

D0501. 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 is 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 increased. Because ships' electrical/electronic systems are ungrounded, personnel and equipment may easily become a path to ground in cases of faulty wiring, resulting in injury or death or damage to equipment.

c. Refer to reference D5-1 for further guidance.

D0502. DEFINITIONS

a. **"Electrical equipment"** shall include generators, electrically powered machinery and mechanisms, power cables, controllers, transformers, and associated equipment.

b. **"Electronic equipment"** shall include radars, sonars, radios, power amplifiers, antennas, electronic warfare equipment, computers, and associated controls and peripherals.

D0503. ELECTRICAL PRECAUTIONS

a. **General Precautions for Portable Electrical Equipment.**

Portable electrical equipment is any device that may be plugged into the ship’s electrical power. All personnel using portable electrical tools shall:

(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/use. Inspect electrical safety gloves prior to storage and store them so they are protected from damage. Do not use electrical safety gloves for cleaning, painting, or any purpose other than electrical work.

(4) Wear eye protection when working where particles may strike the eyes.

(5) Wear hearing protection (earplugs and/or circamaural muffs) 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/damaged plug.

(8) Ensure that the on/off switch is in the "off" position prior to inserting/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 tripping hazard.

(12) Never pick up the tool by the electrical cord.

(13) When drilling/cutting through bulkheads, check the opposite side for cables and pipes.

(14) Only use electric equipment in explosive atmospheres if the equipment is approved for such use (explosion-proof or intrinsically safe).

(15) Do not allow cords to run through hatches, chemicals, scuttles, or watertight doors or over sharp objects or hot surfaces.

(16) Do not join more than two 25-foot extension cords together.

(17) When it is necessary to run electrical leads through doors or hatches, protect the cord to guard against accidental closing of the door or hatch.

(18) Return portable electrical power tools, drop cords, and extension cords, to the proper location to prevent damage to the equipment.

(19) Visually inspect portable cables for any signs of an unsatisfactory condition, such as tears, chafing, exposed insulated conductors, and damaged plugs and receptacles. Cables shall be of the proper length and cross-sectional area.

(20) Use only 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. 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 multipurpose extension light (NSN 9G 6230-00-701-2947).

(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 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 without the commanding officer's permission and only per paragraph B0705 of this manual.

e. Always de-energize and "tag-out" with red "**DANGER, DO NOT OPERATE**" tags, installed electrical equipment before starting any maintenance or repair. Test for energized circuits per reference D5-1.

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.

k. Ensure that "dead-man" switches work properly when installed.

l. Use an authorized voltage meter to test whether equipment or circuits are energized.

m. Never remove overload relays except for replacement or preventive maintenance.

n. Follow all safety precautions in reference D5-1 when working on energized circuits or equipment.

o. Use skin and eye protection when working with wet cell batteries.

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 shall be of the proper length and cross-sectional area. Do not use spliced portable cables except in emergency conditions, as outlined in reference D5-1.

q. Only install fuses of the rating specified on a fuse box or panel. Do not over-fuse. Identify fuse panels that are missing fuse-rating labels.

r. Do not connect single-phase 115 volt (v) mobile equipment, permanently located and energized more than 50 percent of the time (copiers, personal computers and their peripherals, vending machines, and money machines) to the ship's isolated receptacle circuits. Connecting this equipment to the ship's isolated receptacle circuits may overload the circuits, resulting in fire hazards. Connect equipment of this type to a separate single-phase circuit through an isolation transformer supplied by the lighting distribution system. See reference D5-1 for temporary modifications to power such mobile equipment.

s. Do not use aluminum or metal portable ladders when working on electrical equipment.

t. Use only Navy-approved power strips for computer equipment, printers, and peripherals. Never use power strips in series (connected one to another).

u. Wear skin and eye protection when changing out battle lantern batteries.

v. Never rewire bunk fans or lights or use bunk light wiring to install receptacles or other electrical equipment.

w. Do not use non-government owned or contractor’s electrical equipment, extension cords, tools, or lights without the commanding officer’s permission.

D0504. 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 batteries (VLRAs)).

(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 (i.e., insulated carrying tray) to ensure that no tools or equipment are dropped between battery cells.

(f) Tools used in the battery compartment shall 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 VLRAs).

(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 used (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 VLRAs). Hydrogen gas is not expected if a submarine VLRA 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 VLRAs).

(4) Hydrogen is emitted from lead acid batteries during discharge, stand, or charge, and therefore must be continuously ventilated (not applicable to VLRAs). When submarine VLRA 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 D5-2 for details (not applicable to VLRAs).

(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 VLRAs).

(9) Refer to D5-2 and D5-3 applicable technical manuals and shipboard operating procedures for battery operating and maintenance procedures (reference D5-2 is not applicable to VLRAs).

b. Equipment Batteries

(1) Mercury batteries shall not be used in nuclear submarines without approval of COMNAVSEASYSCOM.

(2) Lithium batteries shall not be used aboard ship without specific approval of COMNAVSEASYSCOM per reference D5-3.

(3) Primary batteries, especially mercury and lithium batteries, shall never be punctured, incinerated, compacted or recharged.

(4) Dispose of mercury and lithium batteries promptly as used hazardous material, in accordance with reference D5-1, reference D5-4 and the ship's hazardous material instructions or procedures.

(5) Remove batteries from equipment before shipment or storage. Cover terminals of batteries with an insulating material to prevent short circuits.

(6) Store spare and used batteries in an adequately ventilated and cool fireproof area.

(7) Turn battery switch off when equipment is not in use or after the battery fails to operate the equipment.

D0505. ELECTRICAL FIRES

a. For electrical firefighting procedures, see reference D5-5.

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 PORING WATER ON THE BATTERY. THE HYDROGEN AND OXYGEN GENERATED BY ELECTROLYSIS COULD PRODUC A VIOLENT EXPLOSION.

c. Electrical Fire Prevention

(1) Keep electric motors and generators clean.

(2) Ensure proper maintenance is performed on electrical equipment.

(3) Report overheating or arcing of any electrical equipment.

(4) Keep air filters clean.

(5) Do not overfuse.

D0506. 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. Volt for volt, direct current (DC) potentials are normally not as dangerous as alternating current (AC) as evidenced from the fact that reasonably safe "let-go currents" for 60 hertz alternating current is 9.0 milliamperes for men and 6.0 milliamperes for women, while the corresponding values for direct current are 62.0 milliamperes for men and 41.0 milliamperes for women.

(1) **Symptoms of Electrical Shock.** 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 shall not, necessarily, be considered as rigor mortis. Therefore, artificial respiration shall be administered immediately, regardless of body stiffness, as recovery from such a state has been reported. Consequently, the appearance of rigor mortis shall 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.

All electronic and electrically trained personnel shall be trained annually in cardiopulmonary resuscitation (CPR) procedures by an instructor certified by an authorized agency, such as the American Red Cross or the American Heart Association.

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) When attempting to administer first aid to an electrical shock victim, proceed as follows:

(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 yourself 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, inform controlling station of casualty, 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.

D0507. ELECTRONIC PRECAUTIONS

a. Definitions

(1) **Repair**. 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**. Alignment, adjustment, tuning, or trouble shooting of malfunctioning equipment per published maintenance or technical manual procedure.

(3) **Preventive maintenance**. Alignment, adjustment, tuning, or testing of operational equipment to ensure performance within published maintenance card 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 you are using approved procedures from technical manuals or other documentation, or an emergency condition exists and the commanding officer has granted permission to perform such repair. In such an emergency, trained personnel shall accomplish the repair of energized circuits and an experienced technician or officer shall supervise. Electronic repair personnel should observe the safety precautions in reference D5-6.

c. Corrective maintenance on energized electronic equipment is authorized when done according to published maintenance or technical manual procedures. Freelance corrective maintenance (i.e., maintenance without a procedure) on energized electronic equipment shall be performed ONLY with the specific permission of the commanding officer. Refer to reference D5-1 for specific safety instructions when performing work on energized equipment.

d. Preventive maintenance on energized electronic equipment is authorized when it is according to a published maintenance requirement card or technical manual procedures. Refer to reference D5-1 for specific safety instructions when performing work on energized equipment.

e. Perform preventive or corrective maintenance on energized electronic equipment only when duly authorized and trained on that type of equipment. Refer to reference D5-1 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:

(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, maintenance requirement card, 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 D5-7.

(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 shall 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 you are familiar 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.

(4) Do not touch a conductor or electronic component unless you have proven it 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 reference D5-1 and reference D5-6 for additional precautions regarding electric systems.

D0508. TAG-OUT PRECAUTIONS

Tagging out of electrical or electronic energy sources shall be conducted in accordance with reference D5-8.

CHAPTER D5

REFERENCES

D5-1. Naval Ships' Technical Manual (NSTM) 300, Electrical Plant General

D5-2. Naval Ships' Technical Manual (NSTM) 223, Submarine Storage Batteries, Lead Acid Batteries

D5-3. NAVSEA S9310-AQ-SAF-010, Navy Lithium Safety Program Responsibilities and Procedures

D5-4. OPNAVINST 5090.1B

D5-5. Naval Ships' Technical Manual (NSTM) 555, Submarine Firefighting

D5-6. NAVSEA SE 000-00-EIM-100, Electronics Installation and Maintenance Book (EIMB), General Handbook

D5-7. Naval Ships' Technical Manual (NSTM) 634, Deck Coverings

D5-8. NAVSEA S0400-AD-URM-010, Tag-Out Users Manual (TUM)

CHAPTER D6

SHIPBOARD FUELS

D0601. DISCUSSION

a. Fuels are used aboard submarines to power emergency auxiliary equipment. The biggest hazard with shipboard fuels is explosion and fire. Other hazards include asphyxiation, body burns, dermatitis, eye and respiratory difficulties, and environmental hazards.

b. 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 operational risk management (ORM) review per reference D6-1 before refueling operations and mitigate risks, as feasible.

D0602. 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. Only approved fluorescent fixtures are permitted in areas in which fuel is handled.

c. Ensure forced ventilation is in operation during fueling or venting operations.

d. Always ventilate fuel tanks 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 fuel tank to aid an unconscious crewmember without permission, an emergency breathing apparatus (EAB) as respiratory protection, and a back-up person standing by. The back-up person shall 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 hazardous material (HM) or oil spill clean-up equipment and procedures. Dispose of fuel contaminated materials as directed by the HM 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 in accordance with local HM 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.

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 in accordance with 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 in accordance with reference D6-2. The purpose is to prevent flammable liquids from spraying over a greater area or contacting hot surfaces in the event a leak occurs.

CHAPTER D6

REFERENCES

D6-1. OPNAVINST 3500.39B

D6-2. Naval Ships' Technical Manual (NSTM) 505, Piping Systems

CHAPTER D7

WELDING, CUTTING, AND BRAZING

D0701. 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, 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, 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

(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:

(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

(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 (GTA) welding

(c) Torch brazing

(d) Ferrous metal grinding with abrasive disks.

D0702. 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, are required by reference D7-1, the industrial hygiene survey, or other applicable reference. A respirator may be required if indicated by the respirator program manager (RPM).

(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 and apron while welding. Helmets and welding shields shall 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 shall be dry and in good condition.

(7) Consult with the RPM for specific guidance regarding respirator needs or selection. Cartridge respirators, when properly selected (see chapter B6 of this manual), will protect against the metal fumes generated during welding. They do not provide oxygen, which may be necessary when working in a confined space. If sufficient ventilation is not available, they will not protect against hazardous gases which may be generated during welding; particularly metal inert gas (MIG) and tungsten inert gas (TIG) welding. Where either condition exists, use a supplied-air respirator. Consult the RPM about respirator use and selection.

(8) To protect passers-by from ultraviolet (UV) arc flash and combustible materials from sparks, use NAVSEA-approved welding curtains or panels as defined in reference D7-1.

b. Space Precautions

(1) Observe the following precautions 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 reaccumulation of such materials. For welding in spaces in which explosive materials are located (e.g., torpedo rooms, missile compartments, etc.) refer to reference D7-2.

(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 D7-1 meets this requirement. If openings cannot be covered, post a fire watch on the far side.

(g) Blank-off ducts 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 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 spaces, including adjacent spaces (especially if those tanks contained flammable liquids or vapors) if these spaces are identified as a confined space per chapter B8 of this manual.

(3) Obtain the commanding officer's permission before starting hot work underway (command duty officer, 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 follows:

(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 shall 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 shall stand watch for 30 minutes after hot work is completed.

(c) For **Class-II hot work**, a commanding officer’s representative (normally the command duty officer, engineering officer of the watch, or engineering duty officer) shall 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) shall stand watch for 30 minutes after hot work is completed.

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 shall determine the need for a fire watch.

(d) When a fire watch is not required for Class-II hot work, the hot worker shall have the appropriate fire extinguishing equipment available. The hot worker may leave the site after hot work is completed and after he/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 shall stand watch for 30 minutes after the hot work ends.

(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 D7-1.

(h) Equip fire watches with personal protective equipment (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 shall use are specified in reference D7-1.

(6) Provide ventilation as specified in reference D7-1, industrial hygiene 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 shall 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/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 radiography 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.

(3) Always return cylinders to the proper storage when work is completed and ensure cylinders are secured in place by metal retaining collars, if installed.

(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 your shoulder or other parts of your 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 welding supply cable from the welding machine.

(8) When using portable machines, ensure that the primary supply cables are separately laid 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 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 it is necessary to carry 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 open to prevent damage to welding cables.

(12) To prevent short-circuiting, protect welding equipment used in the open from weather conditions (e.g., rain, snow, sleet, spray).

(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.

CHAPTER D7

REFERENCES

D7-1. Naval Ships' Technical Manual (NSTM) 074, S09086-CH-STM-010, Welding and Allied Processes

D7-2. NAVSEA OP 4, Ammunition and Explosives Safety Afloat

CHAPTER D8

MACHINERY

D0801. 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. The purpose of this chapter is to define 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 accidents.

c. Except in emergencies, and then only when no qualified operator is present, no person shall operate, repair, adjust, or otherwise tamper with any machinery unless assigned by a competent authority, (for example, officer-of-the-deck (OOD), command-duty-officer (CDO), or engineering-duty-officer (EDO)), to perform a specific function on such machinery. No person shall 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.

D0802. GENERAL PRECAUTIONS

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, including any rings or watches, neckties, pagers, cell phones, or loose fitting clothing while operating machinery.

d. Wear proper protective clothing and equipment suited to the operation being performed (e.g., hearing protection, eye, hand and foot protection, dust and paint respirators, if indicated by the respiratory protection manager (RPM).

e. Do not wear polyester or other synthetic clothing when operating fuel fired equipment (in particular, no engine room or fire room personnel may wear such clothing) or while standing watch or performing maintenance in main propulsion spaces.

f. Engine room and fire room personnel shall wear fire retardant coveralls, with sleeves rolled down, when on watch or when performing maintenance in machinery spaces where steam is circulating in the piping systems or fuel fired machinery is in operation. In nuclear propulsion spaces in submarines, engineering department personnel shall wear long-sleeve navy uniform shirts or navy uniform coveralls with sleeves 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.

g. Observe manufacturer's safety precautions in the material safety data sheet (MSDS) and warning labels when handling flammable or toxic liquids; in particular, ensure that ventilation is adequate and wear appropriate personal protective equipment, such as eye protection and respirators, if indicated by the RPM.

h. Use only hand tools and work lights that are in good material condition. Electrical tools and lights shall 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.

i. Ensure that equipment is de-energized and/or depressurized and properly DANGER-tagged before attempting to perform repairs or preventive maintenance.

j. Ensure machinery, hand tools, and electrical equipment are properly grounded prior to operation.

k. 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 ship's electrical officer.

l. 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 pounds per square inch (psi) and that a proper safety shield tip is used. Wear safety goggles, hearing protection, and proper respiratory protection, if indicated by the RPM, when using compressed air for approved cleaning.

m. Hazardous materials (HM) are frequently used in the operation and maintenance of machinery. Refer to chapter D15 for safety precautions associated with HM.

n. Supervisors shall ensure that anyone who incurs any type of injury or who is exposed to any occupational hazard receive prompt medical attention.

o. 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.

p. Be aware of asbestos thermal insulation and asbestos-containing materials. Ensure proper training, handling/disposal requirements are followed (see chapter B1). Asbestos fireproofing material is still common aboard some ships and asbestos can be found in sheet gaskets, spiral-wound (flexitallic) gaskets, pipe hangers, clutch plates, brake pads, and some lagging.

D0803. MAINTENANCE

Ensure that all installed safety devices, alarms, and sensors are inspected and/or tested following scheduled preventive maintenance system (PMS) and other type commander 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 HM 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. Continuously monitor fire and flooding alarm panels. No alarm or flag shall be allowed to go uninvestigated. Alarm panels known to give false or spurious indications shall 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) shall 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/or vents before loosening manhole or handhold plates or flanges. Stand clear of such fittings when initially opening them after service.

D0804. 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/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/system is again set in operation.

(8) Be sure all personnel are clear before starting any industrial tools or equipment.

(9) Ensure there is plenty of light to work by before operating a machine. Incandescent lights must be used for machines with visible rotating shafts or chucks to avoid the stroboscopic (appearance of being stationary) effect from fluorescent lights.

(10) See that tools and work are properly clamped before starting a machine.

(11) 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.

(12) 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.

(13) 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.

(14) Ensure that operating controls are protected by recessing, guarding, location, or other effective means against unexpected or accidental activation of the machine.

(15) 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.

(16) 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.

(17) Ensure non-skid strips are installed on the deck (in the operator's work area) in front of permanently mounted machine tools.

(18) 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 that 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 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 personal protective equipment, 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.

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:

(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 counterweights 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. Secure all bar and sheet-metal stock and do not handle or move while underway.

(5) Inspect foundation bolts of heavy equipment annually in accordance with 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.

(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 shall 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, 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 shall 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 that 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 one-fourth 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 two 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), except as follows:

1. When wheels are two 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.

D0805. TRASH COMPACTOR/TRASH DISPOSAL UNIT

The following is a list of precautions applicable to the submarine trash compactor:

a. When working with disposable cans, wear work gloves (e.g., Kevlar®). Be careful of any sharp edges.

b. Keep unit clean and sanitary.

c. Do not load wet garbage or liquids into the trash compactor. Drain excess liquids from containers that are to be compacted.

d. Do not put rigid materials, such as thick metal or wood, into the compactor.

e. Ensure that disposable cans are properly formed to prevent hang-up in or damage to the trash disposal unit muzzle ball valve mechanism.

f. Do not attempt to service the compactor while it is in operation. Ensure that the hydraulic supply isolation valve is shut and DANGER tagged in accordance with the tag-out procedures.

g. Do not modify interlocks to operate the trash compactor without closing the cover.

h. Wear eye protection, work gloves (e.g. Kevlar®), and a rubber apron when operating the trash compactor.

i. Ensure legible operating instructions are posted for the trash compactor and trash disposal unit.

j. For SSBN/SSGN 726 class trash compactors:

(1) Before unlatching the retainer doors, ensure that the safety hood (cover) is raised.

(2) Do not place hands under the ram unless the safety hood (cover) is raised and the hydraulic supply isolation valve is shut.

(3) 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.

(4) Do not operate the ram with the doors open.

(5) 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.

k. For other submarine trash compactors:

(1) Pin lock the hydraulic control valve in the NEUTRAL position to prevent inadvertent operation while loading the compactor.

(2) Prior to compacting, ensure that the disposable container is in full contact with the retainer to prevent container distortion during compacting.

(3) Prior to compacting, ensure the retainer is securely latched in place so the ram will be unobstructed when it is lowered.

(4) 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.

CHAPTER D9

SANITATION SYSTEMS

D0901. DISCUSSION

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. Sanitation systems hold raw sewage until it can be discharged overboard beyond three nm from any coastline or to a pier connection.

D0902. GAS FREE ENGINEERING FOR SANITATION SYSTEMS

WARNING

The crew shall not open the manhole or enter a sanitation tank at any time unless this is done at a suitable industrial facility and all tank cleaning and gas free requirements are met. If problems develop preventing system operation, that require such tank access for correction, divert all drains overboard and secure the system until proper facilities are available or use redundant/backup sanitary systems, if installed, reference D9-2.

a. Do not open or enter a sanitary tank or remove a component which will leave an opening to the tank unless inspected and certified by a gas free engineer (GFE), or National Fire Protection Association (NFPA) marine chemist, since toxic and explosive gases may exist in the tank.

b. Observe a no smoking regulation. Do not allow open flame, ordinary electric lights, flashlights, regular tools, or sparking electrical apparatus in or near an open tank or piping system.

c. Recertify (gas free) open sanitary tanks at least every four hours. Personnel must recognize that even though a tank may be certified gas free, toxic gases can remain in the sludge blanket and could be released when the blanket is disturbed.

d. Before opening a tank in any manner, or removing any valves or components below the highest level of the tank overflow, wear proper respiratory protective equipment (see

chapter B6 for respiratory protection requirements or consult the respiratory protection manager (RPM).

e. Utilize continuous net exhaust ventilation in accordance with reference D9-1 after opening tank. Ventilation should be sufficient to provide a change of air in the tank every three minutes. Avoid contamination of the air compressor or ventilation intakes.

f. Do not weld or perform hot work inside or outside the tank without a GFE determining that the tank is safe for hot work. After welding is complete, inspect the coating for heat damage and repair as necessary.

g. See reference D9-2 for additional information and precautions.

D0903. SUBMARINE SANITATION SYSTEMS

a. **Control of Toxic Gas Hazards.** To minimize the potential hazards resulting from the release of toxic gases from the sanitation system, observe the following precautions:

(1) 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.

(2) Always assume that the sanitary tank and piping systems contain sewage and toxic gases, and have an oxygen-deficient atmosphere. Be especially attentive for 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 will desensitize the sense of smell over time. As the H_2S concentration increases, the degree of danger increases.

(3) Never enter the tank or open the manhole access at any time unless at a suitable industrial facility, and only after certification by a GFE, industrial hygienist (certified GFE) or National Fire Protection Association (NFPA) certified marine chemist.

(4) 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.

(5) Always recheck gas levels in the tank before reopening the tank or piping to replace repaired components if more than two hours have elapsed since the tank was last certified gas free (one hour if the ambient temperature is above 90 degrees Fahrenheit).

(6) If levels of gases have climbed above acceptable limits, repeat flushing procedure.

(7) Wear proper supplied air respiratory protective equipment, an emergency air breathing (EAB) device when replacing components, as indicated by the RPM.

(8) 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.

b. **Safety Precautions for Sanitary Systems.** After completion of sewage-transfer-hose blowdown or seawater-flushing, ensure transfer hose is depressurized. Close discharge valves prior to disconnecting sewage hose.

c. **Safety Requirements for Sanitary Systems Maintenance**

(1) Do not attempt sanitary system maintenance until the safety requirements and precautions have been thoroughly read and understood and only use the specific procedures for this maintenance outlined in the ship's system manuals (SSM), applicable uniform industrial process instruction (UIPI) or other approved Naval Sea Systems Command (NAVSEA) document. If these procedures cannot be followed due to some equipment malfunction, maintenance shall be deferred until a suitable industrial facility/service becomes available.

(2) If maintenance not requiring tank entry calls for equipment to be removed which will leave an opening in the tank, or calls for the removal or disassembly of any valve or piping component or anywhere below the highest point of the sanitary tank overflow piping, observe the following safety precautions:

(a) Post a safety watch with a spare supplied air respirator (EAB device) at the access.

(b) Ensure that the installed ventilation system is operating properly and that the compartment access is open.

The submarine's GFE shall determine if any additional temporary ventilation is required.

(c) Flush the tank and piping.

(d) Immediately seal openings using either blank flanges or a suitable sealing device.

(e) Have a GFE recheck the tank atmosphere using a proper supplied air respirator (EAB device) before replacing failed components if more than two hours have elapsed since the tank was last certified gas free (one hour if ambient temperature is above 90 degrees Fahrenheit). If levels have climbed above acceptable limits, repeat flushing procedure until acceptable levels are obtained. Equipment or components can then be replaced using proper respirators.

(f) Wash down the area with hot potable water and stock detergent.

WARNING

NEVER ASSUME A TANK IS EMPTY OR IS NOT DANGEROUS BECAUSE THE TANK HAS NOT BEEN IN USE.

D0904. SANITARY, HYGIENIC, AND SAFETY PROCEDURES

a. Hygienic Procedures. The following hygienic procedures are applicable to all submarine sanitation systems:

(1) If connecting or disconnecting sewage transfer hoses, do not subsequently handle potable water hoses without a thorough wash-up (hands, lower arms, and face in that order) with hot soap and water.

(2) Wear appropriate personal protective equipment (e.g., rubber gloves, rubber boots, chemical splash goggles and faceshield, and disposable coveralls), while connecting or disconnecting sewage hoses.

(3) Do not smoke, eat, or drink prior to a thorough wash-up with hot water and soap after working on sanitation systems.

(4) 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 reference D9-3.

(5) Verify that health warning placards are posted in appropriate locations, identifying procedures to be followed in those areas.

b. Maintenance Procedures

(1) Wear appropriate personal protective equipment (e.g., rubber gloves, rubber boots, chemical splash goggles and faceshields, and disposable coveralls) when performing maintenance which requires disassembly of sewage equipment or when contact with sewage is possible.

(2) Wash down the area and components with hot potable water and stock detergent and rinse with seawater or fresh water upon completion of maintenance.

(3) When sanitation system maintenance is complete, place protective clothing contaminated with sewage in two plastic bags for transport to the laundry. Use dissolvable bags plus an outer fabric or plastic bag, where possible, to prevent contact with sewage contamination. Place disposable TYVEK® coveralls in plastic trash bags for disposal.

(4) Wash rubber boots and gloves in hot potable water and stock detergent, and rinse with an approved disinfectant solution.

(5) Launder sanitary-soiled fabric protective clothing separately from other laundry items in 160° Fahrenheit minimum water temperature or water containing a disinfectant such as bleach.

(6) Never walk through living, eating, working, or any manned spaces while wearing protective clothing, boots, or gloves that were worn while working on sanitary systems.

(7) Thoroughly wash hands, lower arms, and face, in that order, with hot water and soap, using the nearest wash-up facilities following maintenance.

c. 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, damage control assistant, and the medical department representative (MDR).

(2) Secure the spill area from traffic.

(3) Test the area for explosive/combustible and toxic gases including hydrogen sulfide (H_2S), carbon dioxide (CO_2), and methane (CH_4). If the area is free of gases, use of respirators is not required; however, maintain EABs readily available at the scene.

(4) Remove spilled sewage and wash down with water and stock detergent.

(5) The MDR must certify the space as clean and sanitized. If food service, berthing, or medical spaces are involved, the MDR shall ensure they are washed down with an approved disinfectant.

(6) The MDR shall ensure personnel involved in the cleanup operations have current immunizations.

d. Sewage Transfer Operations

(1) Wash with hot potable water and stock detergent, and rinse with sea water or potable water, all deck discharge connections, components, and immediate deck areas each time sewage transfer operations are terminated and the sewage hose is disconnected.

(2) Check the discharge connection periodically during sewage transfer operations to ensure that the connection is intact and that an unsanitary condition is not developing.

e. Contaminated Bilges

(1) Bilges contaminated with sewage wastes shall be pumped out, washed down, and pumped out again.

(2) If potable water tanks form the deck or any boundary of the bilge, daily monitor the water from those tanks

for coliform contamination. Continue monitoring until it is assured that sewage contamination of the tanks has not occurred.

(3) If the potable water system is suspected of being contaminated, secure the appropriate tanks until the problem is corrected and the water is determined to be safe for consumption.

(4) Refer to reference D9-4 prior to any discharging overboard.

D0905. DISCHARGE REQUIREMENTS and ADDITIONAL GUIDANCE

a. Refer to reference D9-4 prior to any discharge of sewage overboard.

b. See reference D9-2 for additional guidance and information related to submarine sanitation systems.

CHAPTER D9

REFERENCES

D9-1. Naval Ships' Technical Manual (NSTM), NAVSEA S9086-CH-STM-030/CH-074 V3, Gas Free Engineering

D9-2. Naval Ships’ Technical Manual (NSTM) 593, Pollution Control

D9-3. BUMEDINST 6230.15, Immunizations and Chemoprophylaxis

D9-4. OPNAVINST 5090.1B

CHAPTER D10

HEAVY WEATHER

D1001. DISCUSSION

a. Heavy weather is any weather that results in high winds, extreme sea states, heavy rains, snow and/or 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 potential dangerous environment.

b. A multitude of hazards may occur in heavy weather. Objects can slide and 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.

D1002. SAFETY PRECAUTIONS WHILE IN PORT AND/OR MOORED

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 command duty officer's permission and ensure temporary lifelines are rigged prior to dismantling. Keep lifelines and stanchions in good repair.

b. Keep complete floating lifelines rigged at all times while moored. Keep floating lifelines in good repair.

c. Keep a Jacob's ladder rigged from the ship's safety track or cleat to the waterline 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 that gear adrift topside is removed at all times and report any unsafe conditions to the immediate supervisor.

e. Topside watchstanders inport shall wear approved topside shoes when standing watch on board the submarine vice on the pier.

f. Topside watchstanders shall be secured to the ship and/or wear an authorized life preserver after dark, in inclement weather, and at other times prescribed by the command duty officer 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 and/or install wire rope lines. Forward and after wire rope night riders may also be used.

D1003. OPEN OCEAN OPERATIONS

a. Based on the consideration of personnel safety, sending personnel topside in open sea should be authorized only for emergency situations, sea air rescue operations, and extreme tactical necessity.

b. The officer of the deck (OOD) should 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 shall 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 cranial helmet and a fibrous life preserver will minimize potential injuries when striking the hull or deck if washed overboard.

CHAPTER D11

ABANDONING SHIP

D1101. SAFETY PRECAUTIONS DURING ABANDONING SHIP

a. Follow the specific safety procedures/precautions in the ship's abandon ship casualty bills as delineated in the ship systems manual (SSM).

b. Wear a full set of clothing including shoes and a soft cap or head covering as protection from exposure.

c. If the ship has received submarine escape immersion equipment (SEIE) suits, all personnel should don a SEIE suit prior to abandoning ship. Otherwise personnel should use an inherently buoyant type life preserver, if available. Do not inflate auto-inflatable life preservers until the wearer is in the water. Inflate the life preserver as soon as wearer is in the water.

d. Do not dive; always jump feet first, with feet and legs together and arms across the chest.

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 drift of ship.

g. When in the water, stay calm and do not panic. Obey the following rules:

(1) Conserve energy by moving as little as possible.

(2) 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.

(3) If a danger of underwater explosion exists, float or swim on the back as near the surface of the water as possible

(4) Stay 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.

(5) If ship is sinking rapidly, swim clear promptly, and tow injured persons clear, to avoid suction effect.

CHAPTER D12

PAINTING AND PRESERVATION

D1201. DISCUSSION

a. For application and removal precautions for lead containing paint, see chapter B10. This chapter deals exclusively with the application and removal of non-lead containing paint.

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 submarine material control list (SMCL) provides additional guidance for cautions associated with submarine atmosphere control. See reference D12-1 for detailed procedures and precautions for painting.

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.

D1202. SAFETY PRECAUTIONS FOR PAINT REMOVAL

a. Ship's force shall 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 respiratory protection manager (RPM) 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. Assume all paint contains toxic substances, such as lead or chromate, which are hazardous to your health if ingested or inhaled in small amounts, unless proven otherwise by sample analysis. (See chapter B10 for sample analysis procedures.)

e. 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.

f. Ensure that all personnel involved in paint removal wear disposable coveralls, hand protection, and other personal protective equipment (PPE) as required.

g. Provide ventilation during paint removal for personnel due to airborne particles and vapors. If industrial hygiene surveys identify that respirators are required to provide additional protection, follow the recommendations of the RPM and the requirements of chapter B6 regarding the use and care of respirators.

h. 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 and/or plastic.

i. At the end of the work shift personnel shall vacuum debris and all surfaces in the area with high efficiency particulate air filter (HEPA) equipped vacuum cleaner. Vacuum coveralls and gloves prior to removal.

j. Personnel shall minimize the use of water during paint removal to control dust, since any used in the operation must be treated as used hazardous material.

k. 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 hazardous materials.

l. Wipe down tools and surfaces in the work area after completion of the task.

D1203. 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 RPM about any respirator requirements for the operation. If lead-containing paint 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. Refer to paragraph D1502 for requirements associated with receipt of paint.

c. Do not paint in any area where welding is being performed.

d. Use pneumatic, not electric power, wire brushes and chipping tools when working over the side.

e. Consult the RPM 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 RPM.

NOTE:

Aerosol paint cans are not permitted within the submarine for use or storage.

f. When working over the side or aloft, see chapter D4 for additional precautions.

g. Bring only one 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. Do not smoke when painting. Post "NO SMOKING" signs in the area(s) being painted. If painting with vinyl, saran, or other explosive or toxic vapor paints, observe the following additional precautions:

(1) Fly the BRAVO flag from the sail.

(2) Do not permit smoking on board, topside, or below decks.

(3) Do not permit smoking or hot work within 50 feet of the ship. Post signs on the pier "DANGER-SPRAYING WITH VINYL."

(4) Notify adjacent ships.

(5) Take precautions to prevent vapor pocketing in low points. Shut and dog hatches. Shut induction and exhaust valves.

(6) A petty officer shall supervise painters.

(7) All personnel within 15 feet of vinyl painting or mixing operations shall wear respiratory protection as directed by the RPM.

(8) Painters shall have no spark-producing materials on their person.

(9) Ground spray guns.

j. Provide ventilation in closed areas when painting.

k. Wear protective gloves when handling cleaning compounds, thinners, paints, removers, or other irritants.

l. De-energize all equipment in areas being painted, as appropriate.

m. Provide explosion proof lighting during spray-painting operations.

n. Remove all paints and thinners from the ship when taking a lengthy break. Upon completion of painting, properly dispose of unused paint and waste.

o. Wear electrical safety gloves when using portable, electric powered tools. See chapter D5 for additional precautions when using electrical power tools.

p. All paints, paint cleaners, solvents and brush cleaners are hazardous materials. Refer to chapter D15 for hazardous material storage, use, and disposal procedures.

q. 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.

r. Terminate all internal painting with oil-based paints five days prior to sealing the ship. Terminate painting with latex or water based paint three days prior to sealing the ship.

s. 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.

t. 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 shall report to the medical department for evaluation.

u. Do not allow food or drink in the paint area. When handling painting materials, take care to wash hands prior to eating, drinking, smoking, or using the head.

v. 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/roller application of paint is being performed may be considered, provided that:

(1) The painting operation involves only minor (touch up) operations.

(2) There is no hot work within 25 feet of painting operation while using surface ventilation lineup, unless separated by a watertight bulkhead.

w. For paint removal from special hull treatment (SHT), refer to the SHT technical manual, reference D12-2 and D12-3, for specific guidance and safety requirements.

x. 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.

_____

CHAPTER D12

REFERENCES

D12-1. Naval Ships' Technical Manual (NSTM) 631, Painting and Preservation of Ships

D12-2. NAVSEA S6360-AD-HBK-010, Technical Handbook for Special Hull Treatment Maintenance and Repair for Submarines

D12-3. NAVSEA 6310-081-015, Submarine Maintenance Standard (Submarine Preservation)

CHAPTER D13

FOOD PREPARATION AND SERVING FACILITIES

D1301. DISCUSSION

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. Additional precautions may be found in references D13-1 and D13-2. Personnel assigned to permanent and temporary work in food service areas shall be given a copy of these precautions prior to beginning their assignment.

D1302. GENERAL PRECAUTIONS

Before attempting to operate machinery, observe the following general precautions:

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 your 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. Observe and follow posted operating instructions and safety precautions.

e. If there is any doubt about operating procedures or safety precautions, ask your supervisor.

f. Only authorized personnel shall 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 your hands or body to stop moving blades and parts even if power has been turned off.

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, turn off nonessential machines.

k. Use safety equipment such as protective gloves, eye protection, and dip baskets while handling chemicals or hot water. Personnel at the deep sink shall wear rubber gloves with elbow-length sleeves to prevent hot water burns.

l. Keep your 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, turn off power and DANGER tag-out equipment or unplug, if not hardwired. If in doubt about the requirement to tag-out any equipment, consult your supervisor.

p. Ensure only authorized 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. Ensure that permanently mounted equipment is hardwired (extension cords are not authorized for use). Know where to isolate power for hard-wired equipment.

t. If the ship will be taking steep 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.

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.

D1303. COOKING UTENSILS

a. Ensure that all heavy items, knives, and other sharp tools are securely fastened and stowed in racks to prevent injury to personnel.

b. Secure all coffee pots and urns to prevent dislodging and splashing.

c. 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.

d. Never leave drawers, doors, or access panels open where they could become hazardous to personnel.

e. Never leave operating hot plates, pots, griddles, steam kettles, or fryers unattended.

f. Be careful not to place meat, vegetables, or other foods on a knife or other sharp instrument. The food may conceal the cutting edge.

g. Do not place knives in the wash water until ready to wash them. Lay them in plain view beside the sink.

h. Keep your free hand away from the sharp edge of the cleaver when chopping foods.

i. Use a protective glove (e.g., metal fiber or Kevlar®) when boning meat.

j. Use a scoop or perforated serving spoon to handle shrimp.

k. Store utensils in their proper places.

l. Do not allow pot/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.

m. 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.

n. Use only the proper implements for opening cans and other containers.

o. Hold knives firmly. Ensure knife handles are dry or free of grease before handling them.

p. Only keep knives in a rack designated for this purpose.

q. Magnetic knife racks are prohibited due to knife magnetism picking up foreign material.

r. Keep knives sharp at all times.

s. Never handle a knife while carrying another object.

t. Ensure hot pads are clean and dry.

u. Keep all tools clean and dry.

D1304. FOOD PREPARATION

a. Practice good personal hygiene at all times, and report all illnesses and injuries to your supervisor.

b. Keep your hands clean and thoroughly wash hands with soap and water after using the head, touching your mouth or nose, or handling raw meat or fish.

c. Keep fingernails short.

d. Wear appropriate hair covering at all times in food-handling areas.

e. Do not touch food with your bare hands. Use appropriate implements for handling food or wear plastic food handling gloves.

f. Never handle food when you have an infection of any kind on your hands or arms. If you develop a sore throat, cold, intestinal disturbance, or symptoms of other general disease, report to the corpsman at once.

g. Clean up spilled food immediately.

h. Do not use leftovers held over 36 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 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 40 and 140 degrees Fahrenheit for periods longer than three 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 your supervisor immediately if the heat stress dry bulb thermometers read 100 degrees Fahrenheit or greater, or if you experience dizziness, nausea, or other heat related symptoms.

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 D15 for details on handling of hazardous materials and atmosphere contaminants.

D1305. SAFE OPERATION OF EQUIPMENT

a. General precautions. Observe all posted operating procedures for each piece of food service equipment. Additionally, inspect all exposed electrical equipment (range, griddle hotplate, and disposals) for exposed wiring to ensure 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.

(5) Ensure meat slicers are de-energized at the power source, not just turned off with a local switch, prior to dismantling/reassembling for cleaning.

b. Deep Fat Fryer

(1) Beware, this is high voltage equipment.

(2) Extinguish a fire in the deep fat fryer per reference D13-3.

(3) Never leave fryer unattended when in use.

(4) If solid fat is used, do not allow large pieces to drop on heating units or thermostat bulb.

(5) Whenever possible, melt solid cooking oil or fat prior to putting into deep fat fryer.

(6) Ensure heating coils are completely covered with fat before turning on the equipment.

(7) Never exceed the maximum temperature noted by manufacturer.

(8) Monitor cooking oil temperature with a proper thermometer whenever the deep fat fryer is in use. Ensure back up safety thermostat is installed and operational.

(9) Install cover when fryer is not in use.

(10) Secure deep fat fryer following posted instructions when not in use.

(11) Ensure that grease spills are cleaned up promptly.

(12) Wash and change grease filters in range hoods as often as necessary per preventive maintenance system (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 in accordance with 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/detergent, NSN: (6840-00-526-1129).

(8) Reassemble machine after cleaning.

g. 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/behind hot kettles is eliminated.

(5) Ensure steam-jacketed kettles are hydrostatically tested as required by the equipment maintenance requirement card (MRC).

(6) Piping from relief valves shall extend to just inside the deck coaming.

(7) Lagging under steam kettle shall be removed and replaced with perforated steel or aluminum with approximately 1/2-inch stand off.

h. 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.

i. 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.

j. 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/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 yourself. Call the ship's force electrician to correct the wiring.

k. Proofer

(1) Only authorized personnel are permitted to operate this equipment.

(2) Clean the proofer after each use.

l. Dishwashing Machine. Observe operating instructions and safety precautions.

m. Steam Table

(1) Use the proper implements, such as pot holders and tongs, for handling containers.

(2) Tilt containers away from you when inserting them into the wells.

(3) Carry hot liquids in covered containers with the covers securely in place.

(4) Promptly mop up grease which is spilled on the deck. Greasy decks are doubly hazardous. They can cause fires as well as falls.

n. Garbage Grinder

(1) Do not put hands into grinder when in operation.

(2) Start grinder and turn on water before feeding waste.

(3) Feed food waste gradually.

(4) Do not feed metal, wood, cloth, rubber, plastics, or corn husks into the garbage grinder. If such material is fed accidentally, stop grinder immediately and remove object after disconnecting power.

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. Trash Compactor. Refer to chapter D8 for precautions on the operation of the trash compactor.

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. Meat Tenderizing Machine

(1) Never place your hands near the feed slot when feeding material into this machine.

(2) Avoid wearing loose fitting gloves.

s. Potato Peeler

(1) Make sure water is running before operating this equipment.

(2) Never put your hand in this machine while it is operating.

CHAPTER D13

REFERENCES

D13-1. NAVMED P-5010, "Manual of Preventive Medicine", chapter 1.

D13-2. COMNAVSUBFORINST 6000.2, "Standard Submarine Medical Procedures Manual", chapter 6.

D13-3. Naval Ships' Technical Manual (NSTM) 555, Submarine Firefighting

CHAPTER D14

LAUNDRY MACHINES

D1401. DISCUSSION

Hazards in laundry equipment include mechanical equipment, toxic chemicals, electric power, and heat stress. Safety precautions contained in this chapter are basic and general. Ships shall provide personnel assigned to work with laundry equipment with a copy of these precautions prior to beginning their assignment.

D1402. PRECAUTIONS RELATING TO LAUNDRY EQUIPMENT

a. See chapters B3 and D15 for handling and stowage requirements for hazardous materials used in laundries .

b. Personnel shall use protective equipment listed in the material safety data sheet (MSDS) or current industrial hygiene survey when required.

c. Ensure a readily accessible emergency eye wash station is installed in the laundry area.

d. Ensure ventilation systems and spot coolers are functioning in laundry area

e. Ensure all machinery, hand tools and electrical equipment are properly grounded and bonded prior to operation.

f. 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 cylinder 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 deenergized before cleaning or servicing. Use safety tag-out procedures as required by

reference D14-1 and the applicable equipment maintenance requirement card (MRC).

(5) Ensure safety devices, such as the safety interlock on cover, 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) Do not exceed the recommended detergent amount for load size being washed. Excessive soap may cause skin irritation.

(7) Ensure safety precautions and operating procedures are posted.

g. Tumbler Dryer

(1) Turn off power prior to loading and unloading machine.

(2) Never overload the machine.

(3) Only open the door while the tumbler is in motion to complete authorized preventive maintenance system (PMS) requirements.

(4) Before servicing or cleaning, be sure the power to the tumbler dryer is entirely disconnected. Use safety tag-out procedures as required by reference D14-1 and the applicable MRC.

(5) Maintain safety devices in proper working order at all times. If removed for any reason, replace safety devices before machine is put into motion.

(6) 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 is cleaned after every four hours of operation.

(7) Ensure someone is watching the machine while it is running. It is a fire hazard.

(8) Ensure safety and fire prevention precautions and operating procedures are posted.

(9) Never allow the dryer temperature to exceed 160°F (71°C).

_____

CHAPTER D14

REFERENCES

D14-1. NAVSEA S0400-AD-URM-010/TUM, "Tag-Out User's Manual"

CHAPTER D15

SUBMARINE HAZARDOUS MATERIAL CONTROL AND MANAGEMENT STANDARDS

D1501. DISCUSSION

a. Submarine hazardous material control and management (HMC&M) standards address the storage, use, and disposal of all hazardous material (HM). In addition, these standards also provide more stringent control and management guidance for HM since they may be atmosphere contaminants, in accordance with reference D15-1. The inhalation of particulates, vapors, or gases from these materials may severely impact the health and safety of submariners and submarine equipment.

NOTE:

For purposes of this instruction, submarine material (SM) assigned usage categories prohibited (X), restricted (R), or limited (L) have potential of contaminating the submarine atmosphere and as such are considered atmosphere contaminants. SM classified as P shall meet three basic conditions:

(1) Shall be listed in the submarine material control list (SMCL).

(2) Shall not pose a threat to the submarine atmosphere and therefore to the crew.

(3) Shall be evaluated by the Submarine Material Review Board (SMRB).

HM not listed in the SMCL is considered prohibited until properly evaluated by the SMRB.

b. This chapter provides the detailed guidance that submariners need to properly manage and control HM. This chapter supplements the information contained in chapter B3 of this manual, and the other references in this chapter specifically addressing submarine HMC&M processes.

c. Special precautions are required for the stowage, handling, and use of HM aboard submarines. Significant hazards include fire, poisoning by inhalation of toxic substances in

unventilated spaces, dermatitis, asphyxiation, and burns of the skin and eyes. Some materials normally thought to be safe may become hazardous under certain use or storage conditions. This chapter contains general stowage and use standards for all HM, precautions for subcategories of HM (flammable materials, toxic materials, corrosive materials, oxidizers, aerosol containers, and compressed gases) and specific precautions for certain selected materials. Paragraph B0303 of this manual provides information on HM spill response and training.

d. The Submarine hazardous material inventory and management system (SHIMS) is a menu driven HM inventory and management tool for use aboard submarines. SHIMS provides a standardized tool to assist in submarine HM inventory management, shelf-life management, and implementation of submarine atmospheric control requirements including maintaining a submarine material control log and generating atmosphere contaminant tags. SHIMS include the submarine material control list (SMCL) allowing the Sailor to determine the usage category of HM items prior to procurement. SHIMS also provides a single source for submarine MSDS information and policy/guidance references.

D1502. GENERAL HMC&M STANDARDS

a. HM and Submarine Materials Classification and Review Process. Submarine materials (SM) are either non-metallic or toxicologically significant metals (beryllium, cadmium, lead, and mercury) and include HM used in submarine operations, maintenance, and processes. Only SM listed in the SMCL are allowed to be used aboard submarines. The SMCL is the authorized use list (AUL) for submarines. Personnel shall consult the SMCL to verify that all HM brought aboard is allowed or to identify any limitations or restrictions associated with its use. Non-COSAL HM items not listed in the SMCL will be considered "prohibited" and shall not be brought aboard the submarine at any time. COSAL HM items not listed in the SMCL may be brought on-board, however, they shall not be issued to the divisions until Naval Sea Systems Command (NAVSEA) assigns a usage category and includes them in the SMCL. If a requirement exists for a HM item and the material is not listed in the SMCL, the submarine shall complete a SMCL feedback report (SFR) and submit it to Naval Surface Warfare Center Carderock (NSWCCD) code 634 with a copy to NAVSEA 05Z9, and the type commander. NSWCCD shall coordinate with NAVSEA and the Submarine Material Review Board (SMRB) to respond to the SFR. The SFR (NAVSUP 1400/SUB) is found in SHIMS or on the SMCL website at https://smcl.dt.navy.mil. Each SMCL

item is marked with a SM usage category. NAVSEA assigns a usage category to SM based on the SMRB's safety and health assessment of the product. The usage categories are:

(1) **Permitted (N).** SM usage is not restricted on-board submarines at any time.

(2) **Prohibited (X).** SM usage is not allowed on-board submarines at **any time**.

(3) **Restricted (R).** HM 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 shall not be carried on-board submarines in excess of required quantities.

b. HM Requisition. Personnel requiring HM shall obtain this material only through the submarine's supply department. Supply department personnel shall ensure that requisitioned material is authorized onboard in accordance with the SMCL prior to submitting requisition forms. If the requisitioned HM is assigned a restricted usage category, written permission from the executive officer will be required to carry the material onboard during an underway period.

NOTE:

SERVMART purchases of HM shall be reviewed against the SMCL to ensure that the material is authorized onboard. All HM purchased through a SERVMART shall be provided to the supply department for recording in SHIMS.

c. HM Open Purchase. To the maximum extent feasible, submarines shall procure and use standard stock HM.

(1) In the exceptional case for which the stock-numbered product can be clearly demonstrated to be inferior, or due to the urgency of need cannot be satisfied from supply system stock, commanding officers may justify and authorize open market purchases of HM for those items. The submarine shall obtain an MSDS from the manufacturer or supplier and submit with a SFR as indicated in paragraph D1502a.

(2) If a commercial vendor approaches submarines or support commands offering HM not listed in the SMCL for submarine use or for substitution for stock-numbered HM, the vendors shall be referred to NAVSEA 05Z9.

d. HM Receipt. The supply department will receive all HM brought aboard the submarine. The supply department shall check all containers of HM obtained through open purchase upon receipt to ensure that they contain a manufacturer's label as described in paragraph D1502e. They shall refuse a container if not so marked. Upon receipt, the supply department shall re-verify the received material against the SMCL by stock number, manufacturer, and nomenclature to ensure that the material is allowed onboard and determine if any HM use category other than allowed is assigned.

(1) Regardless of the usage category, all HM issued to divisions must be logged into SHIMS. Stock HM in custody of the Supply Department and "Q-in-Use" HM items in sub-custody of the Engineering Department need not be logged into SHIMS as long as these items are in close supervisory control by the Supply Department and tracked in the supply system database.

(2) If the material is assigned a (L) usage category, the receiving person shall prepare an atmosphere contaminant tag (available at SHIMS or the SMCL website at https://smcl.dt.navy.mil) and affix it to the container. The supply officer/HM coordinator shall sign the atmosphere contaminant tag.

(3) If the material is assigned a (R) usage category, the supply officer shall prepare an atmosphere contaminant tag (available at SHIMS or the SMCL website at https://smcl.dt.navy.mil) and affix it to the container.

(4) If the material is assigned a prohibited (X) use category, do not bring the item aboard.

e. Container Labeling

(1) Manufacturer's labels for shipboard identification of HM containers must clearly identify the material name, the manufacturer's name and address, and the nature of the hazard presented by the HM including the target organ potentially affected by the material. A manufacturer's label may be a tag, sign, placard, or gummed sticker. When HM is dispensed from the shipping container to another unlabeled container, the person

dispensing the HM shall annotate the receiving container to indicate the material name, manufacturer name and address, and the nature of the hazard (including target organ) as specified by the manufacturer to preserve the continuity of information. To mark unlabeled containers or containers where the label has been destroyed or damaged, ships may use the Department of Defense (DoD) hazardous chemical warning label. The hazardous material information resource system (HMIRS) (reference D15-2) provides this label and label information at the end of each MSDS. Personnel can print the label on plain paper or the pre-printed color forms: DD 2521 (12/88) (8.5"x11") (S/N 0102-LF-012-0800) or DD 2522 (12/88) (4"x7") (S/N 0102-LF-012-1100).

NOTE:

If the material is transferred into a small container, such as a dropper bottle for boiler water chemistry, and there is insufficient room on the container to affix the label, an abbreviated label shall be affixed containing the material name, manufacturer's name, and stock number at a minimum. The remaining information shall be provided on a card in a location known to the users, which is in close proximity to the container, so that it can be readily referred to. In addition, supplemental label information may be coded, using numbers or letters, to the smaller containers.

(2) Submarine supply departments shall label HM items that are restricted or limited with an atmosphere contaminant tag (available at SHIMS or the SMCL website at https://smcl.dt.navy.mil) per paragraph D1502(d) prior to issue. If a restricted or limited HM is transferred to another container for use, the new container shall also be labeled with the atmosphere contaminant tag. The department transferring the material to the new container shall obtain the tag from the supply department.

f. HM Issue. The supply department retains only limited quantities of HM 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 HM in assigned lockers.

g. HM Reutilization. Submarines shall practice HM reutilization. This means that submarines will implement efforts to ensure that personnel make all beneficial uses of HM prior to offload as used/excess HM. This requires that material with the

earliest expiring shelf-life limitations is used first. In instances in which a HM is used by more than one work-center, submarines may choose to institute procedures whereby one work-center is responsible for ordering and storing the HM. This action also includes increasing the useful life of the material by extending the shelf life per approved procedures outlined in references D15-3 and D15-4.

h. Used/Excess HM Disposal. When work-centers have completely used a HM or have excess HM, they shall return the container plus any residue to the supply department for disposal. Appendix L of reference D15-5 and maintenance requirement cards (MRCs), as applicable, provide guidance for determining which types of used HM must be collected and held for treatment by shore disposal facilities. The receiving person shall annotate in the submarine material control log and process the used HM for offload per the procedures of section D1502h(4).

(1) Submarines shall segregate collected used HM. A container shall normally be filled with one type of HM (e.g., all the used HM in a container shall normally be of only one stock number). Used HM shall either be placed in the container for the original material or in an impervious container specified in appendix C23-A. The container shall be securely sealed using the installed or provided closure devices to ensure the container does not leak during transportation. The container shall be properly labeled (refer to paragraph D1502h(4)(a) for labeling requirements) to indicate content, and stowed in appropriate locations following the stowage precautions in this chapter for comparable HM.

(2) If the contents of an HM container are unknown, the label must state so, and the fleet must pay, from its own account, the costs of chemical analysis to determine specific content.

(3) Used lube oils shall be collected, stored, and labeled for eventual shore recycling. Synthetic lube oils and hydraulic oils shall be collected separately from other oils.

(4) **Procedures for Off-Loading Used or Excess HM to a Naval Shore Activity**. The supply officer shall be responsible for the receipt and consolidation (as appropriate) of all used/excess HM for offload. Used or excess HM shall be turned over to the shore facility HM offload activity per the requirements of reference D15-5.

(a) **Processing Used HM**

1. The work-center generating used HM shall ensure that it is properly packaged in the original container or in a container specified for the material in appendix C23-A. If there is any question regarding the integrity of the original container (e.g., badly rusted, badly dented, or poorly sealed), the contents shall be transferred to a new container. If the material is not in its original container, the work-center shall ensure that the material is labeled per paragraph D1502e. In addition, a label identifying the material as used HM (see appendix D15-C) shall be completed and attached to the container. This label shall contain information on the process in which the material was used (e.g., used air compressor lube oil, circuit board cleaning solvent, spent OBA canisters, etc.). It should also identify any known impurities that the material might contain based on routine analysis that may be conducted for PMS (e.g., naval oil analysis program (NOAP) test results) and any special storage requirements. This information is necessary to assist the shore activity in properly storing the used HM as well as in filling out disposal documentation if the material is processed as waste.

2. The supply department shall ensure that a DD form 1348-1 (provided in SHIMS) is prepared for each container of used HM. The following information shall be clearly identified (where known) on the DD 1348-1: the NSN, the material name, and the manufacturer's name and address. The individual filling out the DD form 1348-1 shall ensure that the container is properly labeled with information required by paragraph D1502e and with the used hazardous material label specified above.

(b) **Transferring Used HM Ashore**

1. The submarine’s supply officer/HM coordinator shall contact the shore activity point of contact to request a pick-up and ascertain local requirements. These requirements may be obtained from shore activity instructions, senior officer present afloat or ashore (SOPA) regulations or the response to the logistics requirements (LOGREQ) message. For used HM which can be identified by a stock number and manufacturer, and for which a MSDS is available in SHIMS, the submarine need not provide an MSDS to the receiving activity (one will probably be required if transferring to a non-Navy activity or overseas). Used HM for which a MSDS does not exist in SHIMS or which has been open-purchased shall be accompanied by a hard copy of the MSDS. In situations where compatible materials are inadvertently

mixed, the used HM shall be accompanied by the MSDSs of each material in the mixture. If the contents are unknown, the submarine need not include a MSDS, but shall supply information, such as whether the material is flammable, reactive, toxic, or corrosive, in the "Special Stowage Requirements" item of the used HM label to allow proper stowage at the receiving shore activity.

2. Shore activities shall only require that ships provide used HM that is properly packaged in the original container or in a container specified for the material in appendix C23-A, properly secured, properly labeled, with a properly filled out DD Form 1348-1, and with a MSDS, if the material originated outside the supply system or a MSDS is unavailable in SHIMS. Material that is non-compliant shall be returned to the originating submarine. Problems experienced with material received from a submarine shall be reported to the command and, if flagrant or repeated, to the submarine's immediate superior in command (ISIC). If any additional requirements (e.g., waste profile sheets) are placed on the shore activity by federal or state laws and regulations or by the supporting defense reutilization and marketing office (DRMO), the receiving shore activity shall ensure that these requirements are met using information supplied by the submarine on the DD 1348-1 and container label. When required, analysis of unknown material shall be charged to fleet accounts.

(c) **Excess HM.** A work-center shall turn in full, properly sealed containers of usable HM in excess of its needs to the supply department. Supply department personnel shall determine if this material may be used elsewhere in the submarine or if it exceeds the submarine's needs. If the material exceeds the submarine's needs, supply department personnel shall transfer it to the supporting fleet industrial supply center (FISC) with a properly completed DD form 1348-1 for each S/N of material being transferred.

D1503. GENERAL STORAGE STANDARDS

Submarines shall observe the following general standards to minimize hazards inherent in the handling and storage of HM:

a. Mark stowage locations (including lockers) to identify type of HM stored and keep the location/materials clean and dry at all times. Submarines shall post HM stowage locations with a CAUTION sign that states:

HAZARDOUS MATERIAL STORAGE AREA

Submarines should obtain these signs through the supply system using National Stock Number (NSN) 9905-01-342-4851 (10" X 7") or 9905-01-342-4859 (3" X 5").

b. Provide ventilation in HM stowage areas, where appropriate.

c. Entry of tanks where HM is stowed shall be certified as safe to enter by the gas free engineer.

d. Allow only authorized personnel access to stowage locations, where appropriate.

e. When transferring material from one container to another, ensure that existing precautionary labeling is retained and that subsequent containers are marked with appropriate precautionary labeling. DD Form 2521 or DD Form 2522 may be used for labeling of containers into which HM is transferred. Atmosphere contaminant tags should also be affix to new containers of (R) or (L) HM.

f. Do not transfer material to a container that has previously stored a different material without first checking the materials' compatibility.

g. Stow HM only in a container which is compatible to the material (e.g., do not place corrosive materials in metal drums).

h. Stack containers in such a way that they will not crush lower containers, become imbalanced, or be difficult to access.

i. Use material on a first-in, first-out basis, considering shelf life.

j. Prohibit smoking, eating, or drinking in stowage areas. Signs shall be posted indicating these requirements.

k. Ensure that open flames or spark producing items are not permitted in stowage areas.

l. When not in use, seal and protect all containers against physical damage and secure for heavy seas.

D1504. GENERAL HANDLING AND USE STANDARDS

For specific handling and use standards, refer to the material/item MSDS. Observe the following general standards when handling HM:

a. Work-center supervisors shall ensure that, prior to using any HM, machining or abrasive cleaning of components containing HM (e.g., beryllium and other heavy metals), personnel under their supervision are trained on the hazards associated with that material and that they have been provided with necessary protective clothing and equipment (e.g., eye protection, respiratory devices, and gloves impermeable to the HM in use).

b. Work-center supervisors shall ensure that spaces are well-ventilated in areas where HM is used or machined.

c. Upon completion of HM use, return surplus material to its appropriate storage location.

d. Avoid breathing vapors or dust when using or machining HM.

e. Avoid contact with the eyes or prolonged contact with skin when using or machining HM.

f. Prohibit smoking, drinking, or eating in areas where open containers of HM is being used.

g. Ensure personal protective equipment (eye protection, respiratory devices, gloves impermeable to the HM in use, etc.) is in good operating condition and is readily available to all personnel working with HM.

h. Use a respirator with appropriate filter when potentially exposed to particulate matter, hazardous gases, or vapors. Consult the respiratory protection manager/respiratory protection assistant (RPM/RPA) for specific guidance in this regard, and for a determination of the need for more stringent respiratory protection requirements.

i. Do not add incompatible materials to the same collection container. Review guidance provided in appendix D15-A.

j. Conduct an operational risk management (ORM) analysis.

k. Read the MSDS and follow the applicable precautions.

l. Never use flammable or combustible materials near a heat source or spark-producing device.

D1505. FLAMMABLE AND COMBUSTIBLE MATERIAL

A flammable material is any solid, liquid, vapor, or gas that will ignite easily and burn rapidly with a flash point less than 1500 degrees Fahrenheit. The National Fire Protection Association (NFPA) defines a flammable liquid as a liquid with a flash point below 100 degrees Fahrenheit. Liquids having a flash point at or above 100 degrees Fahrenheit are combustible liquids. All flammable and combustible liquids present some danger to personnel and the ship, of prime concern are those liquids having flash points below 200 degrees Fahrenheit. Never carry flammable or combustible liquids aboard the submarine in quantities in excess of that required. Stow flammable and combustible liquids in approved locations. Dispense flammable and combustible liquids from shipping containers only into safety cans or other approved portable containers. Never use flammable or combustible liquids near a heat source or spark-producing device.

a. Storage Standards

(1) Store flammable and combustible materials following precautions listed in paragraph D1503.

(2) Store flammable and combustible materials separately from oxidizing materials (e.g., sodium nitrate, calcium hypochlorite, potassium permanganate, peroxides, and strong inorganic acids (nitric, hydrochloric, and sulfuric acids)), (see appendix D15-A: Hazardous Material Compatibility Storage Diagram).

(3) 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 engineering officer. The containers shall not be stowed within three feet of any surface where the temperature may exceed 140 degrees (°) Fahrenheit (F). More than 12 gallons of grease may be stowed in one location (in original containers and greater than three feet from 140°F surfaces).

(4) Submarines not having flammable/combustible liquid lockers shall 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/combustible liquid lockers available.

(5) Do not stow combustible materials such as rags, paper and wood in the same area as flammable materials; however, submarines may stow oily rags in these areas after placing in suitable containers.

(6) Prohibit open flames or spark-producing items in the vicinity of flammable stowage locations.

(7) Ensure containers are secured with metal banding or other approved tie-downs vice manila line.

(8) Never carry flammable or combustible material on-board the submarine in excess of required quantities.

(9) Only stow flammable and combustible materials in approved locations.

(10) Dispense flammable and combustible material from shipping containers only into safety containers or other approved portable containers.

b. Handling and Usage Standards.

(1) Handle and use flammable materials per the precautions of paragraph D1504. Many flammable and combustible materials have additional hazardous properties, such as toxicity. See also section D1506.

(2) Never use flammable material near a heat source or a spark-producing device. Do not smoke in an area in which flammable material is being used. Designate spaces in which flammable materials are being used as **NO SMOKING** areas.

(3) Keep scrapings and cleaning rags soaked with flammable or combustible liquids in a designated covered metal container until the HM is disposed of properly. Do not leave scrapings and cleaning rags in a soaked state even in a covered metal container for longer than one work shift. Treat such

materials as used/excess HM, containerize to prevent leakage, and properly label and store.

(4) Keep suitable fire extinguishing equipment and materials ready at all times for instant use.

(5) Ensure that containers of partially used flammable materials are returned to proper stowage facilities, are tightly closed, and are properly labeled.

D1506. TOXIC MATERIAL

A toxic substance has the inherent capacity to produce personal injury or death through ingestion, inhalation, or absorption through any body surface. Toxic materials are considered, and often marked by the manufacturer as being, poisonous. Solvents, degreasers, refrigerants, and hydraulic fluids are but a few of the toxic materials that may be found aboard submarines. Avoid contact with toxic materials by using suitable protective clothing and following safe handling procedures. Submarines must, to achieve their missions, carry some toxic material, and personnel will be called upon at times to use them.

a. Storage Standards

(1) Store all toxic material per the standards of paragraph D1503. Many toxic materials have additional hazardous properties, such as flammability or combustibility. See also section D1505.

(2) Store all toxic material in cool, dry, well ventilated locations separated from all sources of ignition, acids and acid mists/vapors, caustics, and oxidizers, (see appendix D15-A: Hazardous Material Compatibility Storage Diagram).

(3) Seal all containers and protect them against physical damage.

b. Handling and Usage Standards

(1) Handle and use toxic materials per the precautions listed in paragraph D1504.

(2) Use appropriate gloves and protective clothing when handling sensitizers or potential skin irritants such as epoxy and polyester resins and hardeners where skin contact is

likely. Protective skin cream shall only be used to supplement, but not replace impermeable gloves for any operation where significant contact work with potentially toxic/irritant/sensitizing materials is likely.

c. Halocarbons (Refrigerants). Liquid or gaseous halocarbons have multiple applications in the Navy. They are used as refrigerants, solvents, and dielectric fluids and as line flushing, and degreasing agents. With common names of refrigerant R-11, R-12, R-22, R-113, R-114, and R-116, these products may be better known by names such as FREON, ISOTRON, FRIGEN, FLUORANE, FREON MF, FREON TF, GENSOLV D, BLACO-TRON TF, and ARKLONE P-113.

NOTE:

Due to changes in the Clean Air Act, the manufacture of halocarbons is being phased out; however, they may still be used in the Navy.

(1) To minimize the size of spills, procure, store, and use halocarbons in the smallest amount and container possible for an operation.

(2) The supply system stocks all normally used halocarbons, and submarines should procure them only through that system.

(3) Prohibit smoking and hot work in areas or vicinity where halocarbons are being used.

(4) Prohibit storage and consumption of food and tobacco in areas where halocarbons are being used.

(5) Some types of FREON are nearly odorless and can numb the sense of smell. They may accumulate in low places and displace oxygen unless ventilation is provided. In high concentrations they can cause death by suffocation.

(6) 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).

d. Toxic Cleaning Solvents. Toxic cleaning solvents such as 1,1,1-Tri-chloroethane shall not be carried aboard. Submarines shall not attempt solvent cleaning except alongside a pier or

tender. Submarines shall 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 HM 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 HM in use to protect the face, neck, arms, hands, and body when using acid or alkali cleaners.

e. Polychlorinated Biphenyls

(1) In general, PCBs, if properly managed, do not present a major health hazard. The Environmental Protection Agency banned PCBs in most manufacturing processes in 1979. However, PCBs may be found as a fire retardant in many materials used in ship construction where stocks of PCB material purchased prior to the ban were installed. Some examples of materials used in submarine construction that may contain PCBs 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/electronic components (primarily capacitors) per the guidance provided in reference D15-6. Label PCB-contaminated tools and waste materials (such as dust from ventilation ducting which are known to contain PCB-impregnated felt gaskets) per appendix D15-E.

(3) With the exception of ventilation duct cleaning, work involving known or potential PCB-containing materials shall normally be accomplished in port. Obtain assistance through the nearest naval shipyard environmental program office, Navy medical treatment facility, or Navy Environmental Preventive Medicine Unit (NAVENPVNTMEDU) prior to such action.

(4) For situations not involving unprotected PCB skin contact, employ routine work and personal hygiene measures (such as washing hands and other exposed skin surfaces with soap and water when work is completed) appropriate for any occupational setting.

(a) When working with PCB-impregnated materials such as insulating felts or with articles that contain liquid PCB solutions, strictly observe good housekeeping procedures to avoid the possibility of secondary surface contamination.

(b) Personnel involved in PCB-related work activities shall not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in the space in which work is being performed.

(c) 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 specified in appendix C23-A and labeled with the large label described in appendix D15-E. Disposal should be per the procedures of section D1502e. Specifically notify the receiving activity that PCBs or material containing PCBs is being transferred.

(d) 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.

(e) 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 D15-6.

(f) Label all reusable cleaning equipment employed in cleaning systems potentially contaminated with PCBs with PCB labels described in appendix D15-E. 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.

(5) The baseline industrial hygiene survey shall specify personal protective equipment and medical surveillance for any potential PCB-related work.

D1507. CORROSIVE MATERIALS

Corrosive materials are chemicals, such as acids, alkalis, or other liquids or solids which, when in contact with living tissue, will cause severe damage to such tissue by chemical action. In case of leakage, corrosive material will materially damage surfaces or cause fire when in contact with organic matter or with certain chemicals.

a. Storage Standards

(1) Store all corrosive materials per the precautions listed in paragraph D1503.

(2) Store corrosive materials in their original containers.

(3) Ensure that corrosive materials are not stored in the vicinity of oxidizers or other incompatible materials, (see appendix D15-A: Hazardous Material Compatibility Storage Diagram).

(4) Ensure that acids and alkalis are stowed separate from each other.

b. Handling and Usage Standards

(1) Handle and use corrosive materials per the precautions listed in paragraph D1504 or as directed by maintenance requirement card, NSTM, industrial hygiene survey, or manufacturer's instructions.

(2) At a minimum, wear goggles, full face shield, and acid resistant gloves when handling acids or other corrosive materials. Greater protection may be required as specified by maintenance requirement card, naval ship's technical manual (NSTM), industrial hygiene survey, or manufacturer's instructions.

(3) Never allow corrosive materials or their vapors to come in contact with the skin or eyes.

(4) 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 shall comply with paragraph 1507b2 of this instruction.

c. Inorganic Acids

(1) Stow liquid inorganic acids such as hydrochloric, sulfuric, nitric and phosphoric acids bottled in glass or plastic in such a manner that they are cushioned against shock. They should be kept in their original shipping carton or box inside suitable acid-resistant corrosive lockers.

(2) Maintain hydrofluoric acid in acid-proof polyethylene or ceresin-lined bottles at all times and never allow them to come in contact with skin or eyes.

(3) Do not stow inorganic acids in the vicinity of flammable liquids.

d. Organic Acids. Do not permit liquid and solid organic acids such as glacial acetic, oxalic, carbolic, cresylic, and picric acids to come in contact with the eyes or skin. These acids are corrosive to aluminum and its alloys, to zinc, and to lead. Keep these acids, usually packaged in glass bottles, from freezing and physical damage. Stow these acids in an approved acid locker lined with acid-resistant material, separated by a partition, or by at least three feet from all other material.

e. Alkalis. Stow alkalis (bases), such as lithium hydroxide, sodium hydroxide, potassium hydroxide (lye), disodium phosphate, trisodium phosphate, monoethanolamine (MEA or "AMINE"), sodium carbonate, and ammonium hydroxide (ammonia water) in designated lockers, cabinets, or chests. Keep alkalis separated from acids, oxidizers, and other incompatible materials. Ensure the stowage area is dry.

NOTE:

Many submarine cleaning agents and laundry materials contain alkalis in very strong concentrations. Observe specified stowage and handling precautions for these materials.

D1508. OXIDIZERS

An oxidizer is a material such as chlorate, perchlorate, permanganate, peroxide, or nitrate which yields oxygen readily to support the combustion of organic matter, or which may produce heat or react explosively when it comes in contact with many other materials. Higher temperatures increase the possibility of oxygen release from oxidizers and the possible initiation of fire. Heat shall be avoided when handling and storing oxidizers. Oxygen candles are oxidizers.

a. Storage Standards

(1) Store oxidizers following precautions listed in paragraph D1503.

(2) Do not store oxidizers in an area adjacent to a torpedo room or small arms ammunition storage or heat source or where the maximum temperature exceeds 100 degrees Fahrenheit under normal operating conditions. Higher temperatures increase the possibility of oxygen release from oxidizers and the possible initiation of fire.

(3) Ensure that oxidizers are not stored in the same compartment with easily oxidizable material such as fuels, oils, grease, paints, or cellulose products. Do not remove or obliterate labels.

b. Handling and Usage Standards

(1) Handle and use oxidizers per precautions listed in paragraph D1504.

(2) When transferring oxidizers to second containers, **ensure that the second container is compatible with oxidizing material**. Place appropriate HM labels on the second container.

(3) Do not remove or obliterate warning labels from containers.

(4) Ensure oxidizing materials are only handled or used by authorized personnel.

c. Calcium hypochlorite is a chemical substance used to provide the sanitizing and bleaching property of chlorine without requiring the handling of liquid or gaseous chlorine.

(1) The following standards apply to the stowage of calcium hypochlorite:

(a) The ready usage stock of 6-ounce bottles issued to the medical and engineering departments shall be stowed in a medical instrument and supply set case, NSN 6545-00-131-6992, which shall be kept in a secured locker with ventilation holes, preferably located in the cognizant department office space. Under no circumstances shall the stock of calcium hypochlorite bottles be stowed in a machinery or nuclear space, berthing space, storeroom, or in the nucleonics laboratory areas.

(b) Label all lockers, bins, and enclosures with red letters on a white background:

HAZARDOUS MATERIAL, CALCIUM HYPOCHLORITE

(c) Dispose of containers as used/excess HM and replace when they exceed two years from the date of manufacture.

(2) The following precautions apply when using calcium hypochlorite:

(a) Mix only with water.

(b) Do not allow to come into contact with paints, oils, greases, wetting agents, detergents, acids, antifreeze, alkalis, or organic and combustible materials.

(c) Do not remove or obliterate warning labels.

(d) Dispense only in clean, dry utensils and only in amounts required for immediate use.

(e) Avoid contact with skin and eyes.

(f) Ensure containers are not used for any other purpose.

(g) For external contact or if taken internally, follow the instructions printed on the container label or on the material safety data sheet (MSDS).

(h) No special firefighting precautions are required for fires caused by calcium hypochlorite.

D1509. AEROSOLS

Aerosol spray cans are prohibited aboard submarines except as specifically allowed by the SMCL. Aerosols are HM dispensed from a pressurized container for the application of paints, enamels, lacquers, insecticides, inspection penetrant kits, lubricating oils, silicones, and rust preventatives. The propellants used in aerosols may be low boiling hydrocarbons that are flammable, such as propane or isobutane. The contents of aerosol containers are under pressure, and exposure to heat may cause bursting. The propellants in higher concentrations may be anesthetic, asphyxiating, and extremely flammable. The decomposition products formed when propellants contact open flames or hot surfaces may be corrosive, irritating, or toxic.

D1510. COMPRESSED GASES

Submarines carry numerous cylinders of compressed gases. Compressed gases are used for welding operations (oxygen and acetylene), in refrigeration and air conditioning systems (FREON), and for purging various systems (nitrogen). Cylinders of compressed gases are potential explosion, fire, and health hazards if strict compliance with applicable requirements is not followed.

a. Storage Requirements

(1) **General**

(a) Only stow compressed gases in compartments and locations designated for cylinder storage, as shown in applicable plans for each submarine. Whenever practical, stowage shall permit removal of any cylinder without disturbing other cylinders. Such locations shall:

1. Be kept free of flammable materials (especially greases and oils).

2. Be maintained at temperatures below 130 degrees Fahrenheit.

(b) Ensure that cylinder valve protection caps are in place.

(c) Stow cylinders by date of receipt, and place into service in the order of receipt.

(d) Tag empty cylinders **EMPTY**, mark **MT**, and segregate from full or partially full cylinders.

(2) **Ready Service.**

(a) The following gas cylinders are found aboard submarines:

1. Fire extinguishers (portable).

2. Fire-extinguishing cylinders permanently connected to fixed fire-extinguishing systems.

NOTE:

Self-contained breathing apparatus (SCBA) are replacing oxygen breathing apparatus (OBA).

3. Gas and chemical canisters for oxygen breathing apparatus.

4. Welding cylinders.

5. Medical gas cylinders.

6. Cylinders containing refrigerants.

7. Disposable cylinders supplied as repair kit accessories (halide leak detector kits, for example).

8. Gas cylinders for the propulsion plant operations.

9. Diving air self-contained underwater breathing apparatus (SCUBA) tanks.

(b) Welding Cylinders. Observe the following special instructions and precautions regarding oxygen and fuel gas cylinders in ready service:

1. Install cylinders of gas per approved plans or specifications.

2. Fasten cylinders securely in a rack. Ensure acetylene cylinders are always stowed vertically. Securely fasten the rack, in turn, at the designated locations.

3. Never leave unstowed equipment unattended.

4. Return welding units to designated stowage as soon as work is complete.

5. Attach a card to each welding unit with the following instructions:

> Return to (designated location) immediately on completion of work. Unit shall not be left unattended while away from above location. Unit is **NOT SECURE** while pressure shows on gauges, or cylinders are not firmly fastened to rack and properly stowed.

b. Handling and Usage Requirements

(1) Never drop cylinders nor permit them to strike against one another violently.

(2) Never use a lifting magnet or a sling (line or chain) when handling cylinders. If a crane or hoist is used, provide a safe cradle or platform to hold cylinders. Do not lift cylinders by valve protection caps.

(3) When returning empty cylinders, be sure that valves are closed and that valve outlet, if provided, and cylinder valve protection caps are in place.

(4) Ensure that all cylinders are approved under DOT regulations. Non-magnetic cylinders are an exception.

(5) Only refill cylinders when the command specifically approves such action.

(6) Fill a cylinder only with the gas for which the cylinder has been specifically designated.

(7) Do not remove or change the numbers or marks stamped into cylinders without the specific approval of the Defense General Supply Center.

(8) Never use cylinders for rollers, supports, or for any purpose other than to carry gas.

(9) Never tamper with the safety devices on valves or cylinders.

(10) Never hammer or strike the valve wheel in attempting to open or close valves. Use only wrenches or tools provided and approved for this purpose. If valve cannot be turned using hand or proper tool, return the cylinder to supply activity.

(11) Be sure that the threads of regulators or other auxiliary equipment are the same as those on cylinder valve outlets. Never force connections that do not fit.

(12) Do not use regulators, pressure gauges, manifolds, and related equipment that are provided for a particular gas on cylinders containing different gases.

(13) Only repair or alter cylinders or valves when authorized by COMNAVSEASYSCOM. If trouble is experienced, remove cylinder from service, tag as defective, and return to supply activity. Do not remove the stem from a diaphragm-type cylinder valve.

(14) Never subject compressed gas cylinders, either in stowage or in service, to a temperature in excess of 130 degrees Fahrenheit. Never permit a direct flame to come in contact with any part of a compressed gas cylinder.

(15) Handle cylinders carefully. Rough handling, knocks, or falls are liable to damage the cylinder, valve, or safety devices and may cause leakage. Protect cylinders from objects that will cut or otherwise abrade the surface of the metal.

(16) When testing for leaking gas cylinders, use soapy water or leak-detection compound conforming to military specification (MIL-L-25567E) requirements.

NOTE:

If bottle contents are in question, the central atmosphere monitoring system (CAMS) has a limited gas analyzing function to assist in identifying certain gases.

(17) Only use a gas cylinder that is properly marked (by color of paints or with the name of the gas stenciled on cylinder and valve). Return all mis-marked cylinders to the nearest supply depot.

(18) Work-center supervisors shall ensure that supply and exhaust ventilation exists in compartments where compressed gases are stored or in use, systems are in good operating condition, and have been evaluated as adequate by an industrial hygiene survey team.

(19) To thaw out valve outlets that are clogged with ice, use warm (not boiling) water. The use of boiling water will melt the fusible plugs, if present, and vent the cylinders.

(20) Never discharge a cylinder into any device or equipment in which the gas will be entrapped and create pressure. The only exception is a cylinder equipped with a pressure regulator set to control the pressure.

(21) Never use oil-tolerant gases when oil-free gases are required.

(22) Close the cylinder valve and release the gas from the regulator before removing the regulator from a cylinder valve.

c. Recharging Cylinders

(1) Recharging of diving air (scuba) cylinders: The charging of divers' scuba tanks from the ship's air system shall meet the purity requirements of paragraph 5.2.1.2 of reference D15-7. Commanding officers may omit this requirement during emergency situations.

(2) Personnel may refill small cylinders of hydrogen routinely used for nuclear propulsion plant operations per the Reactor Plant Manual.

(3) Personnel may recharge fire extinguishers and fire extinguishing system cylinders per NSTM 555.

(4) Recharge a cylinder only if less than five years have passed since its last hydrostatic test date. The only exceptions are 3A and 3AA cylinders having water capacities under 125 pounds, for which a 10-year hydrostatic test frequency is approved. For fire extinguisher and fire extinguishing system cylinder hydrostatic test requirements, see NSTM 555.

(5) Never attempt to mix gases in a cylinder. Unauthorized personnel should never refill a cylinder.

d. Welding Cylinders

(1) 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.

(2) Do not place cylinders where they might become part of an electric circuit. Avoid contact with energized equipment. Keep cylinders away from piping systems 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.

(3) 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. Always stand to one side of the outlet when opening the cylinder valve.

(4) 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 two hours to stabilize the gas. If acetone flows from the cylinder, put aside the cylinder for an additional period.

(5) Do not place anything on top of an acetylene cylinder that may damage the safety device or interfere with the quick closing of the valve.

(6) 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.

(7) Do not use copper tubing with acetylene gas cylinders due to the increased potential for an explosive chemical reaction.

(8) Back off on the regulation screws, and then open the cylinder valves slowly. Open the acetylene valve one-fourth to one-half turn. This will allow an adequate flow of acetylene, and the valve can be closed quickly in an emergency (never open the acetylene cylinder valve more than one and a half turns). The oxygen cylinder valve should be opened all the way to eliminate leakage around the stem.

CHAPTER D15

REFERENCES

D15-1. NAVSEA S9510-AB-ATM-010/(U), Nuclear Powered Submarine Atmosphere Control Manual (NOTAL)

D15-2. Hazardous Material Information Resource System (HMIRS)

D15-3. NAVSUP Publication 4105, List of Items Requiring Special Handling (NOTAL)

D15-4. NAVSUPINST 4410.52B, Shelf-Life Item Identification, Management, and Control (NOTAL)

D15-5. OPNAVINST 5090.1B

D15-6. NAVSEA S9593-A1-MAN-010, Shipboard Management Guide to PCBs and Associated NAVSEA issued PCB Advisories (NOTAL)

D15-7. NAVSEA 0944-LP-001-9010, U.S. Navy Diving Manual (NOTAL)

D15-8. NAVSUP 573, Storage and Handling of Hazardous Materials,

D15-9. NAVSUP Pub 485-Naval Supply Afloat Procedures

D15-10. NAVSUP Pub 722 Consolidated Hazardous Reutilization Inventory Program (CHRIMP) Manual NTSM 593 Pollution Control Manual

D15-11. NSTM 670 Stowage, Handling, and Disposal of General Use Consumables

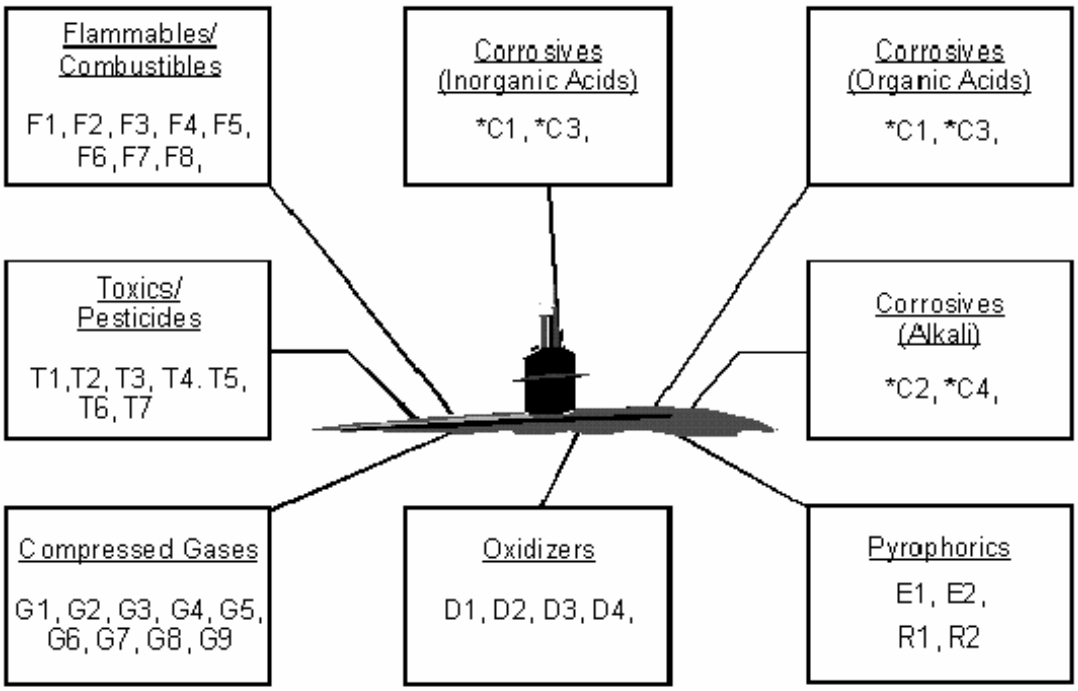
D15-12. Naval Ships' Technical Manual (NSTM 593), Pollution Control Manual

D15-13. Naval Ships' Technical Manual (NSTM 555), Surface Ship Firefighting

Appendix D15-A

HAZARDOUS MATERIAL COMPATIBILITY STORAGE DIAGRAM (USING HAZARD CHARACTERISTIC CODE (HCC))

The Hazardous Characteristic Code (HCC) for each item can be found in the MSDS located in the Submarine Hazardous Material Control List (SMCL).



Instructions:

1. Each block represents a separate stowage location. The codes in the boxes are grouped with other codes with which they are compatible for storage. Generally, materials with different codes will not be stowed together unless specified below:

a. Inorganic acids may be stowed in a flammable liquid storeroom inside a designated locker, separated by at least three feet from all other material.

b. Organic acids may be stowed in a flammable liquid storeroom inside a designated locker, separated by at least three feet from all other material.

NOTE:

C1, C3-HM identified with the C1 or C3 code may be either an inorganic or an organic acid. See page D15-E-2 for examples of inorganic and organic acids.

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

The words **shall**, **will**, **must**, **should**, **may**, and **can** are used throughout this manual. **Shall**, **will**, and **must** are directive in nature and require mandatory compliance. **Should** is a strong recommendation, but compliance is not required. **May** or **can**, when used, are optional in nature and compliance is not required.

Abate - To eliminate or reduce permanently an unsafe or unhealthful working condition by coming into compliance with the applicable NAVOSH 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.

Acid - Any corrosive having a pH less than 7.

Acid Locker - A locker specifically designed and authorized for storing HM with a pH less than 7.

Action Level - Unless otherwise specified in a NAVOSH standard, one-half the relevant Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV).

Acute - Severe, usually crucial, often dangerous in which rapid changes are occurring. An acute exposure runs a comparatively short course.

Administrative Control - Any procedure which limits daily exposures to toxic chemicals or harmful physical agents by control of the work schedule.

Aerosol - Any material dispensed from a pressurized container using a gas propellant.

Afloat Mishap - Any mishap caused by DoD operations resulting in injury or death to anyone aboard the ships (craft) listed below whenever the ship is underway; ship's military and federal civilian mariners assigned as a crew member (permanent or under temporary orders) aboard the ships listed below, on- or off-duty ashore; or material loss or damage, occurring to the ships listed below at all times, both underway and moored:

a. Commissioned, U.S. Navy ships and their embarked boats and landing craft or leased boats.

b. Pre-commissioned, U.S. Navy ships and their embarked boats and landing craft or leased boats beginning when the ship gets underway for Acceptance Trials

c. United States Navy Ship (USNS) ships manned by federal civilian mariners assigned to Military Sealift Command.

d. All on-duty diving mishaps.

ALARA - As Low as Reasonably Achievable.

Alternate Standards - Proposed standards giving equal or better protection than existing NAVOSH standards. Proposed alternate standards shall be submitted to CNO (N45) through the chain of command for approval.

ANSI - American National Standards Institute, a national consensus standard-developing organization.

Atmosphere Immediately Dangerous to Life or Health (IDLH) - The concentration of a contaminant which can produce an immediate irreversible debilitating effect on health, or which can cause death.

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.

Asbestos Medical Surveillance Program (AMSP) - A program consisting of a periodic medical screening examination which may include special purpose histories, physical examinations and laboratory tests. Directed at detecting early changes in specific organ systems which have been identified with asbestos diseases.

Audiogram - A graph or table showing hearing threshold levels as a function of frequency.

Audiometer - Instrument used to measure hearing sensitivity using pure tones.

Aviation Bends (Altitude Decompression Sickness) - Aviators exposed to altitude may experience symptoms of decompression sickness similar to those experienced by divers.

A-Weighted Sound Level - Sound level in decibels 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/labels to be issued or cleared.

Base - Any corrosive having a pH greater than seven.

Baseline Survey - Initial survey (after construction or overhaul) to identify hazardous workplace conditions or unsafe work practices.

Biological Monitoring - Periodic examination of blood, urine or any other body substance to determine exposure to toxic substances.

Bound Asbestos - Asbestos which is tightly compacted and is not normally a health hazard unless worked by punching, grinding, machining or sanding or when the material is deteriorated.

Canister, Oxygen-Generating - A container filled with a chemical which generates oxygen by chemical reaction.

Capture Velocity - That velocity at a distance from a hood, necessary to overcome dispersive forces and capture the contaminant.

Carbon Dioxide 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 seven.

Caution Tag - Yellow tag used as precautionary notification to indicate that caution must be exercised in operating tagged equipment.

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.

Class A Mishap (afloat) - The total cost of reportable damage is $1,000,000 or more; or any injury or work-related illness resulting in death or permanent total disability. All class A mishaps occurring on a ship specified in OPNAVINST 5102.1D, Navy and Marine Corps Mishap And Safety Investigation Reporting and Recordkeeping Manual, require investigation by a safety investigation board (SIB) and submission of a safety investigation report (SIR). Class A mishaps occurring ashore or as a result of motor vehicle mishaps also shall be investigated and reported according to OPNAVINST 5102.1D.

Class B Mishap (afloat) - The total cost of reportable property damage is $200,000 or more, but less than $1,000,000; an injury or work-related illness resulting in permanent partial disability; or a mishap resulting in the hospitalization of three or more people. Class B mishaps shall be investigated and reported according to OPNAVINST 5102.1D, Navy And Marine Corps Mishap And Safety Investigation Reporting and Recordkeeping Manual.

Class C Mishap (afloat) - The total cost of reportable property damage is $10,000 or more, but less than $200,000; or an injury preventing an individual from performing regularly scheduled duty or work beyond the day or shift on which it occurred; or a nonfatal illness or disability causing loss of time from work or disability at any time (lost time case). Class C mishaps shall be investigated and reported according to OPNAVINST 5102.1D, Navy and Marine Corps Mishap and Safety Investigation Reporting and Record Keeping Manual.

Collection, Holding and Transfer (CHT) System - A type of marine sanitation device 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 at or above 100°F.

Compressed Gas - Material, which may or may not be HM in itself, which is stored in pressurized containers.

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 or dusts

. ppm parts per million for vapors or gases

. fibers/cc fibers per cubic centimeter for asbestos

Confined Space - 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.

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

Contaminant - A material that is not normally present in the atmosphere, which can be harmful, irritating or a nuisance to anyone who breathes it.

Contractor Caused Mishaps - Injuries or work-related illnesses of DoD personnel caused by contractor operations. The parent command of affected DoD personnel shall report these mishaps. All work-related injury and occupational illness mishaps involving a contractor where DON provided direct supervision of the contractor, the mishap was caused wholly or in part by DoD operations, and DON has the means to affect change to prevent reoccurrence of the mishap are reportable under OPNAVINST 5102.1D, Navy and Marine Corps Mishap and Safety Investigation Reporting and Recordkeeping Manual. Contact COMNAVSAFECEN or CMC (SD) for guidance for mishaps involving civilian contractor personnel caused by contractor operations.

Conventional Ordnance Deficiency - CODR incident is where ordnance or weapon systems fail to function in accordance with the designed and/or intent of the system and results in no property damage or injury. This includes improper storage, explosives, ammunition, explosive systems, or devices, including weapon systems components that come in direct contact with the ordnance (e.g., ammunition, explosives, missiles) and armament, handling, support equipment used to fire, handle, load, deliver, store or transport ordnance.

a. The Conventional Ordnance Deficiency Report (CODR). A CODR is initiated for the following events using the Airborne Weapons Information System (AWIS) at https://awis.mugu.navy.mil/awis/Index.asp. For commands without Internet access use the procedures defined in of OPNAVINST 8000.16.

b. Malfunction. The failure to function properly of conventional ordnance, explosives, ammunition, small arms, weapons, or weapon system components and support equipment that come in direct contact with the ordnance.

Example: Failure to launch, dud weapons, gun fails to cycle, JATO fails to ignite, etc.

c. Inadvertent launch or arming. The unintentional launch, arming an explosive component or weapon caused by mechanical failure.

d. Defective weapons support equipment. Deficiencies involving any equipment or device used in the manufacture, test, assembly, handling or transportation of any explosive system (e.g., skids, trailers, slings or similar equipment).

e. Observed defect. A discovered defective weapon or weapon system component that comes in direct contact with the ordnance, small arms, weapons, conventional ordnance, explosives, and ammunition.

Example: Protruding primers, cracked grains, damaged or broken breech bolts, broken or scratched missile radomes, and advanced corrosion). Items that are under warranty, new, or newly reworked will be reported using a product quality deficiency report (PQDR) per this instruction.

f. Other Deficiencies. The failure of an explosive component or explosives system to test, calibrate, or otherwise meet pre-loading or pre-launch requirements.

Example: The failure of Built-In-Test (BIT)and OTTO fuel spills. Any part of ordnance, ordnance systems, or ordnance equipment falling from aircraft requires a CODR per OPNAVINST 8000.16.

Corrosive Material - Any HM 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.

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 type commander. Reports can provide either a detailed or summary listing of deferred maintenance information. The CSMP is used for generating Board of Inspection and Survey packages and automated work requests (AWRs) prior to overhaul or availabilities.

Damage - The partial or total loss of hardware caused by component failure. Exposure of hardware to heat, fire or other environments; human errors; or other inadvertent events or conditions.

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.

Designated Safety and Occupational Health Official - The individual at the Secretary of the Navy level who is responsible for the administration of the Navy safety and occupational health program.

Detector Tube - A glass tube which utilizes a sensitive chemical (in a suspension of silica gel) which produces color change whenever contaminated air is pulled through the tube.

Disabling Work/Duty Injury - Any impairment resulting from an accident or occupational disease which prevents a military person from performing his or her regularly established duty or work for a period of 24 hours or more, subsequent to 2400 on the day of injury.

Diving Mishap - Injury, recompression therapy, or death resulting from an incident occurring while breathing compressed gases (for example, air, HeO_2, or oxygen) before, during, or after entering or leaving the water.

DoD Personnel - Defined as:

a. On-duty, DoD civil service employees (including National Guard and Reserve technicians, unless in military duty status); non-appropriated fund employees (excluding part-time military); Corps of Engineers civil works employees; Youth or Student

Assistance Program employees; foreign nationals employed by DoD components; and Army-Air Force Exchange Service employees.

b. All U.S. military personnel on active duty; U.S. Military Reserve or National Guard personnel on active duty or in a drill status; Service Academy cadets or midshipmen; Reserve Officer Training Corps (ROTC) cadets or midshipmen when engaged in directed training activities; Officer Candidate School students when engaged in directed training activities; and foreign national military personnel assigned to DoD components.

Dosimeter - A device for cumulatively measuring radiation or noise exposure of 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.

Examples of processes that generate dust: use of machine shop tools, paint chipping, sanding, woodworking, abrasive blasting.

EEBD (Emergency Escape Breathing Device) - A respirator that provides the user with oxygen through a chemical reaction. Only to be used in emergency escape procedures.

Effectiveness of Corrective Action - The degree to which the proposed hazard abatement system can be expected to reduce the cited hazard. For health hazards, this would typically be expressed as the intensity of the hazardous chemical or physical agent remaining, in appropriate units, after the proposed abatement measure is operational. For safety hazards, effectiveness is expressed as "in full compliance" or "not in full compliance" with the applicable standard, if any.

Electric Shock - The passage of direct or alternating electrical current through the body or a body part.

Electrical Safety Officer - Person who is responsible to the commanding officer in conducting an effective ship-wide electrical safety program.

Emergency Repair - A repair necessary to protect life or the ship.

Employment Mishap - A mishap occurring as a result of work performance exposure to the work environment.

Enlisted Safety Committee - A committee consisting of the safety officer, division safety petty officers, and the chief master-at-

arms. Identifies and discusses NAVOSH problems, enhances interdepartmental communication in mishap prevention, and submits issues and recommendations to the Safety Council.

Excess Hazardous Material – Excess HM 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, or by commercial industry.

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.

Explosive Material - A chemical, or a mixture of chemicals, which undergoes a rapid chemical change (with or without an outside supply of oxygen) liberating large quantities of energy in the form of blast, light, or hot gases. Incendiary materials and certain fuels and oxidizers which can be made to undergo a similar chemical change are also explosive materials. Examples of explosive materials include:

a. Explosives. TNT, PBXN, PETN, PBXC, RDX, compositions, Explosive D, tetryl, fulminate of mercury, black powder, smokeless powder, flashless powder, and rocket and missile propellants.

b. Fuels and Oxidizers. OTTO fuel II, mixed amine fuel, inhibited red fuming nitric acid, and ethylene oxide.

c. Incendiaries. Napalm, magnesium, thermite, and pyrotechnics.

Explosive Mishaps - An incident or accident involving conventional ordnance, ammunition, explosives, or explosive systems and devices resulting in an unintentional detonation, firing, deflagration, burning, launching of ordnance material (including all ordnance impacting off-range), leaking or spilled propellant fuels and oxidizers, or chemical agent release. Even if an ordnance system works as designed, if human error contributed to an incident or accident resulting in damage, injury, or death, the event is

reported as an explosive mishap and is reportable as specified in OPNAVINST 5102.1D, Navy And Marine Corps Mishap And Safety

Investigation Reporting and Record Keeping Manual. Explosive mishaps include:

Explosive System - A weapon, device, or tool using explosive materials.

First Aid - Any one-time treatment, with follow-up treatment if required, to clean, bandage, or observe a scratch, cut, burn, splinter, sprained ankle, etc., not necessarily provided by competent medical authority. First aid, for purposes of this instruction and 29 CFR Part 1904, are not required to be recorded or reported according to OPNAVINST 5102.1D, Navy And Marine Corps Mishap And Safety Investigation Reporting and Recordkeeping Manual, using the following definition of first aid:

a. Using a non-prescription medication at nonprescription strength (for medications available in both prescription and non-prescription form, a recommendation by a physician or other licensed health care professional to use a non-prescription medication at prescription strength is considered medical treatment for record keeping purposes).

b. Administering tetanus immunizations (other immunizations, such as hepatitis B vaccine or rabies vaccine, are considered medical treatment).

c. Cleaning, flushing or soaking wounds on the surface of the skin.

d. Using wound coverings such as bandages, Band-Aids™, gauze pads, etc.; or using butterfly bandages or Steri-Strips™ (other wound closing devices such as sutures, staples, etc., are considered medical treatment).

e. Using hot or cold therapy.

f. Using any non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc. (devices with rigid stays or other systems designed to immobilize parts of the body are considered medical treatment for record keeping purposes).

g. Using temporary immobilization devices while transporting an accident victim (e.g., splints, slings, neck collars, back boards, etc.).

h. Drilling of a fingernail or toenail to relieve pressure, or draining fluid from a blister.

i. Using eye patches.

j. Removing foreign bodies from the eye using only irrigation or a cotton swab.

k. Removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs or other simple means.

l. Using finger guards.

m. Using massages (physical therapy or chiropractic treatment are considered medical treatment for record keeping purposes).

n. Drinking fluids for relief of heat stress.

Flammable Liquid - A liquid with a flash point below 100°F and having a vapor pressure not exceeding 40 lbs/square inch.

Flammable Liquids Cabinet - A cabinet specifically designed and authorized for storing flammable in-use material.

Flammable Liquids Storeroom - A space specifically designed and authorized for storing flammable liquids.

Flashpoint - The minimum (lowest) temperature at which the vapors given off from a material will support combustion provided an ignition source.

Frequency - The rate at which a sound source vibrates or makes the air vibrate determines frequency. The unit of time is usually one 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 - Loosely bound asbestos whose fibers may easily crumble or pulverize. A health hazard because it easily releases contaminants into the air.

Fume - Very small particles (1 micrometer or less) formed by the condensation of volatilized solids, usually metals.

Examples of processes that generate fumes: zinc socket pouring, smelting, furnace work, foundry operations, and welding.

Gas - A material that under normal conditions of temperatures and pressure (20 degrees Celsius and 760mmHg, 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.

Government Motor Vehicle - A motor vehicle that is owned, leased, or rented by a DoD component (not individuals); and whose general purpose is the transportation of cargo or personnel. Examples of GMVs are passenger cars, station wagons, vans, golf carts, 4-wheeled scooters, ambulances, buses, motorcycles, trucks, and tractor-trailers. Vehicles on receipt to, and operated by, non-DoD persons or agencies and activities such as the U.S. Postal Service or the American Red Cross are not GMVs.

Ground - Base (zero) potential. To make an electrical connection between an object and the ship or from ship to dry dock to ensure that no potential difference exists.

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/equipment. Mishap investigators use the term to explain causes of mishaps. Hazards are detected through inspections, industrial hygiene surveys, observations of near-mishaps, safety program evaluations, or from other activity reports.

Hazard Abatement Log - A record of identified deficiencies in chronological order by department.

Hazard Report - A message report notifying COMNAVSAFECEN and CMC (SD) of a hazardous condition or near-mishap that occurred at the reporting command.

Hazard Severity - An assessment of the worst potential consequence which is likely to occur as a result of deficiencies. Hazard severity categories are:

a. Category I - Catastrophic: the hazard may cause death or loss of a facility/asset or result in grave damage to national interests.

b. Category II - Critical: may cause severe injury, illness, property damage, damage to national or service interests or degradation to efficient use of assets.

c. Category III - Marginal: may cause minor injury, illness, property damage, damage to national, service or command interests or degradation to efficient use of assets.

d. Category IV - Negligible: presents minimal threat to personnel safety, health or property, national, service or command interests or efficient use of assets.

Hazardous Material (HM) - Any material that, because of its quantity, concentration, or physical or chemical characteristics, may pose a hazard to human health or the environment during use, handling, storage, transportation, or spill. Excluded are those materials cited in reference B3-3, such as materials that do not require a Material Safety Data Sheet (MSDS), Food, Drug and Cosmetics Act items, articles, ionizing and non-ionizing radiation and biological hazards. Materials that require special handling and disposal procedures include ammunition, weapons, explosives, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical waste, infectious materials, bulk fuels, asbestos, lead, and radioactive materials. Guidance/direction for these materials can be found in other related documentation.

Hazardous Material Information Resource System (HMIRS) - A Department of Defense (DoD) automated system developed and maintained by the Defense Logistics Agency. HMIRS is the central repository for MSDS for the United States government military services and civil agencies. It also contains value-added information input by the service/agency focal points. This value-added data includes hazard communication warning labels and transportation information. HMIRS provides this data for hazardous materials 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 hazardous materials. HMIRS can be accessed via http://www.dlis.dla.mil/hmirs/. HMIRS MSDS contain hazard characteristic codes (HCC) that can be used to determine proper storage for HM.

Hazardous Material Minimization Center (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 HM. The smallest ships (submarines, minesweepers, patrol craft) often require little HM and are too small to include a dedicated HAZMINCEN storeroom or

office. In these instances, HM is stored in work-center lockers, and centrally managed/controlled in the Supply Department. Other small ships (frigates, cruisers, destroyers) have only a small flammable storeroom and utilize lockers for other HM. HM on these ships can be issued from the flammable storeroom, and centrally managed/controlled in the Supply Department. On these smaller ships, there usually is insufficient space to allow for a dedicated HM consolidation space. Consolidation takes place in the flammable storeroom. On larger platforms (Amphibious Class ships, Aircraft Carriers), the ship is large enough to support a separate HAZMINCEN Office, multiple HM storerooms, issue room(s), and a consolidation space.

Hazardous Waste - Any discarded material (liquid, solid or gas) which meets the above definition of hazardous material and/or is designated as a hazardous waste by the Environmental Protection Agency or a state hazardous material control authority.

Hearing Level - Amounts in decibels by which the threshold of audition for an ear differs from zero decibels (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 resulting in unconsciousness, convulsions, delirium and possible death.

Hertz (Hz) - Unit of frequency.

Hospitalization - The admission of Navy and Marine Corps personnel to a hospital or shipboard medical facility on an inpatient basis related to the immediate injury or occupational illness.

Hyperbaric - Pressure greater than that normally measured at sea level. High gaseous pressure found in a diving environment.

Hypobaric - Pressure less than that normally measured at sea level. Low gaseous pressure found at altitude as in flight or a chamber flight simulator (hypobaric chamber).

Illness and/or Disease. - A non-traumatic physiological harm or loss of capacity produced by systemic; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc., or other continued and repeated exposures to conditions of the environment over a long period of time. For practical purposes, an occupational illness and/or disease are any reported condition that does not meet the definition of injury. Illness includes both acute and chronic illnesses, such as, but nor limited to, a skin disease, respiratory disorder, or poisoning.

Imminent Danger - A condition that **immediately** threatens the loss of life or serious injury or illness of an employee.

Impulse or Impact Noise - Sound of short duration, usually less than one second, with an abrupt onset and rapid decay.

Incompatible HM/HW - Any materials that react with each other to produce undesirable products. Mixing incompatible hazardous material can produce heat or pressure, fire or explosion, or toxic, irritating, or flammable dusts, mists, fumes, or gases.

Industrial Hygiene - The science that deals with the recognition, evaluation and control of potential health hazards in the work environment.

Industrial Hygiene Officer (IHO) - Medical service corps officer with a subspecialty and trained in the area of industrial hygiene. Trained to identify, evaluate, and prescribe controls for workplace hazards. Assigned as safety officer aboard tenders and as assistant safety officer aboard aircraft carriers. Some staffs are designated to have IHOs assigned.

Injury - A traumatic wound or other condition of the body caused by external force including stress or strain. The injury is identifiable as to time and place of occurrence and the part or function of the body affected, and is caused by a specific event or series of events within a single day or work shift. Injuries include cases such as, but not limited to, a cut, fracture, sprain, or amputation.

Inspection - Careful and critical workplace monitoring for safety hazards and deficiencies conducted by ship's force and outside commands (type commander, group commander, squadron commander,

Inspection and Survey (INSURV) Board). Ensures 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 (IUM) - The minimum quantity of HM required to be ready for a 1-week's use by maintenance requirement cards (MRCs) job process, etc.

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.

Lost Time Case - A non-fatal traumatic injury that causes any loss of time from work after the day or shift on which it occurred; or non-fatal non-traumatic illness and/or disease that causes any loss of time from work.

Lost Workdays or Days Away From Work - The total number of full calendar days, weekends included, that a person was unable to work as a result of an injury or occupational illness, excluding the day of the mishap and the day returned to duty or work.

a. For Navy and Marine Corps military personnel, these include days hospitalized, sick-in-quarters, or on convalescent leave as a result of injury or work-related illness.

b. Navy and Marine Corps reserve personnel, in a not physically qualified (NPQ) status sustained as a result of an injury at any time en route to, during, or returning from drill, or during annual training, is considered lost time.

c. For Navy and Marine Corps civilian personnel, this includes continuation of pay (COP) leave, annual leave, sick leave, days hospitalized, and leave without pay granted, or a full work shift missed because of a work-related illness or injury.

Man-made Vitreous Fibers (MMVF) - are a group of fibrous inorganic materials, generally aluminum or calcium silicates, that are derived from rock, clay, slag, and glass and used for thermal and acoustical insulation and as reinforcement materials.

Material Safety Data Sheet (MSDS) - A document that contains on the potential health effects of exposure to chemicals, or other potentially dangerous substances, and on safe working procedures when handling chemical products. It is an essential starting point for the development of a complete health and safety program. It contains hazard evaluations on the use, storage, handling and emergency procedures related to that material. The MSDS contains much more information about the material than the label and it is prepared by the supplier. It is intended to tell what the hazards of the product are, how to use the product safely, what to expect if the recommendations are not followed, what to do if accidents occur, how to recognize symptoms of overexposure, and what to do if such incidents occur.

Medical Attention - An injury or exposure requiring treatment by the ship's medical department representative (physician, nurse, or corpsman) and a medical record entry.

Medical Surveillance - An effort to monitor the health of individuals for job certification/recertification, for ensuring the effectiveness of hazard limiting programs, for indication of excessive exposure in the workplace and for compliance with NAVOSH standards.

Medical Treatment - Treatment administered by a physician or by registered personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even though provided by a physician or registered professional personnel.

Mercury Control Officer - Appointed in writing by the commanding officers of afloat IMAs to ensure the requirements of this directive are implemented.

Military Personnel - All Navy military personnel on active duty (USN/USNR); Naval Reserve personnel (USNR-R) on active duty or in a drill status; Naval Academy midshipmen; Reserve Officer Training Corps (ROTC) midshipmen when engaged in directed training activities; and other DoD and Foreign National military personnel assigned to the Navy or embarked in Navy or Military Sealift Command ships.

Mishap - Any unplanned or unexpected event causing personnel injury, occupational illness, death, or material loss or damage or an explosion of any kind whether damage occurs or not.

Mishap Causes - Conditions or events explaining why a mishap occurred. See OPNAVINST 5102.1D, Navy and Marine Corps Mishap and Safety Investigation Reporting and Recordkeeping Manual, for additional information.

Mishap Costs - Include all DoD property damage, other property damage, and injury costs.

a. DoD Property Damage Costs. The cost of repair or replacement of all DoD property involved in the mishap by determining the actual cost of materials or by estimates provided by the repair activity. If necessary, use estimates based on the actual cost of materials and $18 for each hour of organizational- or intermediate-level labor or $60 for each hour of depot-level labor.

b. Other Property Damage Costs. The actual cost of repair or replacement, if available.

c. Injury Costs. The cost based on the extent of injury reported and current costs estimates. These costs are calculated by COMNAVSAFECEN from data received.

Mishap Investigation - The investigation conducted into the facts surrounding the causes of a mishap.

Mishap Probability - The likelihood that a hazard will result in a mishap or loss, based on an assessment of such factors as location, exposure in terms of cycles or hours of operation, and affected population. Represented by a letter according to the following criteria:

Subcategory	Description
A	Likely to occur immediately or in a short period of time.
B	Probably will occur in time.
C	May occur in time.
D	Unlikely to occur.

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 Industrial Hygiene - Measurement of the amount of contaminant or physical stress reaching the worker in the environment.

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.

Moored - Secured alongside a pier, wharf, quay, or causeway; to a mooring buoy; or at anchor.

Motor Vehicle Mishap - A mishap entailing the operation of a motor vehicle or motorcycle involving collisions with other vehicles, objects, or pedestrians; fatality, personal injury, or property damage; fatality or personal injury in moving vehicles or by falling from moving vehicles; towing or pushing mishaps; and other injury and property damage. Collisions involving pedestrians or bicyclists when struck by a motor vehicle or other vehicular objects are to be included if other reporting requirements are met.

MSHA - Mine Safety and Health Administration.

NAVOSH - Navy Occupational Safety and Health.

Navy Environmental and Preventive Medicine Unit (NAVENPVNTMEDU) - A Navy Medical Command activity which provides training and technical assistance in environmental and occupational health to Navy commands, afloat and ashore.

Navy Occupational Safety and Health (NAVOSH) Standards - Occupational safety and health 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 are given in section C of this manual and submarine standards are given in section D of this manual.

Navy Personnel - Includes the following categories:

a. **Civilian** - General Schedule and Wage Grade employees; Youth/Student Assistance Program employees, Foreign Nationals directly employed by Navy commands; and non-appropriated fund employees.

b. **Military** - All U.S. Navy personnel on active duty; U.S. Military Reserve or National Guard personnel on active duty or in drill status; Service Academy midshipmen/cadets; Reserve Officer Training Corps midshipmen when engaged in directed training activities; Foreign National military personnel assigned to Navy commands. Personnel of other branches of the Armed Forces serving with the Navy.

Near Mishap - An act or event in which injury or damage was avoided merely by chance. The situations are reported internally by Safety Hazard Report (OPNAV 3120/5) or Internal Mishap/Near Mishap Report; and externally, when there is a lesson learned, according to OPNAVINST 5102.1D, Navy and Marine Corps Mishap and Safety Investigation Reporting and Recordkeeping Manual.

NIOSH - National Institute of Occupational Safety and Health.

NIOSH/MSHA Certified Equipment - Respirators or other equipment that have been tested by NIOSH or MSHA and jointly 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 radiowaves, microwaves, visible light, and ultraviolet radiation.

Normal Working Population Exposed to Hazard - The number of people whose authorized activities cause them to be exposed to the specified hazardous condition on a significant number of occasions during a work year; no one should be included in this estimate who is exposed to the cited hazard so infrequently or at such low exposure concentrations that it can be considered insignificant. Do not count as exposed those persons who only

occasionally pass by the door of a room where a hazard is present.

For specific chemical or physical agents, the population exposed is dependent on the numbers of personnel involved in the specific activity, the effectiveness of confinement or containment systems, and the process steps involved. For agents requiring extensive processing, potential exposure may be ship-wide, but will vary in intensity. If isolation is practiced, the exposed population may be only one person per shift or watch. If collection systems are not used to confine potential emissions, personnel not actively engaged in the operation may also be exposed to hazardous substances.

Populations exposed to a specific safety hazard will vary with the type of hazard and its locations. If the safety hazard is associated with a specific piece of equipment, only the operator may be exposed. For a grinder, the population exposed could differ according to the safety features of the equipment. If the grinder has a guard, only the operator might be injured through contact with the grinding wheel; on the other hand, if a grinder is without an adequate guard, shattering of the grinding wheel could injure other personnel in the immediate vicinity.

Occupational Health - That multidisciplinary field of general preventative medicine which is concerned with the prevention and/or treatment of illness induced by factors in the workplace environment. The major disciplines involved are: occupational medicine, occupational health nursing, epidemiology, toxicology, industrial hygiene, and health physics.

Occupational Medicine Services - Occupational medicine services shall include medical examinations and tests related to preemployment, preplacement, periodic, and pretermination; 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.

Off-Duty - Applicable to DoD personnel. Such personnel are off-duty when they are not on-duty as defined below.

On-Duty. DoD personnel are on-duty when:

a. Physically present at any location (area under the control of a DoD component) where they are to perform their officially assigned work. (This includes those activities

incident to normal work activities that occur on DoD installations, such as lunch, coffee, or rest breaks, and all activities aboard vessels.)

b. Being transported by DoD or commercial conveyance for the purpose of performing officially assigned work. (This includes travel in private motor vehicles for performing official duty, but not routine travel to and from work).

c. Participating in compulsory physical training activities (including compulsory sports and command-sponsored activities during work hours).

d. Ready Reservists performing inactive duty training (drill) and are between departure and return home without diversion.

e. On temporary duty or temporary additional duty (TDY/TAD). Personnel on assignment away from the regular place of employment are covered 24 hours a day with respect to any injury that results from activities essential or incidental to the temporary assignment. However, when personnel deviate from the normal incidents of the trip and engage in activities, personal or otherwise, which are not reasonably incidental to the duties of the temporary assignment contemplated by the employer, the person ceases to be considered on-duty for reporting purposes of occupational injuries or illnesses.

Operational Readiness Repair - A repair necessary to accomplish ship's mission.

OSHA - Occupational Safety and Health Administration, Department of Labor.

OSHAct - The Williams-Steiger Occupational Safety and Health Act of 1970 (Stat. 1590 et seq., 29 U.S.C. 651 et seq.).

OSHA Standards - OSHA standards are those standards issued by the Department of Labor's Occupational Safety and Health Administration under Section 6 of the OSHAct.

Oxidizers - Any material that readily yields oxygen to support combustion.

Oxygen Breathing Apparatus (OBA) - Respirator that provides the user with oxygen through a chemical reaction. OBA's are for emergency or damage control use only.

Oxygen Deficient Atmosphere - Atmosphere with insufficient oxygen (O_2) to support life. This deficiency is generally caused by oxidation, dilution, or by the displacement of oxygen by other gases.

Examples: Oxidation can consume O_2 either very quickly as in a fire or quite slowly as rusting in a confined space. Dilution/displacement of O_2 may occur in one of three ways: (a) deliberately, as in suppressing a fire using carbon dioxide (CO_2) or a halocarbon; (b) deliberately, as in inerting to prevent rusting or for inerting prior to hot work, using nitrogen (N_2) or another inert gas; or (c) accidentally, as when a halocarbon solvent, such as "Freon"-113, is spilled and vaporizes in a confined space.

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.

Permanent Partial Disability - An injury or occupational illness that does not result in death or permanent total disability but, in the opinion of competent medical authority, results in permanent impairment through loss, or loss of use, of any part of the body, with the following exceptions:

a. Loss of teeth.

b. Loss of fingernails or toenails.

c. Loss of tips of fingers or tips of toes (less than one joint).

d. Inguinal hernia, if it is repaired.

e. Disfigurement.

f. Sprains or strains that do not cause permanent limitation of motion.

Permanent Total Disability - A nonfatal injury or occupational illness that, in the opinion of competent medical authority, permanently and totally incapacitates a person to the extent that he or she cannot follow any gainful occupation.

NOTE:

The loss, or loss of use, of both hands, both feet, both eyes, or a combination of any of these parts of the body

as a result of a single mishap, shall be considered as a permanent total disability.

Permissible Exposure Limit (PEL) - The legally established time-weighted average (TWA) concentration or ceiling concentration of a contaminant or exposure level of a harmful physical agent that shall not be exceeded.

Personal Information - Information exempt from release under exemption (b)(6) of the Freedom of Information Act.

Personal Protective Equipment (PPE) - A 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 in entering hazardous areas or under hazardous conditions. Equipment includes hearing protection, respirators, electrical matting, barricades, traffic cones, lights, safety lines, and life jackets.

Pesticide - Any chemical used to kill pests, such as insects.

Examples: Baygon (propoxur), Killmaster (dursban), d-phenothrin, Malathion.

Physiological Heat Exposure Limit (PHEL) - A set of curves that compare the Wet Bulb Globe Temperature (WBGT) index and the degree of effort or work rate to determine the maximum permissible exposure to the heat stress environment.

Potentially Hazardous Noise - Exposure to 85 dB (A-weighted) or greater sound level or 140 dB peak sound pressure level for impact or impulse noise. The safe exposure time (T) for periods of less than 16 hours in any 24-hour period may be determined using the equation found in chapter B4, appendix B4-B.

Potentially Hazardous Noise Area

a. Any work area where the A-weighted sound level (continuous or intermittent) is routinely 85 dB or greater.

b. Any work area where the peak sound pressure level (impulse or impact noise) routinely exceeds 140 dB.

Private Motor Vehicle - A motor vehicle (not government owned), primarily designed for highway use to transport cargo or personnel over public streets or highways.

Privileged Information - That information voluntarily provided under a promise of confidentiality or information which would not have been discovered otherwise, but for information voluntarily provided under a promise of confidentiality. The deliberative analyses of findings, conclusions, and recommendations of the SIB or command investigator in the report are privileged. Also privileged are calculations and deductions the SIB or investigator make that would reveal the board's deliberative process. Report endorsements also are part of the deliberative process and are similarly privileged against disclosure.

Property Damage - DoD and civilian or foreign facilities, equipment, property, or material destroyed or made inoperable in a DoD mishap. The cost of environmental cleanup and restoration also shall be included in property damage costs. DoD expresses property damage severity in terms of cost.

Protective Clothing - 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 Testing - A simple procedure of fitting an individual with a respirator face mask.

Quantitative Fit Testing - Respirator fit test procedure involving the use of a special enclosure filled with sodium chloride mist or other chemicals, a sensor attached to the mask to be tested, and a monitoring device to detect leakage of the chemical into the mask.

Radiation Safety Officer - An officer assigned by the commanding officer to be the technical manager of the radiation protection program.

Rate of Exposure - The estimated number of hours per year that an average member of the exposed population is exposed to the cited hazardous condition. This figure should be an estimate by someone familiar with the work situation, based on the best available existing information. Special studies to obtain these data are not required.

The estimate should be based on net working days per year (e.g., total working days per year minus leave and holidays. Usually, net working days is 40 hours per week and 50 weeks per year (e.g., 2,000 hours per year).

For an exposure to a health hazard, the rate of exposure may be easily calculated if the individual works only at the operation in question. However, an employee will generally work in an area of potential exposure for a period of time and move to another location. If the transiency follows a predictable routine, the rate of exposure can be assessed by determining the degree of hazard at all work locations and eliminating those where the potential hazard is minimal.

The rate of exposure to safety risks may also vary. As an example, in general traffic areas, the lack of a guard rail on platforms or hand rails on stair steps may create brief repetitive exposures to several people, including operators, inspectors, and occasional casual personnel. In such cases, calculate average use of the steps or the platforms to determine the rate of exposure.

Recompression Therapy - Treatment to compress gas bubbles in the blood to a small volume to relieve local pressure and restart blood flow, allow sufficient time for gas bubble resorption, and increase blood-oxygen content and improve oxygen delivery to injured tissues.

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.

Risk Assessment Code (RAC) - A simple expression of risk which combines the elements of hazard severity and mishap probability. This assessment will be used to help prioritize abatement projects.

Safety - Freedom from those conditions that can cause death, injury, occupational illness, or damage to or loss of equipment or property.

Safety Committee - Consists of the safety officer, chief master-at-arms (CMAA), and divisional safety petty officers. The

committee identifies and discusses NAVOSH problems and makes recommendations to the Safety Council.

Safety Council - Consists of the commanding officer, safety officer, training officer, all department heads, medical officer/representative and the ship's command master or senior chief petty officer. The Council develops specific NAVOSH policies and analyzes the progress of the overall program.

Safety Data File - The computer file, developed as part of the HMIS, used to store the hazardous material characteristics relevant to their safe handling, use, and disposal.

Safetygrams - A form submitted to the Naval Safety Center by personnel identifying a new or potential safety hazard or a near mishap.

Safety Investigation Board (SIB) - A formal investigating body appointed to determine the primary cause(s) mishaps. The board consists of a minimum of three members. The immediate superior in command (ISIC) of the ship or craft involved in the mishap normally appoints the senior member of the mishap investigation board.

Safety Investigation Report (SIREP) - A message report that identifies deaths, injuries, or damage occurring in all mishap classes, the causal factors, and the recommended corrective actions to prevent similar mishaps.

SOH - Safety and Occupational Health

Safety or Health Professional - Persons who meet the Office of Personnel Management standards for Safety and Occupational Health Manager GS-018, Safety Engineer, GS-803, Safety Technician GS-019, Aviation Safety Officer GS-1825, Air Safety Investigating Officer GS-1815, Fire Protective Engineer GS-0804, Fire Protection Specialist/Marshall, GS-0081, Medical Officer GS-602, Health Physicist GS-1306, Industrial Hygienist GS-690, Occupational Health Nurse GS-610, Industrial Hygiene Technologist, or comparably qualified personnel as determined by appropriate Navy authority.

Safety Stand-down - 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.

Safety Zone Inspection - A special zone inspection which specifically identifies safety hazards and deficiencies for baseline workplace surveillance.

Self-Contained Breathing Apparatus (SCBA) - Breathing apparatus where compressed air is carried in a tank on the user's back.

Serious Physical Harm - Permanent, prolonged, or temporary impairment of the body in which part of the body is made functionally useless or is substantially reduced in efficiency on or off the job. Illness could shorten life or significantly reduce physical or mental efficiency by inhibiting the normal function of part of the body. Examples of such illnesses are silicosis, asbestosis, hearing impairment, radiation exposure, and visual impairment.

Sewage Disposal Operational Sequencing System (SDOSS) - Operating instructions for collection, holding and transfer (CHT) tanks tailored for each ship.

Ship's Hazardous Materials List (SHML) - The SHML is the master HM authorized use list for surface ships. The list was developed to ensure only required HM is brought aboard ships and to prevent the introduction of unnecessary or unsafe HM.

Significant Threshold Shift - A change of hearing threshold level of 15 dB or greater, in either ear, at any frequency (1,000 to 4,000 Hz) between the reference audiogram and any subsequent audiogram.

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.

Specific Hazard (Safety or Health) - A word or words constituting the distinctive designation of the cited hazard; for example, the name of the safety hazard might be "unguarded flywheel" or "lack of fire exit"; the name of the health hazard might be "asbestos fibers in the air," "mercury," or "noise." General terms are not acceptable for health hazards.

For chemical hazards, the specific name of the dangerous chemical is required. As an example, if a solvent is being used, its chemical name (i.e., "trichloroethylene" must be given); the word "solvent" is not adequate. If more than one chemical is involved

in the work operation, or a chemical mixture is being used, give the chemical name of the single most hazardous chemical involved. If the specific hazard is a chemical by-product or by-product mixture resulting from the work operation, give the chemical name of the single most hazardous by-product.

For noise hazards, specify whether they are steady-state or impulse. When the cited health standard is one that details ventilation requirements for a particular type of operation, such as spray painting or arc-welding, the specific hazard name should be "insufficient ventilation to control _____." Terms such as spray paint, welding fumes, etc., are adequate only in cases relating to ventilation standards.

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.

a. **Criteria** - Those parts of a standard that establish a measurable quality, i.e., specifications, inspection intervals, etc.

b. **Equivalent Criteria** - The measurement of equivalency shall be a judgment based on the preponderance of information available. Generally, they must provide protection at least as effective as the criteria they replace.

Submarine Hazardous Material Inventory and Management System (SHIMS) - SHIMS is a menu driven HM inventory and management tool for use aboard submarines. SHIMS allows submarines to be in full compliance with this instruction and applicable Atmospheric Control Requirements. It assists the operator in the systematic, positive control and management of HM.

Submarine Material Control List (SMCL) - The SMCL is a Navy data application that lists the authorized HM for use on submarines as established by reference B3-2.

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.

Survey - An examination of the condition of industrial hygiene and occupational health of a command. This examination is

performed by industrial hygienists or technicians under the supervision of an industrial hygienist.

Surveys of Damages - A formal procedure relevant to admiralty claims and litigation. Only the Judge Advocate General may accept survey invitations from potential claimants, extend survey invitations to persons responsible for damage to naval property, or request representation of the United States by a marine surveyor. In no case shall any person involved in mishap investigating or reporting accept or offer an invitation for a survey of damages on behalf of the United States. In any instance of receipt of invitation to a survey, refer to chapter XII of the NAVJAGMAN and notify the Office of the Judge Advocate General, Admiralty Division (Code 31).

Tender - A mobile intermediate maintenance and repair activity (i.e., AS Class ships).

Threshold Limit Value (TLV) - An atmospheric exposure level under which nearly all workers can work without harmful effects. TLVs are established by the American Conference of Governmental Industrial Hygienists (ACGIH).

Time-Weighted Average (TWA) - The average concentration of a contaminant in air during a specific period of time, usually an 8-hour work day 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.

Transportation Data File - The computer file, developed as part of the HMIS used to store the hazardous material characteristics relevant to their safe transportation and handling.

Underway - A vessel not made fast to the ground in any manner. She may or may not have way on (that is, she may be hove to), but she is free floating in the sea, subject to wind, currents, and of course her own propulsion system.

Used Hazardous Material - Used HM 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, or by commercial industry.

Vapor (inorganic or organic) - 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.

Variances - When and if a NAVOSH standard is found to be impossible to comply with, variances can be requested from the type commander, via the chain of command. Variance requests shall explain why compliance is impossible and describe actions taken to achieve the maximum degree of protection possible.

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 conditions (heat stress). Consists of a weighted average of dry-bulb, wet-bulb, and globe temperatures. Expressed in the following equation:

WBGT = (0.1 x dry-bulb) + (0.7 x wet-bulb) + (0.2 x globe temperature)

WBGT Meter - Instrument used for measuring heat stress. Measures dry-bulb, wet-bulb and globe temperatures and integrates these values into the WBGT index.

Workplaces

a. **Applicable Workplaces and Operations** - Navy workplaces and operations generally comparable to those of business and industry in the private sector.

b. **Unique Military 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 includes operations that are uniquely military such as naval operations, flight operations, associated research

test and development activities and actions required under emergency conditions.

Workplace Monitoring - The evaluation of each Navy workplace to accurately identify and quantify all potential hazards. This will consist of internal command routine inspections and industrial hygiene surveys.

Zone Inspections - Command inspections which ensure that proper measures are taken to keep machinery, spaces, and equipment operational, clean, and in a satisfactory state of preservation.