

Safety

for the

Division Officer

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I. PURPOSE

The purpose of this manual is to provide the Naval Reserve Officers Training Corps midshipman an overview of the Navy Occupational Safety and Health (NAVOSH) program and other aspects of safety and damage control equipment related to the operation of Navy ships, aircraft and submarines. Specifically, it will focus on forces afloat requirements and the division officer's responsibilities. It will be used as a supplemental text in the Naval Ships Systems I (Engineering) and Leadership and Ethics curricula. It is not the intent to provide detailed instruction or an all encompassing document.

II. REFERENCES

- (a) OPNAVINST 5100.23D, NAVY OCCUPATIONAL SAFETY AND HEALTH (NAVOSH) PROGRAM MANUAL
- (b) OPNAVINST 5100.19C, NAVOSH PROGRAM MANUAL FOR FORCES AFLOAT
- (c) SECNAVINST 5100.13A, TOBACCO PREVENTION PROGRAM
- (d) NAVY SHIPS TECHNICAL MANUALS (NSTM)
- (e) OPNAVINST 5100.25A, NAVY RECREATION, ATHLETICS AND HOME SAFETY PROGRAM
- (f) OPNAVINST 5100.12F, ISSUANCE OF NAVY TRAFFIC SAFETY PROGRAM
- (g) OPNAVINST 5090.1B, ENVIRONMENTAL AND NATURAL RESOURCES PROGRAM MANUAL

III. GENERAL SHIPBOARD SAFETY

A. Introduction

It is the Navy policy to enhance operational readiness and mission accomplishments by establishing an aggressive safety and health program which will reduce occupational injuries, illnesses or deaths, and material loss or damage and to maintain safe and healthy working conditions for personnel. As a division officer, you will be responsible for the safety of your personnel in the division. Your responsibilities will include emphasizing safety as a top priority in all activities (work, driving, recreational, and off-duty), consistent with mission requirements; ensuring that all mishaps and near-mishaps are investigated and results are reported to the safety officer; taking prompt action to abate/correct any identified deficiency under your control; and appointing a senior petty officer (E-5 or above) as the division safety petty officer to assist in the responsibilities previously outlined. This manual is only a brief overview of the Navy Occupational Safety and Health (NAVOSH) program. The references upon which this manual are derived provide much greater detail and guidance.

B. Principles of Hazard Prevention and Control

1. There are three methods of controlling the impact of hazards. The first is to prevent the hazard, if possible. The second is to identify and eliminate existing hazards. The third is to reduce the likelihood and severity of mishaps from hazards that cannot be eliminated.

2. Prevention of hazards can be accomplished on board through the careful following of preventative maintenance procedures and operating procedures. The Navy's planned maintenance system (PMS) maintains equipment in proper working order to prevent catastrophic failures which might otherwise cause personal injury. Standard operating procedures (SOPs) and similar instructions are written to ensure safe operation of equipment during hazardous evolutions. Compliance with these instructions is paramount to safe operations.

part of the division officer's job. Zone inspections, divisional space tours, and management by walking around (MBWA) are just a few of the methods division officers must use to identify hazards. As a supervisor you must maintain a broad view of the operation at hand and be prepared to stop the evolution if any questions regarding safety arise.

4. Sometimes hazards cannot be completely eliminated. In these situations there are four methods of hazard control. In the order of preferred application they are substitution, engineering controls, administrative controls and use of personal protective equipment.

(a) In some cases a substitution of materials or equipment may decrease the existing hazard of an evolution. Care must be taken in the choice of substitution to ensure that the substitute is acceptable and does not inadvertently increase the hazard.

(b) Engineering controls are introduced at the planning and design stage. When you, as a division officer, are approving or reviewing upcoming maintenance, you should consider what engineering controls are available. Examples include electrical insulation, exhaust ventilation, machinery guards, sound barriers, etc. You should consult the ship's safety officer or your department head if you have little experience in the given task.

(c) Administrative controls are the employment of special operating procedures to attempt to reduce the hazards involved. Examples include limiting access to the hazardous area and adjusting work schedules.

(d) Finally, the use of personal protective equipment is least preferred because any misuse or breakdown of the equipment can immediately expose the individual to danger. Examples include steel toed boots, goggles, electrically insulated gloves, etc.

C. Risk Assessment

Every evolution and shipboard environment requires the assessment

Every evolution and shipboard environment requires the assessment for risk. The division officer is expected to evaluate the risks involved in evolutions under his or her cognizance and act accordingly. You should assess the risk in terms of both potential severity and mishap probability. Reference (a), section A0404, provides further guidance.

General Shipboard Safety Discussion Topic

1. Discuss the NAVOSH program and the division officer's role in it.

IV. WORKPLACE SAFETY

A. During your division officer tour, you will encounter some terminology concerning NAVOSH programs. References (a), NAVOSH Program Manual, and (b), NAVOSH Program Manual for Forces Afloat, contain specific information regarding the individual programs listed below.

1. Occupational Safety: Focuses on the elimination or control of the type of hazard that can result in instantaneous traumatic injury or death. Safety programs include occupational, aviation, weapons, off-duty, shipboard, traffic, and confined-space entry (gas-free engineering).

2. Occupational Health: Focuses on health effects usually produced by long-term exposures to toxic chemicals or harmful physical conditions and treatment of work-related injuries. Occupational health is divided into two major specialties: industrial hygiene and occupational medicine. Health programs include hazardous materials and waste, hearing conservation, sight conservation, respiratory protection, asbestos exposure, radiation, lead exposure, and heat stress.

3. Industrial Hygiene: Involves the identification and evaluation of occupational health hazards, and the recommendation of practical controls which will lower workplace health risk

4. Occupational Medicine: Focuses on the medical surveillance of employees potentially exposed to the hazards identified during the industrial hygiene workplace evaluation

B. The following is a partial list of hazardous conditions in the workplace. Included are basic safety procedures and supervisory actions associated with them:

1. Machinery

a. Machinery is located everywhere in your ship, from the more obvious examples of propulsion equipment in the engineroom, to the less than obvious example of galley equipment. All machinery has moving parts and some involve high energy

systems. Both present the possibility of personnel injury.

b. The main propulsion equipment on your ship may involve high pressure and temperature steam or highly flammable fuels under pressure. Either system is dangerous and warrants proper safety observations. The auxiliary systems onboard may involve high energy fluids. Examples are the high pressure air systems, hydraulic systems, and refrigeration and air conditioning systems. As the division officer, you must ensure your division members are properly trained in the operation and maintenance of the equipment under your cognizance. You will not be the technical expert on your equipment. However, you should be able to spot obvious safety violations and unsafe work conditions. Supervision at the deck plate level will allow you to not only observe work practices but also learn about the equipment for your own professional development.

c. Never allow your personnel to operate equipment or perform maintenance without using the appropriate procedures. Too many accidents have occurred because one step was left out of a procedure the worker was performing from memory. The combination of proper training, experience and the thoughtful use of approved procedures will allow the smooth and safe completion of any task.

2. Aircraft Operations

a. During aircraft operations, only those actually involved are allowed in the flight deck area. All other personnel remain clear or below decks. Personnel engaged in flight operations must wear appropriate safety equipment, including hearing protection.

b. Engine noise of the plane you are watching will drown out the noise of the ones you are not watching. Don't move without looking in all directions and don't direct all your attention to a single aircraft.

3. Heat Stress

a. Heat stress is 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 ability to adjust is exceeded, resulting in increased body temperature. This condition can produce fatigue, rash, cramps, profuse sweating, tingling in extremities, rapid heartbeat, severe headache, nausea, vomiting, and poor physical and mental performance. As body temperature continues to rise, heat injuries such as heat exhaustion and heat stroke will occur. Recognizing personnel heat stress symptoms and obtaining prompt medical attention for affected persons is an all hands responsibility.

b. It is the supervisor's responsibility to ensure workers are not subject to conditions which could cause heat stress and stop work when heat stress conditions arise unexpectedly. Proper training of all workers will assist in the recognition of heat stress conditions.

4. Compressed Gas

a. Precautions must be taken when working on high-pressure air systems to keep from opening lines which are not completely isolated and bled down.

b. No person should attempt repairs of any nature on an air system under pressure. Bottles containing compressed gases, which are not in use, must be capped and well secured.

c. Oxygen bottles and fittings must be kept away from oil and grease. Never substitute oxygen for compressed air.

5. Fire and Explosion Protection

a. Minimizing fire and explosion hazards is every sailor's responsibility. All potential hazards should be eliminated, including non-essential flammables and combustibles. Whenever possible, replace flammable and combustible materials with less hazardous ones. Stow and protect essential flammables or combustibles to reduce the chance of fire.

b. Avoid accumulating oil and other flammables

in bilges and inaccessible areas. Any accumulations should be removed immediately in accordance with established procedures for disposing of oily waste. Oily rags should be stowed in authorized air-tight metal containers. Stow paint, brushes, rags, thinners, and solvents only in authorized locations.

c. Do not use compressed air to accelerate the flow of liquid containers of any type.

d. Keep damage control equipment ready for any emergency.

6. Lifelines, Ladders, and Safety Nets

a. No one shall lean, sit, stand, or climb on any lifeline in port or underway. Personnel working over the side in port may climb over lifelines when necessary, but only when fitted with approved safety gear and following established procedures.

b. No lifeline shall be dismantled or removed without specific permission of the first lieutenant, and then only if temporary lifelines are rigged.

c. No person shall hang or secure any weight or line to any lifeline unless authorized by the commanding officer.

d. Ladders must not be removed without permission from the cognizant department head. When ladders are removed, all accesses must be carefully and adequately roped off, or suitable railings installed. Work on ladders must be performed during periods of low traffic.

e. Safety nets installed around vertical ladders must be in place at all times.

7. Lights: When in port at night, weather decks, accommodation ladders, gangways, and brows must be well lighted.

8. Materials Handling

a. Safety shoes or toe guards must be worn when

handling heavy stores or equipment.

b. Gloves must be worn when carrying, lifting or moving objects that have sharp edges or projecting points. Always remove rings when wearing gloves.

c. Material must not be thrown from platforms or trucks to the floor or ground. Use suitable lowering equipment.

d. Don't overload hand trucks. On a ramp or incline, keep the load below you--pull the load up and push it down.

e. To lift objects, stand close to the load, with your feet solidly placed and slightly apart. Bend your knees, grasp the object firmly, and lift by straightening your legs, keeping your back as straight as possible.

9. Personnel Protection

a. Avoid wearing clothing with loose ends or loops when working on or near rotating machinery. Suitable leather or other heavy-type gloves must be worn when working on steam valves or other hot units. Keep the body well covered to reduce the danger of burns when working near steam equipment. Division officers shall stock personal protective clothing and equipment and shall provide it to personnel as needed. Consult Chapter B12 of reference (b) (OPNAVINST 5100.19C, CH-1) for personal protective clothing and equipment.

b. A helmet or goggles and leather welding jacket must be worn when brazing, welding, or cutting. Fire watches must wear protective goggles. Protective goggles should also be worn whenever working with corrosive substances such as acid, alkali, and vinyl paint. Eyewash stations should be available when working with chemicals. For specific personal protective equipment and requirements consult reference (b), CH-1 Volume I, Section B and Volume II, Section C.

c. Plastic face shields must be worn when handling primary coolant under pressure, and suitable eye protection--a shield, goggles, or safety glasses--must be worn

when buffing, grinding, or doing similar eye hazard operations.

10. Safety Clothing: Special clothing may consist of flameproof coveralls, disposable coveralls, impervious chemical spill coveralls, welding leathers, and chemical aprons. These items may be specified as required by annual safety zone inspections, industrial health surveys, or standard work practices. Special clothing is required for personnel involved in asbestos ripout (see Chapter B1, reference (b), CH-1). Synthetic clothing such as certified Navy twill, will not be worn in ship's firerooms, main machinery spaces, and in hot work areas. Fire retardant coveralls and dungarees will be used by engineering personnel who stand watch or work in these spaces. See Appendix B12-B, reference (b), CH-1 for stock number information on safety clothing.

11. Smoking

a. Reference (c), SECNAVINST 5100.13A, provides guidance on tobacco prevention and its use in ensuring a healthy work environment.

b. There is no smoking in holds, storerooms, gasoline tank compartments; gasoline pump rooms, voids, or trunks; in any shop or space where flammable liquids are being used or handled; in the ship's boat; in bunks or berths; in magazines, handling rooms, ready service rooms, gun mounts or turrets; in gasoline control stations, oil relay tank rooms, and battery and charging rooms; in the photo lab; anywhere that there is bleeding oxygen; in any area where vinyl paint is being applied; on the flight deck, flight deck catwalks, and gun platforms; or in the hangar and gallery spaces open to the hangar.

c. No smoking is permitted in any area of the ship or alongside when ammunition is being handled; in any part of the ship when receiving or transferring fuel oil, diesel oil, aviation gasoline, or other volatile fuel, except in spaces designated as smoking areas by the commanding officer.

d. There is no smoking during general quarters, drills, or during emergencies except as authorized by the

commanding officer. There is no smoking when the word "the smoking lamp is out" is passed.

12. Tanks and Voids

a. Division officers will ensure the gas-free engineer (GFE) is notified before any unventilated, non-occupied space that has been designated to store hazardous or toxic materials or any sealed space is entered. In all cases, the person working in the space will follow all prescribed safety precautions and have a standby person outside the space in the nearest uncontaminated area acting as a tender/safety observer. Refer to Chapter B8 of reference (b), CH-1 for program requirements and reference (d) CH-074, Gas-Free Engineering, for specific requirements.

b. The space entered should be continuously ventilated. A reliable person must be stationed at the entrance to keep count of the number of persons inside as well as to maintain communications. Suitable fire-extinguishing equipment must be at the scene and non-sparking tools will be used. Persons entering will not carry matches or lighters, or wear articles of clothing that could cause a spark.

13. Working Over the Side

a. No work is done over the side without permission of the officer of the deck (OOD). Individuals working over the side on stages, boatswain's chairs and on work floats or boats along the side of the ship must wear buoyant life preservers, and shall be equipped with parachute-type safety harnesses with safety lines tended from the deck above. When another ship comes alongside, all individuals working over the side should be cleared.

b. Division officers have the responsibility for instructing personnel in all safety regulations and ensuring that they are qualified before allowing them to work over the side. Responsibility for ensuring that a competent petty officer is available for constant supervision also rests with the division officer.

c. All tools, buckets, paint pots, and brushes used over the side must be secured by lanyards to prevent loss overboard and injury to personnel below.

d. No person may work over the side while the ship is underway without the permission of the commanding officer.

Workplace Safety Discussion Topics

1. Assume you are assigned as safety officer for linehandling. As you observe your troops, what discrepancies are you looking for?
2. Assume you are a division officer. Some of your division personnel must work over the side to conduct maintenance. What should be done before you give them approval?
3. What are the basic safety considerations concerning main propulsion systems?
4. What are the basic safety considerations concerning auxiliary propulsion systems?
5. Describe the Navy's policy on workplace safety.

V. GENERAL SHIPBOARD PROTECTIVE EQUIPMENT

Everyone in your division, including yourself, will have to don personal protection equipment from time to time on board the ship. Sometimes it will be for training purposes, and other times for actual events. The equipment may be used for maintenance, but some of this equipment will be used in emergencies. For both reasons, the proper donning of personal protection equipment is essential. You should make it a point, on occasion, to informally inspect your personnel to ensure they are suited up properly.

A. Respiratory Protection

1. Oxygen Breathing Apparatus (OBA)

a. Description

(1) Self-contained, closed-air breathing system. No external oxygen tank is necessary.

(2) Water vapor and carbon dioxide exhaled by the user reacts with a chemical in a canister to release oxygen and reaction by-products. The oxygen produced is collected in a breathing bag and supplied to the user.

(3) Provides 60 minutes of oxygen--less if user is engaged in heavy work

b. An OBA is used in atmospheres lacking oxygen or atmospheres polluted with smoke and/or toxic gases.

(1) Damage control/Fire fighting

(2) Rescue

c. OBA Operation. Don the OBA in a fresh oxygen space.

(1) Worn on chest

(2) One size fits all

- (3) Adjust straps.
- (4) Remove the tear-away cap and metal disk from canister.
- (5) Ensure the opening in the canister is free of contamination.
- (6) Ensure the copper seal under the metal disk is in place.
- (7) Place the canister in the OBA opened end first with concave side towards body
- (8) Lock the canister in place.
- (9) Adjust mask straps.
- (10) Remove the cover from the candle activating the device in the bottom of the canister.
- (11) Pull the lanyard out of the activating device and visually sight the cotter pin to ensure proper light off.
- (12) Begin breathing.
- (13) Bags should inflate with oxygen.
- (14) Ensure an airtight face seal.
- (15) Set the timer at 60 minutes and back off to 30 minutes.
- (16) The OBA can be started manually by breaking the face seal, pinching the air tubes closed while breathing in fresh air, and then exhaling into the mask while releasing the air tubes after an airtight face seal has reformed.

d. Special Procedures and Considerations for the OBA

(1) Care must be taken to keep discarded canisters away from petroleum products. Failure to do so may cause an explosion. Canisters are hot when expended--use gloves when removing canisters from the OBA.

(2) There is a limited supply of OBAs and canisters aboard ship.

(3) OBAs and canisters are stored in damage control lockers throughout the ship.

(4) Always inspect the OBA and canister prior to use ensuring the material condition is satisfactory.

(5) Operational canisters are green, training canisters are red.

e. OBA Training

(1) On a ship, fire fighting and damage control is every crew member's responsibility.

(2) As many individuals as possible are trained to use an OBA during training and drills.

2. Emergency Escape Breathing Device (EEBD)

a. Description

(1) Self-contained, air-supply device used by personnel to evacuate smoke-filled areas of a ship in an emergency

(2) Located in virtually every inhabited compartment on a ship (not used on submarines) (should have one per crewmember occupying the space during general quarters and one per rack)

(3) Provides approximately 15 minutes of air; intended for emergency escape only

b. Operation

(1) Check the tamper seal on the orange protective case to ensure the EEBD has not been tampered with. Viewports on side should be light blue to white. Pink means the vacuum seal has been broken.

(2) Open the orange protective case and remove the EEBD unit.

(3) Unfold the plastic bag/mask and inspect it for tears.

(4) Open the sealed bag.

(5) Pull the pin to start the oxygen supply.

(6) Pull the plastic bag/hood over one's head, ensuring a tight seal around the neck.

(7) Breathe normally.

c. Special Considerations

(1) Do not use for fire fighting.

(a) The hood and face piece are fire resistant, but can melt, so avoid flames.

(b) EEBD produces oxygen (highly flammable), so avoid flames and do not smoke after use.

(2) Limited amount of oxygen; control your breathing

(3) Very useful: It has saved many lives, so become familiar with it and know how to use it.

3. Supplementary Emergency Escape Device (SEED)

a. Experiences involving main machinery space fires have indicated that there may not be sufficient time for watchstanders to reach and/or don an EEBD, thus all surface ships

are being outfitted with SEEDs to be utilized by personnel in main propulsion and auxiliary machinery.

b. The SEED is not a replacement for the EEED, but a vital supplement when life threatening conditions may inhibit the watchstanders ability to immediately don an EEED.

c. Because the SEED is worn on the belt of the watchstander, it augments the EEED by providing rapid donning capability. Utilizing the SEED while seeking safe haven from heat and flame, the watchstander can obtain, activate, and don an EEED to complete space egress.

d. The SEED is 8.75 inches long and 2.25 inches in diameter and holds 1.7 standard cubic feet of air at 3000 PSI. It provides 30 breaths of air (1.5 to 3 minutes depending on the users respiration rate). The pressure is read on the pressure gauge. The required operating pressure is from 3000 to 2600 PSI, highlighted by a green area on the pressure gauge. The unit is designed to maintain the minimum operating pressure for more than a year.

e. The SEED is also equipped with a single stage regulator which is always pressurized and ready for use. The mouthpiece is protected by a cover which is sealed to indicate tampering.

4. MCU-2P Gas Mask

a. Provides respiratory protection against nuclear, biological, and chemical warfare

b. Protects the wearer's face, eyes, nose, throat and lungs by filtering inhaled air to remove particles and/or purifying the air by absorbing poisonous gases

c. Mechanical and chemical filters remove solid and liquid particles suspended in the air and absorb or neutralize toxic/irritating vapors.

d. Protects against the inhalation of some nerve, blister, choking, vomiting, and tear agents

e. Must be donned immediately upon notice of imminent chemical, biological or radiological (CBR) attack (even one breath without it can be fatal in a polluted atmosphere)

f. Does not protect against carbon monoxide, carbon dioxide, ammonia, or volatile vapors

g. Not to be used in conjunction with fire fighting or in other low oxygen environments

B. Protective Clothing

1. Chemical, Biological, Radiological (CBR) Clothing Set

a. Discussed more fully in chapter X

b. Green color and stored in sealed plastic bags

c. When removed from bags, usefulness deteriorated and life span of clothing becomes a few days

d. Charcoal impregnated

2. Other Protective Clothing

a. Ordinary Work Clothes

(1) Protects easy contact with skin

(2) Quickly saturates with contaminant and loses protective characteristics

b. Foul Weather Clothing

(1) Parka, trousers, rubber boots, gloves

(2) Heavier clothing that provides increased protection, such as an exposure suit

(3) Loses protective characteristics when

saturated

(4) Limited supply

C. Personal Flootation Devices

1. Kapok Life Jacket

a. Inherently buoyant and stable life preserver used to protect against drowning

b. Orange in color for visibility

c. Used when threat of falling overboard is increased. Also used during:

(1) Underway replenishment

(2) Boat launch

(3) Boat crews

(4) Topside work parties

d. Worn over the head and on the chest similar to a large commercial marine life preserver

(1) Leg straps make it more effective.

(2) Ensure all straps are secured; no loose

ends

2. CO2 Inflatable Life Jacket

a. Description

(1) International orange in color

(2) Carried in gray waterproof pouch on web belt

(3) Contains CO2 cartridge/activating device

- (4) Oral inflation tube
- (5) Light
- (6) Dye packet (marker, activated on contact with water)
- (7) Lanyard

b. Proper Wear

- (1) Open pouch, and place vest over head
- (2) Do not inflate until in the water
- (3) Pull cord to activate the CO2 charge.
- (4) If necessary, oral inflation via tube

D. Other Equipment: Safety Harness

- 1. Parachute harness worn by crew members working aloft or over the side
 - a. Hull Work/Painting
 - b. Electronic Repair/Personnel Aloft
- 2. The harness is attached to a safety line.
- 3. Prevents wearer from hitting the deck or falling into the sea

General Shipboard Protective Equipment Discussion Topics

1. An OBA should be checked for satisfactory material condition prior to donning. What constitutes "satisfactory material condition"?
2. Assume you are sleeping in your stateroom aboard ship. You wake up to find the space filled with smoke. What personal survival device is readily available to provide safe egress?
3. When examining an EEBD, what are the indications it has not been tampered with?
4. What is the primary function of the MCU-2P gas mask? Are there any substances against which it is not effective?
5. Demonstrate the proper procedures for donning, doffing and proper operation of an OBA, EEBD, SEEDs, and standard Navy gas mask. If actual equipment is not available, describe the procedure in detail using drawings, if necessary.

VI. ELECTRICAL SAFETY

Ships have an ungrounded electrical system. This means there are no permanent, low resistance connections between the power system and the structure of the ship.

This ungrounded system is critical to achieve maximum reliability and continuity of electrical power under combat conditions. With a wet, metal environment surrounding the worker, the risks of electrical shock are much higher than work ashore. Special precautions and procedures are required aboard ship.

A. Basic Precautions for Working on Electrical Equipment

1. Wear Approved Rubber Gloves: Gloves will insulate hands from source of current. Gloves must be inspected prior to each use.

2. Remove Metallic Devices (i.e. insignia, belt buckles, etc): These items could become conductors of electricity.

3. Equipment Tagout: When equipment is "tagged out," the person to perform the maintenance secures all sources of power to a component and hangs appropriate tags to prevent accidental reactivation. Equipment tagout can only be accomplished after the tagout procedure has been reviewed and approved by the authorizing officer. Once authorized, the person initiating the tagout hangs the tags and places equipment in the appropriate condition indicated on the tag. A second person then checks the positioning of the tags. Removal of the tag also requires approval of the authorizing officer. If the equipment must be energized for maintenance, **only the CO can authorize work on an energized circuit!**

4. Rule on Energized Equipment: An additional person is required to pull the worker (via a rope and harness) from energized gear in case of an accident. If injury should occur, the second person can request medical assistance and administer initial first aid. A CPR-qualified person must be available in the immediate area and must be fully briefed on the evolution. **The commanding officer's permission is required to work on or in**

the vicinity of energized gear.

5. Stand on Rubber Matting: Rubber matting is required to be installed over the steel deck in the vicinity of electrical equipment. This matting will act as an insulator between the person and the deck.

6. Post and Obey High Voltage Signs: Designates danger area where risk of electric shock is most likely to occur

7. Rope Off Danger Area: Ensures no stray traffic in the area of the electrical work

8. Make sure the individual knows what he/she is doing: If not, stop work immediately. As a division officer, this is crucial. When the worker briefs you, determine his/her level of knowledge of the task to be performed. Also review the basics of electrical safety with him/her to ensure compliance.

B. Portable electrical tools and personal electronic equipment have specific additional safety requirements.

1. Portable Electrical Tools: All tools will be maintained in the ship's tool issue shop.

2. Tools must be inspected by an electrician's mate weekly and prior to each use.

3. If the tool has a metal case, it must be equipped with a green grounding conductor.

4. The operator must wear all safety equipment (gloves, goggles, etc) that is issued with the tool.

5. If tool is damaged or malfunctions in any way, return it to tool issue immediately and report the failure.

6. Extension cords must be inspected daily. When using the cord, energize by plugging the cord in first at the equipment (load), then at the power outlet (source). This is called energizing load-to-source. De-energize in the reverse order, source-to-load. At no time should an energized plug lie

loose and unconnected.

C. Personal Electric Equipment: Personal electric equipment includes all electrical equipment that is brought onboard for personal use. This includes portable stereos, electric razors, personal computing equipment, etc. Equipment authorization is at the discretion of the commanding officer. Unauthorized equipment includes personal electric tools, lights, fans, etc. One of your sailors may be using an unauthorized iron or hair dryer and be electrocuted before someone ensures that it is inspected and fitted with a grounded plug. Review your command's directive on this subject and impress on your sailors how much more dangerous electrical equipment can be aboard ship than ashore.

1. Personal electric equipment must be inspected and tested by an electrician's mate or electronics technician prior to shipboard use.

2. Personal electric equipment must be reinspected every 6 months.

3. Electric irons are sometimes authorized, but must be modified with a grounding conductor by an electrician's mate.

4. The electrical officer should make frequent inspections to ensure unauthorized equipment is removed.

Electrical Safety Discussion Topics

1. Why is electricity particularly dangerous aboard ship?
2. Assume you are a division officer. Your people must perform maintenance on electrical equipment. What precautions will you be sure they undertake?
3. Discuss load-to-source and source-to-load connecting procedures. When should each be used?
4. What precautions are required before personal electronic devices can be operated aboard ship?

VII. ORDNANCE SAFETY

Ordnance, by its very nature, is dangerous. It contains material that not only explodes, but may also burn. The primary hazards associated with ordnance handling are explosion and fire. Some fuels containing liquid explosives are harmful if inhaled or splashed on the skin.

In addition to the ordnance itself, guns, gun mounts, turrets and launchers that propel the ordnance can crush or maim anyone who gets entangled in their moving parts. There is a red warning circle painted on the deck surrounding each launcher. Always stay clear of the circle. A safety watch must be posted whenever the unit is moved and warning bells also sound.

Firing or launching a weapon is very dangerous. The magnitude of the danger is directly proportional to the amount of ammunition and people involved. Danger can be minimized with close adherence to established operating procedures.

Accidents are caused by an action or failure to take timely action. Although an accident may be caused by material failure, the majority of accidents are caused by personnel on the scene. Primary causes of accidents are lack of knowledge, carelessness, and misunderstanding.

Ordnance can be affected while being handled or while in storage.

A. Storage Hazards

1. Temperature: Below the lower limit, the weapon may fail to operate. Above the upper limit, the weapon may ignite.

2. Humidity: Dampness may cause a chemical reaction which, in the case of pyrotechnics, can cause spontaneous ignition.

3. Hazards of Electromagnetic Radiation to Ordnance (HERO): Fields of electromagnetic radiation can cause current surges in electro-explosive devices sufficient to cause detonation. Specific radio frequencies and radar operations must

be secured when handling certain types of ordnance.

4. All ammunition has a shelf life. Use of ammunition beyond its shelf life must be approved by higher authority.

5. Ammunition magazines must be locked or manned at all times to reduce the chance of unauthorized access by terrorists or saboteurs.

B. Handling Hazards: While it is periodically necessary to bring ammunition onboard, send it ashore, or reposition it aboard the ship, ammunition handling should be kept to a minimum. Special care should be taken to ensure that ammunition is never handled carelessly.

1. All personnel involved in handling ammunition will be carefully and frequently instructed in safety precautions, methods of handling, storage, and use. When moving ammunition, safety observers are posted. As a division officer, one of your duties during an ammunition-handling evolution may be as a safety observer or safety officer. Do not allow yourself to become distracted and lose your concentration. As a safety observer, you are not to become involved in the task. If additional personnel are required, send for them. The safety observer must remain detached and maintain a complete safety picture throughout the evolution.

2. Equipment used for handling ordnance requires special periodic testing for strength and reliability. Anytime the equipment being used is in question, stop the evolution immediately and have the equipment inspected.

3. Concurrent operations should be avoided except in an emergency. No other distracting operations (i.e. refueling) should be undertaken during an ammunition-handling evolution.

4. Military personnel afloat are restricted in the work or repairs they can perform on ordnance. No ammunition shall be used for purposes for which it was not designated. No alterations are allowed to be made to ordnance.

C. Magazines should be kept scrupulously clean and dry.

1. Matches, lighters, naked lights, or other flame-producing devices are never allowed in a magazine.

2. Smoking is not permitted in a magazine nor in the immediate vicinity.

D. Small arms are portable ship defense weapons (e.g. shotguns and .45 caliber pistols). In port, the quarterdeck is manned 24 hours a day, and the petty officer of the watch is armed with a pistol. In addition, a roving patrol is also armed. Any mishandling or misuse of these weapons calls for the immediate relief of the watchstander and disciplinary action. There is no place for unsafe handling of small arms. As an officer you will become qualified with these weapons, and it is your duty to ensure they are always treated with the respect they deserve.

Ordnance Safety Discussion Topic

1. Assume you are acting as safety officer during a movement of ammunition aboard ship. Discuss your duties and responsibilities.
2. What are the safety considerations when working with ordnance.

VIII. OFF-DUTY SAFETY

Safety does not cease to be a concern when the division goes on liberty. Though they work safely in an inherently dangerous environment aboard ship, sailors sometimes get careless during recreation and athletic events.

A. Reference (e) provides information on the Navy Recreation, Athletics, and Home Safety Program. Essentially, this program requires quarterly inspections and evaluations of facilities and equipment, guidelines for use of personnel protective equipment, and hazard awareness training. This program applies to all Navy military personnel, ashore and afloat, on or off base. It also applies to any person, including civilians and Navy military dependents participating in recreational or athletic activities on government property. Also included are all participants in command-sponsored events on or off base.

B. Many off-duty mishaps occur as a result of traffic accidents. Reference (f) provides information on the Navy traffic safety program. Guidance is provided on occupant crash protection, speed limits, driving time limitations, portable listening devices, alcoholic beverages, and radar detection devices. This instruction applies to all individuals on a naval station, all Navy motor vehicles on and off a naval station, all Navy military personnel at all times, and all civilian personnel in a duty status on and off a naval station.

C. While these instructions provide safety program information, individual adherence may or may not occur. As a division officer, the training and awareness you impart to your sailors will directly affect the priority they place on safety both on and off the ship. Leadership by example is tremendously important in off-duty safety. If your sailors see that your concern for safety and professionalism extends from your work to your off-duty activities, they are much more likely to do so as well.

Off-Duty Safety Discussion Topic

1. Discuss how your conduct at a ship's picnic may be interpreted by your people in terms of safety.

IX. ENVIRONMENTAL PROTECTION

"The Navy's ability to accomplish its mission requires daily operation in the land, sea, and air environments. The Navy is committed to operating in a manner compatible with the environment. National defense and environmental protection are and must be compatible goals. Therefore, an important part of the Navy's mission is to prevent pollution, protect the environment, and natural, historical, and cultural resources. In order to accomplish this mission element, personnel must be aware of the environmental and natural resources laws and regulations which have been established by Federal, State, and local governments. The Navy chain of command must provide leadership and a personal commitment to ensure that all Navy personnel develop and exhibit an environmental protection ethic."

Quote from,
Chief of Naval Operations
OPNAVINST 5090.1B
N45
1 November 1994

Reference (g) discusses Federal regulations, Department of Defense (DoD) requirements, and Navy requirements which apply to Navy ships and shore activities. In addition, all Navy personnel (military and civilian) must be aware that besides reference (g), there are State and local environmental requirements the Navy must comply with.

A. Chapters That Apply to Ships:

Chapter

- 1. Policy, Organization and Funding
- 6. Management of Ozone-Depleting Substances
- 10. Oil and Hazardous Substance Contingency Planning
- 19. Environmental Compliance Afloat

-21. Ocean Dumping

-24. Environmental and Natural Resource Training

B. Appendices that apply to ships:

Appendix

-A. Pertinent laws, Executive Orders, Regulations and Directives

-B. Processing Notices of Violations (NOVs) or Non compliance (NONs) under environmental laws and regulations

-D. Environmental and Natural Resources Awards Program

-H. Oil Spill Report (Message Format)

-I. Hazardous Substance Release Report (Message Format)

-K. Afloat Environmental Checklist

C. The Navy's Environmental Program consists of five main elements:

1. Cleanup of past waste disposal sites (installation restoration)

2. Compliance with current Federal, State and local laws and regulations

3. Conservation (stewardship) of natural, cultural and historic resources

4. Pollution prevention (recycle, reuse, reduce), keeping pollution from entering the environment

5. Technology transfer, looking at equipment industry uses to see if it can be applied to shipboard usage

D. General Definitions

1. Geographic

a. Contiguous Zone: A zone of the ocean extending 3-12 nautical miles from the U.S. coastline.

b. Navigable Waters: The territorial sea and internal waters (rivers, lakes) of the U.S.

c. Territorial Seas: For purposes of this discussion, a zone of the ocean extending from the U.S. coastline 3 nautical miles from shore

2. Sewage

a. Graywater: Discarded water from deck drains, lavatories, showers, dishwashers, laundries, and garbage grinders, as well as discarded water from shipboard medical facilities. Does not include industrial wastes, infectious wastes, and human body wastes

b. Industrial Waste: Wastewater or semi-solid material generated in shipboard processes such as manufacturing, production, and maintenance. Examples are metal plating, acid cleaning, photo processing, solvent cleaning, and painting materials.

c. Marine Sanitation Device (MSD): Any equipment on board a ship or craft which is designed to receive and treat sewage to a level acceptable for overboard discharge, or which receives or retains sewage on board for later discharge ashore or in waters where discharge is permissible

d. Sewage (blackwater): Human body wastes and the wastes from toilets and other receptacles intended to receive or retain bodily wastes

e. CHT: Collection, holding and transfer system designed to collect both sewage and graywater while in port

3. Oil and Oily Waste

- a. Oil: Any petroleum-based fluid or semi-solid
- b. Oily Waste: Oil mixed with water or other fluids such that the mixture is no longer useful
- c. Reclamation: The processing of used oil to recover useful oil products
- d. Sheen: An iridescent appearance on the surface of the water
- e. Used Oil: Oil whose characteristics have changed since being originally refined, but which may be suitable for future use and is economically reclaimable. Used oil excludes synthetic-based lubricating and transmission products.
- f. Waste Oil: Oil whose characteristics have changed markedly since being originally refined and has become unsuitable for further use, and is not considered economically recyclable
- g. Annex I Special Areas: Addresses oil pollution from ships at sea. Annex I establishes "special areas." Annex I special areas include the Mediterranean Sea, the Baltic Sea, the Black Sea and the Antarctic area.

4. Hazardous Materials/Hazardous Waste

a. Hazardous Material (HM): Any material that, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may pose a substantial hazard to human health or the environment

b. Hazardous Waste (HW): A solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

(1) Cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, incapacitating reversible, illness; or

(2) Pose a potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed

The term solid waste includes liquid, semisolid, or contained gaseous material.

c. Hazardous Substance (HS): HM or HW

d. Used or Excess Hazardous Material: HM for which there is no further, immediate use on board the ship processing the material

5. Solid Waste

a. Foreign Source Garbage: Goods, food wastes, wrappers, containers, and disposal materials originating in any foreign country excluding Canada or Hawaii, Puerto Rico, U.S. Virgin Islands, American Samoa, Guam, and the Trust Territories of the Pacific Islands

b. Food Waste: Spoiled or unspoiled victual substances, such as fruits, vegetables, dairy products, food scraps, and food particles

c. Garbage: All kinds of victuals and domestic and operational waste generated during the normal operation of the ship.

d. Pulped Garbage: Pulped, ground, or comminuted garbage capable of passing through a screen with opening no greater than 25 millimeters (0.98 inch)

e. Plastic Processor: A device that melts, compresses, and sanitizes plastic waste so that it can be efficiently and safely stored aboard ship for shore disposal

f. Annex V Special Area: Three Annex V special areas (no plastic discharges) are in effect as of August 1994; the Baltic Sea, the North Sea, and the Antarctic Area (south of 60 degrees south latitude)

E. General Policies

1. Air Restrictions

a. In port Navy ships shall minimize operation of boilers and diesel engines by using shore-provided "hotel" services whenever operational requirements permit.

b. Only approved solvents, paints, fuels, lubricants, and chemicals shall be used aboard ship.

c. Shipboard emergency asbestos ripout or removal shall not be performed by ship's force within U.S. territorial waters. All emergency ripouts must be performed 3 nm from coastline.

d. Ozone-Depleting Substances (ODS). Whenever possible, shall be recovered prior to maintenance performed on air conditioning and refrigeration systems and on fire protection systems using halon. Only maintenance personnel trained in minimizing loss of ODS shall perform maintenance on equipment containing such substances.

2. Hazardous Waste/Hazardous Material

a. Special considerations must be taken when handling, storing, using, or disposing of hazardous substances. The following paragraphs should be considered as informational in nature and are not to be considered directive. Part of your responsibilities as a division officer will be to ensure your personnel are properly trained in the handling of HM and ensure they have the proper resources needed when dealing with these materials. References (b) and (e) provide directives. These references should be consulted when working with HM.

b. To the maximum extent practicable, ships shall retain used/excess hazardous material on board for shore disposal. Limited disposal at sea is allowed. Again, consult references (b) and (e) for guidance. When transferring hazardous material ashore for disposal, the material shall be properly segregated, containerized, and labeled. You must ensure that all hazardous material handled within your division is handled

properly and in accordance with directives.

3. Solid Waste

a. Shipboard Procedures. The following solid waste procedures shall be followed by ships.

(1) Foreign Food and Garbage: Navy ships will comply with USDA regulations pertaining to the entry by ships of any foreign source garbage into the U.S., its territories, and possessions.

(2) Plastics Retention

(a) Ships will retain food contaminated plastics on board for shore disposal during the last 3 days prior to entering port.

(b) Non-food contaminated plastics shall be retained on board for shore disposal for a goal of 20 days or longer as storage space permits. If at sea longer than 20 days and storage space is not available, plastic waste generated after the first 20 days may be disposed of beyond 50 nm from the nearest shoreline by properly packaging the waste for negative buoyancy.

(c) Violation of the 3/20 day rule could result in Federal, criminal or civil prosecution under the Act to Prevent Pollution from Ships (APPS)

(3) Garbage (Non-plastic)

(a) No garbage will occur within 3 nm of any coastline.

(b) Pulped garbage may be discharged beyond 3 nm of the U.S. coast.

(c) Compacted or unprocessed garbage may be discharged beyond 25 nm from the U.S. coastline. Use available means to cause unprocessed garbage to sink as rapidly as possible.

(d) Ships equipped with incinerators may use them when operating beyond 12 nm from land for the disposal of non-plastic and non-hazardous garbage only.

(4) Medical Waste

(a) Medical waste is any waste that is generated during patient diagnosis, treatment or immunization. Medical waste may be divided into two categories: infectious waste and non-infectious waste.

(b) Infectious medical waste shall be steam sterilized, suitably packaged, and stored for disposal ashore. Needles (sharp) and syringes shall be collected in plastic autoclavable containers and retained on board for proper disposal ashore.

(c) Non-infectious waste may be disposed of as trash and does not require steam sterilizing or special handling.

Environmental Protection Safety Discussion Topic

1. Discuss the implications of medical waste disposal at sea.
2. The ship you are assigned to spills 500 gallons of oil into the harbor. What are the potential consequences of this accident?
3. For the scenario in question 2, what message should you use and where can you find a sample?
4. In accordance with reference (g), what are the special areas designated "in effect" for no discharge of plastic?
5. Environmental awareness in the Navy focuses on what main elements?
6. Describe the Navy's programs and policies regarding environmental protection.

X. CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL (CBR) DEFENSE

A. Radiological Warfare

1. The following hazards are associated with nuclear bursts:

a. Air Burst (fireball does not touch the surface of the earth)

(1) Blinding flash

(2) Heat

(3) Blast

(4) Radiation

(5) Electromagnetic pulse (EMP) which will damage or degrade unshielded electronic components

b. Surface Burst (fireball touches the surface of the earth). Same effects as air burst but with an additional pressure wave (base surge)

c. Subsurface Burst (fireball is completely beneath the surface). Major effect is a shockwave

2. Types of Radiation

a. Alpha: An alpha particle is a helium atom stripped of its electrons. It is a relatively massive particle compared to other radiation types. It can cause great damage because of its size; however, for the same reason it has a short range. It can be stopped by a piece of paper. The greatest danger comes from inhaling or digesting an alpha emitter.

b. Beta: A beta particle is a fast-moving electron or positron which is much lighter than an alpha particle and therefore is more penetrating. Beta particles can be shielded by normal clothing. Skin burns are possible if the skin

is exposed. Beta emitters are very harmful if ingested or exposed to the eye.

c. Gamma: Gamma radiation is high-energy, shortwave-electromagnetic energy (similar to X-rays). Gammas have no charge or mass and therefore have the greatest penetration. The most significant type of radiation in a CBR environment.

d. Neutron: A subatomic particle which may be released during fission. Neutrons are more massive than betas but carry no charge. Therefore, they penetrate deeper and cause more damage.

3. Dangers of Radiation (two phases)

a. Initial Radiation: This occurs within the first minute of detonation. The dangers are primarily due to neutron and gamma radiation.

(1) Casualty range can extend for several miles from center of blast

(2) Consists of the majority of the radiation

(3) Mortality rate can be as high as 90 percent for personnel exposed to this phase

(4) May be shielded by dense material, steel, concrete, and water (to a limited extent)

b. Residual Radiation: This occurs after the first minute of detonation. The dangers are primarily due to gamma and beta radiation.

(1) Fallout: This is radioactive debris which falls back to the earth's surface. This is the most prevalent source of residual radiation.

(2) Carried by water vapor and surface elements

(3) Influenced by weather, size of debris, and size/type of detonation

4. Thermal Radiation: This is part of the initial radiation. It causes flammable material to ignite and will cause severe burns to unprotected personnel. The dangers involved can be reduced by taking shelter inside the skin of the ship and activating the water washdown system.

5. Methods of Detecting Radiation

a. Radiacs: Radiacs are radiation detectors which detect the presence and level of different types of radiation.

b. Dosimeters: Dosimeters measure accumulated radiation.

(1) Self-reading (read by person wearing the dosimeter)

(2) Non-self-reading (requires a special instrument to read)

B. Chemical Warfare

1. Types of Agents

a. Nerve

(1) Physiological action: Cessation of breath; death may follow

(2) Protection: Requires protective mask and clothing

b. Blood

(1) Physiological action: Interferes with use of oxygen by body tissues

(2) Protection: Requires protective mask

c. Blister (Mustard Gas)

(1) Physiological action: Blisters; affects respiratory tract; destroys tissues; injures blood vessels; may cause welts and systemic poisoning

(2) Protection: Requires protective mask and clothing

d. Choking

(1) Physiological action: Damages lungs

(2) Protection: Requires protective mask

e. Vomiting

(1) Physiological action: Causes severe nausea and vomiting

(2) Protection: Requires protective mask

f. Tear

(1) Physiological action: Causes intense pain in eyes, skin and nose; tightness of the chest and breathing difficulties

(2) Protection: Requires protective mask; protective clothing will avoid skin irritation

2. Detection: Detection is relatively quickly accomplished with devices which rely on a color-changing chemical reaction. Also, electronic devices are installed on most ships.

C. Biological Warfare

1. Types of Agents

a. Viruses

- b. Rickettsia
- c. Fungi
- d. Bacteria
- e. Protozoa

2. Detection: Samples must be taken and evaluated by medically trained personnel. The process may require culturing. Therefore, personnel may start showing symptoms before the agent is identified and antidote administered.

D. CBR Defense

1. Preparatory

a. Training: One of the most important aspects of CBR defense. It is also the one over which you will have the most control as a division officer.

b. Removal of material likely to be contaminated. Includes food, water, cigarettes, etc.

c. Protective Clothing: Must be properly worn

d. Equipment Issued: Gas masks and dosimeters

e. Ship Condition: Set ZEBRA and CIRCLE WILLIAM

f. Water Washdown: A system that sprays water over all topside surfaces. This increases the likelihood that contamination will be swept overboard. This should be activated before the attack.

g. Evasive Action: Maneuver ship to minimize exposure/damage

2. Post-Attack Measures

a. Evacuate exposed personnel

- b. Personnel perform self-protective measures
- c. Detect and predict location of contaminated areas
- d. Decontaminate crew
- e. Decontaminate ship (internal and external)
- f. New ships can be pressurized to keep out particles and gases.

3. Nuclear Decontamination of Ship

- a. Gross: Rapid method to reduce radiation to a safe level. Survey and detect high levels of contamination requiring immediate decontamination
- b. Detailed: Usually conducted in port to remove all contamination. Includes sandblasting, cutting out area, sealing with paint or other compound

4. Chemical/Biological Decontamination of Ship: Similar to procedures used for nuclear. Special solution is used in gross decontamination. Steam may also be effective.

5. Personnel Decontamination: A decontamination station is set up. Personnel stripped, showered and monitored. Their dosimeter is read for radiation dosage, if possible. Radiacs are used to detect levels of contamination.

E. Protective Equipment

- 1. Impregnated (permeable) clothing for defense against chemical agents
 - a. Includes jumper, pants, socks, gloves, & hood
 - b. Treated with neutralizing agent which may irritate skin
 - c. Will not neutralize large quantities of

chemicals

- d. Used in conjunction with impermeable gear
- 2. Wet Weather (impermeable) Clothing
 - a. Rubberized, resistant to liquid penetration
 - b. Includes parka, pants, boots, & gloves
 - c. Used for biological and chemical liquids and radioactive alpha particles

d. Cumbersome and hot, which limits personnel usefulness

- 3. Gas Mask
 - a. Protects eyes, face, and respiratory tract
 - b. Not to be worn in oxygen-deficient air (acts as a filter, not an oxygen source)
 - c. Issued to every member of the crew
 - d. Uses replaceable charcoal filter canister
 - e. Donning Procedures
 - (1) Place mask against face
 - (2) Pull straps over back of head
 - (3) Tighten top straps, then side straps
 - (4) Check for proper seal

- 4. Additional Measures
 - a. Water Washdown System: Saltwater system fed from the firemain which, when activated, continuously sprays the superstructure and weather decks.

(1) If used prior to and during a CBR attack, it is approximately 85-90 percent effective in preventing agents and radioactive debris from sticking to the ship's surfaces.

(2) If only used after attack, it is approximately 70-80 percent effective in reducing the levels of contamination.

b. Ready Shelter: All personnel move inside the skin of the ship when the word is passed to go to "ready shelter." Protects personnel from the initial effects of nuclear shock, thermal blast, effects of alpha and beta radiation, and exposure to biological and chemical agents

c. Deep Shelter: Non-essential personnel go as deep inside the ship as possible to predesignated areas when the word is passed to go to "deep shelter." Protects personnel by shielding gamma and neutron radiation in addition to the protection provided by "ready shelter"

d. Mission-Oriented Protective Posture (MOPP). Levels: the levels of readiness set for the ship when any type of CBR attack is suspected.

(1) MOPP 1

(a) Condition: Suspected attack

(b) Action: Issue equipment

(2) MOPP 2

(a) Condition: Possible threat

(b) Action: Commence donning equipment

(3) MOPP 3

(a) Condition: Probable threat

(b) Action: Ready gas masks for

use/install filter

(4) MOPP 4

(a) Condition: Imminent threat

(b) Action: Completely dress out in protective clothing and take shelter

CBR Defense Discussion Topics

1. What measures should be taken prior to CBR exposure?
2. Assume your ship is conducting a CBR defense exercise. MOPP level 2 has been set. When you observe your people, what do you expect to see?