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PACAREAINST 9555.4

PACIFIC AREA INSTRUCTION 9555.4

Subj: 87 FOOT MARINE PROTECTOR CLASS PATROL BOAT MACHINERY SPACE FIREFIGHTING DOCTRINE FOR CLASS BRAVO FIRES

Ref: (a) COMDTINST M9555.1 (Series), Machinery Space Firefighting Doctrine
(b) Naval Ships' Technical Manual (NSTM) Chapter 079 V2, Practical Damage Control
(c) Naval Ships' Technical Manual (NSTM) Chapter 079 V3, Damage Control Engineering Casualty Control
(d) Naval Ships' Technical Manual (NSTM) Chapter 555, Firefighting-Ship
(e) NWP 3-20.31 (Series), Surface Ship Survivability
(f) Naval Ships' Technical Manual (NSTM) Chapter 074 V3, Gas Free Engineering
(g) COMDTINST M9000.6 (Series), Naval Engineering Manual
(h) COMDTINST M3502.4 (Series), Cutter Training and Qualification Manual
(i) USCGC_____, Engineering Casualty Control Manual

1. PURPOSE. This instruction promulgates the Machinery Space Firefighting Doctrine (MSFD) for Pacific Area Marine Protector Class Patrol Boats and establishes Pacific Area policy for fighting Class BRAVO fires in machinery spaces. It provides all Pacific Area Marine Protector Class Patrol Boats with a class specific MSFD to use in reviewing and improving existing doctrines

2. ACTION. This document is effective upon receipt. Commanding Officers/Officers in Charge shall update current ship's instruction within 90 days from the receipt of this instruction, establishing a cutter specific MSFD using the format and applicable contents of this instruction and references (a) through (i).

3. DIRECTIVES AFFECTED. None.

4. DISCUSSION.

   a. Enclosure (1) complies with reference (a) MSFD requirements. The MSFD was developed through the collaborative efforts of the PACAREA Training Team, MLCPAC, their respective counterparts in LANTAREA, and field units. Cutters shall tailor this MSFD to their specific unit by making minor editing changes to the text. A cutter's MSFD may expand on the text of this instruction if the information provided does not conflict with this instruction or references (a) through (i).

   b. This instruction is based on reference (a). References (b) through (h) contain the best guidance on military shipboard firefighting available today. Because of differences in equipment, ship design, policy, and watchstanding the MSFD in reference (d) is not entirely applicable to Coast Guard cutters. This instruction defines specific firefighting procedures to be used on all Marine Protector Class Patrol Boats assigned to Pacific Area. It accounts for the number of machinery spaces, mechanical and authorized equipment, personnel levels and cutter design. The doctrine applies to fighting Class BRAVO fires in manned and unmanned machinery spaces both inport and underway.

c. All Marine Protector Class Patrol Boats shall have their MSFD reviewed by either the PACAREA Training Team or MLCPAC for compliance with guidelines contained in this instruction. Electronic copies of this doctrine are available through the PACAREA Training Team website at **www.uscg.mil/pacarea/pactra**.

5. RESPONSIBILITIES.

a. CG PACAREA (Pof) shall:

(1) Maintain ownership of the MSFD. The PACAREA Training Team will act as the custodian of the document. Training Team will collect and maintain input regarding this document for consideration during an annual review.

(2) Promulgate changes to the MSFD.

b. CG MLCPAC (v) shall:

(1) Provide technical expertise as appropriate. The type desk shall collect and maintain input regarding this document for consideration during an annual review. The type desk shall work closely with the Training Team to schedule annual updates or interim updates when appropriate.

(2) For immediate attention to safety related issues, coordinate with Pof and Training Team to assess the situation and promulgate a change via message, as needed.

c. Commanding Officers/Officers-in-Charge shall:

(1) Tailor the enclosed MSFD to reflect the hull specific details of each cutter. Ensure compatibility with other ship's doctrines and bills.

Encl: (1) Marine Protector Class Patrol Boat Machinery Space Firefighting Doctrine

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RECORD OF CHANGES

CHANGE NO.	DATE OF CHANGE	DATE ENTERED	ENTERED BY

SIGNATURE SHEET

NAME	DATE	NAME	DATE

CHAPTER 1. GENERAL

A. Purpose. The purpose of this doctrine is to identify equipment, systems, and procedures used to prevent, control, extinguish, and overhaul* a Class BRAVO fire in a machinery space*. **(NOTE: Words used for the first time are marked with an asterisk "*" and defined in the glossary).** This doctrine covers the preferred sequence of events during a major oil or fuel leak or machinery space fire. Reference (d) provides additional guidance on fighting shipboard fires. This doctrine does not replace the use of good judgment by all hands. All hands must be familiar with firefighting systems and available equipment, and how to combat different fires using these systems and equipment. **When a fire starts it's too late to read this doctrine.**

B. Introduction. One of the most hazardous shipboard casualties both to human life and machinery is the machinery space Class BRAVO fire. This doctrine is structured to provide the basis for proper decisions and actions in response to a machinery space fire or major oil or fuel leak. This doctrine addresses fire prevention, firefighting systems' capabilities and limitations, considerations for choosing the correct firefighting equipment, and the actions necessary both in and external to the affected space* if a major oil or fuel leak or a fire occurs. The Machinery Space Firefighting Doctrine shall* be accessible on the Bridge (Damage Control Central) and in each repair locker. Restricted maneuvering policies and judgments or unforeseen circumstances may require departure from this guidance.

C. Reducing Human Error. The risk of fire in a machinery space poses a tremendous threat to the ship and crew. The principles of Team Coordination applied when a machinery space fire occurs can reduce the risk to personnel and the ship, and can aid in the successful extinguishing of the fire. Remember: The goal is to reduce human error by increasing the effectiveness of each individual and the firefighting team. Below are some primary principles of Team Coordination that must be learned and applied when attempting to extinguish a machinery space fire.

1. Effective Mission Analysis

    a. Develop your firefighting plans. Choose the right people for critical firefighting positions. The Main Space Fire Doctrine details the tactics, environment and the complexity of a main space fire. Plan in advance by training for different fire scenarios in the engineroom. Take all of the known risks into account when performing main space fire planning. Review potential risks and how to reduce those risks when debriefing each drill. This will help personnel to reduce risk should an actual fire occur.

    b. Risk Assessment and Risk Management. Given the grave risks involved with engineering casualties and main space fires, risk assessment and the subsequent management of that risk is critical in reducing and preventing personnel casualties. Everyone has a responsibility to assess the risk involved, and to manage and minimize that risk.

2. Situational Awareness. Situational Awareness is the ability to identify, process and comprehend information concerning what is happening to the team as the firefighting organization is implemented.

a. Look for clues to the loss of Situational Awareness as the firefighting organization is implemented. These clues include:

(1) Confusion.

(2) Uncertainty.

(3) Preoccupation (tunnel vision).

(4) Departure from the firefighting plan.

(5) Departure from regulation and/or procedures.

(6) Failure to observe hazards.

b. Be assertive. Regardless of rank, each crewmember has the responsibility to inform their superior when Situational Awareness is lost. Trust gut feelings, experience and knowledge.

D. Prevention. The risks of fire in machinery spaces can be significantly reduced by preventive measures. Enforce the following principles to reduce fire hazards:

1. Frequent inspections. The Engineering Petty Officer, Safety Officer, Department Heads, or designated fire marshal shall make regular and frequent inspections including, but not limited to, the items discussed below.

2. Properly stow and protect all combustibles.

3. Test and inspect flammable systems both routinely and after repairs.

4. Reduce the likelihood of fire by conducting fire drills frequently and educating all hands to eliminate potential fire hazards.

5. Enforce the following fire prevention policies and practices:

    a. Maintain flange shields on required flammable liquid pipelines.

    b. Maintain proper covers on flammable liquid strainers. Keep sounding tube caps in place and isolation valves closed.

    c. Take immediate action to stop and repair all oil or fuel leaks.

    d. Clean up oil or fuel spills and leaks.

    e. Keep ventilation ducts free of oily residue.

    f. Keep bilges free of oil, fuel and trash.

    g. Prevent stockpiling excess or unauthorized flammables.

6. Properly maintain all firefighting equipment and systems.

7. Operate and maintain all firefighting equipment and systems.

8. Properly maintain all machinery space damage control closures and fittings.

9. Follow electrical and mechanical tag-out procedures.

E. Battery Hazards. This class of cutter is equipped with Gel cell batteries according to the manufacturer's recommendations. Gel cell batteries present no immediate hazard even when the outer casing is breached or when engulfed by flame. However, if the cutter is outfitted with Lead Acid or Dry Cell batteries extreme caution must be observed. Lead acid batteries can be a serious hazard during and after a machinery space fire. Hydrogen gas is given off by lead acid batteries and is combustible and can be explosive. As the batteries become hotter, more gas is given off and the danger increases. The acid in the batteries is very corrosive. If the battery leaks acid from a melt down or explosion, the acid could be harmful to the ship and/or firefighters. Using water on a battery fire can also cause an explosion. Additionally, when salt water and sulfuric acid are mixed a toxic chlorine gas is produced. Dry cell batteries operate on the same lead acid battery concept but use powdered sulfuric acid and do not create the specific hazards associated with lead acid batteries. Batteries are located in 2-14-O-E and under the main console in the Bridge. Additional details are contained in enclosure (1).

CHAPTER 2. DUTIES AND RESPONSIBILITIES

A. Duties and Responsibilities. Duties for the following personnel are found in Enclosure (2).

1. Engineering Petty Officer (EPO).
2. Officer of the Deck (Inport)
3. Officer of the Deck (Underway)
4. Engineering Officer of the Watch (EOW Inport)
5. Engineering Officer of the Watch (EOW Underway)
6. On Scene Leader (OSL)
7. Repair Party Electrician
8. CO2 Activating Personnel
9. Emergency Medical Technician (EMT)

Inport Personnel onboard not in duty section

CHAPTER 3. PERSONNEL PROTECTION

A. General. The proper use of personnel protection clothing, equipment, and procedures is required to reduce the risk of injury and help extinguish the fire. The OSL is responsible for rotating personnel to prevent heat exhaustion and for monitoring Oxygen Breathing Apparatus (OBA) activation times. The Bridge shall also record and monitor OBA activation times. In fighting major fires, firefighters should leave the fire area after 30 minutes (in conjunction with the OBA timer alarm) and fresh personnel should be rotated to the fire scene to minimize personnel heat stress.

B. Oxygen Breathing Apparatus (A4-OBA).

1. All personnel shall wear an OBA when entering the buffer zone* until the atmosphere is certified safe for reentry without OBAs.

2. Activate OBAs when smoke is present or on order of the OSL who reports to the Bridge or Damage Control Central.

3. **When setting the OBA timer, wind it fully to the 60 minute mark and back to zero to check the bell for proper operation. Again turn timer to 60 and then to the 30 minute mark for activation.**

4. Remember that all personnel breathe at different rates. Some will be required to depart the space before 30 minutes have elapsed.

C. Clothing.

1. Firefighting ensembles (FFEs). Reentry into a machinery space that has been evacuated because of a fire requires protective clothing for firefighters. FFEs include one-piece coveralls, gloves, anti-flash hood, helmets with lights, and steel-toed rubber boots. It is mandatory that the nozzlemen and hose tenders on each team wear FFEs.

   a. The one-piece coveralls provide the firefighter with protection from flash, flame, heat, cold, hot water, and minor steam exposures.

   b. The steel-toed rubber boots must but be properly sized to prevent slipping and trip hazards.

2. Fire retardant utility coverall. The engineering coverall may be worn by personnel which are exposed to an immediate threat of injury from flash or flame. This includes the OSL, electrician, and investigating team.

3. Battle dress. All other personnel shall don proper battle dress and flash gear as a minimum safety protection.

NOTE: The only flash hood authorized to be worn with the FFE is the type made of 80% Rayon/20% PBI > NSN 8415012683473

D. OBA Management.

1. OBAs are stowed in the following spaces:

a. Two OBAs are located in the deck locker (*-**-*).

b. Two OBAs are located in the ships office (*-**-*).

2. OBA canisters are stored in the following locations:

a. OBA storage boxes as listed above (5 to 6 per box).

3. The primary change out location of OBA canisters shall be conducted on the fantail. The secondary location is on the forecastle.

4. Canister Disposal. Expended canisters are retained onboard until arrival inport. Canisters will be set aside, allowed to cool, then wrapped in plastic bags for disposal. The expended canisters are to be treated as hazardous waste and turned in to the Hazardous Waste Coordinator onboard USCGC_____, for disposal in accordance with USCGC_____ waste program guidelines. In accordance with COMDTINST 16478.1B DO NOT JETTISON CANISTERS OVER THE SIDE.

WARNING: If OBA canisters come in contact with petroleum products a violent reaction will occur.

5. The OSL shall:

a. Inspect firefighters for proper wearing and activation of all gear before entering a space.

b. Report to the Bridge persons wearing OBA's, their respective activation times, and who entered the affected space.

c. Order relief of the OBA men when necessary.

6. Hose Tenders will be the primary relief firefighters. If additional firefighters are needed, selection will be on an "as available" basis. **ALL CREWMEMBERS must be trained to perform the duties of hose tender and nozzleman as well as how to properly don an FFE with OBA's**.

NOTE: Bridge will log OBA times and notify OSL when only ten minutes remain on OBAs.

E. Firefighter's Heat Stress Prevention.

1. The EMT shall:

   a. Continually observe firefighters physical condition (i.e., movements, flesh tone, speech), monitoring for possible heat exhaustion and heat stroke.

   b. Ensure that relieved firefighters are provided with room temperature fluid (i.e., water, *Gatorade*, etc.) and energy replacements (i.e., snacks).

   c. Provide dry clothing, towels, blankets, etc., for firefighters after exiting a space for relief.

2. Relieved firefighters shall muster on the forecastle and rest for a minimum of 30 minutes before being reused at the fire scene.

3. To minimize heat stress, FFE's shall be worn up to the waist (relaxed position) prior to entering the space. The top half of the FFE will be unzipped and folded down at the waist. The helmet, gloves, and OBA shall not be worn, but kept available for immediate donning. Firefighting boots shall be worn.

NOTE: **"Corfram" shoes can melt at high temperatures and can cause severe foot injuries during a fire. As emergencies happen unexpectedly, "Corfram" shoes shall not be worn aboard ship. They may be worn for inspections at the Commanding Officer's discretion.**

CHAPTER 4. COMMUNICATIONS

A. General. Use standard damage control communications in fighting machinery space fires. Ensure the Bridge is briefed on the status of plant securing and isolation, personnel status, and on the exact location and cause of the fire.

B. CO2 Activation. After personnel muster is taken and upon receiving a request from the OSL, the Commanding Officer shall authorize CO2 activation. Primary activation shall be from the Bridge. Secondary activation shall be from the vestibule leading to the engineroom from the messdeck (Vestibule 2-12-0-Q). CO2 discharge should be confirmed by observing discharge alarm located on the Bridge and/or Engine Room vestibule. If necessary, consider bypassing the time delay when activating.

C. Communications.

1. Primary.

    a. The primary source of communication shall be portable hand-held radios or radio-headset and shall be utilized by the Bridge, the OSL, and Investigators. Best practices have proven that hand-held communications are the most effective means of communications between the Bridge, OSL, and Investigators.

2. Secondary.

    a. The secondary source of communications shall be the 1JV Sound-Powered Phone (SPP) circuit.

    b. Messengers shall be used to run message blanks between the Bridge and the OSL in the event all communications are lost.

D. Records. The proper preparation of written DC messages using standard DC symbology is a fundamental damage control skill, which must not be lost. This is done to facilitate communications, especially between the OSL and the Bridge. Since the writing of DC messages is impractical with a small crew and the close proximity of the OSL, this skill will be maintained through normal DC PQS training.

CHAPTER 5. FIREFIGHTING SYSTEMS

A. Capabilities and Limitations. The firefighting systems and equipment described below are installed onboard this vessel. Each has capabilities and limitations that must be understood by firefighting personnel to ensure quick and proper selection of equipment.

B. Firemain System. Pressure to the installed firemain system is supplied from two fire pumps located in the engineroom. The fire pumps are rated for ___ gal/min at ___ psi each. The firemain system shall be kept intact so water is available for producing Aqueous Film Forming Foam (AFFF) and for cooling. Water is useful for cooling hot bulkheads in spaces adjacent to the fire and for extinguishing ordinary combustible (Class ALPHA) fires.

1. The ship's installed fire main should be the primary source of firefighting water to an AFFF hose for a major lube oil or fuel leak scenario.

2. The fire pumps can be energized from the _____ remote switches or the engine room. Located_____. The pumps are located to the port and starboard side of the engine room QAWTD (*-**-*-*).

3. Fire pumps should be energized in an engineroom fire until ship's power is secured.

4. When a hose attack is required to extinguish a flammable liquid fire, water fog may be used as the primary extinguishing agent. However, the time required to fight the fire will be longer, more firefighters will be needed, increased fire damage can be expected and risk of reflash is greater than if AFFF were used.

C. P-100 Fire Pump. The P-100 is the primary source of firefighting water in a machinery space fire and must provide adequate pressure to the fire main. The P-100 pump can be tied into the installed fire main system via deck connections located at _____to provide firefighting water to all fire stations. In the event main deck integrity and/or fire main failure occurs the P-100 pump may be relocated to the Port Quarter and rigged with a special tri-gate for one 2 ½ inch hose to charge the fire main system. The P-100 may be tied into the fire main at the deck riser located next to QAWTD (*-**-*). Two 1 ½ inch hoses shall be rigged with AFFF pick up tubes from either the P-100 or from the Port and/or Starboard fire stations for attack hoses. Both attack hoses must be of sufficient length to reach all accessible areas of the affected space.

NOTE: The fire pumps utilize ship's power. During a main space fire, all power will be secured. For this reason, the P-100 is the primary source of direct firefighting water.

D. Carbon Dioxide (CO_2). Carbon Dioxide is an odorless, colorless gas that extinguishes a fire by displacing the oxygen. CO_2 portable extinguishers are used primarily on small electrical fires (Class CHARLIE) and have limited effectiveness on small Class ALPHA and Class BRAVO fires of low heat intensity with an involved surface area of four square feet or less. A successful attack requires a close approach due to the CO_2's effective range of four to six feet. CO_2 extinguishers are located in the following spaces.

1. _____
2. _____
3. _____
4. _____

WARNING: Caution is necessary when using CO_2, especially when more than one extinguisher is used, as CO_2 displaces oxygen.

E. Purple-K-Powder (PKP). Purple-K-Powder is a dry chemical agent (potassium bicarbonate), stored in 18lb or 27lb portable extinguishers that extinguishes a fire by interrupting the chemical reaction process. PKP is very effective on small, isolated Class BRAVO pool fires (fires less than 10 square feet). The maximum range for the extinguisher is 20 feet. Unprotected operators who discover a fire may be in the best position to take initial action with PKP. Successful use of PKP for initial action is time critical. PKP is not designed for use on a fire which is out of control* (unless needed for evacuation) or for reentry. Simultaneous action to secure the source of oil or fuel is required. PKP extinguishers are located in the following spaces:

1. 1 on Bridge
2. 3 in Lazarette
3. 3 in Engineroom
4. 1 in Ships Office

WARNING: Operators must use caution when using PKP to avoid incurring breathing difficulties, reducing visibility, and discharging into electrical equipment.

F. Aqueous Film Forming Foam (AFFF).

1. AFFF is a surfactant* produced by mixing water and the AFFF concentrate (3%) with an inline pickup tube used with a hose line and vari-nozzle. AFFF can be applied from a separate fire station or P-100. **3% AFFF, is the primary agent used for indirect attack and space reentry.** It is effective on Class BRAVO bilge fires, in vapor securing* surfaces, and in preventing large scale reflash.

2. When making a hose line attack to extinguish a flammable liquid fire, use AFFF. If AFFF is expended, use water fog. A good match between the flow rate of the vari-nozzle and eductor is required for efficient foam application. The Akron Brass inline eductor style 2901 shall be set up for 3% AFFF concentrate and used with 95 gpm vari-nozzles (i.e., Akron Brass style 3019 or Elkhart Brass model SFL-GN-95). **Mechanical foam nozzles and 60 gpm (LP-6) eductors are not permitted.** AFFF cans are stowed in the following locations:

a. ___ cans in the Lazarette.

b. ___ cans in the Ships Office.

NOTE: One five gallon can of 3% AFFF will last for approximately 90 seconds and must have a minimum of 65 psi for proper foam generation.

WARNING: Care must be taken if using water fog after laying down a layer of AFFF. The water can wash away the AFFF, possibly leading to a reflash.

G. Foam Production with P-1 Salvage Pumps. The P-1 salvage pump can be used to produce AFFF. Although this is an unconventional method of applying AFFF it allows the AFFF concentrate to be proportioned with water, adequately agitated and delivered at a relatively high rate. The P-1 series pumps are designed to pump a large volume of water (120 gpm with a 5 foot head) at low pressure. Although the P-1 pump is not designed for use as a fire pump, it can be utilized for foam production. Foam can be delivered with the P-1 if the following procedures are followed:

1. Break out either pump from its container (leave container in stand), and set pump up for normal dewatering operation.

2. Pour two gallons of AFFF (1/2 can) into the pump container that has been filled with water.

3. Fill the storage container with water by using the discharge hose of the operating dewatering pump. The container will hold approximately 35 gallons of foam/water mixture.

4. After the storage container is full of the mixture, the pump suction hose should be shifted from the water source to the pump storage container. The discharge hose (approximately 20 feet long) is used in the same manner as a mechanical foam nozzle to fight the fire. This method allows a high volume of foam to be delivered in a short period of time.

5. Drawbacks exist with this method. Once the container is empty, foam application must be halted to refill the container. Also, the quality and density of foam is not optimal.

6. Modified two pump application can be performed as follows: Perform the steps of filling the container and emptying the container with separate pumps. Fill the can with one pump and immediately pump out foam mixture as soon as can is full. Allow the pump to keep suction and discharge excess water either on deck to cool area or over the side when not needed. The main drawback of the method is losing suction with the pumping of foam between can fill-up. Overall, it does allow a great deal more foam to be produced in a short period of time.

H. CO2 Flooding System.

1. CO2 (Carbon Dioxide) is a dry, non-corrosive gas that is inert when in contact with most substances. It will not leave a residue and damage machinery or electrical equipment.

2. The CO2 system must be activated only after the machinery space is evacuated.

3. CO2 flooding system activation will initiate visual and audible alarms and automatically secure air intake fans as well as main diesel engines and ship service generators.

4. The CO2 discharges after a ** second time delay. During this delay, all 440 volt engine room forced ventilation systems and air consuming equipment will be secured. If the CO2 does not discharge, the installed bypass located in the vestibule (1-14-0) shall be used to release CO2. **ALL HANDS MUST KNOW HOW TO OPERATE THE CO2 FLOODING SYSTEM**. After CO2 activation and if effective, cool the space for a minimum of 15 minutes before reentry. The system can be activated from the controller on the bridge, Mess deck, or from the vestibule leading to the engine room (2-14-0-Q). All hands shall be accounted for prior to activation.

5. Remember the following:

   a. Before attempting an indirect attack, check the effectiveness of the installed CO2 system by observing changes in the color of the smoke (i.e. black --> gray "OK"; blue --> white "OUT OF SIGHT"), temperatures of surrounding bulkheads, gauge pressures, depletion of bottles, (etc.)

   b. Engine room shall be evacuated and personnel shall be accounted for prior to CO2 discharge.

CHAPTER 6. CHOOSING THE CORRECT FIREFIGHTING EQUIPMENT

A. General. The proper choice of firefighting equipment should be based on:

1. The phase of firefighting action (e.g. action against a lube oil/fuel leak, a Class BRAVO fire, a Class BRAVO fire out of control, or for reentry).

2. The rate of the flammable liquid released and whether the source can be secured quickly.

3. Whether the flow is a spill or spray.

4. The extent of the area covered by the spill, spray, or fire.

B. Firefighting Phase. Give consideration to the particular phase of firefighting action when selecting firefighting systems and equipment. Systems are listed in order of effectiveness. Use the most effective installed system(s) available first.

1. To prevent fire during major lube oil/fuel leak, use AFFF with a 1 1/2 inch hose, inline foam pickup tube and vari-nozzle to wash oil or fuel from deckplates, bulkheads and machinery into the bilge. The hose shall be passed down from the starboard side fire station on the maindeck, through the QAWTH 1-21-1. Vapor-secure the hazard with a foam blanket.

2. Initial action against Class BRAVO fires.

   a. Use PKP portable extinguishers on Class BRAVO fires confined to a small area. When a pool fire covers an area greater than 10 square feet, initial action utilizing PKP may not readily extinguish the fire. However, PKP on large fires may extinguish or knock down the flames temporarily allowing added time to secure the fuel source. Use PKP with caution on large fires as it is difficult to get within the 19 foot effective range without getting burned.

   b. Initial action is NOT recommended against large unconfined Class BRAVO fires, spraying oil or fuel fires, or when the oil or fuel source cannot be secured quickly unless such actions are required to evacuate the space. Normally, these fires are already out of control.

3. Initial action against Class BRAVO fires out of control.

    a. Activate the CO2 flooding system after engine room has been confirmed evacuated. Notify Bridge of the status.

    b. Conduct an indirect attack through the engine room hatch with AFFF and 1 ½ inch hose with inline educator. Several cans (approximately two to three) of foam should be discharged into the space to vapor secure the hazard. This procedure must be conducted regardless of whether CO2 is effective or not.

    c. Make a direct entry with fire team(s) using the P-100 as the primary source of firefighting water. At a minimum, firefighting teams shall be provided with two 1 ½ inch AFFF hoses equipped with inline educator and vari-nozzle. Hoses shall be supplied either from fire stations ____ and ____, or directly from the P-100. Both attack hoses shall be of sufficient length to reach all accessible areas of the affected space.

    d. The bilge must be vapor secured by repair party firefighters using AFFF.

NOTE: <u>Flammable liquid spray fires</u> are automatically considered a Class BRAVO fire out of control.

CHAPTER 7. SMOKE CONTROL

A. Smoke Boundaries.

1. Set smoke boundaries* in accordance with Enclosure (3), then set material condition ZEBRA (start from the affected space, move outward). Establish smoke boundaries around the affected space to prevent the spread of smoke and provide controlled areas for local firefighting.

2. Establish a buffer zone by closing hatches and doors immediately adjacent to the affected space. Secure ventilation to make the buffer zone a dead air space. Only personnel with OBAs shall enter the buffer zone. Activate OBAs when smoke is present or on orders from the OSL.

3. When practical, set a second boundary around the buffer zone to check the spread of smoke and provide a safe area for firefighting personnel without OBAs. Use smoke curtains to control the spread of smoke where accesses must be open for the passage of equipment, hoses, and personnel.

B. Primary and Secondary Smoke Boundaries. A list of primary and secondary smoke boundaries is found in Enclosure (3).

C. Ventilation.

1. Secure affected space ventilation immediately after the casualty occurs.

2. Buffer Zone ventilation. Secure buffer zone ventilation to provide a dead air space at the entrance to the affected space. Buffer zones for an engine room fire are listed in Enclosure (3).

D. Fans and Controllers. Enclosure (4) of this doctrine lists:

1. Supply intake and exhaust discharge locations on the weather decks.

2. Fans and associated controllers affecting the machinery space(s) and adjoining spaces.

Controllers location, designation and areas served.

CHAPTER 8. SPACE ISOLATION

A. General. Isolation of the affected space is necessary to prevent a fire from intensifying due to the addition of flammable liquids or oxygen and to reduce electrical hazards. Before a Class BRAVO fire gets out of control, the machinery space should be isolated with the exception of firefighting systems and lighting. Once the fire is out of control, secure all systems. The following is a list of local and remote controls (valves, switchboards, circuit breakers, etc.) for rapid space isolation in accordance with the Ship's Casualty Control Manual. The designation, location, function, and area served by each control is provided.

B. Fire Boundaries. Establish fire boundaries around the affected space to confine the fire and designate bulkheads to be checked for heat. These boundaries are generally the watertight bulkheads and decks immediately adjacent to the affected space. The minimum degree of tightness for a fire boundary is fume tight. **Set condition ZEBRA, from the affected space outward.**

C. List of Fire Boundaries. Enclosure (3) to this doctrine contains a list of designated fire boundaries for machinery spaces. Fittings and closures are listed by number and class.

D. Mechanical Isolation. Make every effort to secure and/or isolate systems, machinery, and tanks that have the potential to feed or otherwise contribute to the intensity of the fire. Not all systems have remote securing or isolation capabilities. Along with other concurrent firefighting actions, locally secure those systems without remote securing or isolating capabilities as soon as possible. Familiarity with location and type of local securing and isolating capabilities and with casualty control procedures is required. Establish communications and exercise care to prevent cascading casualties to equipment necessary to maintain propulsion, electrical power and firemain pressure in unaffected spaces. Oil and fuel systems, and fuel tanks located close to space boundaries are of particular concern. **NOTE - Be sure to open the RHIB ramp door prior to securing ships electrical power. The ramp door can not be opened manually once power has been secured.** Systems to secure include in order of priority:

1. Main diesel engines.

2. Ship service generators.

3. Fuel systems.

4. Hydraulic systems.

5. Ventilation.

E. Electrical Isolation. Do not secure lighting and power to firefighting equipment before evacuation of personnel. Complete electrical isolation will be very difficult due to the number of cables within and transiting any given space. To the greatest extent possible, secure all electrical equipment from outside the affected space at the cutter's breaker panels. The emergency ballast lighting will provide adequate lighting for approximately two hours.

F. Mechanical and Electrical Isolation Bills. Enclosure (6) lists the local and remote controls (valves,

switchboards, circuit breakers, etc.) for space isolation. Included are the designation, location, function and area served by each control. Enclosure (6) has a breakdown of the Mechanical and Electrical Isolation Bills.

Fuel Tanks. Transfer of fuel to a safe location to remove fuel contents puts the empty fuel tank at maximum risk to fire. Therefore, transfer of fuel from the fire area should not be attempted. **Pressing up the vapor space in a fuel tank with seawater to protect tank contents is not authorized.** Experience indicates that ignition does not occur in fuel tanks exposed to fire, conditions for ignition within the tank are highly unlikely, and no accurate method exists to verify the vapor space has been eliminated. In addition, the fuel tank will become contaminated with seawater. The only action necessary to prevent tank contents from contributing to a machinery space fire is to isolate and secure the fuel system.

CHAPTER 9. FIREFIGHTING AND MAJOR OIL OR FUEL LEAKS

A. Major Oil or Fuel Leak Scenario. Any major flammable oil or fuel leak (anything more than a drip) presents an immediate fire hazard that must be dealt with quickly. An oil or fuel leak that forms a spray can ignite when it comes in contact with any hot surface or equipment capable of electrical arcing. Rapidly securing the source and using AFFF to cover liquid surfaces will greatly reduce the risk of fire. In addition, small problems (i.e., drips) may become large problems. Take the following actions when a major oil or fuel leak occurs:

NOTE: Reference (a) states that a drop of lube oil or fuel oil is considered a major leak and should be washed into the bilge and covered with 1 inch of foam. However, common sense must dictate at what point to wash the fluid into the bilge.

1. Report the leak. At sea, the person discovering the leak shall report immediately to the Bridge (OOD when inport) and begin concurrent actions. Concurrent actions include:

    a. Notify the EPO.

    b. Secure the affected machinery or equipment. MDE's may only secured with permission from the OOD.

    c. Notify the CO/OIC.

    d. General Quarters will be sounded by the OOD as directed by Enclosure (2).

    e. Pump out the bilge to the oily waste holding tank. Only with the express permission of the Commanding Officer will any oily waste be pumped overboard. When cleaning up the oil or fuel spill, place clean up rags in a suitable container.

2. Secure the source. The leak should* be stopped or isolated as quickly as possible by locally or remotely closing system cutout valves or shutdown controls. Initiatives such as rag wraps and collection using a bucket can control the flow of oil or fuel effectively or deflect it away from hot surfaces. **When not in restricted maneuverability, secure the effected piece of machinery. If in restricted maneuverability, permission must be obtained prior to securing a piece of machinery.**

3. Apply AFFF. Start fire pump(s) and pass a starboard side fire station hose (with inline eductor for 3% AFFF in place) through the main deck QAWTH *-**-*-*. Use AFFF to wash oil or fuel from deckplates, bulkheads, and machinery into the bilge, to include bilge pockets located beneath both MDE and SSDG. Ensure entire area is covered with a 1 ½ inch foam blanket. Water may* be used to flush the oil or fuel to the bilge. However, be careful not to disturb AFFF blankets that are providing a vapor barrier covering the bilge and other areas of heavy oil or fuel buildup. Continue discharging AFFF into the bilge and bilge pockets to cover liquid surfaces and prevent ignition of the oil or fuel. Reapply AFFF as necessary to maintain blanket coverage.

4. Concurrent actions. As time and personnel permit, the space supervisor or EOW shall direct the following actions:

    a. Secure operating machinery in the vicinity of the leak to control the casualty as described in the Casualty Control Manual.

    b. Pump out the bilge to the oily waste holding tank or, with the permission of the Commanding Officer, pump overboard. When cleaning up the oil or fuel spill, place cleanup rags in a suitable container.

    c. Stand by with a PKP extinguisher until help arrives.

B. Initial Firefighting Actions. Initial actions must be completed quickly. Class BRAVO fires and smoke spread rapidly and the fire can grow out of control in seconds. The person discovering the fire, should take the following initial actions in conjunction with procedures in the Casualty Control Manual:

1. Report the fire. The person discovering the fire shall report the cause and location of the fire immediately to the Bridge (Inport OOD). The Bridge will sound General Quarters and notify the CO.

2. "Size up" the fire. The OOD or EOW shall assess the report of the fire and either direct watchstanders to extinguish the fire or direct them to evacuate the space.

    a. Flammable liquid spray fires. These fires should not be attacked. Past experience and fire testing have demonstrated that a pressurized release of a flammable liquid can create a fire that is unapproachable. Life threatening conditions created by extreme heat, smoke and toxic gases can occur in as little as 60 seconds. **Under such conditions the only prudent action is to evacuate the space and secure the propulsion plant remotely.** Such fires are commonly started by an oil or fuel source that cannot be quickly and completely secured.

NOTE: Watchstanders and personnel transiting the engineroom lacking adequate breathing and flash/burn protection will likely be the ones taking initial action. Therefore, it may be impossible to take initial action without risk of severe personal injuries. If the fire is localized and small enough, notify the Bridge and attack the fire with appropriate firefighting equipment based on the size, anticipated behavior and travel of the fire. GOOD JUDGEMENT MUST DICTATE THE COURSE OF ACTION.

3. Secure the source. Stop or isolate the fire's fuel source as quickly as possible by locally or remotely closing system cutout valves or shutdown valves. Securing an engine or other piece of equipment may be the quickest way of reducing or stopping the flow of oil or fuel that is feeding the fire. The mechanical and electrical isolation bills (Enclosure 6) list critical controls including those for the EOW to secure.

4. Fight the fire. Fight small Class BRAVO fires using portable PKP extinguishers or AFFF hoses from stations --- and --- if they can be brought to bear quickly using the installed firemain system. Chapters 5 and 6 contain information on firefighting systems and on choosing the correct firefighting equipment. The OSL will direct repair party personnel to provide hoses to the space and provide AFFF.

C. Class BRAVO Fire Scenario - Contained. Take the following actions for a machinery space Class BRAVO fire generated by pooled oil or fuel.

1. Initial actions. Take initial action if possible. If not, evacuate the space.

2. Concurrent actions. The following concurrent actions, specifically assigned per the Watch, Quarter, and Station Bill shall be accomplished:

   a. The person discovering the fire shall inform the OOD. Report the fire's location and source.

   b. The OOD will sound General Quarters and announce on the 1MC: "Now, fire in *-**-*-*, engine room, all hands set material condition ZEBRA throughout the ship".

   c. Secure ventilation in the affected space.

   d. Account for all personnel onboard, cover supply and exhaust vents.

   e. Energize the CO2 flooding system from the Bridge. If necessary, bypass the time delay if space is evacuated.

   f. If inport:

      (1) Notify OOD at X----.

      (2) Notify the CO, XO and EPO

      (3) Recall crew as directed by CO/OIC

      (4) Notify Group OOD at X----

g. Establish communications with the Bridge. Keep Bridge advised of firefighting progress and securing checklists.

h. The OOD is in charge of all firefighting actions until the repair parties are manned and ready.

i. The P-100 will be rigged to supply water to the fire main.

j. Secure power to the entire space including all equipment located within that space.

k. Set fire and smoke boundaries (Enclosure 3) around the effected space to prevent the spread of fire and smoke to other parts of the cutter. See Chapter 7 for further information on smoke control.

l. Set material condition ZEBRA to help isolate the effected space and establish fire and smoke boundaries. Use smoke curtains when boundaries must be broken to allow passage of people and firefighting equipment.

m. P-1 pumps shall provide cooling water to the boat deck.

3. Contain and fight the fire:

a. Reentry and firefighting shall take place per the guidance given in Chapter 10.

b. After the fire is extinguished, take post fire actions as discussed in Chapter 11.

D. Class BRAVO Fire Scenario - Out of Control. A Class BRAVO fire, especially a flammable liquid spray fire or a fire started by an unsecured oil or fuel source, can get out of control within seconds. When this happens, evacuate the space and remotely secure mechanical and electrical systems. Firefighters shall combat the fire using installed systems and the reentry techniques outlined in Chapter 10. Take the following actions when faced with a fire out of control:

1. "Size up" the fire. When the fire is fed by a oil or fuel source which cannot be secured or is threatening firefighting or escape, consider the fire out of control. The space should be evacuated. A small fire that is not rapidly extinguished can generate large volumes of smoke and deadly gases, forcing space evacuation.

2. Mechanical and electrical isolation:

a. Every effort should be made to secure and/or isolate systems and equipment that are the cause of a fire or have the potential to increase the intensity of a fire, or pose a safety hazard to repair personnel.

b. When a space is abandoned due to fire, flooding, or other damage the space should be mechanically and electrically isolated to the greatest extent possible, with the exception of lighting.

c. The OSL may direct firefighting efforts to commence before electrical isolation is complete.

Firefighting efforts should not be delayed awaiting complete electrical isolation unless there is a serious risk to personnel.

d. Secure ventilation upon notification of major oil or fuel leak.

3. Evacuate. Evacuate the effected space before activating the CO2 system. Secure access doors, hatches and scuttles. The OSL shall:

   a. Take muster and pass personnel count to the Bridge.

   b. Report to the Bridge when evacuation of space is complete and ZEBRA is set.

4. Establish communications. Establish communications per Chapter 4. The OSL shall notify the Bridge when the fire is declared out of control. The OSL shall brief the hose teams on the location and cause of the fire, personnel status, and plant status.

5. Secure the space mechanically and electrically per Chapter 8.

6. Activate CO2 flooding system. Note time of CO2 activation. Ensure CO2 activation actually occurred by checking the CO2 discharge alarm(s) located on the bridge or in engine room vestibule. Observe the smoke color and status of Fire boundaries.

   a. Wait a minimum of 15 minutes after CO2 activation (only if effective) prior to reentry into affected space. Prior to reentry, check effectiveness of CO2 by observing changes in color of smoke via the engine room door portlight (i.e. black --> grey "OK"; grey --> white "ALRIGHT") and condition of fire boundaries.

7. Conduct an indirect attack through the engine room QAWTH 1-21-0 with AFFF and a 1 ½ inch hose with inline eductor. Several cans (approximately three to five) of foam should be discharged into the space to vapor secure the hazard. This procedure must be conducted regardless of whether CO2 is effective or not.

NOTE: If engine room QAWTH is inaccessible, conduct an indirect attack through the engine room door (via forward vestibule).

8. Reentry and firefighting shall take place per the guidance given in Chapter 10. Reenter from vestibule through QAWTD *-**-*. Secondary reentry shall be from the engine room hatch through QAWTD *-**-*. Use personnel protection described in Chapter 3.

9. After the fire is extinguished, conduct post fire actions as discussed in Chapter 11.

E. Inport/Cold Iron Class BRAVO Fires. Watchstanders shall take the following actions in the vent an oil or fuel fire occurs in the engine room while inport:

1. Sound the alarm and ensure all personnel onboard are aware of the situation.

2. “Size up” the fire. Using proper risk assessment, take initial action. Secure Shore Tie power, Set ZEBRA if possible. Activate CO2 flooding system.

3. Call the local Fire Department or 911 then notify CO/OIC, XPO, and Group as directed by Ship’s

Organization Manual.

4. Brief Rescue and Assistance (R and A) Teams and fire department. The OOD should brief the fire department and R and A Team personnel when they arrive, providing fire and plant status.

    a. The CO or direct representative (XO or OOD) is responsible for making the decision to use the fire department and is ultimately responsible for the cutter. As such decisions are difficult to make under the stress of a major fire, standing agreements with the ---------- Fire Department addressing span of control and decision making procedures have been created between SOPA, ------- and CUTTER----------.

5. Standby to assist. Inport watchstanders and personnel not in the duty section but onboard, shall assist the R and A teams and fire department personnel as directed by the OOD.

NOTE: Inport watch standers shall ensure that the shore tie power is secured by opening shoretie breaker located pier side.

CHAPTER 10. REENTRY AND FIREFIGHTING

A. General.

1. Reentry to a machinery space to fight a fire out of control is the most critical part of the firefighting evolution and the most dangerous to personnel. The primary functions of the reentry team are:

   a. Attack and extinguish the fire.

   b. Rescue trapped personnel.

   c. Secure fuel source.

   d. Overhaul the effected space (including cooling surfaces and desmoking).

2. When the affected space is reentered, a backdraft explosion* or an intensifying fire may occur as hot fire gases escape into the buffer zone. Firefighters should use caution to position themselves to the side of the access when the door or scuttle is initially opened. In general, follow standard repair party firefighting procedures.

B. Reentry Location.

1. Primary reentry location is through the vestibule QAWTD *-**-*-*. (**After AFFF has been applied via the QAWTH on the main deck)**. Secondary reentry location is through the main deck QAWTH to the engine room *-**_*-*. Never reenter the effected space through an access obstructed by fire. Choice of access is at the discretion of the OSL.

2. Fight the fire. Once inside the space, report when the fire is located, extinguished, reflash watch is set and fire is overhauled. Visibility will likely be extremely limited. Extinguish Class ALPHA fires using AFFF. Secure oil or fuel source and cover all flammable liquids with AFFF.

NOTE: Primary reentry should be lowest readily accessible point into the effected space. Caution should be exercised with respect to the aluminum deck plates. If the fire has burned for even a short time the deck plates may have melted.

C. Hoses. At a minimum, firefighting teams shall provide two attack 1 ½ inch AFFF hoses equipped with vari-nozzles supplied from fire stations ____ and ____, or directly from the P-100. Both attack hoses shall be of sufficient length to reach all accessible areas of the effected space. The hose team may enter with one hose at the discretion of the OSL.

1. Additional hose handlers may be needed to help maneuver the hoses. Hose handlers must have proper personal protection equipment according to Chapter 3. Ensure hose handlers are properly spaced to maintain communications with the OSL.

2. Nozzle patterns. Repeated efforts may be necessary to gain access to the space. The nozzleman should use the reentry AFFF hose with wide-angle fog for protection. The vari-nozzle 30 degree fog pattern or "power cone" should be used to attack the fire, and lay down vapor securing AFFF blankets. Adjust the nozzle pattern to suit the particular tactical situation.

D. Conserving AFFF.

1. Enough AFFF is carried onboard to cover a machinery space bilge four to five times. Reentering the space may be a lengthy and awkward process. Use the AFFF needed but do not waste it. Use water to cool accesses, but water should not be used in the effected space as it will impair the effectiveness of the AFFF. To conserve AFFF, hoses equipped with inline educators can discharge water if pickup tubes are removed from AFFF cans. The educator will continue to function with reinsertion of the pickup tube into the AFFF containers. The lead hoseman will determine when water or AFFF is needed and pass commands to the OSL for coordination at the P-100 pump.

2. To protect against reflash, firefighters should take care to replenish AFFF blankets covering flammable liquids that are disturbed by cooling water. The AFFF blanket must be maintained at 1 ½ inches for at least 24 to 48 hours.

E. When CO2 is Used:

1. Reentry should not be made for a least 15 minutes after CO2 is discharged and only if effective. Reentry personnel must wear OBAs and personnel protection equipment as per Chapter 3. The 15 minute wait allows the space to cool, limiting the probability of reflash if air enters during reentry. Reenter before 15 minutes only on direction from the Commanding Officer.

    a. If evidence indicates that the CO2 did not extinguish the fire, the indirect method of extinguishing the fire should be attempted prior to reentry.

Electrical isolation will be completed because power to the vessel will be secured when the CO2 flooding system is activated.

CHAPTER 11. POST FIRE ACTIONS

A. General. After the fire is out, the space shall be desmoked and atmospheric testing shall be conducted. Post a reflash watch with AFFF hose to extinguish any fires that may reignite. The OSL shall report to the Bridge when the reflash watch is set and when overhaul is completed.

1. Desmoking. When a BRAVO fire has been extinguished, combustible gases may be present. Operating electric controllers to start fans may ignite these gases. Leave circuit breakers and other protective devices, which tripped automatically during the fire, in the tripped position until system damage is assessed. Examine the electrical distribution system. Do not re-energize electrical equipment until space has been declared safe. Desmoke space by Venturi Principle or natural ventilation.

B. Atmospheric Testing.

1. Desmoke first. Desmoking shall precede atmospheric testing as combustible gas analyzers are not reliable in a CO2 atmosphere, and oxygen analyzers are not reliable if the sensor is exposed to excessive moisture, heat, or particulates found in a post-fire atmosphere. When the space is clear of smoke, test for oxygen, combustible gases, and toxic gases IAW NSTM 074, Volume 3. Oxygen shall be between 19.5 to 22 percent, combustible gases shall be less than 10 percent of the lower explosive limit (LEL), and all toxic gases below their threshold limit values (TLV) before the space can be certified safe for personnel to enter without OBAs.

2. Shipboard personnel authorized to conduct post-fire atmospheric tests for the purpose of certifying the space safe for personnel are gas free engineers and gas free engineering petty officers (E-5 and above) as defined by NSTM 074, Volume 3. When emergency conditions exist and the gas free engineer or gas free petty officer is not available, a Performance Qualification Standard (PQS) qualified repair party post-fire gas free test assistant may perform gas free tests with the approval of the CO/OIC. **The repair party post-fire gas free test assistant MAY NOT make "safe for hot work" gas free tests unless he is qualified per the requirements of NSTM 074, Volume 3.**

3. Extent of test.

a. After a flammable liquid fire has been extinguished, toxic gas tests for hydrocarbons, carbon dioxide, carbon monoxide, hydrogen chloride, hydrogen cyanide, and chlorine are required. The threshold limits are as follows:

(1) Carbon Dioxide (CO_2): 5000ppm TLV or 5% by volume.

(2) Carbon Monoxide (CO): 50ppm TLV.

(3) Hydrogen Chloride: 5ppm TLV.

(4) Hydrogen Cyanide: 10ppm TLV.

(5) Chlorine: 0.5ppm TLV.

b. Tests in the space should be conducted near the center and all four corners on each level, taken high and low, with a minimum of ten (10) test points taken. At least one satisfactory test shall be obtained at each location tested.

NOTE: A compartment is considered "safe" only after satisfactory test results at all test locations is obtained during the latest round of tests. An "unsatisfactory" test result at any test point will require further desmoking and retesting at all test points.

C. Dewatering. The OSL shall direct the space to be dewatered with the Commanding Officer's permission and per standard operating procedures. The fixed bilge system and the P-100 should be used for dewatering uncontaminated water (i.e. water free of flammable liquids).

1. P-1 pumps or P-100 utilizing an educator shall be used to remove water contaminated with flammable liquids.

2. Retest the space for toxic gases after dewatering. Water can trap and release toxic gases during dewatering.

D. Remanning. Once the space is certified as safe for personnel to reenter without OBAs, remanning can begin.

E. Investigating Damage. The EPO shall direct the damage investigation and shall determine which, if any, equipment and machinery may be restarted.

F. Reenergizing Uneffected Systems and Equipment. The EPO shall direct the line up, starting and energizing of mechanical and electrical equipment only after a detailed assessment of the damage shows that these operations can be conducted without endangering personnel or the cutter. This may include retesting the effected space for explosive gases to be sure that it is safe to start machinery or equipment which could produce a spark or provide hot surfaces sufficient to cause a fire or explosion.

LIST OF SPACES REQUIRING SUBSECTIONS

A. Aft Steering Compartment (*-**-*-*). Fire in this space will be fought the same as the engine room except that the use of CO2 flooding does not apply.

NOTE: Refer to Enclosures (4) and (6) for items to secure prior to entering space to a fight the fire.

DUTIES AND RESPONSIBILITIES OF PERSONNEL

A. Engineering Petty Officer (EPO). The EPO shall:

1. Be assigned in accordance with -----INST 1601--.
2. Be assigned in accordance with -----INST 1601--.
3. Be responsible for maintaining this instruction.
4. Ensure that Damage Control PMS is completed as required.
5. Notify the OOD and CO of any DC discrepancies.
6. Keep Compartment Checkoff Lists (CCOL's) up to date.
7. Coordinate and provide all crewmembers DC PQS training.

B. Officer of the Deck (OOD) - Inport. The Inport OOD is responsible for the following:

1. Make hourly fire and flooding rounds of all spaces during non-working hours.
2. Ensure proper stowage of all flammables, ammunition, rags, trash, etc.
3. Immediately correct any fire hazards when found.
4. Upon detection/notification of a fire the OOD must:
   a. Immediately sound General Quarters.
   b. Pipe over the 1MC the type and location of the fire.
   c. Take personnel muster.
   d. Notify CO/OIC, XO, EPO, recall crew
   e. Notify The Senior Officer Afloat (SOPA), Group ------- ----- (or OPCON).

C. OOD - Underway. The Underway OOD is responsible for the following:

1. Stay abreast of any planned evolutions/drills.
2. Upon notification of fire, sound General Quarters and announce fire type and location on 1MC.

3. Notify the CO of any fires or emergencies.

4. Notify closest Group, or OPCON via radio and advise them of situation.

D. Engineering Officer of the Watch - Inport. The EOW shall:

1. Know the present and planned status of all machinery onboard.

2. Inform the OOD when a casualty occurs affecting a piece of equipment, especially DC or firefighting equipment.

3. In the event of a fire, isolate the affected space.

E. Engineering Officer of the Watch - Underway. The EOW shall:

1. Make rounds in accordance with the Engineering Standing Orders.

2. Immediately correct any fire hazards discovered.

3. Inform the OOD and EPO of any changes to equipment status especially DC equipment.

4. Upon detecting a fire, take initial action to prevent spread of the fire and notify the OOD.

F. On Scene Leader. The OSL shall:

1. Direct firefighting efforts at the scene of the fire.

2 Keep the OOD advised of firefighting efforts and difficulties encountered.

G. Electrician. The Electrician shall:

1. Isolate the affected space.

2. Conduct emergency tests and repairs of circuits.

H. CO2 Activating Personnel.

1. CO2 may be activated only with express permission of the CO or XO. During non-working hours, the Inport OOD may authorize the activation of the Halon system.

2. Prior to activation of the CO2 system, consideration must be made regarding personnel accountability and space shutdown (ie. ventilation fans and vent covers).

3. Underway, the CO2 system will be activated by Bridge personnel, with permission from the CO/XO, upon notification of an accurate personnel muster from the OSL.

I. Medical. The Emergency Medical Technician (EMT) shall:

1. Be assigned in accordance with -----INST 1601--.

2. Properly maintain all medical equipment onboard.

3. Provide first aid to injured crewmembers.

4. Update and procure equipment as required.

5. Provide First Aid training to all crewmembers.

6. Monitor firefighters for signs of heat stress, injuries, etc.

J. Personnel. Personnel onboard during a fire, but not assigned to the duty section shall muster on the bridge and perform duties as determined by the OOD.

PRIMARY AND SECONDARY SMOKE BOUNDARIES, BUFFER ZONES AND SMOKE CURTAINS

1. Primary smoke boundaries.

    a. FWD-QAWTD 2-14-0, NTD 2-12-0, Archway from the messdeck to Office Space, QAWTD 2-9-0

    b. AFT – None.

2. Secondary smoke boundaries.

    a. FWD Maindeck penetration (NAT EXH), NTD 1-8-1, QAWTD 2-9-0

    b. AFT NONE

3. Buffer zone.

    a. Mess deck (2-9-2-0-Q)

4. Smoke curtains.

Smoke curtains are required at NTD 2-12-0 and archway from the messdeck to the office space and in the engineroom vestibule.

FANS, CONTROLLERS, SUPPLY INTAKES AND EXHAUST DISCHARGE

A. Engineroom Fire.

1. Secure supply intake fans located on main deck.

    a. Secure fans from remote emergency shutdowns (*-**-*-*) in vestibule between messdeck and engineroom.

FIRE BOUNDARIES

A. Primary Fire Boundaries

1. FWD - FR 14
2. AFT - FR 22

B. Secondary Fire Boundaries.

1. FWD - FR 9
2. AFT - NONE

C. Overhead-Boat Deck

1. 1-10-0Q Office
2. 1-8-2-L Crew Quarters
3. 1-8-1-L Crew Quarters
4. 1-10-1-L Shower
5. 1-10-2-L Head

Note: Location of P-100 and P1B Pumps are on top of Engineroom fire boundary.

MECHANICAL AND ELECTRICAL ISOLATION BILLS

A. Engineroom. The following items must be secured for a machinery space fire.

1. Secure main diesel engines from:

    a. Bridge "STOP" switch.

    b. Open Bridge "STOP" switch.

    c. Emergency shutdowns located in:

        (1)

        (2)

2. Secure ship service generators from emergency shutdowns located _____.

3. Port transfer remote cutoff valve (*-**-*).

4. Starboard transfer remote cutoff valve (*-**-**).

5. Starboard day tank supply cutoff valve (*-**-*).

6. Port day tank supply cutoff valve (*-**-*).

GLOSSARY

1. **AFFECTED SPACE**: A space involved in a major oil or fuel spill or fire.

2. **BACKDRAFT EXPLOSION**: An explosion which results from combining fresh air with hot flammable fire gases which have reached their auto-ignition temperatures.

3. **BUFFER ZONE**: An enclosed area immediately adjacent to the entrance to the affected space (i.e., between the primary and secondary smoke boundaries). The buffer zone should be a region of dead air. The buffer zone shall not be pressurized. The buffer zone is usually located on the damage control deck but may be located around a lower entrance (i.e., messdeck) if the fire will be attacked from that entrance.

4. **FIRE AND SMOKE BOUNDARIES**: Any physical barrier can be a fire boundary. Primary boundaries are bulkheads, deck and overhead surrounding the fire. Secondary fire boundaries are generally set at fire zone bulkheads or watertight subdivisions. Most fire boundaries are not insulated and cooling by water spray may be required. Cooling water may be required on all sides of the compartment, particularly when the fire is in an advanced stage. **It is very important to set boundaries over the fire as quickly as possible as fire tends to spread faster vertically than horizontally.** Combustibles in contact with fire-exposed decks, bulkheads and overheads should be removed to avoid ignition and spread of fire. Smoke Boundaries are normally set with fire boundaries. The OSL decides initially when and where boundarymen with charged hoses are needed.

5. **FIRE OUT OF CONTROL**: A fire that creates conditions due to heat and smoke which forces personnel to abandon the space.

6. **MACHINERY SPACE**: A main machinery or auxiliary machinery space which contains any of the following: installed firefighting systems, oil or fuel fired boilers, internal combustion engines, gas turbines, oil or fuel transfer equipment.

7. **MAY**: When application to a procedure is optional.

8. **OVERHAUL**: Determine the extent of the fire while extinguishing residual, embedded fires followed by clean up operations.

9. **SHALL**: When application of a procedure is mandatory.

10. **SHOULD**: When application of a procedure is recommended.

11. **SURFACTANT**: A large group of surface acting compounds that include detergents, wetting agents, and liquid soaps.

12. **UNAFFECTED SPACE**: Any space other than the space involved in a major oil or fuel spill or fire.

13. **VAPOR SECURE**: Establishing a film or foam blanket over flammable liquids to prevent vaporization thereby isolating the oil or fuel source from oxygen and heat.

87' MACHINERY SPACE FIRE CHECK LIST

A. OOD ACTIONS

1. _____Receive report from Alarm or EOW. Announce Location:_____, Class/Size of Fire:_____ and Initial Action:_____. **SOUND ALARM.**

2. _____Pipe "*(FIRE, FIRE, FIRE)* or *(MAJOR LUBE OIL LEAK) in the Engineroom PORT/STBD side. All hands man your Machinery Space Fire Billets. Set Material Condition YOKE throughout the ship.*

3. _____Take a fix, establish vessel safety (Drop Anchor?).

4. _____Notify CO/OIC of nature and status of fire/leak.

5. _____Request Assistance from other vessels.

6. _____Contact local Group or OPCON.

7. _____**ESTABLISH COMMS** with Scene Leader.

8. _____Conduct Crew Muster.

9. _____**OPEN RHI RAMP DOOR BEFORE POWER IS SECURED!**

10. _____Secure Machinery, Ventilation, Electrical Plant, & F/O Valves.

11. _____Send Out Investigators (if OBA activated note times #1_____ #2_____).

12. _____Material condition Yoke Set?

13. _____Installed Flooding System Activated; Release Verified_____.(Minimum soak time 15 minutes)

14. _____Fire/Smoke Boundaries Set fwd. FR 14/ aft.FR 22/fwd FR 9.

15. _____P-100 Rigged and Tied into Fire Main System (tie down pump).

16. _____Cool Exterior Decks, Pyro Locker, Boundaries (tie down P-1, P-5).

17. _____OBA Personnel Dressed Out in Stand-by Position (unless otherwise directed).

18. _____Lay AFFF Blanket in E/R via engine room escape hatch (3 cans).

19. _____Permission to re-enter space (OBA Personnel Fully dressed).
19a._____Timers Set #1_____ #2_____ #3_____ #4____ changeout time_____.

20. _____Time Re-entry made _____.

21. _____Conditions Found fire under control____ fire out____.

22. _____AFFF Blanket applied in the bilge.
22a._____AFFF Blanket applied on affected Machinery.

23. _____Ventilate/Desmoke space (Venturi effect) - this may be required several times throughout evolution.

24. _____Reflash watch set _____(request to back out hose to most advantageous area).

25. _____Overhaul fire. Attack "hot spots" as necessary.

26. _____Conduct Atmospheric Tests.
    a._____O2 test (19.5% - 22%)_____
    b._____Explosive Gases test (<10% L.E.L.)____
    c._____Toxic gases test (Draeger) CO2_____ CO_____ Phosgene_____ Hydrogen_____ Cyanide_____ Benzene_____ Other_____

27. _____Request to relax OBA Personnel (if **ALL** tests are sat).

28. _____Report level of AFFF/water in the bilge_____.

29. _____Request AFFF/water remain in bilge 48 hrs.

30. _____Request machinery/electrical/structural damage assessment _____

31. _____Request permission to re-energize unaffected gear.

32. _____Set Firewatch. _____ (min. requirement flashgear/extinguishing agent).

_____Request to secure from scene (set yoke____) stow all gear_____.