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COMMANDANT INSTRUCTION M9555.1A

Subj: Machinery Space Firefighting Doctrine For Class Bravo
Fires

- Ref:
- (a) Naval Ships' Technical Manual (NSTM) Chapter 074 V3, Gas Free Engineering
 - (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) FXP-4
 - (f) NWP 62-1(Series), Surface Ship Survivability
 - (g) COMDTNOTE 5600, Directives, Publications, Reports Index
 - (h) COMDTINST M2600.1(Series), Comtac Publications Index
 - (i) COMDTINST M3502.4B, Cutter Training and Qualification Manual
 - (j) COMDTINST M9000.6(Series), Naval Engineering Manual
 - (k) COMDTINST M9000.7(Series), Naval Engineering Technical Publication Index
 - (l) Engineering Casualty Control Manual

1. PURPOSE. This instruction promulgates the Machinery Space Firefighting Doctrine (MSFD) for Coast Guard cutters and establishes Coast Guard policy for fighting Class Bravo fires in machinery spaces.
2. DIRECTIVES AFFECTED. COMDTINST M9555.1 is canceled.

3. DISCUSSION.

- a. References (a) through (l) contain the best guidance on military shipboard firefighting available today. Because of differences in equipment, ship design policy, and watchstanding, the Machinery Space Firefighting Doctrine in reference (d) is not entirely applicable to Coast Guard cutters. However, Coast Guard doctrine is based on, and closely follows, references (b) through (f).
- b. This instruction is written for use by all cutters, 65 feet and longer. As such it contains references to equipment which may not be available to all cutters. Such references must be deleted from specific cutter doctrines. The doctrine applies to fighting Class Bravo fires in manned or unmanned machinery spaces both inport and underway. This instruction has been revised to reflect the changes in reference (d), and the training provided in Navy Refresher Training.
- c. Commanding officers and officers in charge of cutters, 65 feet and longer, 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 (l). As an "enclosure" to the MSFD, cutters shall develop checklists covering the actions to be taken by the different watch stations and control stations. The MSFD shall be tailored for an individual cutter by editing the text of this instruction, taking into account the number of machinery spaces, authorized equipment, personnel levels, and the design of the cutter and its mechanical systems. The MSFD shall be tailored with the cutter's Casualty Control Manual. 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 (l).
- d. Main space fire training shall be conducted in accordance with reference (i).
- e. Cutters participating in Navy Refresher Training (REFTRA) will have the MSFD closely evaluated as part of the Training Readiness Evaluation. Adoption of REFTRA recommendations for changing the MSFD for a cutter is authorized only when compatible with this instruction, references (a) through (l), and other Commandant and Area directives.
- f. Cutters not regularly scheduled for Navy REFTRA shall have their MSFD reviewed by the cognizant Maintenance and Logistics Command (MLC) for compliance with the guidelines contained in this instruction.

3. g. Standard terminal compatible diskette copies of this instruction are available from the MLCs for loan to cutters upon request.
- h. Recommended MSFD changes to this instruction shall be forwarded through the appropriate MLC and Area to Commandant (G-ENE) for approval.
4. ACTION. Area and district commanders, commanders of maintenance and logistics commands, and unit commanding officers shall comply with the contents of this instruction.

/s/ R. L. JOHANSON
Chief, Office of Engineering,
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Encl: (1) Machinery Space Firefighting Doctrine for Coast Guard Cutters

Non-standard Dist:

*B:c MLC PAC, MLCLANT (6 extra)

*D:1 FTG Guantanamo Bay

FTG San Diego

FTG Pearl Harbor

FTU Little Creek only

FTC Norfolk

FMWTC Mayport

FMWTC Charleston

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Enclosure (2) Duties and Responsibilities of Personnel

- Enclosure (3) Primary and Secondary Smoke Boundaries,
Smoke Curtains, Buffer Zone Ventilation
- Enclosure (4) List of Fans, Controllers, Supply Intake,
Exhaust Discharge
- Enclosure (5) Fire Boundaries
- Enclosure (6) Mechanical and Electrical Isolation Bills
- Enclosure (7) Glossary

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*. Words used for the first time which are defined in the glossary, are **marked with an asterisk (*)**. This doctrine covers the preferred sequence of events during a major oil leak or machinery space fire. Reference (d) provides additional guidance on fighting shipboard fires. Where conflicts arise between this doctrine and References (b), (c), (d) and (e), this doctrine takes precedence. This doctrine does not replace use of good judgment by all hands. All hands must be familiar with all firefighting systems and equipment available to them and the best to use for different fires. **When a fire starts, it is 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 leak. This doctrine addresses fire prevention, firefighting systems' capabilities and limitations, considerations necessary in choosing the correct firefighting equipment, and the actions necessary both in and external to the affected space* if a major oil leak or a fire occurs. The Machinery Space Firefighting Doctrine shall* be accessible in damage control central, main control/central control station, [engineering assist team location,] repair lockers, the pilothouse, and each main space*. Unforeseen circumstances may dictate variations to this guidance. Also, restricted maneuvering policies and judgments may require departure from this guidance.
- [NOTE: Square brackets ([]) are used in the text to highlight items which may vary from cutter to cutter. Some are notes, such as this paragraph, some give specific words to include if appropriate, **some require cutter generated text**, and some indicate when follow-on text should be included. Edit material in square brackets and delete the square brackets from individual cutter doctrines.]
- C. Prevention. The risks of fire in machinery spaces can be significantly reduced by the preventive measures below. Enforce the following principles to reduce fire hazards:

- 1.C.1. Frequent Inspections. The Engineering Officer, Safety Officer, and principal assistant(s); or fire marshal; shall make regular and frequent inspections including, but not limited to, the items discussed in C.2, 5, 6, and 8 below.
2. Properly Stow and Protect All Combustibles.
3. Test and Inspect Flammable Systems Routinely, As Well As After Repairs.
4. Reduce the Likelihood of Fire by Performing Fire Drills Frequently and Educating All Hands to Eliminate and Preclude Fire Hazards.
5. Enforce the Following Fire Prevention Policies and Practices:
 - a. Maintain flange shields on required flammable liquid pipe lines.
 - 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 leaks.
 - d. Clean up oil spills and leaks.
 - e. Keep ventilation ducts free of oily residue.
 - f. Keep bilges free of oil and trash.
 - g. Prevent stockpiling excess or unauthorized flammables.
 - h. Do not use uptake spaces as storerooms for combustible materials.

1.C.6. Properly Maintain All Firefighting Equipment.

7. Operate and Maintain Systems and Equipment per references (a) through (i) and Consistent with Good Engineering Practice.
8. Properly Maintain All Machinery Space Damage Control Closures and Fittings.
9. Follow Electrical and Mechanical Tag Out Procedures.

D. Hazards. Lead acid batteries can be a serious hazard during and after a machinery space fire. Hydrogen gas, given off by batteries, 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 they give off a chlorine gas, which is toxic. All cutters, with lead acid batteries in machinery spaces, shall include special guidance in the machinery space fire doctrine for firefighting and overhauling fire in the vicinity of lead acid batteries.

CHAPTER 2. -DUTIES AND RESPONSIBILITIES

[Cutters develop and list Duties and Responsibilities, and install a checklist in Enclosure (2), as they pertain to a Machinery Space Fire, for the following:] A list of Duties and Responsibilities for each of the following personnel is found in Enclosure (2).

- A. Damage Control Assistant
- B. Officer of The Deck (Inport/Underway)
- C. Engineering Duty Officer
- D. Repair Locker Leaders
- E. Repair Locker Scene Leaders
- F. Repair Lockers
- G. Inport - Personnel onboard not in duty section
- H. Attack Team Leader (NFTI operator)
- I. Watchstanders- EOW, Throttle, Oiler, etc...
- J. Repair Party Electrician (Include electrical isolation of the effected main space.)
- K. Halon Activating Personnel
- L. Medical

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 nozzle men and hose tenders on each hose team [and the team leader] shall wear firefighter ensembles. Repair locker leaders are responsible for rotating personnel to prevent heat exhaustion and for monitoring activation times for OBAs. In fighting major fires, fire fighters should leave the fire area after 30 minutes (in conjunction with the OBA timer alarm) and ensembles recycled to fresh personnel to minimize personnel heat stress. Some general considerations are:
1. Oxygen Breathing Apparatus (A4-OBA). All personnel shall wear an OBA when entering the buffer zone until the atmosphere is certified safe for reentry without OBAs. Activate OBAs when smoke is present or on order of the on scene leader who reports to repair locker leader who reports same to Damage Control Central.
 2. Clothing. Reentry into a machinery space that has been evacuated because of a fire requires protective clothing for firefighters. Firefighter ensembles (FFE's), including one-piece coverall, gloves, anti-flash hood, helmet and steel-toed rubber boots, are required.
 3. OBA MANAGEMENT. [Cutter should insert here: 1) locations of all OBAs and canisters. 2) where shall changing out of OBA canisters be conducted (primary and secondary locations). 3) how are expended canisters properly stowed until disposal. 4) how/where are expended canisters disposed. 5) who will order activation of OBAs. 6) who will inspect firefighters prior to entering the space for proper wearing and activation of all gear. 7) who will pass on to the RLL: each person that enters the space, position in the fire party, OBA start times. 8) who will order relief of the OBA men. 9) how will the relief process be conducted 10) who is in charge of the relief process and relief OBA men prior to them reporting to the OSL. 11) who will be the relief firefighters, and where do they muster.]
 4. Firefighter's Heat Stress Prevention. [Cutters should insert here: 1) who will monitor the firefighters for heat exhaustion and heat stroke. 2) how will this monitoring be accomplished. 3) where do the relieved firefighters muster and rest.

A.4. (cont'd) 4)who is in charge of the resting area to ensure the relieved firefighters are provided with fluid replacements (room temp.) (i.e. water, gatorade etc.) and energy replacement (i.e. snacks) 5)how long of a resting period are the firefighters allowed before they are allowed to be reused. 6)to minimize heat stress, how shall the FFE's be worn prior to entering the space (relief firefighters) and after exiting the space. 7)do provisions need to be made to provide suitable dry clothing for the firefighters after exiting.

NOTE: "Corfam" Shoes. "Corfam" shoes melt at low temperatures and can cause severe foot injuries, especially during fires. Since emergencies happen unexpectedly, "Corfam" shoes shall not be worn aboard ship. They may be worn for inspections at the Commanding Officer's descretion.

CHAPTER 4. COMMUNICATIONS

- A. Communications. Use standard damage control communications in fighting machinery space fires, in accordance with reference (f). In addition, it is very important that the damage control organization be briefed on the status of plant securing and isolation, personnel status, and on the exact location and cause of the fire. If possible, the EOW or space supervisor should brief the on scene leader as well as Damage Control Central (DCC). Otherwise, DCC shall be briefed and pass the word to others in the damage control organization. [Where installed] Notify DCC of the exact time when halon is activated. [Insert list of primary and secondary communications for each station and procedures for establishing them, include subsections according to Enclosure (1).] [Insert inport procedures here.]

NOTE: DC WIFCOM. DC WIFCOM eliminates the need for the scene leader and investigators to write messages. Reports received in the repair locker will be recorded on message blanks to be used for both plotting and maintaining a record of communications. The writing of message blanks is a fundamental damage control skill which must not be lost. Scene leaders, investigators and other DC WIFCOM users must continue to train in message writing to maintain their skills in the event DC WIFCOM is unavailable.

CHAPTER 5. FIREFIGHTING SYSTEMS

- A. Capabilities and Limitations. The firefighting systems and equipment described below are installed on [insert ship's name]. Each has capabilities and limitations which must be understood by fire fighting personnel to ensure quick and proper selection of equipment.
- B. Water (Firemain System). 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. When a hose line attack is needed 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-250 Fire Pumps. A P-250 fire pump shall be lit off and standing by to pressurize the firemain if needed. Man this secondary pump and establish communications with Damage Control Central. [Include specific details on where to locate the P-250, where to tie into the firemain, and how to establish communications with DCC.] This pump must be able to provide a pressure of 100-125 psi to the firemain. [If all fire pumps are in one machinery space] The only source of pressurized water for fires in [insert space with fire pumps] is the P-250 emergency fire pump. [Insert instructions for configuration of P-250 pumps to fight a fire in the machinery space with all fire pumps]
- D. Carbon Dioxide (CO₂). Carbon dioxide portable extinguishers are used primarily for small electrical fires (Class CHARLIE). These extinguishers have limited effectiveness on small Class ALPHA and Class BRAVO fires of low heat intensity and an involved surface area of four square feet or less. A successful attack requires a close approach due to an effective range of four to six feet. [Fixed carbon dioxide hose reels are used for Class CHARLIE fires also but have a larger capacity than portable CO₂ extinguishers.]

NOTE: Caution is necessary when using CO₂, especially when more than one extinguisher is used, as CO₂ displaces oxygen.

5.E. Purple-K-Powder (PKP). Purple-K-Powder is a dry chemical agent (potassium bicarbonate) stored in portable extinguishers [or in large fixed cylinders as part of an installed Twin Agent Unit (TAU) fire extinguishing system or hangar/flight deck firefighting system]. Portable 18 lb. PKP extinguishers are very effective on small, isolated Class BRAVO pool fires (fires less than 10 square feet). The maximum range for the extinguisher is 20 feet. PKP is intended for use by unprotected operators who are in the best position to take initial action to extinguish a fire at its onset. Successful use of PKP for initial action is time critical. Application of PKP is required before the fire is out of control. PKP in not designed for use on a fire which is out of control or for reentry. Simultaneous action to secure the source of fuel is required.

CAUTION

Caution should be exercised when using PKP to avoid breathing difficulties, reduced visibility and discharging into electrical equipment.

F. Aqueous Film Forming Foam (AFFF). AFFF is a surfactant* produced by mixing water with AFFF concentrate [either by a fixed, balanced pressure foam proportioning unit or] with an inline eductor used with a hoseline and vari-nozzle. [AFFF can be applied either as part of a Twin Agent Unit hose reel, from an installed AFFF hose reel with vari-nozzle, from a separate fire plug and hose with portable inline eductor and vari-nozzle, or from a bilge sprinkling system.] AFFF, the primary agent used for space reentry, is effective on Class BRAVO bilge fires, in vapor securing* surfaces, and in preventing large scale reflash. When making a hose line attack to extinguish a flammable liquid fire, use AFFF if available. 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 used with 95 gpm vary-nozzles, e.g., Akron Brass style 3019 or Elkhart Brass Model SFL-GN-95. **Mechanical foam nozzles and 60 gpm (LP-6) eductors are not permitted.**

NOTE: Must have a minimum firemain pressure of 65 psi for proper foam generation.

G. [Twin Agent Unit (TAU)]. The TAU, i.e., AFFF and PKP, is designed for initial action by unprotected operators against a Class BRAVO fire. PKP is used to knock down the fire (first wave) and AFFF is used to provide a seal and thus prevent reflash (second wave).

5.G. (cont'd) Successful use of the TAU is time critical. PKP must be applied before the fire is out of control. **The TAU shall not be used on a fire which is out of control or for reentry.** The AFFF side of TAU provides adequate pressure for initial action when the screen is removed from the nozzle tip. The PKP side can only be used within 8 to 10 feet of the fire. Large fires often prevent such a close approach making TAU ineffective on large fires. Use of a 27-lb PKP extinguisher together with the AFFF side of the TAU is very effective. [Note: ShipAlts are being developed to remove the PKP side of TAU and substitute a 27-lb PKP extinguisher. These ShipAlts will substitute 95 gpm, pistol grip vari-nozzles for the existing foam nozzles on the TAU where possible. The vari-nozzles will provide greater range. Once these ShipAlts are performed, an AFFF hose line from a TAU outside the affected space may be used for out of control fires and reentry.] If only one person is available, a 27-lb PKP extinguisher used first, followed by foam application, is nearly as effective as use of the TAU for initial action.]

H. [AFFF Bilge Sprinkling. AFFF bilge sprinkling is a fixed fire extinguishing system designed to extinguish bilge fires or to vapor secure the bilge by laying a blanket of foam over the bilge. When there is a major oil leak or Class BRAVO fire, start a fire pump and activate the AFFF bilge sprinkling system. To prevent running the system dry, operate AFFF bilge sprinkling no longer than four minutes. Do not operate the system when the concentrate level is not visible in the tank sight glass. Prompt manning of the AFFF proportioner station is essential to speed tank replenishment. AFFF bilge sprinkling shall be used to:

1. Vapor Secure the Bilge to Minimize the Potential for a Bilge Fire from a Major Oil Leak;
2. Extinguish Bilge Fires Independently;
3. Augment the TAU System for Fighting a Bilge Fire;
4. Vapor Secure the Bilge During and After a Class BRAVO Fire, thus Minimizing the Potential for Fire or Reflash in the Bilge.]

5.I. [Halon. Halon 1301 is an effective gaseous agent for extinguishing oil spray and other Class BRAVO fires by totally flooding the space. Activate the halon 1301 system when a machinery space is evacuated because of fire. [For cutters with a two shot capability] The second shot is installed to combat the fire if the first shot fails to extinguish it. Operation of the halon system will activate visual and audible alarms and will shut down space ventilation and air consuming equipment which draws air from within the space. Halon discharges after a time delay to allow engine room ventilation systems and air consuming equipment to stop before discharge. **Verify the release of halon.** [Assign designated personnel] shall check that halon did release after the time delay. If not, the installed bypass shall be used to release halon. All hands shall know how to operate the halon system. After halon is used, the space should be allowed to cool for 15 minutes before reentry. However, make an earlier check of the space to be sure that halon was effective. [Include how this check will be performed.]]

CHAPTER 6. CHOOSING THE CORRECT FIREFIGHTING EQUIPMENT

- A. Considerations. The proper choice of firefighting equipment should be based on:
1. Phase. The phase of firefighting action (action against an oil leak, a Class BRAVO fire, a Class BRAVO fire out of control, or action for reentry).
 2. Flow Rate. The flow rate of the flammable liquid released and whether the fuel source can be secured quickly.
 3. Spill or Spray. Whether the flow is a spill or spray.
 4. Extent. 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 available system(s) [which is(are) installed onboard the cutter.]
1. Firefighting Equipment Used To Prevent Fire During Major Oil Leaks.
 - a. Use AFFF [from an AFFF hosereel, TAU, or individual 1-1/2 inch hoseline with an inline foam eductor and vari-nozzle] to prevent ignition and to wash oil from deckplates, bulkheads and machinery into the bilge.
 - b. Use AFFF [from a bilge sprinkling system, AFFF hosereel, TAU, or individual 1-1/2 inch hoseline with an inline foam eductor and vari-nozzle] to vapor secure the bilge.
 2. Firefighting Equipment Used For Initial Action Against Class BRAVO Fires.
 - a. Use PKP from portable extinguishers [or TAU] to extinguish Class BRAVO fire confined to a small area. Initial action, using portable extinguishers may not extinguish the fire when the spray or pool fire covers an area greater than 10 sq. ft.

- 6.B.2.a (cont'd) Using PKP on large fires may extinguish or knock down the fire temporarily and allow added time to secure the source of fuel. However, use PKP with caution on large fires because it is difficult to get within an effective range of 20 feet without getting burned.
- b. [If installed] Use the AFFF bilge sprinkling system to fight a Class BRAVO fire confined to the bilge. [If bilge sprinkling is not installed] Use AFFF from a TAU or AFFF hosereel within the affected space to fight bilge fires. [If none of these systems is installed] Initial action against large bilge fires should not be attempted except when necessary to gain more time to secure fuel sources before space evacuation. Initial action against a bilge fire larger than 10 sq. ft. is appropriate only if the fire is confined to the bilge and the source of fuel can be secured quickly.
 - c. Use AFFF [from a TAU or AFFF hosereel within the affected space] to fight confined pool fires large than 10 sq. ft. Initial action using one of these systems is appropriate when the fire is confined and the source of fuel can be secured quickly.
 - d. Initial action is not recommended against large unconfined Class BRAVO fires or when the fuel source cannot be secured quickly unless such actions are required to gain essential time to secure controls and evacuate the space.
3. Firefighting Systems Used Against Class BRAVO Fires Out of Control. [If installed] Activate the halon 1301 system, after evacuating the space, to extinguish Class BRAVO fires which are out of control. [If halon is not installed] The fire must be extinguished by repair party firefighters using AFFF hoselines. [Where installed] Activate the AFFF bilge sprinkling system to vapor secure the bilge or to extinguish a bilge fire. [If bilge sprinkling is not installed] The bilge must be vapor secured by repair party firefighters after reentry using AFFF hoselines.

NOTE: Flammable Liquid Spray Fires are automatically considered a **Class Bravo Fire out of Control**.

CHAPTER 7. SMOKE CONTROL

- A. Smoke Boundaries.
1. Establish Boundaries. Set smoke boundaries (IAW Enclosure (3)), then set Zebra (starting from the affected space out). Establish smoke boundaries around the affected space to prevent the spread of smoke and provide controlled areas for local firefighting. First, establish a buffer zone* by closing those hatches and doors immediately adjacent to the access to the affected space. Secure ventilation to make the buffer zone a dead air space. Only personnel with Oxygen Breathing Apparatuses (OBAs) shall enter the buffer zone. Activate OBAs when smoke is present or on orders from the scene leader. 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, or personnel.
 2. Set the Boundaries. Machinery space fire and smoke boundaries must be set upon evacuation.
- B. List of Primary and Secondary Smoke Boundaries. [(Insert in Enclosure (3) a list of the primary and secondary smoke boundaries for each machinery space listed in Enclosure (1).) A list of the Primary and Secondary Smoke Boundries is found in Enclosure (3). Smoke curtains, in accordance with ref (b), may be used where hatches and doors may be required to remain open for fire fighting purposes. (List locations designated for smoke curtains in Enclosure (3).)]
- C. Ventilation. If the fire is declared out of control, secure ventilation in the affected space when personnel are evacuated. Otherwise, when a machinery space fire is reported, ventilation shall be set as follows:
1. In the affected machinery space
 - a. [If possible] Set negative ventilation (exhaust on high, supply low).
 - b. [On cutters with interlocked fans and remote controls with a remote emergency exhaust button] Activate emergency exhaust (exhaust high and supply off).

- 5.C.1.c. [On cutters with fans interlocked through a local master switch but with independent control on controllers inside the space] Set negative ventilation using local controllers if conditions permit.
 - d. [On other cutters with interlocked fans] The ventilation system shall remain operating.
2. In spaces surrounding the affected machinery space other than buffer zones.
- a. [Where possible] Set positive ventilation (supply on high, exhaust off) to limit smoke movement to unaffected spaces.
 - b. [On cutters with fans interlocked through a local master switch inside the space but with independent control on controllers] Set positive ventilation using local controllers.
 - c. [On other cutters with interlocked fans] The ventilation system shall remain operating.
 - d. If smoke is ingested into adjacent machinery spaces from the weather, [shift ventilation supply to intakes on opposite side of cutter] or maneuver the cutter to clear the vent intakes or secure ventilation. (This should be added to OOD's checkoff list in Enclosure (1)).

NOTE: Establishing positive air pressure on the damage control deck to control smoke by breaking condition ZEBRA in transverse fire and smoke boundaries and opening accesses to unaffected spaces is not recommended. Paths for fire spread from the affected space to unaffected spaces by way of the damage control deck will exist.

3. Buffer Zone Ventilation. Secure buffer zone ventilation to provide a dead air space at the entrance to the affected space. (List of Buffer Zones should be included in Enclosure (3)).

5.D. List of Fans and Controllers. [Enclosure (4) of this doctrine shall have a list of supply intake and exhaust discharge locations on the weather decks and a list of fans and associated controllers affecting the machinery space(s) and adjoining spaces. Include the location of controllers, their designation and areas served.][In this section designate ventilation setup for fires in each machinery space listed in Enclosure (1)] A list of all supply intake and exhaust discharge locations on the weather decks and a list of fans and associated controllers affecting the machinery space(s) and adjoining spaces is found in Enclosure (4). Also, for ready reference, this list is maintained separately in DCC and each repair locker.

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, lighting and ventilation. Once the fire is out of control, secure all systems, with the exception of lighting if possible. Each ship shall supplement its doctrine with a list of local and remote controls (valves, switchboards, circuit breakers, and so forth), for rapid space isolation IAW Ship's Casualty Control Manual. The designation, location, function and area served by each control shall be 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. [Sound general quarters to establish fire boundaries rapidly.] [Set material condition Zebra, from the affected space out.]
- C. List of Fire Boundaries. [Each ship shall provide a list of designated fire boundaries for machinery spaces listed in Enclosure (1). This list shall be in Enclosure (5). List all fittings and closures, by number and class.] A list of Fire Boundaries is in Enclosure (5).
- D. Mechanical Isolation. Make every effort to secure and/or isolate systems, machinery, and tanks which 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. These capabilities and procedures are in the Engineering Casualty Control Manual, NSTM Chapter 079, VOL 3, Ship's Engineering Casualty Control Manual, and applicable machinery manuals. Establish communications and exercise care to prevent cascading casualties to equipment necessary to maintain propulsion, electrical power and firemain pressure in unaffected spaces. Fuel, oil, steam and air systems and fuel tanks located close to space boundaries are of particular concern. Systems to secure include in order of priority:

8.D.1. Fuel Piping plus Transfer, Service, and Stripping Pumps and Centrifugal Purifiers.

2. Lube Oil Piping, Pumps and Centrifugal Purifiers.

3. Hydraulic Systems.

4. HP, LP and Starting Air Systems.

5. Air Compressors.

6. Steam Systems.

7. Fuel (DFM and JP-5) Tanks.

8. Lube Oil Tanks.

9. [Damage Control Deck Cutout Valve to TAU Station. Do not isolate AFFF systems unless personnel are evacuated.]

E. Electrical Isolation. Do not secure lighting and power to firefighting equipment and ventilation 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 extent possible, secure all electrical equipment from outside the affected space at the cutter's service, [IC and emergency switchboard,] load center(s) or distribution panel(s). When possible, do not secure the lighting.

F. Mechanical & Electrical Isolation Bills. [Enclosure (6) shall have a list of local and remote controls (valves, switchboards, circuit breakers, etc.) for space isolation. Include the designation, location, function and area served by each control. Clearly indicate controls the machinery space personnel should secure, include subsections according to Enclosure (1).] Enclosure (6) has a breakdown of the Mechanical and Electrical Isolation Bills. These bills include: List of local and remote control valves, switchboards, breaker and distribution panel locations etc.; for total space isolation.

8.G. 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 **shall not be done**, because experience indicates that ignition has not occurred 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. In summary, 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 LEAKS

- A. Major Oil Leak Scenario. [Include subsections to this section as designated in enclosure (1).] Any major flammable fuel leak (anything more than a drip), presents an immediate fire hazard which must be dealt with quickly. An oil leak which forms a spray can ignite when it comes in contact with any hot surface or equipment capable of electrical arcing. Rapidly securing the oil source and using AFFF to cover liquid surfaces will greatly reduce the risk of fire. In addition, small problems (i.e., non-securable drips) may become large problems. **DEAL WITH THEM PROMPTLY**. Take the following actions when a major oil leak occurs:
1. Report the Leak. At sea, the person discovering the leak shall report the leak immediately to the space supervisor or the EOW to begin concurrent actions. [Each cutter must delineate what concurrent actions are.] The Engineer Of the Watch (EOW) shall report the leak to the Officer Of the Deck (OOD). Notify the [quarterdeck watch][OOD] when in port. General Quarters will be sounded by OOD/Quarterdeck Watch, as directed by ships policy. [List all appropriate pipes to be made by the OOD/Quarterdeck Watch.][This maybe done in a separate enclosure.]
 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 effectively or deflect it away hot surfaces. When consistent with the Casualty Control Manual or Restricted Maneuvering Doctrine of the cutter, securing an engine or other piece of equipment may be the quickest way of reducing or stopping the flow of oil.
 3. Apply AFFF. Start the fire pumps [and activate the installed AFFF systems]. Use AFFF to wash oil from deckplates, bulkheads, and machinery into the bilge. Water may* be used to flush the oil to the bilge; however, be careful to prevent disturbing AFFF blankets which provide a vapor barrier covering the bilge and other areas of heavy fuel buildup. Continue discharging AFFF into the bilge to cover liquid surfaces to prevent ignition of the oil. Reapply AFFF as necessary to maintain blanket coverage.

- 9.A.4. Concurrent Actions. As time and personnel permit, the space supervisor or EOW shall direct the following be accomplished:
- a. Per the Casualty Control Manual, secure operating machinery in the vicinity of the leak to control the casualty. [If possible] Provide propulsion, electrical power and firemain pressure from unaffected spaces*.
 - b. [If installed] Man the foam proportioning station and activate AFFF bilge sprinkling for one minute to cover all bilge surfaces with a blanket of AFFF.
 - c. Pump out the bilge to the oily waste holding tank or, with the permission of the Commanding Officer, pump overboard. When cleaning up the fuel spill, place clean-up rags in a suitable container.
- B. Initial Firefighting Actions. Work rapidly because Class BRAVO fires and smoke spread rapidly and the fire can grow out of control* in seconds. The person discovering the fire, the space supervisor and/or EOW 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 space supervisor or EOW to begin concurrent actions.
 2. Size Up the Fire. EOW/space supervisor shall assess the report of the fire and either direct watchstanders to extinguish the fire or direct them to evacuate the space.

NOTE: Watchstanders or dayworkers 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. However, if the fire is localized and small enough, attack the fire with appropriate firefighting equipment based on the size and anticipated behavior and travel of the fire. Good judgment must dictate the course to pursue.

9.B.2. (cont'd)

NOTE: As soon as firefighting and plant securing efforts allow, personnel in the space should obtain and carry an Emergency Escape Breathing Device (EEBD). EEBDs are designed for escape only and shall not be used for firefighting purposes. When evacuating machinery spaces, don EEBDs.

NOTE: Flammable Liquid Oil Spray Fires should not be attacked. Past experience and fire testing have demonstrated that a pressurized released of a flammable liquid can create a fire that is unapproachable. Life threatening conditions created by extreme heat, smoke and toxic gases can occur, especially on the upper level, in as little as 60 seconds. Under such conditions the only prudent action, time permitting, is to secure the propulsion plant, don EEBDs and evacuate. Such fires are commonly fueled by an oil source which cannot be quickly and completely secured.

3. Secured The Oil Source. Stop or isolate the leak as quickly as possible by locally or remotely closing system cutout valves or shutdown valves. Initiatives, such as rag wraps and collection using a bucket can control the flow of oil effectively or direct it away from hot surfaces. When consistent with the Casualty Control Manual or Restricted Maneuvering Doctrine of the cutter, securing an engine or other piece of equipment may be the quickest way of reducing or stopping the flow of fuel. The mechanical and electrical isolation bills, section 8.F. and Enclosure (6), list critical controls including those for the machinery space watch to secure.
 4. Fight the Fire. Fight the fire using portable PKP extinguishers, installed AFFF Systems, or other installed firefighting systems if they can be brought to bear quickly. Chapters 5 and 6 contain information on installed firefighting systems and on choosing the correct firefighting equipment.
- C. Class Bravo Fire Scenario (Contained). [Include subsections according to Enclosure (1).] Take the following actions for a machinery space Class BRAVO fire generated by pooled oil.
1. Initial Actions. Take appropriate initial actions per section 9.B.

- 9.C.2. Concurrent Actions. The following concurrent actions, specifically assigned per the Watch, Quarter, and Station Bill, shall be accomplished:
- a. The EOW shall inform the OOD and all engineering spaces of the fire. Report the Class BRAVO fire to the OOD, give its location and source, OOD will [sound General Quarters][cutter shall insert ships' appropriate pipes], as directed by ships policy. Notify OOD of maximum speed available. Establish communications with Damage Control Central (DCC) on 2JV or engineering circuit. Keep DCC advised of progress on firefighting and securing checklists so repair personnel can complete their checklists in case the machinery space must be evacuated quickly. The EOW is in charge of all firefighting actions until the affected space is evacuated and the repair parties are manned and ready.
 - b. Start all fire pumps. [If installed] Start the AFFF system and immediately man the machinery space foam proportioning station to speed AFFF tank replenishment.
 - c. Repair party personnel shall rig and start at least one P-250 to supply water in the event that firemain pressure is lost or falls below 65 psi, as directed by DCC and RLL.
 - d. [Where installed] For a bilge fire, activate the AFFF bilge sprinkling system long enough to ensure all bilge surfaces are vapor secured. [The time required to achieve a complete foam blanket should be determined and incorporated in the ship's doctrine. If the required time is not known, operate bilge sprinkling for one minute.] If AFFF must be conserved, then operate bilge sprinkling for one minute. When AFFF bilge sprinkling system and reentry attack hoses have a common supply, avoid simultaneous application to conserve AFFF.
 - e. [On Cutters with more than one main space] Isolate the affected space mechanically and electrically per Chapter 8. [When the fire is in a cutter with one main space] Only secure machinery and equipment affected by, or contributing to, the fire process. When in doubt, secure the equipment.
 - f. Set ventilation per Chapter 7.

- 9.C.2. g. Set fire and smoke boundaries* (IAW Enclosure (3)) around the affected space to prevent the spread of fire and smoke to other parts of the cutter. See Chapter 7 for further information on smoke control. Set material condition Zebra to help isolate the affected space and establish fire and smoke boundaries throughout the cutter rapidly. [Use smoke curtains when boundaries must be broken to allow passage of people and firefighting equipment.]
- D. Class Bravo Fire Scenario (Out of Control). [Individual doctrines shall include subsections according to Enclosure (1).] A Class BRAVO fire, especially a flammable liquid spray fire, or a fire fueled by an unsecurable oil 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 over a large area, is fed by an oil 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 which is not extinguished rapidly, can generate large volumes of smoke and deadly gases thereby 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 Commanding Officer may choose not to electrically isolate a damaged space, or selected equipment, due to safety or tactical considerations.

- 9.D.2. d. The Scene Leader 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.
- e. The decision to secure lighting may be made by the scene leader.
3. Evacuate. [Where installed] Evacuate the affected space before activating the halon system. When evacuating machinery spaces, don Emergence Escape Breathing Devices (EEBDs). Secure access doors, hatches and scuttles when all personnel are out of the space. Muster shall be taken at [insert location] by [insert designated person]. [Note: Muster location should be a safe location outside the fire and smoke boundaries and preferably on a weather deck. A safe haven to muster may not be available on the damage control deck.] Account for all personnel at muster. Report when evacuation of the space is complete to Damage Control Central. After a delay of 15 minutes to purge oxygen from hair and body, reassign uninjured personnel to assist with firefighting. The EOW is in charge of firefighting until the affected space is evacuated and the repair parties are manned and ready. Control of firefighting then passes to the [Damage Control Assistant (DCA)]. Transfer control of machinery in unaffected spaces to the main control general quarters watch. If the normal general quarters watch station is within the affected space, control the unaffected machinery plant from [designate.]
4. Establish Communications. Establish communications per chapter 4. The EOW shall advise the OOD and DCC when the fire is declared out of control. The space supervisor or EOW should brief the repair party scene leader on the location and cause of the fire, personnel status, and plant status.
5. Contain and Fight the Fire. Take the following actions and report them to the Engineering Officer (EO), DCA, or Damage Control Central as appropriate:

- 9.D.5. a. [If installed] Activate halon and AFFF bilge sprinkling systems. Note time of halon activation. Be sure halon activation in fact occurred and that ventilation was automatically secured. [designate means of determining Halon activation] Investigate for halon effectiveness 15 minutes after activation.
- b. [If installed] Continue to man, monitor and replenish AFFF foam stations. For the initial foam blanket, operate the AFFF bilge sprinkling system no longer than one minute to prevent running the system dry. Stop operating the system if the concentrate level in the tank sight glass is not visible. [Cutter shall insert who will replenish the tank, and location of spare foam canisters for replenishment] [If bilge sprinkling is not installed] Apply an initial foam blanket after reentry.
- c. Secure the space mechanically and electrically per Chapter 8.
- d. Reentry and firefighting shall take place per the guidance given in Chapter 10. Repair [designate] shall reenter through [designate access.] [Repair [designate] shall stand by to assist as directed.] Use proper personnel protection per Chapter 3.
- e. After the fire has been extinguished, take the post fire actions discussed in Chapter 11.

E. Inport/Auxiliary Steaming/Cold Iron Class Bravo Fires.
 Watchstanders shall take the following actions in the event an oil fire occurs in a machinery space while inport:

1. Fight the Fire if You Can. Follow the procedures in Section A of this chapter.

[Note: If adequate cutter firefighting resources are available, the fire may be fought by the cutter, If cutter is unable to combat fire, rescue and assistance will be requested.]

2. [Call the Local Fire Department, SOPA, Port Authority as applicable.] [A checklist for inport actions may be added as a separate enclosure.]
3. [Brief Fire Department. The EOW or OOD should brief the fire department personnel when they arrive, giving fire and plant status to a fire department supervisor if the fire department is to fight the fire.

- 9.E.3. (cont'd) The cutters commanding officer or direct representative (OOD) is responsible to make the decision to use the fire department and is ultimately responsible for the cutter. Such decisions are difficult to make under the stress of major fire. Therefore, it is highly recommended that each cutter have standing agreements with their homeport fire departments to address span of control and decision making procedures for the participants in the case of a major shipboard fire.]
4. [Standby to Assist. The EOW or OOD shall standby to advise and assist the fire department supervisor. Shipboard personnel should assist as directed by EOW or fire department supervisor on scene.]

CHAPTER 10. - REENTRY AND FIREFIGHTING

- A. General. 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 to attack and extinguish the fire, to rescue trapped personnel, to be sure the source of fuel is secured, and to overhaul the affected space (including cooling surfaces and desmoking). At the time of reentry, a backdraft explosion* or an intensifying fire may occur as accesses to the affected space are opened and hot fire gases are relieved into the buffer zone. Firefighters should use caution to position themselves to the side of the access when the door, hatch, or scuttle is initially opened. In general, follow standard repair party firefighting procedures. Specific guidelines for machinery space reentry follow:
- B. Reentry Point. The primary reentry point is [designate.] The secondary reentry point is [designate.] Repair [designate] is the primary repair party responsible for reentry. [Repair [designate] shall assist as directed. Include subsections according to Enclosure (1).]

NOTE: Primary reentry should be lowest readily accessible point of reentry to the affected space.

- C. Hoses. As a minimum, reentry teams shall use two attack 1-1/2 inch AFFF hoses, with vari-nozzles. AFFF for the lead hose may be supplied [If installed] either from a balanced pressure proportioner or from 5-gallon cans using an inline eductor. Supply AFFF for use by the backup hose from 5-gallon cans using an inline eductor. Use inline eductors designed for use with 95 gpm vari-nozzles. Maintain enough distance between the first and second hoses to permit maneuverability and prevent firefighting progress from being impaired. The backup hose team should attack the primary blaze by approaching it from a different direction or enter the affected space after the lead attack hose, keep heat off the lead hose team and extinguish any fires that form behind the lead hose team. Both hose teams have to be aggressive but careful not to get trapped by the fire. [If an additional person is available to act as team leader] [A team leader, in a firefighter's ensemble, should enter the space and direct the actions of the hose teams. The team leader should use the thermal imager to locate the fire and direct the hose teams to it.]

10.C. (cont'd) Additional hose handlers may be needed to maneuver the hoses. Hose handlers must have proper personnel protection in accordance with chapter 3. Ensure hose handlers are properly spaced to maintain communications with the scene leader.

NOTE: 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 to protect himself. The vari-nozzle 30 degree fog pattern or "power cone" should be used to cool metal surfaces, attack the fire, and lay down vapor securing AFFF blankets. Adjust the nozzle pattern to suit the particular tactical situation.

D. Conserving AFFF. Sufficient AFFF is normally available to cover a machinery space bilge eight or more times. Reentering the space may be a lengthy and awkward process. Use the AFFF you need but do not waste it. Use water hoses to cool accesses but water hose teams should not enter the affected space as they will impair the effectiveness of the AFFF hose teams. To conserve AFFF, hoses equipped with inline eductors can discharge saltwater if pickup tubes are removed from AFFF cans. The eductor will continue to function with reinsertion of the pickup tube into the AFFF containers. [Include directions for water only supply from installed AFFF stations.]

E. [When Halon And AFFF Bilge Sprinkling Are Installed and Used:]

1. Increase AFFF in Bilge. Operate the AFFF bilge sprinkling system for 2 minutes to increase the foam blanket. The initial foam application may have been disturbed by the fuel source.
2. Wait 15 Minutes. Reentry should not be made for at least 15 minutes after halon discharge and then only by personnel wearing personnel protection in accordance with chapter 3. The 15 minute wait allows the space to cool, limiting the probability of reflash if air enters during reentry. Waiting may not be justified in a battle situation. Reenter before 15 minutes only on direction from the commanding officer. [When a two shot halon system is installed] if the first shot of halon is ineffective in putting out the fire, use the second shot immediately.

- 10.E.2. (cont'd) [If the second shot also fails] If the evidence is that Halon has not extinguished the fire, reentry should be attempted as quickly as possible after the space is evacuated and mechanically isolated. Electrical isolation with the exception of lighting will be completed. Electrical isolation, although ongoing, should not delay space reentry. The DCA may direct reentry after a 15 minute wait. [On units which do not have a DCA, the repair locker leader shall make reentry determinations.]
3. Reenter Through a Safe Access. Reenter through an access which is not obstructed by the fire. Choice of access should be made by DCC/repair locker leader upon receipt of plant status and fire location from the EOW or space supervisor.
 4. 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. [On units so equipped] If the location of the fire is not obvious, [insert designated person] in a firefighting ensemble should follow the lead attack nozzleman/team leader with a thermal imager. This person will direct the hose teams until relieved. Extinguish class ALPHA fires within the space using AFFF (halon is not effective on smoldering ALPHA fires). Secure fuel sources and cover all flammable liquids with AFFF. To conserve AFFF, use water to cool the space after the fire is out and overhauled. To protect against reflash, firefighters should take care to replenish AFFF blankets covering flammable liquids that are disturbed by water.
- F. [When Halon Is Installed and AFFF Bilge Sprinkling Is Not Installed:].
1. Wait 15 Minutes. Reentry should not be made for at least 15 minutes after halon discharge and then only by personnel wearing personnel protection in accordance with chapter 3. The 15 minute wait allows the space to cool, limiting the probability of reflash if air enters during reentry. Waiting may not be justified in a battle situation. Reenter before 15 minutes only on direction from the commanding officer. [When a two shot halon system is installed] if the first shot of halon is ineffective in putting out the fire, use the second shot immediately.

- 10.F.1. (cont'd) [If the second shot also fails] If the evidence is that Halon has not extinguished the fire, reentry should be attempted as quickly as possible after the space is evacuated and mechanically isolated. Electrical isolation with the exception of lighting will be completed. Electrical isolation, although ongoing, should not delay space reentry. The DCA may direct reentry after a 15 minute wait. [On units which do not have a DCA, the repair locker leader shall make reentry determinations.]
2. Reenter Through a Safe Access. Reenter through an access which is not obstructed by the fire. Choice of access should be made by DCC/repair locker leader upon receipt of plant status and fire location from the EOW or space supervisor.
 3. 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. [On units so equipped] If the location of the fire is not obvious, [insert designated person] in a firefighting ensemble should follow the lead attack nozzleman/team leader with a thermal imager. This person will direct the hose teams until relieved. Extinguish class ALPHA fires within the space using AFFF (halon is not effective on smoldering ALPHA fires). Secure fuel sources and cover all flammable liquids with AFFF. To conserve AFFF, use water to cool the space after the fire is out and overhauled. To protect against reflash, firefighters should take care to replenish AFFF blankets covering flammable liquids that are disturbed by water.
- G. [When AFFF Bilge Sprinkling Is Installed and Halon Is Not Installed:]
1. Increase AFFF in Bilge. Operate the AFFF bilge sprinkling system for 2 minutes to increase the foam blanket. The initial foam application may have been disturbed by the fuel source.
 2. Reenter Quickly. Reentry should be attempted as quickly as possible after the space is evacuated and mechanically isolated. Electrical isolation with the exception of lighting will be completed. Electrical isolation, although ongoing, should not delay space reentry.

- 10.G.3. Reenter Through a Safe Access. Reenter through an access which is not obstructed by the fire. Choice of access should be made by DCC/repair locker leader upon receipt of plant status and fire location from the EOW or space supervisor.
 4. 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. [On units so equipped] If the location of the fire is not obvious, [insert designated person] in a firefighting ensemble should follow the lead attack nozzleman/team leader with a thermal imager. This person will direct the hose teams until relieved. Extinguish class ALPHA fires within the space using AFFF. Secure fuel sources and cover all flammable liquids with AFFF. To conserve AFFF, use water to cool the space after the fire is out and overhauled. To protect against reflash, firefighters should take care to replenish AFFF blankets covering flammable liquids that are disturbed by water.
- H. [When Halon And AFFF Bilge Sprinkling Are Not Installed:]
1. Reenter Quickly. Reentry should be attempted as quickly as possible after the space is evacuated and mechanically isolated. Electrical isolation with the exception of lighting will be completed. Electrical isolation, although ongoing, should not delay space reentry.
 2. Reenter Through a Safe Access. Reenter through an access which is not obstructed by the fire. Choice of access should be made by DCC/repair locker leader upon receipt of plant status and fire location from the EOW or space supervisor.
 3. 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. [On units so equipped] If the location of the fire is not obvious, [insert designated person] in a firefighting ensemble should follow the lead attack nozzleman/team leader with a thermal imager. This person will direct the hose teams until relieved. Extinguish class ALPHA fires within the space using AFFF.

10.H.3. (cont'd) Secure fuel sources and cover all flammable liquids with AFFF. To conserve AFFF, use water to cool the space after the fire is out and overhauled. To protect against reflash, firefighters should take care to replenish AFFF blankets covering flammable liquids that are disturbed by water.

CHAPTER 11. POST FIRE ACTIONS

- A. General. After the fire is out, the space shall be desmoked and tested safe for remanning. Post a reflash watch with AFFF hoses to extinguish quickly any fires which may reignite. Report when the reflash watch is set and when overhaul is completed.
- B. 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 and, if possible, reestablish power to the installed ventilation fans. If fully operational, run all fans on high speed for a minimum of 15 minutes to remove smoke and toxic gases. If the installed system is partially operable or inoperable, desmoking will take longer, but can be accomplished by using portable blowers, operable installed fans or positive pressure from adjacent spaces. Desmoking with the installed ventilation system can proceed with minimal risk when:
1. Halon and AFFF Bilge Sprinkling Have Been Used to Extinguish the Fire.
 2. The Space Has Been Allowed to Cool.
 3. The Source of Fuel Has Been Secured and All Fuel Has Been Washed into the Bilges.
 4. No Damage Has Been Sustained to the Electrical Distribution System.
- [NOTE: On cutters without halon an AFFF bilge sprinkling, the safest way to desmoke machinery spaces is to exhaust with portable blowers or to use positive pressure from adjacent spaces. These methods minimize the risk associated with igniting flammable liquids that have not been vapor secured with AFFF.]
- C. Atmospheric Testing.

- 11.C.1. Desmoke First. Desmoking shall precede atmospheric testing because combustible gas analyzers will not operate reliably in a halon atmosphere and oxygen analyzers will not operate reliably 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 per NSTM 074, Volume 3. Oxygen shall be between 20-22 percent, combustible gases shall be less than 10 percent of the lower explosive limit, and all toxic gases below their threshold limit values before the space can be certified safe for personnel to enter without OBAs.
2. Authorized Personnel. 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 testing with the approval of the commanding officer. 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. After a flammable liquid fire has been extinguished, toxic gas tests for hydrocarbons, carbon dioxide, carbon monoxide, hydrogen chloride, and hydrogen cyanide, chlorine are required. (ship shall list the threshold limit values for each gas here) If Halon 1301 has been discharged, a test for hydrogen fluoride shall also be conducted. Tests 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.

NOTE: An "unsatisfactory" test result at any test point will require further desmoking, and retesting at @#all#@ test points.

- 11.D Dewatering. The DCA shall direct the space to be dewatered with the commanding officer's permission and per standard operating procedures. [Insert commands standard operating procedures for dewatering.] Retest the space for toxic gases after dewatering, since water can trap toxic gases and release them during dewatering.
- E. Remanning. Once the space certified as safe for personnel to reenter without OBAs, remanning can begin.
- F. Investigating Damage. The EO shall direct the damage investigation and shall determine which, if any, equipment an machinery may be restarted.
- G. Reenergizing Unaffected Systems & Equipment. The EO 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 affected 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

All cutters shall develop subsections to the Machinery Space Fire Doctrine (MSFD) to cover space unique actions.

Compartments that require subsections are listed below by class.

400' WAGB: Diesel Generator Room 1, Diesel Generator Room 2, Gas Turbine Room, Motor Room, Motor and Gear Room, and Boiler Space, JP-5 Pump Room, Emergency Generator Room.

378' WHEC, 270' and 210' WMEC: Main Machinery Space, After Steering and JP5 Pump Room.

205' and 213' WMEC: B1 and B2.

295' WIX: Engineroom and Auxiliary Machinery Room.

230' WMEC and 180' WMEC and WLB: Engineroom and Emergency Generator Room.

290' WAGB: B1, B2 and B3.

110' WSES: Engineroom and Generator Room.

All Other Cutters: Engineroom.

Encl. (2) to COMSTINST M9555.1A

Duties and Responsibilities of Personnel

(Cutters shall develop and list Duties and Responsibilities, as they pertain to a Machinery Space Fire, for personnel listed in Chapter 2.)

**Primary and Secondary Smoke Boundaries, Buffer Zones
and Smoke Curtains**

[Cutters shall develop and list all Primary and Secondary Smoke Boundaries, Smoke curtains location, and Buffer Zone Ventilation for each machinery space listed in Enclosure (1).]

Encl. (4) to COMDTINST M9555.1A

Fans, Controllers, Supply Intakes, Exhaust Discharge

[Cutter shall list supply intake and exhaust discharge locations on the weather decks and a list of fans and associated controllers affecting the machinery space(s) and adjoining spaces. Include the location of controllers, their designation and areas served.]

Fire Boundaries

[Cutters shall make a list of designated fire boundaries for machinery spaces listed in Enclosure (1).]

Encl.(6) to COMDTINST M9555.1A

Mechanical and Electrical Isolation Bills

GLOSSARY

1. **AFFECTED SPACE** - A space involved in a major oil 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. **FIRE AND SMOKE BOUNDARIES** - Any physical barrier can be a fire boundary. Ideally primary boundaries are the 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, since 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 scene leader decides initially when and where boundaryman with charged hoses are needed.
4. **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 if the fire will be attacked from that entrance.
5. **MACHINERY SPACE** - A main machinery or auxiliary machinery space which contains any of the following: installed firefighting systems, oil fired boilers, internal combustion engines, gas turbines, or fuel transfer equipment.
6. **MAIN SPACE** - A machinery space with internal combustion engines, gas turbines, or boilers used for propulsion.
7. **MAY** - When application of a procedure is optional.
8. **OUT OF CONTROL FIRE** - A fire that creates conditions due to heat and smoke which forces personnel to abandon the space.

Encl.(7) to COMDTINST. M9555.1A

9. **OVERHAUL** - Determine the extent of the fire while extinguishing residual, embedded fires, followed by clean up operations.
10. **SHALL** - When application of a procedure is mandatory.
11. **SHOULD** - When application of a procedure is recommended.
12. **SURFACTANT** - A large group of surface acting compounds that includes detergents, wetting agents, and liquid soaps.
13. **UNAFFECTED SPACE** - Any space other than the space involved in a major oil spill or fire.
14. **VAPOR SECURE** - Establishing a film or foam blanket over flammable liquids to prevent vaporization thereby isolating the fuel source from oxygen and heat.