



DEPARTMENT OF THE NAVY

NAVAL SEA SYSTEMS COMMAND
1333 ISAAC HULL AVE SE
WASHINGTON NAVY YARD DC 20376-0001

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22 February 2006

From: Commander, Naval Sea Systems Command

Subj: ADVANCE CHANGE NOTICE (ACN) 1/A TO NSTM 555V1R11 - CLARIFICATION OF GUIDANCE FOR LPD-17 CLASS SHIPS AND USE OF SPRINKLERS FOR FIRE BOUNDARIES

Ref: (a) Naval Ships' Technical Manual, NAVSEA S9086-S3-STM-010, Chapter 555, Volume 1 "SURFACE SHIP FIREFIGHTING", Revision 11, Dated 01 October 2004

Encl: (1) ACN 1/A to NSTM 555 Volume 1 Revision 11

1. This letter provides enclosure (1), Advance Change Notice (ACN) 1/A (NSWC Port Hueneme control number N00024-06-DS01) to reference (a). This ACN will be incorporated into the next revision. Recipients are requested to remove existing pages 555-156, 555-170, 555-193, 555-213, 555-299, 555-323 through 555-334 and replace with pages provided by enclosure (1).

2. This ACN clarifies firefighting guidance for the LPD-17 class as follows:

a. Adds more detail on LPD-17 Fire Detection System and provides guidance for using heat sensors and video to remotely actuate water mist in a machinery space.

b. Emphasizes early use of the Smoke Ejection System (SES).

c. Emphasizes early re-entry of water mist protected spaces and concurrent refill of water mist tanks to prevent tank depletion.

3. This ACN discusses use of automatic sprinklers to set a fire boundary, when limited manning or extensive ship damage warrants sacrifice of the boundary space..

4. This ACN does not authorize modification of existing Government contracts, project orders, work requests or allotments. Therefore, requests must be made to cognizant authorities for authorization and funding as may be required to accomplish this ACN. Cognizant authorities are requested to authorize accomplishment of this ACN as appropriate.

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5. The NAVSEA point of contact is Mr. David B. Satterfield, NAVSEA 05P4, DSN: 326-3647, commercial: (202) 781-3647, email: David.Satterfield@navy.mil. This letter may be downloaded at <http://www.dcfp.navy.mil/>.



D. McCrory
by direction

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PMS 317

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05P4 (file)

05P4 (D.Satterfield)

SECTION 5. FIREFIGHTING ORGANIZATION

555-5.1 INTRODUCTION

555-5.1.1 GENERAL. The fire party functions as a special element to coordinate a repair party's response to a fire. The overall shipboard damage control organization, including the repair party, is described in NSTM Chapter 079 Volume 2.

555-5.2 FIRE PARTY.

555-5.2.1 FIRE PARTY FUNCTIONS. The number of people in the fire party assigned to a repair party will vary, depending on the nature of the fire and the number of people available. As a minimum, the following functions as defined in NWP 3-20.31 shall be performed:

- Be in charge at scene
- Direct and coordinate nozzlemen
- Operate the NFTI - Operate nozzles
- Tend hoses
- Operate fire plugs and rig jumper hoses
- Open accesses and use forcible entry tools
- Determine location of fire and nature of casualty
- Set and man fire, smoke and chemical, biological and radiological (CBR) boundaries as necessary (CBR boundaries are discussed in paragraph 555-7.13)
- Carry messages
- Carry and supply to the scene AFFF concentrate, OBA's or SCBA's, OBA canisters or SCBA cylinders, equipment, and material as required
- Deenergize circuits and rig power cables as required
- Perform first aid
- Desmoking
- Recharge depleted breathing air cylinders, if using SCBAs
- Man Foam Station [and Water Mist Station](#) when operated

The manning for each repair party will determine the size of the fire party. Some people may have to perform multiple functions.

555-5.2.2 SCENE LEADER. The scene leader is in charge of firefighting at the scene of a fire. He sizes up the fire. He determines the method of attack and directs the attack against a particular fire, see paragraph 555-5.2.3 below. He determines the protective clothing requirements for the fire party based on assessment of conditions found. He should be normally located outside the primary fire boundary in order to best control the fire party. He

on the side facing the fire, the fire zone boundaries should be used for setting fire boundaries. Most fire boundaries are not protected with fire insulation and cooling by water spray may be required. Cooling water may be required on all sides of the compartment, particularly when the fire is fully developed. 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 and bulkheads should be removed to avoid ignition and spread of fire. Refer to Figure 555-1-11, which provides ignition thresholds for materials in compartments adjacent to the fire area. It should be the repair party leader's decision to man fire boundaries with charged hoses. Deploying hoses to cool the boundaries may be delayed if boundaries show no indication of heat or extension of the fire across the boundary. Since boundary cooling does not require a sustained effort, a single person may man and operate a 1-3/4 inch or 1-1/2 inch fire boundary hose.

555-7.2.7.1.1 Relatively small amounts of water are required to cool bulkheads and decks surrounding flashedover compartments. This cooling can be achieved while preventing rapid build-up of steam by intermittent applications of water to bulkheads from a 1-3/4 inch or 1-1/2 inch hoseline. Continuous flow from a 1-1/2 inch nozzle can create significant amounts of steam. In order to prevent rapid steam build-up and increased risk of steam burns, the firefighter should use initial bursts of water which may be as short as 1-2 seconds. Steam produced from the bulkhead wetting should be observed and further wetting adjusted so as not to generate more steam than can be tolerated. Time of water application may vary with conditions. Another method of limiting water application is to partially open the vari-nozzle to reduce the flow rate. Initially, water should be applied slowly by directing the stream near the overhead and slowly moving the stream down the bulkhead toward the deck. The pattern should be about 4 feet in diameter. The stream should be continuously swept over the bulkhead for the 15 second period. This technique should keep hot gases and steam in the compartment overhead. Decks are easier to cool than bulkheads. A continuous thin film of water running across the deck is one technique to use. Alternatively, the deck may be cooled by applying water to a depth of 1 inch. Greater depths of water do not improve cooling and increase the risk of burns from hot water to personnel in the space.

555-7.2.7.1.2 Three-quarter inch diameter hose reels, where installed as described in paragraph 555-4.12, may be determined by the personnel on scene to be acceptable to set a fire boundary. When fire boundaries are set using 3/4 inch hose reels, a 1-1/2 inch hose or larger should be available as a backup.

555-7.2.7.1.3. An automatic sprinkler system can prevent spread through a fire boundary space to the ship beyond, but the typical delay in sprinkler head actuation will result in some fire damage to the boundary space. When limited manning or extensive ship damage precludes the setting all fire boundaries, the ship may consider designating non-vital spaces which have an automatic sprinkler system and does not contain special hazards as a sacrificial unmanned fire boundaries. The spaces should be periodically inspected by investigators to ensure that fire does not spread through the space to the ship beyond and the boundary manned if fire spreads into the space and is not extinguished.

555-7.2.7.2 Smoke Boundaries. Smoke boundaries are set to contain smoke. When exhausting smoke to the weather by active desmoking (see Section 555-7.7), smoke boundaries also are used to establish a controlled path for exhausting smoke to the weather. The smoke boundary nearest the fire is designated as the inner smoke boundary and normally coincides with the primary fire boundary. A second smoke boundary, called the outer smoke boundary and located farther away from the fire, also should be set. The area between the inner and outer smoke boundaries is called the smoke control zone. Thus, when the access to the fire space is opened by the attack team, smoke will be trapped in the smoke control zone. Only personnel wearing breathing apparatus should enter the smoke control zone. Breathing apparatus should be activated when smoke is present or when ordered by the scene leader.

555-7.2.7.2.1 The following shall be considered when selecting an outer smoke boundary:

- a. The access to the fire space must be within the smoke control zone.
- b. Fire plugs and hose reels used by the fire party should be within the smoke control zone to minimize penetrations of the outer smoke boundary.
 1. If active desmoking is to be conducted, it will be necessary to establish and maintain an active desmoking flow path (supply and exhaust) from the smoke control zone to weather. See paragraph 555-7.7.

555-7.6.3 **ATTACK THROUGH A HOLE CUT IN THE BULKHEAD OR OVERHEAD.** Compared to using a cracked open access for the indirect attack, attacking through a hole cut in a bulkhead or overhead will reduce the amount of heat and steam blowing out of the fire space.

555-7.6.3.1 Cut a hole in a bulkhead or in the overhead of the fire space. **NSTM Chapter 079** provides detailed guidance in the operation of cutting units. The hole should be no larger than necessary to accommodate the nozzle or applicator. Insert the nozzle into the hole, see Figure 555-7-6, and apply water fog into the fire space continuously for approximately five to ten minutes. Then, secure the water flow and assess conditions in the fire space through a cracked open access. Based on the conditions found, either reenter the fire space and conduct the direct attack or conduct another indirect attack.

555-7.6.3.2 Under some conditions it may not be possible to man the nozzle continuously for the desired duration of the indirect attack. If an applicator is used under such conditions, it may be possible to leave the applicator in the hole unmanned, with periodic monitoring, and retreat to a cool area while water is spraying into the fire space. Vari-nozzles are not recommended for use in this procedure. For example, such conditions may be encountered when attacking from the space above the fire shown in Figure 555-7-6; see Section 555-7.8.

555-7.7 ACTIVE DESMOKING

555-7.7.1 **INTRODUCTION.** Active desmoking is removing smoke and heat from the smoke control zone between the inner smoke boundary and outer smoke boundary prior to extinguishing the fire, to aid firefighting efforts and reduce smoke spread in the ship. Active desmoking shall not remove smoke and heat from the fire compartment inside the inner smoke boundary. Smoke and heat from a severe fire can cause mission interruption, damage vital electronic equipment, create a large demand for breathing apparatus, delay fire fighters in locating the fire and present a life threatening environment. Controlling the spread of smoke with smoke boundaries is discussed in Section 555-7.2.7.2. Active desmoking is not required for all fires and is used at the discretion of the scene leader. Generally, the initial direct attack on the fire should not be delayed awaiting active desmoking. Most fires are extinguished before active desmoking is needed. If the initial attack is unsuccessful or if it is likely that the fire attack will go on for an extended period, then active desmoking should be considered. If smoke or heat in spaces beyond the fire space is impeding the attack on the fire, then active desmoking can improve the environment for firefighters. [On Smoke Ejection System \(SES\) equipped ships \(e.g., LPD-17 class\), SES should be activated early to prevent untenable conditions from developing. Refer to 555-7.7.7 for more information regarding SES.](#)

555-7.7.2 ORGANIZATION.

- a. The scene leader requests active desmoking, considering the factors discussed in paragraph 555-7.7.3.
- b. The repair party leader approves and directs active desmoking efforts that are not at the immediate scene of the fire.
- c. The desmoking team implements active desmoking. The desmoking team will need communications with the repair locker and the scene leader. Desmoking team personnel shall wear breathing apparatus, when required, but, to minimize heat stress, should not wear the FFE coveralls.

555-7.7.3 **TECHNIQUES.** Fire and smoke boundaries shall be set prior to establishing active desmoking. Active desmoking may require breaking material condition ZEBRA, if set, along the desmoking flow path.

555-7.7.3.1 When using passageways and compartments as the desmoking flow path, the flow path for active desmoking should be in as straight a line as practical. The make up air and smoke exhaust should flow in the

555-7.7.7.1.2 Use of SES. The SES should be used for an affected fire zone if smoke is building up in the passageways on the Damage Control Deck or Main Deck. For example, SES should be used when personnel are forced to don breathing apparatus. SES is not required for a fire which does not buildup smoke in the passageways.

555-7.7.7.1.3 Effect of SES on CPS. The effectiveness of the Collective Protection System (CPS) will be compromised in the pressure zone in which (SES) is activated. Fire Zones 2, 3, 4 and 5 are CPS pressure zones. Fire Zones 1, 6 and 7 are not CPS pressure zones. For fire zones under CPS pressure (Fire Zones 2, 3, 4 and 5), SES should not be used when the ship is in a chemical, biological, or radiological (CBR) threat environment unless the risk of reduced firefighting effectiveness outweighs the CBR threat. The DCA should communicate with the scene leader in evaluating whether to use smoke ejection.

555-7.7.7.2 System Capabilities and Limitations:

- a. Testing has established that the SES has the ability to remove smoke and improve visibility from five feet to twenty feet within 5 minutes within protected passageways assuming access to the fire space has been secured.
- b. In the smoke ejection mode, most smoke in SES passageways will be directed to specific exhaust points. Since the Damage Control Deck (2nd Deck) is under a positive pressure (Type I SES) while the Main Deck is under a slight negative pressure (Type II SES), open hatches and in-deck passageway pressure equalization ducts can provide paths for smoke movement from the Second Deck (Fire Zones 2,3,4 and 5) to the Main Deck and subsequently from the Main Deck to non-SES spaces on the 01 Level and decks above (which are at the same pressure as the Main Deck). These openings between the Damage Control Deck and the Main Deck should be closed when time and personnel permit. This issue becomes less important when SES is activated early since less smoke will be present in the passageways allowing improved visibility to be reached more rapidly. Should smoke migrate through HVAC ducting into manned vital spaces, operate installed manual smoke shutoff dampers to effectively exclude smoke.
- c. In the smoke ejection mode, many spaces in the affected fire zone will lack ventilation. Continued manning and operation of such spaces will depend on the number of personnel in these spaces, size of the spaces and the length of time SES is operating.
- d. The use of SES is recommended ~~during prior to~~ machinery space fire reentry ~~only if smoke begins to accumulate on the Damage Control Deck before smoke is allowed to accumulate on the DC Deck. However,~~ When the machinery space water mist fire extinguishing system is operating and machinery space accesses are used for re-entry, it has been noted during fire tests that smoke does not migrate from the machinery space onto the DC Deck. In addition, separate testing has shown that even without discharge of water mist, maintaining operation of the collective protection system on LPD-17 will result in air velocities through the machinery space access sufficient to prevent smoke migration onto the Damage Control Deck.

555-7.7.7.3 ESTABLISH SMOKE EJECTION.

NOTE

SES does not remove smoke from areas that are not swept. Therefore, vital space accesses must remain closed as smoke builds in the passageways both prior to and during SES operation.

555-8.12.2.4 LPD-17 Fire Detection System. The VSAs are fitted with analog [addressable](#) heat detectors that transmit alarms to ~~D.C. Central~~ [the Central Control Station \(CCS\) via Local Control Units. Heat detector temperatures are displayed on the Safety Management System \(SMS, a windows-based graphical interface for fire and smoke detectors on the LPD-17 class\) in CCS. Each detector can be monitored individually, in a group of detectors, or by zone. The heat detectors are accurate up to 176°F \(80°C\), above which the accuracy degrades.](#) Spaces with hazardous materials that are at risk with a fire in the well include the MVSA, MOGAS ~~pump room, MOGAS pump motor room~~ [Bladder Storeroom](#) and Cargo Storeroom (POL). All of these spaces are fitted with analog heat detectors.

555-8.12.2.5 LPD-17 Well Deck and VSA Mechanical Ventilation Systems. Ventilation systems are provided in the Well Deck and VSAs. The Upper and Main Vehicle Stowage Areas and the well are ventilated as a single space. LCAC fans are provided in the Well Deck and are used during LCAC operations to clear vehicle exhaust. The LCAC fans are reversible. Fan supply and exhaust points, normal operating mode, control location and approximate capacity of each fan in the Well Deck and VSAs are summarized in Table 555-8-1. Centralized remote control for all fans serving the vehicle stowage spaces and the well is provided in CONFLAG #5. Fans shown in Figure 555-8-9 indicate the supply and exhaust points, and not the actual fan locations.

Table 555-8-1. LPD-17 MECHANICAL VENTILATION SYSTEMS FOR WELL DECK AND VEHICLE STOWAGE AREAS (VSAs)

Fan Exhaust and Supply Points (Approximate location)	Normal Operating Mode	Primary Control Location	Approximate Capacity	
			cfm	L/s
UVSA, forward bkhd	Supply	CONFLAG Station # 3	90,000	42,500
MVSA, forward bkhd	Supply	CONFLAG Station # 1	90,000	42,500
Forward LVSA, forward bkhd (Fr 63)	Supply	CONFLAG Station #2	22,250	10,500
LCAC fan stbd (Fr 73)	Supply	CONFLAG Station #3	170,000	80,250
Forward LVSA, aft bulkhead (Fr 95)	Exhaust	CONFLAG Station #2	22,250	10,500
Aft LVSA, forward bkhd (Fr 102)	Exhaust	CONFLAG Station #4	22,250	10,500
Aft LVSA, mid bulkhead (Fr 120)	Supply	CONFLAG Station #4	22,250	10,500
LCAC fan port (Fr 132, via ramp)	Exhaust	CONFLAG Station #5	170,000	80,250
Well Deck, P/S wing walls aft	Exhaust	CONFLAG Station #5	160,000	75,500

555-8.12.2.6 LPD-17 Fire Insulation. Fire insulation is installed on LPD-17 fire zone bulkheads and selected additional high-risk bulkheads and overheads to delay fire spread to adjoining compartments. These fire-insulated boundaries include the forward bulkhead of the VSA complex, the port and starboard bulkheads of the VSAs and the overhead of the UVSA. See paragraphs 555-2.1.2.1 and 555-7.2.7.1 for guidance on setting fire boundaries where fire insulation is installed.

555-8.12.3 FIRE FIGHTING WITHIN THE LPD-17 WELL DECK AND VSAs.

555-8.12.3.1 Nature of the Hazard.

555-8.12.3.1.1 General. The VSAs are used to stow Diesel, JP-5 or JP-8 fueled military and amphibious type vehicles, which can result in a large, difficult combination Class A and Class B fire. These spaces will be densely packed and will provide little room for a fire fighter to maneuver within. Fire fighter access may require navigating around or over tied down vehicles to reach all portions of the space. Normally, two fueled LCACs are stowed in the well.

555-10.3.2.10 FIRE/SMOKE DETECTION SYSTEMS AND INSTALLED CAMERAS ON LPD-17.

a. Fire/Smoke two-in-one detectors onboard LPD-17 class will accurately indicate temperatures up to 176°F (80°C) dynamically on a graphical display. The detectors are divided into seven zones, each with a local control unit that feeds information to the master computer located in CCS. Heat detectors in a Main or Auxiliary Space may be used to remotely determine the presence of an out-of-control fire. Installed cameras should also be used as an initial action to further identify a fire that should not be attacked by an unprotected rover or casualty response team. The following are indications of fire for remote watchstanders in CCS to activate water mist.

- 1) The fire occupies a large area or prevents access to the space.
- 2) Two detectors in the space indicate a temperature of 140°F (60 °C) or higher.
- 3) One detector indicates a temperature of 140°F (60 °C) or higher AND visible flame or smoke is present through a camera.
- 4) One detector indicates a temperature of 140°F (60 °C) or higher AND another local detector is out-of-commission as a result of the casualty. An out-of-commission detector may indicate fire damage to the detector. The system requires eight seconds to determine the presence of a out-of-commission detector.
- 5) The fire is determined optically to be fed by an oil-source that cannot be secured.

555-10.3.3 CONSIDERATIONS NECESSARY IN CHOOSING CORRECT FIREFIGHTING EQUIPMENT.

The proper choice of firefighting equipment should be based on an on-the-scene estimate of the situation. This estimate should be done quickly and should take into consideration the volume of flammable liquid release and its form (atomized or spilled); the area occupied by the flammable liquid (confined or unconfined); the ability to quickly secure the oil source; and how rapidly flame, heat, and smoke are threatening firefighting and escape. The following general guidelines are provided for consideration when selecting the proper class B firefighting equipment.

555-10.3.3.1 Small Pool Fires (Less Than 10 Square Feet). Use readily accessible portable PKP extinguishers, AFFF hosereel, or CO2 portable extinguishers (which shall not be used on fires greater than 4 square feet) or AFFF extinguisher (if available) . For pool fires greater than 10 square feet see paragraph 555-10.3.5.3. 555-

10.3.3.2 Oil Spray Fires. An oil spray fire can quickly grow out of control and require evacuation after evaluation of the fire. Securing the fuel source is the single most important step in controlling an oil spray fire. An oil spray fire resulting from the ignition of atomized flammable liquids, which cannot be quickly and completely secured, should not be attacked. Loss 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, 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, and evacuate in accordance with paragraph 555-10.3.6.2. Oil spray fires may occur around fuel and lube oil strainers, recently repaired flanges and valves, and flexible line failures. An oil spray fire can grow out of control within seconds. Such fires are commonly fueled by an oil source which cannot be quickly and completely secured. Fires which spread to overhead insulation and cables, or which produce sufficient products of combustion (flame, heat, smoke, and fire gases) can also force space evacuation.

555-10.3.4 MAJOR OIL LEAK SCENARIO. Any major flammable liquid leak presents an immediate hazard which should be dealt with quickly to reduce the threat of fire. An oil leak which forms a spray can ignite when it comes in contact with any hot surface or equipment capable of arcing. Based on rapid initial assessment, deflecting the leak, securing of the oil source and the use of AFFF to cover liquid surfaces will greatly reduce the risk of fire. The following general guidelines are provided for dealing with a major oil leak.

555-10.3.4.1 Report the Leak. The oil leak should be immediately reported to the Space Supervisor and the Engineering Officer of the Watch (EOOW) to allow for concurrent action.

555-10.3.4.2 Deflect or Secure the Source. The oil leak should be stopped as quickly as possible. This can be done by deflecting the leak away from hot surfaces and ignition sources or by closing system cutout valves or shutdown valves, thereby isolating the leak-, or by securing the pump-. Even the application of a rag or bucket can significantly reduce the flow of oil and deflect it away from hot surfaces.

555-10.3.4.3 Apply Aqueous Film Forming Foam. Hydrogen sulfide gas may be released to the space atmosphere during the discharge of AFFF. See paragraph 555-2.7.10 for associated potential health hazards. Actuate the AFFF hosereel to remove oil accumulation on deckplates or bulkheads and wash oil into the bilge. Water may also be used. Rags that have been used for cleanup shall be placed in a suitable container. Discharge AFFF into the bilge to cover liquid surfaces and prevent ignition of the oil. Installed AFFF foam systems should be used that most effectively deal with the casualty. In some scenarios, the oil leak may discharge directly into the bilge. In others, the oil leak may discharge onto the deck plates and then into the bilge. Therefore, the decision to use either a hose, a sprinkling system, or both, as well as which to apply first, must be made by the watchstanders to ensure that the oil is flushed to the bilges and covered with AFFF. The AFFF hose reel is used to remove oil accumulation on deckplates or bulkheads, and wash it into the bilge. AFFF bilge sprinkling is used to ensure all bilge surfaces are vapor secured. The time required to achieve a complete foam blanket shall be determined and incorporated into the ship's doctrine. If the required time is not known, or AFFF must be conserved then operate bilge sprinkling for one minute.

555-10.3.4.4 Concurrent Actions-. As time and personnel permit, the following concurrent actions should be accomplished.

1. Secure operating machinery as necessary in the vicinity of the leak to control the casualty.
2. Start or maintain equipment in unaffected spaces to maintain propulsion, electrical power, and firemain pressure.
3. Man the machinery space foam proportioning stations upon notification of major oil leak in the space.

555-10.3.4.5 Remove the Oil. Pump bilge to the oily waste holding tank or overboard as conditions permit.

555-10.3.5 INITIAL ACTIONS FOR CLASS BRAVO FIRE SCENARIO. A class B fire can result from any pooled oil and can quickly develop from an oil spray or atomized fuel. The following guidelines are provided for a class B fire. For a class B fire within a gas turbine module or diesel engine module, see paragraph 555-8.5 .

555-10.3.5.1 Report the Fire. The fire should be immediately reported to the Space Supervisor and EOOW to allow for concurrent actions. When fire or smoke is reported, as soon as firefighting and plant securing efforts allow, personnel in the space should obtain and carry an Emergency Escape Breathing Device (EEBD). EEBD's are designed for escape only and shall not be used for firefighting purposes. See paragraph 555-10.3.9 for actions concerning breathing protection when a CBR threat exists.

555-10.3.5.2 Man Foam Proportioning [and Water Mist](#) Station. Man the machinery space foam proportioning stations [and water mist stations](#) upon notification of a fire in the space. [Prepare to align water mist tanks to be refilled from the potable water system, where applicable.](#)

555-10.3.5.3 Size Up and Attack a Localized Fire. Assess the size and location of the fire. If the source of fuel can be secured quickly and the fire is localized, activate AFFF hose reel(s) and/or portable fire extinguisher(s) and attack the fire. A PKP extinguisher is the most effective portable fire extinguisher for a class B fire and has an initial range of 20 feet. In addition to toxic products of combustion in the space atmosphere, hydrogen sulfide gas may be released during the discharge of AFFF. ~~See~~ paragraph 555-2.7.10 for associated potential health hazards.

555-10.3.5.4 Secure the Oil Source. The oil leak should be stopped as quickly as possible. This can be done locally or remotely by closing system cutout valves or shutdown valves, thereby isolating the leak. Even the application of a rag or bucket can significantly reduce the flow of oil and deflect it away from hot surfaces.

555-10.3.5.5 Concurrent Actions. Personnel in the affected space should concentrate on securing the source of oil and extinguishing the fire; they can take other actions as time and personnel permit. Actions assigned to personnel outside the affected space should be accomplished as soon as the fire is announced and appropriate stations are manned. The following concurrent actions should be accomplished:

- a. Actuate AFFF bilge sprinkling, where installed, until the bilge fire is out. Where AFFF bilge sprinkling and hoses have a common supply from a 50-gallon tank through an FP-180 proportioner, simultaneous use of hoses and bilge sprinkling shall be avoided because the sprinkler demand will reduce nozzle pressure in the fire hose and increase the hazard to the firefighter.
- b. Start or maintain equipment in unaffected spaces to maintain propulsion, electrical power and firemain. Secure the plant and operating machinery in the affected space.
- c. Set ventilation according to the following:

1. In Affected Machinery Space:

- (a) Set negative ventilation (exhaust on high and supply on low).
- (b) On ships with interlocked fans and remote controls with emergency exhaust button (remotely located in EOS or at access on ships without EOS) set emergency exhaust (exhaust on high and supply off).
- (c) On ships with fans interlocked through a local master switch but with independent control on controllers inside the space, set negative ventilation.
- (d) On other ships with interlocked fans the ventilation system shall remain operating.
- (e) If installed ventilation has been secured automatically because Halon 1301, ~~or HFP, or water mist~~ has been actuated, do not restart fans for the affected space. [See paragraph 555-10.3.10.b.5 for ventilation with water mist.](#) See paragraph 10.3.10 for guidance on ventilation at re-entry.

2. In Unaffected Machinery Spaces:

- (a) Set positive ventilation (supply on high and exhaust off). Setting positive ventilation is intended to prevent smoke on the damage control deck from entering unaffected spaces.
- (b) On ships with fans interlocked through a local master switch inside the space but with independent control on controllers, set positive ventilation.
- (c) On other ships with interlocked fans the ventilation system shall remain operating.
- (d) If smoke is pulled into adjacent machinery spaces from the weather, shift ventilation supply to intakes on opposite side of ship if installed, maneuver the ship to clear the vent intakes, or secure ventilation. On CPS-equipped ships, smoke can clog ventilation supply filters. Clogged filters will reduce CPS overpressure and degrade protection and may force shutdown of ventilation supply fans. Watchstanders may require breathing apparatus or Emergency Air Breathing Masks (EAB's) to prevent premature evacuation of unaffected spaces because of smoke.
- (e) On CPS-equipped ships when a CBR threat exists, do not set positive ventilation in unaffected machinery spaces. Maintain normal ventilation to avoid spreading CBR contamination from the limited protected machinery space to adjacent total protected zones and to minimize gaseous contaminant accumulations in the machinery space. The DCA may order positive ventilation based on threat.

[3. Outside of Machinery Spaces: see paragraph 555-10.3.7.2.](#)

d. Isolate the affected space with the exception of firefighting equipment, lighting, and ventilation. See paragraph 555-10.3.8.

e. Set fire and smoke boundaries around the affected space to prevent the spread of fire and smoke throughout the ship. The ship may want to set general quarters and material condition ZEBRA to facilitate the complete isolation of the affected space and the rapid establishment of fire and smoke boundaries. In setting boundaries, consideration should be given to the trade-off between impeding personnel egress versus spread to smoke to unaffected spaces. Machinery space access hatches must be closed quickly to prevent spread of heat and smoke to the Damage Control Deck. Balanced (Ellision) doors can not be relied on to serve as a fire barrier because pressures generated in machinery space fires may cause the doors to open, and high temperature can melt through aluminum doors and vestibule boundaries. If unable to operate hatch closures, throw a smoke curtain over the hatch opening and keep the curtain wet. As a reminder, main accesses are normally classified "Zebra" alternate accesses are normally classified "Yoke", and escape scuttles are "X-Ray" or "Circle X-Ray".

f. CBR considerations.

1. Typically in ships equipped with a collective protection system (CPS), machinery spaces have a lower level of CBR protection than other spaces in the ship. Evacuation and firefighting actions may compromise the CPS boundary between the affected machinery space and the total protection zones in which accesses to the affected machinery space are located. Therefore, as soon as a machinery space fire is reported, personnel in total protection zones in which accesses to the affected machinery space are located should don CBR protective gear appropriate to the CBR threat level and the contamination likely to occur in a machinery space.
2. The anticipated sequence of events when a CBR threat exists and a fire is reported in a machinery space normally would be as follows:
 - (a) First, personnel in total protection zones with accesses to the affected machinery space don CBR protective gear.
 - (b) Second, fight the fire, set fire and smoke boundaries, isolate the space, etc.
 - (c) Third, if necessary, evacuate the machinery space.
 - (d) Fourth, evaluate the situation with respect to the CBR threat as well as the fire. Continue with fire-fighting and re-entry.
 - (e) Fifth, if CBR boundaries are considered necessary, re-establish CBR boundaries around the pressure zone affected by the fire. When areas protected from CBR contamination are determined to be clear, personnel in protected areas may return to the mission oriented protective posture (MOPP) level appropriate for protected areas and the CBR threat level.
- 3 Paragraph 555-7.13 provides guidance on CBR boundaries, ventilation systems and smoke control for ships equipped with a collective protection system (CPS) when a CBR threat exists. Ships without a CPS may be able to apply some of the techniques discussed in paragraph 555-7.13 to mitigate the consequences of a CBR threat.
- 4 Ships should conduct fire drills simulating various CBR threats and protective postures and simulating fire-fighting where CBR contamination exists. Where the ship design supports establishing zones that are clear of CBR contamination when a CBR threat exists (such as a CPS), drills should include setting CBR boundaries.

555-10.3.6 OUT-OF-CONTROL CLASS BRAVO FIRE SCENARIO. A class B fire, especially one that has burned for a period of time or is fed by an unsecurable oil source, can be out of control within seconds. When this happens, operating machinery and the plant should be secured and the space evacuated. In addition, the following guidelines are provided for consideration when faced with an out-of- control fire.

555-10.3.6.1 Size of the Fire. If the fire occupies a large area, is fed by an oil source which cannot be secured, or is threatening firefighting and escape, the space should be evacuated. Even a small fire, if not extinguished rapidly, can generate large volumes of smoke and toxic gases that can force a space to be evacuated.

555-10.3.6.2 Evacuation. Once the decision is made by the EOOW or Space Supervisor to evacuate the space, all personnel should cease firefighting efforts, abandon all firefighting equipment (unless required to protect egress), don emergency breathing device and exit using the nearest safe access.

555-10.3.6.2.1 For ships with Ocenco Emergency Escape Breathing Devices (EEBDs), the watchstander should don his belt-worn EEBD to evacuate the space. Supplementary Emergency Egress Devices (SEEDs) are not required on ships using Ocenco EEBDs.

555-10.3.6.2.2 For ships with Scott EEBDs, which are not belt worn, the watchstander should don the EEBD to evacuate the space. If, at any time, life threatening conditions inhibit the watchstander's ability to locate and immediately don a Scott EEBD, he should utilize the belt-worn SEED. **NSTM 077-3.5** requires machinery space watchstanders on ships with Scott EEBDs to carry belt-worn SEED. **NSTM 077-3.5** does not require SEEDs in CVN nuclear machinery spaces since the lack of hot surfaces makes an out-of-control class B fire on CVNs very unlikely. The watchstander should use the SEED and proceed to the nearest access. He should obtain a Scott EEBD, if not already shouldered. The Scott EEBD should be donned when out of danger of immediate harm from heat or flames, if a breathable atmosphere cannot be reached using SEED. Because the SEED lacks protection for the eyes and nose and has a short operational time, it is a supplemental device. However, it is immediately available and is easily operated on the run.

555-10.3.6.2.3 Factors to consider when using these devices include (a) how quickly conditions are deteriorating, (b) ease of egress, including travel time to a breathable atmosphere, (c) operating times for each device, and (d) capabilities and limitations of each device. Do not breathe through the nose and breathe only through the mouth when using the SEED or Ocenco EEBD. EEBDs and SEEDS shall not be used for firefighting purposes.

555-10.3.6.2.4 Evacuation with ~~w~~Water ~~m~~Mist. If water mist is discharged into a space without a fire, personnel do not need to evacuate immediately. They should avoid touching electrical equipment, and should evacuate if the mist discharge continues past five minutes. If water mist is discharged into a space with a fire, personnel should evacuate immediately and commence isolation actions. Personnel with SCBA may remain in the space or reenter to conduct investigation, isolation, and extinguishment actions.

555-10.3.6.3 Agent Application. The Halon 1301, water mist or HFP (as applicable) fixed extinguishing system and AFFF bilge sprinkling shall be actuated (if installed), concurrent with evacuating the space, as soon as possible after determining that the fire is out of control. Actuation can be accomplished either by the watchstander evacuating the space or, if necessary, by supervisory personnel.

555-10.3.6.4 Isolation During Evacuation. Supervisory personnel must weigh the impact of their actions for space isolation, such as electrical isolation, securing ventilation and firefighting system isolation, against the safety of space watchstanders who are engaged in firefighting or evacuation.

555-10.3.6.5 Actions Outside the Machinery Space During Evacuation.

555-10.3.6.5.1 Non-CBR Threat Environment. Access doors, hatches and scuttles shall be secured when all personnel are out of the space. At this time, ventilation in the affected machinery space shall be secured for ships without Halon. The escapees should congregate at a safe, predetermined location outside the space, where EEBDs can be removed and a muster taken. History indicates that the damage control deck is not always a safe haven. A safe location is outside fire and smoke boundaries or a weather deck.

555-10.3.6.5.2 CBR Threat Exists. If protective masks are already being worn, switch breathing protection from MCU-2/P protective masks to EEBDs; an MCU-2/P protective mask does not protect against carbon monoxide nor does it provide oxygen. See **NSTM Chapter 077** for guidance on switching breathing protection. Access doors, hatches and scuttles shall be secured when all personnel are out of the space. At this time, ventilation to the affected machinery space shall be secured for ships without Halon. The escapees should congregate at a predetermined location outside the space, where EEBDs can be switched for appropriate breathing protection (MCU-2/P protective mask or breathing apparatus) and a muster taken. The significant factors to consider in determining where escapes should congregate are as follows:

- a. Evacuees should congregate outside of designated smoke and fire boundaries.
- b. Generally, evacuating to a predetermined location inside the ship would be preferred because it generally poses less of a CBR threat to evacuating personnel than exiting to the weather. The CBR threat should be evaluated and as evacuating personnel arrive at the location, they should be evaluated and directed to either a decontamination station, medical, a safe area of the ship or duty as the situation dictates. The evacuation route may become contaminated.
- c. On ships not equipped with CPS, breathing protection must be maintained while at MOPP Level 4. Escapees will need to switch from EEBDs to either a MCU-2/P protective mask or a breathing apparatus before the EEBD's 15 minute supply of oxygen runs out.
- d. On CPS-equipped ships breathing protection should be maintained consistent with the protection required in the machinery space until an area of the ship which is known to be clear of contamination is reached. Total protection zones that have accesses to the affected machinery space should be considered contaminated by the evacuation.

555-10.3.6.6 Muster Location. Ships should designate a location for evacuees to congregate for each machinery space considering the foregoing factors. Different locations may be designated for use when a CBR threat exists than for use when there is no CBR threat. In any case, the location should be outside of designated fire and smoke boundaries for the affected machinery space.

555-10.3.6.7 AFFF Operation. To prevent running the system dry, operate AFFF bilge sprinkling no longer than 4 minutes. In no case operate the system when the concentrate level in the tank sight glass is not visible. Immediate manning of the AFFF proportioner station is essential to expedite tank replenishment.

[555-10.3.6.8 Water Mist Operation. To prevent running out of fresh water before fire overhaul is completed, begin refilling water mist tanks from the potable water system as soon as practicable after water mist system activation.](#)

555-10.3.6.89 Notification. The EOOW and Repair Five Party Leader shall be notified that the following actions were taken:

- a. Lighting to space has remained on.
- b. Ventilation to the space has been shut down (or if re-activated for a water-mist protected compartment).
- c. Halon, water mist ~~or~~ HFP system and AFFF bilge sprinkling have been actuated, if installed. Halon or HFP system actuation should be verified by checking that pressure switches have operated.
- d. The space is evacuated and all personnel are accounted for. For compartments protected by an operating water mist system, identify any SCBA-protected personnel who remained in the fire compartment, if any.
- e. The DC response organization has been briefed on the location of the fire and plant status.
- f. All remote actuators have been operated to verify system isolation. Verify that the damage control deck cutout valve to the AFFF hoses located in the affected space has been secured.
- g. If a CBR threat exists, the status of the potential contamination in the space (if known), the status of contamination of surrounding areas and the contamination of personnel.

555-10.3.7 SMOKE CONTROL. Smoke control is comprised of the following areas.

555-10.3.7.1 Ventilation. The operation of ventilation systems is described where required in this doctrine. Each ship shall supplement its doctrine with a list of fans and their controls to be secured for a designated fire and smoke control zone. Weather deck supply intake and exhaust discharge locations shall be listed. The location of controllers, their designation and area served shall also be listed.

555-10.3.7.2 Smoke Boundaries. Due to the large volume of dense smoke that typically is produced by class B fires, inner and outer smoke boundaries shall be set quickly around accesses to the affected space. Smoke boundaries shall be set using structure that is at least fume tight. Both inner and outer smoke boundaries shall be set as described in paragraph 555-7.2.7.2. ~~For class B fires in machinery spaces, the area between the inner and outer smoke boundaries is designated as the smoke control zone and is monitored by the DC response organization for smoke buildup and removal. Ventilation within the smoke control zone is established by securing ventilation fans serving the smoke control zone and by closing appropriate ventilation dampers, if installed. Only personnel with breathing apparatus should enter the smoke control zone once it is established. Breathing apparatus should be activated when smoke is present or when ordered by the scene leader. Each ship shall supplement its firefighting doctrine with a list of designated smoke boundaries for machinery spaces.~~

555-10.3.7.2.1 Smoke Boundaries For Non-CPS ships. Once a machinery space has been evacuated, fire and smoke boundaries should be maintained. 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. At the time of reentry, firefighters may encounter a backdraft explosion or an intensifying fire as accesses to the affected space are opened and hot fire gases are relieved onto the damage control deck. Firefighters should use caution to position themselves to the side of the access when the door, hatch, or scuttle is initially opened.

555-10.3.7.2.2 Smoke Boundaries For CPS and SES equipped ships. CPS should be operated to maintain positive pressure on the DC Deck. This is intended to reduce the spread of smoke and provide cooling air flow at the back of the attack team during space re-entry. If CPS is ineffective in preventing smoke spread to the DC Deck, ~~operate the Smoke Ejection System (SES), if available (e.g., LPD-17 class), or~~ conduct active desmoking in accordance with paragraph 555-10.3.7.2.3. If equipped with SES (e.g., LPD-17 class), activate SES early in the smoke control zone at the reentry point.

555-10.3.7.2.3 Active Desmoking for non-SES Ships. Active desmoking is removing smoke and heat from the smoke control zone prior to extinguishing the fire, to aid firefighting efforts and reduce smoke spread in the ship. Active desmoking is not required for all fires. Active desmoking may be conducted at the scene leader's discretion using procedures described in paragraph 555-7.7. Active desmoking shall not delay machinery space firefighting reentry efforts. There is a very low probability of an explosive atmosphere in the smoke control zone above the LEL. In general, it is considered safer to ventilate the smoke control zone to prevent buildup of an explosive mixture of fuel vapors rather than secure the space, which can potentially create a fuel-rich environment.

555-10.3.8 SPACE ISOLATION. The complete isolation of systems listed below in the affected space, with the exception of lighting, is necessary to prevent a fire from intensifying due to the addition of flammable liquids and oxygen, and to reduce the electrical hazards. 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. The designation, location, function and area served by each control shall be provided. The following areas shall be considered when isolating the space.

555-10.3.8.1 Mechanical. Every effort shall be made to secure and isolate those systems, machinery, and tanks that have the potential to feed or otherwise contribute to the intensity of the fire. These include, in priority, those systems where action should first be taken.

- a. Fuel transfer, service, and stripping pumps and centrifugal purifiers
- b. Fuel systems, storage and service tanks
- c. JP-5 systems
- d. Lube oil pumps and centrifugal purifiers
- e. Hydraulic systems
- f. Lube oil tanks
- g. HP, LP, and bleed air systems
- h. Air compressors
- i. Steam systems
- j. Damage control deck cutout valve to AFFF hose reels within the fire compartment.

555-10.3.8.1.1 When initiating action to secure and isolate the foregoing, the following factors shall be considered.

555-10.3.8.1.2 Not all of the above have remote securing or isolation capability. As such, much local securing or isolating shall be accomplished as soon as possible together with the start of firefighting actions. As a minimum, local securing of systems shall include tank and bulkhead boundaries. Familiarity with location and type of local securing and isolating capabilities, and casualty control procedures such as those contained in the Engineering Operational Casualty Control (EOCC), **NSTM Chapter 079, Volume 3**, and applicable propulsion plant manuals are required.

555-10.3.8.1.3 Where remote capability is provided for any of the above, it is most likely located within or immediately adjacent to the access to Engineering Operating Station (EOS), Central Control Station (CCS) and Damage Control Central (DCC), and at the access to the machinery space on the damage control deck. Ensure system isolation by visual or operational verification of all remote actuators.

555-10.3.8.1.4 Care shall be exercised to prevent cascading casualties to equipment in unaffected spaces necessary to maintain propulsion, electrical power, and firemain pressure. Steam and air systems, air compressors, and fuel tanks located close to space boundaries are of particular concern. Communication with other machinery spaces is essential to minimize the potential for cascading casualties.

555-10.3.8.2 Electrical. Complete electrical isolation will be very difficult due to the sheer number of cables within and transiting any given space. To the extent possible, all electrical equipment, with the exception of lighting, shall be secured outside the affected space at the ship's service, IC and emergency switchboard, load center, or distribution panel. The switches, circuit breakers, and fuses necessary to do this shall be clearly identified. For water mist protected spaces, ventilation may be re-energized for space re-entry.

555-10.3.8.3 Fire Boundaries. Fire boundaries shall be established around the affected space to confine the fire and ensure designation of adjacent spaces to be observed for hot bulkheads. 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. The ship may designate the setting of material condition ZEBRA, in whole or in part, or general quarters to rapidly establish fire boundaries. Each ship shall supplement its doctrine with a list of designated fire boundaries for machinery spaces. Fire boundaries should be monitored for indication of heat or fire extension across the boundary, and manned as appropriate. Re-entry should not be delayed for purposes of placing hoses at fire boundaries. Where there is an operating water mist system in the fire space which is controlling the fire and removing the source of heat, fire boundaries may be checked periodically by investigators in lieu of setting a permanently manned hose.

555-10.3.8.4 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. Adding water to eliminate the vapor space in a fuel tank is not recommended because experience indicates that ignition has not occurred in fuel tanks are highly unlikely, and no accurate method exists to verify that 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.

555-10.3.9 PERSONNEL PROTECTION AND FIREFIGHTING EQUIPMENT. The proper use of personnel protection and firefighting equipment is required to reduce the risk of injury and facilitate extinguishing the fire. Some general considerations for those individuals who enter the space are the following.

555-10.3.9.1 Breathing Protection.

555-10.3.9.1.1 General. Breathing apparatus (OBA's or SCBA's) (with voice amplifier if on ship's allowance list) should be worn by all personnel within smoke control zone or when entering the affected space until the atmosphere is certified safe. When smoke is present, breathing apparatus activation should be ordered by the repair locker leader and reported to damage control central.

555-10.3.9.1.2 CPS-Equipped Ships When a CBR Threat Exists. See **NSTM Chapter 077** for guidance on switching breathing protection when a CBR threat exists. See paragraph 555-6.1 for guidance on adjusting personnel protection. During the fire in a machinery space when a CBR exists, the following breathing protection should be used:

- a. As soon as the fire is reported, protective masks shall be donned by all personnel in total protected zones in which accesses to the affected machinery space are located. This action is to protect personnel from CBR contaminants that could enter a total protected zone as the affected machinery space is evacuated.
- b. Protective masks may be removed in spaces on the protected side of a CBR boundary once it is determined that the CBR boundary is secure and the protected zone is clear of CBR contaminants.
- c. Protective masks or breathing apparatus shall be worn in areas not protected from CBR contamination.
- d. Breathing apparatus shall be worn inside smoke boundaries to provide oxygen and to protect against smoke, other combustion products and CBR contaminants.

- e. Personnel escaping from the affected machinery space shall don EEBDs for evacuation then change to the appropriate breathing protection (breathing apparatus or protective mask) if required for the area of the ship in which they congregate after evacuation; see paragraph 555-10.3.6.2.

555-10.3.9.2 Clothing. Firefighter's ensemble shall be appropriately prepositioned to be readily available to fire party personnel when the fire party is called away. Personnel recommended to wear the firefighting ensemble are listed in **NSTM Chapter 077**, paragraph 077-4.3.5. Where water-mist is effective, the scene leader may normally consider SCBA, engineering overalls, gloves, boots, and flash hoods as adequate PPE for personnel to conduct investigation, isolation, re-entry and extinguishment actions. See paragraph 555-6.1 for guidance on adjusting personnel protection. Support personnel such as phone talkers, electricians, and medical personnel, outside the fire boundary, shall wear battle dress. Firefighting personnel exposed to a CBR threat should wear the fire-fighter's ensemble or appropriate CBR protective gear; see paragraph 555-6.1.7 and **NSTM Chapter 470**.

555-10.3.9.3 Hoses. As a minimum a single attack 1-1/2 inch AFFF hose, with vari-nozzle, shall be used by the reentry team. The hose and nozzle provide added protection for the nozzleman and hose tenders. Before the single attack hose enters the space, a second (backup) attack AFFF hose shall be manned to render assistance. The back up AFFF hose is not required to be charged. When assigned by the scene leader, the attack team will be led by an attack team leader. The second hose shall be supplied from an in-line eductor, high capacity or low capacity foam station. The in-line eductor is designed to only work with a 95 gpm vari-nozzle. Sufficient distance shall be maintained between the first and second hoses to prevent maneuverability and firefighting progress from being impaired. The scene leader decides what resources are needed, including the need for an attack team leader, a second hose to enter the machinery space and a NFTI. In as much as reentering the space may be a lengthy and awkward process, conserving AFFF shall be considered. Seawater hoses may, therefore, be used to cool access doors, hatches, and scuttles, but the seawater hose should not enter the space where it will impair the effectiveness of the AFFF. To conserve AFFF, hoses equipped with in-line eductors can discharge seawater if pickup tubes are removed from AFFF 5-gallon cans. The eductor will continue to function with reinsertion of the pickup tube into the AFFF containers.

555-10.3.9.3.1 Two hoses advancing simultaneously delay fire extinguishment. A second hose creates problems for the lead nozzleman such as impaired visibility, increased heat stress and delay in approaching the fire.

555-10.3.10 ATTACK TEAM REENTRY. Reentry to a machinery space that has been evacuated because of fire is the most critical part of the firefighting evolution and potentially the most dangerous. The primary function of the reentry team is to attack and extinguish the fire, ensure the source of oil is secured and cool the space so ventilation may be started. The general guidelines for consideration upon reentry are as follows:

- a. When Halon and AFFF bilge sprinkling have been actuated :
1. If a check of the conditions in the affected space described in 4. below indicates that the fire has not been extinguished and continues to grow after Halon discharge, operate the second shot of Halon, where installed.
 2. Operate AFFF bilge sprinkling a second time for at least 2 minutes before reentry to prevent the possibility of an unsecured fuel source having degraded the initial foam blanket.
 3. Reentry shall be attempted at the following times:
 - (a) If the evidence is that the fire is extinguished by Halon, report fire contained. Do not attempt reentry for at least 15 minutes after discharge of Halon, if effective.
 - (b) If only AFFF bilge sprinkling is installed, or 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 as specified in EOCC immediate actions. Electrical isolation, although ongoing, should not delay space reentry.

4. Reentry should be made through the access, main door, hatch, or escape trunk, whichever is not obstructed by the fire. In some instances escape trunks may be preferable to main accesses for re-entry purposes since the trunk can provide a protected path to get below the fire where temperatures will be cooler and air will be clearer. See paragraph 555-7.14.6. The conditions in the affected space should be checked if possible before entry by:
 - (a) Feeling bulkheads for temperature near the desired access.
 - (b) Monitoring exhaust vent discharge for smoke.
 - (c) Monitoring conditions through the EOS windows or peephole in escape trunk doors. The NFTI cannot be used for this purpose because the NFTI cannot see through glass.
 5. After reentry to the space, locate and extinguish any remaining fire, report when the fire is out, reflash watch is set, and fire overhauled. Ensure all sources of fuel are secured and covered with AFFF. To conserve AFFF, saltwater hoses should be used to cool the space after the fire is out. It should be assumed that the AFFF hoses in the space have been damaged by the fires and they should not be relied on until it can be established that the system has not been damaged by fire.
- b. When water mist and AFFF bilge sprinkling have been actuated:
1. Effective operation of the water mist system should be monitored prior to attack team entry by:
 - (a) Monitor the pressure in the nozzle distribution piping. This is indicated at the supervisory panel near the entrance to the protected space, at the DC Deck remote panels, and at any DC console via the Damage Control System. Monitor the system components for failures, which will be indicated at the DC consoles via the Damage Control System. Rationale: The status of mist flow to each protected space is a design feature of the system. Various failure modes and component feedback signals are monitored and displayed by the DCS.
 - (b) Feeling bulkheads for temperatures near the desired access.
 - (c) Monitoring exhaust vent discharge for smoke.
 - (d) Monitoring conditions through the EOS windows or peephole in the escape trunk doors. The NFTI can not be used for this purpose because the NFTI can not see through glass.
 - (e) Reports by SCBA-personnel who remained in the space, if available.
 - [\(f\) Temperatures decreasing as indicated by surviving space heat detectors and installed cameras \(e.g., LPD-17 class\).](#)
 2. If there is evidence that the water mist system did not operate, review the status of the system components to determine the failure point. The system includes redundant pumps, dual power supplies, alternate flow paths, and the ability to isolate damage. Reconfigure the system and attempt to provide water mist flow. Continue preparation for manual fire attack while attempting to reconfigure and operate the water mist system.
 3. If inoperative water mist cannot be restored, [operate exhaust ventilation on high \(if operable\) within the space and reenter the space for fire attack. If severe conditions prevent reentry, initiate](#) indirect cooling with an AFFF wide angle fog, high within the machinery space to help thermally manage the conditions in the space. The indirect cooling action will create adequate turbulence in the region around the fire, water vapor/steam and vitiated gases will dilute the oxygen, and the fire size will be reduced. [When the re-entry team is manned and ready and after at least five minutes of indirect attack, secure the indirect attack and reenter. Maintain exhaust ventilation on high \(if operable\) during reentry and fire attack.](#)
 4. Operate AFFF bilge sprinkling a second time for at least two minutes before entry to prevent the possibility of an unsecured fuel source degrading the initial foam blanket.
 5. For a compartment with a functioning water mist system, exhaust ventilation should be used during space reentry to improve visibility and reduce toxic fire gases. Since water mist cools and maintains the space below the flashpoint temperature of common shipboard fuels and lubricants, desmoking during reentry will pose minimal risk of reflash. Maintain desmoking with installed ventilation and water mist operation until all remaining fire has been manually extinguished and overhauled, AFFF bilge sprinkling has been operated, the source of oil secured, the space cooled, and all fuel washed into the bilges.

6. Attack team re-entry should be attempted as soon as possible after the water mist is actuated. [With a functioning water mist system where conditions permit, the Flying Squad with breathing protection may determine to re-enter immediately to locate and extinguish residual fires while the remaining fire party is still staging.](#) Water mist shall remain operating during re-entry. A 15-minute delay, as provided for space cool down and agent soak time with Halon-protected spaces, is not required for water mist-protected spaces.
 7. Attack team reentry may be made through the main access entrance or the escape trunk. The space exhaust ventilation should be restored prior to re-entry to improve visibility. Lighting may be restored if operational. Ensure electrical equipment other than ventilation and lighting have been isolated. If the operating water mist system appears effective and is maintaining tenable space temperatures, space investigation may be expedited by having independent DC personnel navigate throughout the machinery space, separate from the manned AFFF hose.
 8. Once the fire is reported out, set reflash watch and complete fire overhaul
 9. Water mist can be secured after the fire space has been investigated, all fuel sources have been secured and the fire is reported out. Securing water mist will assist in final investigation process and expedite fire overhaul. Water mist should be re-activated if the fire reflash. Full-scale testing has determined that most class B fires will be extinguished in less than 60 seconds and that AFFF on fuel surfaces should prevent major reflash. Water mist performance is enhanced as fire size increases (i.e., large fires are more easily suppressed than very small fires). [Secure refilling the water mist tanks.](#)
- c. Where HFP and AFFF sprinkling has been actuated:
1. Establish active desmoking in the smoke control zone. Ensure all personnel within the smoke control zone and smoke exhaust path are wearing breathing apparatus and have minimal exposed skin surfaces for potential acid gas exposure. Periodically monitor smoke control zone atmosphere for HF acid gas before, during and after fire space re-entry. Breathing Apparatus should be activated if HF concentration is above 3 ppm. Withdraw all personnel if HF level exceeds 90 ppm.
 2. Operate the AFFF sprinkling system a second time at least two minutes before re-entry to prevent the possibility of an unsecured fuel source having degraded the initial foam layer.

WARNING

HFP produces toxic Hydrogen Fluoride (HF) acid gas when exposed to fire. Personnel must leave the space when the HFP system is actuated. HF has a Permissible Exposure Limit (PEL) of 3 ppm and an Immediately Dangerous to Life or Health (IDLH) of 30 ppm, per NSTM 074 Volume 3. HF airborne concentrations will typically reduce with time as HF reacts with metal surfaces within the space. If the fire reflash, exposed HFP will produce additional quantities of HF acid gas.

3. Reentry shall be attempted at the following times:
 - (a) If the evidence is that the fire is extinguished by HFP, report fire contained.
 - (b) After 15 minute HFP soak period, operate exhaust ventilation, if available, for at least 15 minutes to reduce the airborne HF acid gas concentration. Do not attempt reentry for at least 15 minutes after ventilation has been established.
 - (c) Crack open the access door or hatch and determine HF level exposing only one arm to interior space conditions. Use the 10 to 90 ppm range tube for the gas tube detector. Personnel with SCBA and protective clothing may enter the space if HF concentration is less than 90 ppm. Maintain negative ventilation, if available, during space re-entry and overhaul. If negative ventilation cannot be set, establish positive pressure in surrounding spaces may be an alternative. If exhaust ventilation is not available, wait an additional 30 minutes after the 15 minute HFP soak period (i.e., 45 minutes after HFP discharge) before reentry. Continue to determine the HF concentration after re-entry. Firefighters should withdraw from areas where HF concentration exceeds 90 ppm.

WARNING

Re-entry should not be made if the HF acid gas concentration is above 90 ppm .