c. Zone area officers:

(1) Direct the securing of their zone areas.

(2) Inspect their zone areas to insure that all closures are properly made and maintained.

(3) Report to damage control central by sound-powered phone.

2. In "Cruising" Condition. Closures will be made as directed by the master. The master-at-arms, room stewards and other crew members will make closures, as instructed. The damage control officer will check to assure that closures are properly made.

3. Under All Conditions:

a. All hands must assist in setting and maintaining closures by:

(1) Properly making and checking required closures.

(2) Moving about ship without passing through closed watertight doors.

b. All hands must report when closures cannot be made properly because they cannot be closed or cannot be closed securely.

E. Inspections. All fittings must be maintained in good operating condition. To insure readiness for use and proper closures, the following inspections will be made:

1. Weekly at Sea. Check the following fittings:

a. Watertight doors and their mechanisms, remote controls, and indicators.

b. Remote controls and indicators for valves and closures.

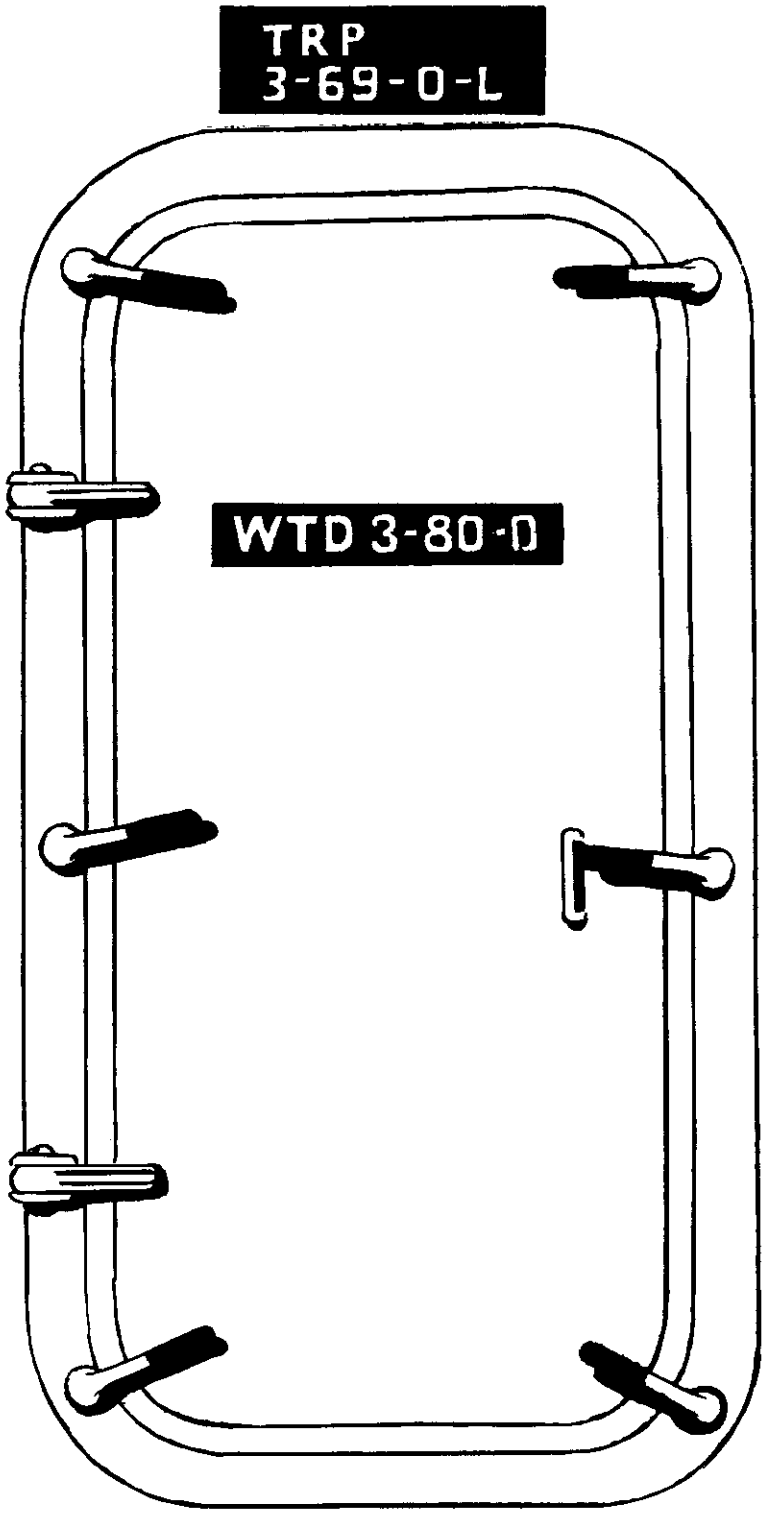
c. Valves and closures (if accessible).

2. Ready-for-Sea Inspection. Before leaving sheltered waters, check to insure proper closure of:

a. Hinged WT doors between cargo spaces.

b. Manholes in WT bulkheads.

c. Side ports.



HINGED WATERTIGHT DOOR DOGGED DOWN

d. Portholes, portlights and deadlights near the waterline, particularly those not accessible during navigation.

F. Tests. Fittings will be tested for proper operation and tightness as follows:

1. Before Leaving Port.

a. Watertight doors will be operated.

b. Valves and closures will be operated including:

(1) Portlights and deadlights. Those near the waterline will be secured as directed by the master.

(2) Scupper closures.

(3) Rubbish chutes.

2. Weekly, At Sea. Valves and closures will be operated.

3. Daily. Watertight doors will be operated.

G. Construction and Operation of Watertight Fittings.

1. Watertight Doors.

a. Hinged Wt doors have a gasket which fits snug against a steel knife-edge and steel wedges against which the dogs set up tight. Hinged WT doors may have individual dogs or a quick-acting wheel.

(1) The individual dog type is closed as follows:

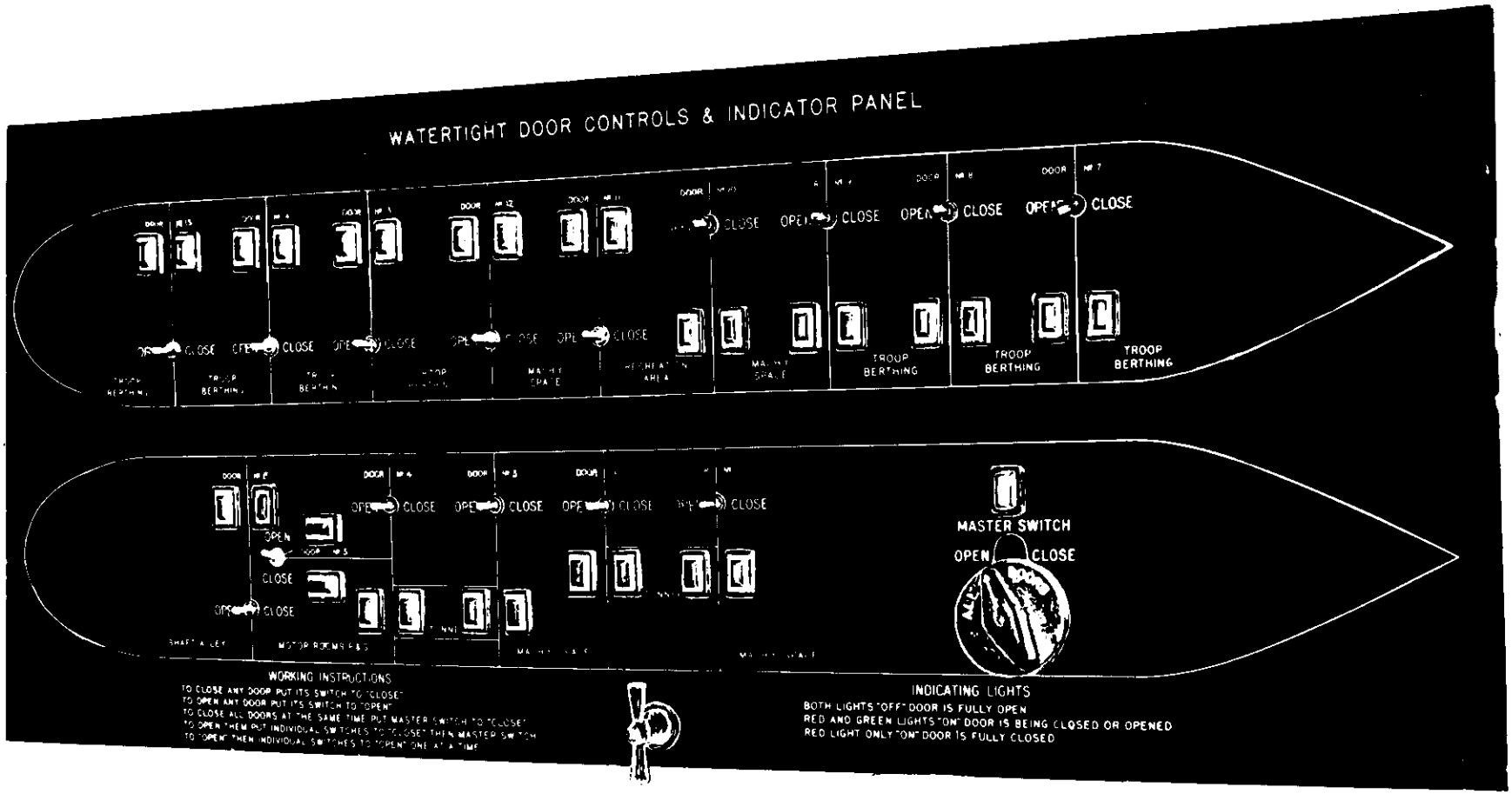
(a) One dog on the side opposite the door's hinges is partially set up to hold the door closed.

(b) All other dogs are partially set up.

(c) Set up all dogs tightly and evenly, a little at a time to dog down the door securely and evenly on all sides.

(d) To open the door, loosen the dogs nearest the hinges first. This keeps the door from springing and makes it easier to open the other dogs.

(2) The quick-acting handwheel WT door has a handwheel mounted on both sides of the door which works all the dogs at the same time by means of gears and levers. It is closed by pulling it tight and turning the handwheel to set up all dogs securely. It should



WTD CONTROLS

work easily and must not be forced or the gears or levers may be damaged.

b. Sliding WT doors have smooth machined surfaces on the door and frame so that the door slides closed to make a tight fit. They are operated by a hand wheel on each side or by remote control from the bridge. An alarm sounds when the door is power-operated.

2. Portholes and Portlights.

a. Have a gasket for watertightness.

b. Portlights have two knife edges, one on the inner rim for sealing against the ship's side and one on the outer rim against which the deadlight gasket seals.

c. Dogs secure the portlight and deadlight cover.

d. Deadlight covers back up and secure the portlight in heavy weather. They have a gasket to provide a tight seal.

e. Method of closing. Demonstrate proper securing of portlight and deadlight covers. Set up evenly on all dogs to avoid cracking the glass.

3. Other Fittings.

a. Manholes have threaded studs, a gasket, a cover, and are secured by tightening down evenly on all nuts.

b. Overboard discharges are closed by means of their remote-controlled valves above the bulkhead deck. These are suitably marked. Overboard discharges which have no remote-controlled valve are fitted with two check valves.

4. Maintenance of Fittings. Fittings must be maintained in good condition, ready for use.

a. Gaskets must fit properly with no gaps or lumps, must be kept free of paint and grease, and must be replaced when hard, brittle or cracked.

b. Knife edges must be kept clean, sharp and true, free of paint, grease or rust. Nicks or burrs may be polished off with emery cloth.

c. Dogs. WT door dogs must not have loose spindles which would permit leaking. They require occasional cleaning. Dogs on portlights must turn easily, threads should be kept clean, and they should have adequate lock nuts where required.

H. Temporary Repairs. In emergencies, temporary repairs may be made to fittings which have been damaged and do not close properly.

1. WT doors may be shored to seat gasket on knife edge.

2. Cracks may be plugged where doors do not seat properly.

3. Damaged doors may be replaced with mattress and shoring.

4. Portholes and hatches may be temporarily repaired in the same manner.

V. SUMMARY. Review the following key points:

A. Watertight subdivision of your ship.

B. Types and locations of watertight fittings.

C. Progressive flooding through an open watertight fitting may cost a ship and lives.

D. Conditions of readiness and how they are set.

E. The importance of maintaining watertight integrity and maintenance of WT fittings.

F. Stress the importance of keeping WT fittings free of dirt, rust and excess paint and in good working condition.

* G. USCG, in Navigation and Vessel Inspection Circular No. 2-62, stressed the need for maintenance of integrity of watertight bulkheads as follows:

"Within the last 18 months, two tankers were lost as a consequence of failures in the propelling plant installation resulting in machinery space flooding. In both of these cases, eventual loss was apparently caused by extension of initial flooding through relatively minor openings in bulkheads which were otherwise watertight. Although there was no loss of life in either of these instances, the fact that such loss might have occurred under more unfavorable circumstances cannot be disregarded. When it is realized that in many cases such losses can be prevented by simple inexpensive measures without any adverse effect on the vessel's operation, the wastefulness of not taking such measures becomes apparent."

VI. TEST AND APPLICATION.

A. Test. Use these and additional questions as an oral quiz to check comprehension. Explain questionable items.

1. Q. Name the boundaries of a watertight compartment of your ship.

A. Sides, fore and aft bulkheads, inner bottom, and bulkhead deck.

2. Q. What is the bulkhead deck?

A. The uppermost deck to which the transverse watertight bulkheads extend.

3. Q. What are the conditions of readiness?

A. Condition " emergency" and condition "cruising".

4. Q. What is the difference between setting condition "emergency" and setting condition "cruising"?

A. Under condition "cruising", all watertight fittings below the bulkhead deck are secured except when actually in use and these must be closed immediately after use or passage. Under condition "emergency", all closures and systems are secured except those required for operation of vital machinery or health of personnel.

5. Q. Describe the method of securing a watertight door with individually operated dogs.

A. First hold door closed with a dog on the side opposite the hinges. Then set up on all dogs evenly, a little at a time.

6. Q. How would you open a WT door fitted with individual dogs?

A. Loosen the dogs nearest the hinges first, then the others.

7. Q. What responsibility do all-hands have for watertight closures?

A. All-hands are responsible for checking watertight closures, making watertight closures if not already made, and maintaining watertight closures when once made.

8. Q. What is watertight integrity?

A. The maintenance of the watertightness of those parts of the ship designed to prevent the passage of water--keeping water out of compartments and maintaining the ship's buoyancy.

9. Q. What condition must a watertight door gasket be kept in?

A. Free of paint and grease, with no gaps or lumps and pliable--not hard and brittle.

10. Q. What portlights require deadlight covers?

A. All those below the bulkhead deck.

B. Application. Tour the ship, pointing out WT features and fittings and have members of the group demonstrate proper WT closures of:

1. Hinged WT doors.

2. Sliding WT doors, including remote controls.

3. Portlights and deadlights.

WT INTEGRITY

4. Sideports.

5. Overboard discharge by remote control.

VII. HANDOUT.

"DANGER--BEWARE LOOSE DOG!" (WT Doors)

(Condensed from the January 1956 Proceedings of the Merchant Marine Council, USCG)

A large modern diesel towing vessel was flooded and severely damaged after she had struck a submerged object. However, there is a strong presumption that the damage was caused more by the failure to control the progressive flooding which resulted after the damage, than by the initial damage. Flooding took place through at least two "watertight" doors.

On a routine trip, a strong blow was suddenly felt on the bow of the vessel. Apparently a steel object had been hit. Flooding through a bottom plate near the starboard bow was immediately detected. The officers and crew rushed to the engine room and saw water flowing aft into the machinery space through two "watertight" doors which were open at the time. They quickly closed these doors but, since the doors did not fit tightly, a large quantity of water continued to flow into the engine room. Flooding progressed aft and the vessel was soon in a sinking condition. The captain headed his vessel for shore and beached her on a nearby mud bank. However, flooding continued and the stern sank in 17 feet of water. The two watertight doors at the after end of the engine room were not closed. Consequently, the entire after part of the tug was submerged and flooded and extensive damage occurred to all of the machinery. Damage was estimated at over $100,000.

It was most unfortunate for this vessel that the four watertight doors were not only not in good operating condition, but opened the wrong way, that is, into the engine room (she was an uninspected vessel). Although the vessel was salvaged and completely restored and there were no deaths or injuries, this mishap could have resulted in the complete loss of the vessel and loss of life.

This casualty illustrates the importance of maintaining watertight doors and fittings in good condition so that they can do the job they were designed to do--maintaining watertight integrity and preventing progressive flooding in an emergency. Furthermore, they cannot do this job if they are not closed, when necessary, and kept closed.

The most important point to be remembered is that watertight doors are installed for a specific purpose and should be kept in condition

for that purpose at all times. Any factor which affects the ability of a watertight door to close a bulkhead tightly and prevent flooding is a factor which endangers the ship. Rendering a watertight door or hatch inoperative by lashing it open, obstructing its closure in any way, altering it materially so that it cannot function, or removing it should never be permitted. Any condition which temporarily affects the full usefulness of a watertight door should be remedied just as quickly as possible. The moment of greatest need may arrive sooner than you think.

Hand-operated watertight doors and hatches found on merchant vessels of the United States are usually one of two types. The type most usually found is completely manual, that is, after the door is closed, the dogs have to be closed by hand. The number of dogs vary from one to six. A door with less than six dogs is far from being an efficient watertight door.

The second type is partly automatic, that is, the action of the dogs depends upon the manual turning of a handwheel. The handwheel is mounted on both sides of the door on a common shaft and actuates all the dogs simultaneously by means of gears and eccentric levers.

Watertight doors of either type are useless unless they close tightly against the door frame. A properly designed WT door is so constructed that a continuous rubber gasket around it will come flush against a steel knife-edge built into the frame of the door so that this knife-edge presses tightly into the gasket and forms a seal entirely around the door.

Therefore, it is necessary to keep knife-edges clean, sharp, and true. They should not be painted and any damage must be repaired, to return them to true. The rubber gaskets must be complete, that is, full length, and kept free of paint so that the rubber will remain soft and pliable. Rubber gaskets are a favorite object to be painted by inexperienced painters, perhaps because they find these gaskets unpainted. Once such a gasket has been painted, it is usually necessary to renew it, as paint will harden and deteriorate the rubber.

Steel wedges against which the dogs tighten when they are closed have a tendency to wear, so that the door can no longer be made tight. In this case it may be necessary to build up and remachine the surface of the wedges or renew them. The dogs themselves require occasional cleaning or adjustment so that they operate freely and are positioned to engage the wedges properly. This adjustment can usually be made by using different size shims and washers. Many a WT door has been found to be "out of service" due to frozen dogs.

On any well-run vessel which is equipped with WT doors or hatches, they should be tested regularly to see that they function properly, and

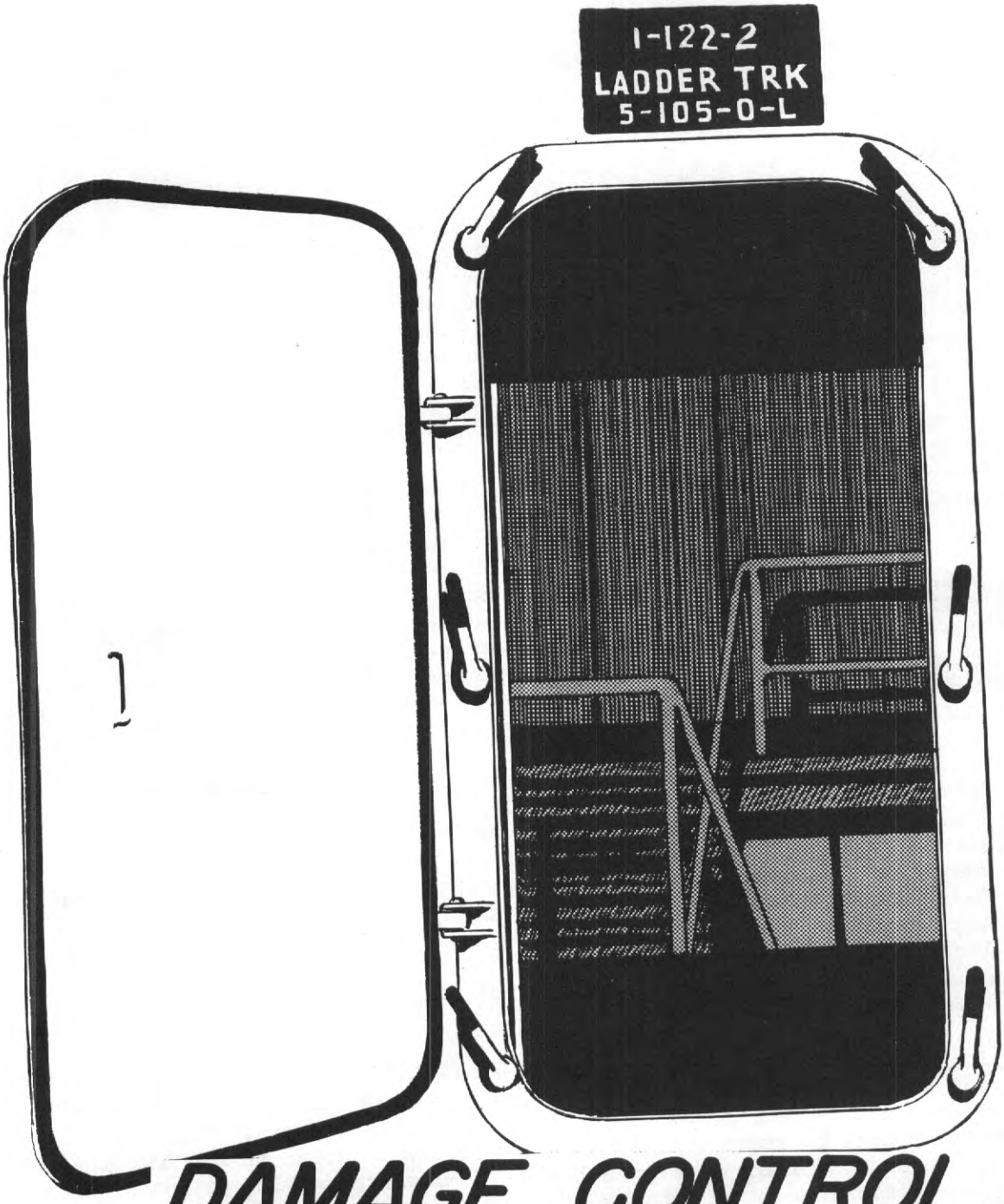
any repairs which are needed should be promptly accomplished. It should never be forgotten that a fault in such a closure may be just as drastic to the safety of the ship as a hole in the hull. A periodic test of such closures is particularly important if such closures are not used regularly; for instance, WT doors to storerooms or little-used compartments which may remain closed most of the time.

On WT doors of the quick-acting type, the actuating mechanism should be disassembled and inspected occasionally to insure that all of the parts are intact and working properly. Lubrication of the working parts at this time is highly desirable. On doors of this type, which are springloaded to automatically close, the spring should be closely examined to make sure it is completely operative. The actuating mechanism should never be forced open or forced closed. If it does not work easily, undue force may easily break the gears or levers inside the door and this closure is then "out of service" until repaired.

Of vital importance is the general principle that WT doors are installed in a vessel to be used. In general, unless it is obviously necessary to keep such a door open for some specific purpose, the door should be kept closed, so that it will not be necessary for someone to remember to close it after damage occurs. Lives have been lost due to failure to observe this principle. Lashing WT doors and hatches open for convenience, or simply because the need of the tight closure is not staring in your face, is about the same as leaving fire extinguishers and life preservers on the dock when getting underway because you do not expect to have a fire or a man overboard on that trip.

A point of advice to be remembered in case of flooding which has been confined by a WT door--if you are uncertain whether a compartment behind a WT door is flooded and you are attempting to determine this by partially opening the door, don't try loosening the dogs on the edge away from the hinges. If you do, and there is full pressure behind the door, this pressure may burst open the door and you have lost control of the flooding. Try one of the dogs on the hinged edge. In this manner leakage will tell you if the compartment is flooded and you will not lose control and possibly flood another compartment, perhaps with the loss of the ship.

One common method of completely disabling a WT door which practically every vessel will encounter at some time or other is the habit of leading cables, air hoses, etc., through opened WT doors. This is usually done by shore workmen who have no appreciation of the importance of the door, and may care even less. If at all possible, do not disable your WT closures in this manner, as the only measures which can be taken in an emergency to close a door thus disabled, that is, cutting the cables and hose, etc., may lead to many unfortunate complications, and such a procedure may take too long to prevent flooding.



DAMAGE CONTROL - MARKINGS

CHAPTER 2

BASIC DAMAGE CONTROL - For All-Hands (Lesson Plan)

Section 2.3

DAMAGE CONTROL MARKINGS

I	Objectives	V	Summary
II	Material	VI	Test and Application
III	Introduction	VII	Handout
IV	Presentation		

I. OBJECTIVES.

A. To acquaint all hand with the MSTS marking system.

B. To insure that crew members are able to readily locate any area, compartment or damage control fitting in the ship.

II. MATERIAL.

A. Training Aids.

1. "Know Your Ship" Chart (12ND P1711).

2. Ship's Inboard Profile Chart.

3. "Compartment Numbering" (Handout).

B. References.

1. COMSTS INSTRUCTION 9280.3 (effective revision), Designation and Marking of Hull Structure.

2. Rules and Regulations for Passenger Vessels, CG 256.

III. INTRODUCTION.

A. Introduce self and subject (Damage Control Markings).

B. Arouse interest.

1. We spend a great part of our lives traveling from one place to another and we have many ways of determining our location. At sea, position is determined by latitude and longitude or bearing and distance from a known point. Ashore we use highways, street names, and numbers, house numbers, floor numbers in a building, etc.

2. We at sea spend much time going from one part of our ship to another. Although we know our way around the ship quite well, without a system of marking it would be quite difficult to direct someone else to a distant part of the ship. Also, without a marking system, it would be almost impossible to direct a person to a particular fire station, watertight door, or a remote-control valve. Steward department personnel, particularly, must know how to direct passengers to their staterooms and to various locations about the ship.

3. Therefore, a system of marking has been devised which permits you to quickly and accurately direct someone to any part of the ship. It permits pinpointing damage so that action can be taken quickly to control and repair it.

4. In this discussion we will learn how to use the MSTS system of marking which will enable us to:

a. Find our way about the ship quickly and to locate damage control fittings and equipment readily.

b. Report accurately the location of fire and other damage.

c. Isolate and control fire and other damage without delay.

5. The ability of all-hands to quickly and accurately report and control casualties may result in the saving of your ship and many lives, including your own.

6. Standardization in marking provides a method of rapidly locating compartments and equipment. This is the basis for effective damage control.

IV. PRESENTATION. Damage Control Markings.

A. Purpose of Markings. A uniform system of marking, identifying

and locating decks, compartments, equipment, and fittings is essential to effective damage control. Therefore MSTS has adopted a standard marking system patterned after the Navy system but adapted to merchant ships and Coast Guard requirements.

1. Label plates are installed which clearly identify the location and purpose of each compartment and provide a permanent marking which does not require painting. These label plates identify all spaces such as machinery spaces; berthing, messing and lounging spaces (as LOUNGE); offices (as PURSER'S OFFICE); ship control spaces (as WHEELHOUSE or WLHS); storerooms (as ABC LOCKER or ABC LKR); sanitary spaces (as CREW'S SHOWER or CR SH); and tanks (such as SETTLING TANK or SET TK). These compartment names and abbreviations are standardized in MSTS ships.

2. Label plates also readily identify all locations by deck, frame and side numbers, with an additional letter indicating the primary use of the compartment.

3. Zone areas, WT bulkheads, fire screen doors, fire extinguishers, and other damage control fittings are clearly identified and located by means of their label plates.

4. Various other safety and instructional label plates are used, such as identification of compartments which ladder trunks lead to, alarm bells, life preservers, boat stations, etc.

5. Label plates are used for markings to avoid their being painted over or the necessity of restenciling markings.

B. Marking System. The basis for the MSTS marking system is a group of three numbers separated by hyphens. (Refer to the "Know Your Ship" chart).

1. Deck Number. The first number of markings is the deck number. Decks are numbered 1 for the main deck (the highest deck extending from stem to stern), 2 for the next deck below the main deck, 3 for the third deck down, etc. "A" deck, "B" deck, etc. are no longer used. Decks above the main deck are called levels and are marked 01 for the first level above the main deck, 02 for the second level above the main deck, etc. (Refer to your ship's inboard profile chart to show arrangement of decks and levels).

2. Frame Number. The second number in all basic markings is the frame number. Frames are usually numbered from the bow, number one, to the stern although some ships (such as tankers) are numbered in reverse with the after frame as number one. Frames are the transverse "ribs" of a ship, generally spaced about 2 feet to 33" apart (8 feet in LSTs), depending upon the size of the ship. Frames are closer together


22
FSD 4-129-2
FIRE SCREEN DOOR

at the bow and stern. (Refer to your ship's inboard profile chart to show arrangement and numbering of frames).

3. Side Number. The third number of all basic markings is the side number. As in numbering of lifeboats and whistle signals for passing, side numbers are odd numbers for the starboard side and even numbers for the port side. Thus all fittings to starboard of the ship's centerline are numbered 1 and all fittings to port of the centerline are numbered 2. All fittings on the ship's centerline are numbered 0. Therefore, the third number of basic markings is the side number--1 for starboard, 2 for port, and 0 for centerline.

a. If two or more fittings or compartments have the same deck and frame number, they are numbered consecutively higher odd or even numbers from the centerline outward. Fittings or compartments on the same deck and frame will be numbered to starboard of the centerline 1, 3, 5, 7 etc. To port of the centerline, they would be numbered 2, 4, 6, 8 etc.

4. Prefix. Markings for fittings such as watertight doors, fire extinguishers, fire screen doors, etc. have identifying prefixes. Examples are: WTD 3-24-2, FSD 01-75-1, FE 1-134-0, FS 2-109-2 (fire station on 2nd deck, frame 109, port side), and FMCOV 3-120-1 which indicates a firemain cutout valve on the third deck, at frame 120, to starboard of the centerline.

5. Compartments. Compartment markings are similar to the general markings of deck, frame, and side numbers for fittings. However, they have the marking numbers followed by an additional capital letter that identifies the primary use of the compartment, such as:

A - for stowage spaces.

AA - for cargo holds.

C - for vital ship operating spaces, such as the wheelhouse.

E - for engineering spaces.

F - for fuel and lubricating oil compartments.

L - for living spaces.

Q - for spaces not otherwise covered, such as engineering spaces not normally manned, galley, laundry, offices, utility rooms, etc.

T - for vertical access trunks.

V - for void compartments, ballast tanks, cofferdams, etc.

W - for water tanks.

For example, 01-107-1-Q is the chief engineer's office on the 01 level, frame 107, starboard side, office space.

a. Compartment label plates are generally located over the door entering into the compartment. They combine the location or the door with the name of the compartment and its location and description. For example:

01-107-1
CHIEF ENGINEER'S SR
01-102-1-L

This door is located on the 01 level, at frame 107, starboard side of the centerline. The space it opens to is the chief engineer's stateroom, on the same 01 level extending forward to frame 102, starboard side, living space.

(1) If a compartment extends vertically through more than one deck, the deck number of the lower deck is used. For example, the label plate above a door in a passageway reads:

01-125-1
LADDER TRUNK
4-127-0-L

This ladder trunk leads from the 01 level, frame 125, starboard side, to the troop compartments on the 4th deck, with their forward bulkhead at frame 127, on the centerline. The door to this ladder trunk is marked FSD 01-125-1, indicating it is a fire screen door on the 01 level, at frame 125, starboard side. Another label plate near the overhead reads FR 125, indicating location of frame number 125. Another example is the label on FSD 01-128-0 inside the ladder trunk at MVZB 128 on the 01 level:

01-128-0
ENGINE ROOM
6-128-0-E

This indicates that the door leads into the engine room at the 01 level and that the engine room extends down to the 6th deck, with the forward bulkhead at frame 128, and that the engine room extends across the ship's centerline.

b. Compartments are numbered for the frame number at the foremost bulkhead. Thus the label plate on a door opening into the afterside of a compartment will bear the frame number of the door's

location and also the frame number of the compartment's forward bulkhead. This gives a ready indication of the size of the compartment. Label plates on doors opening into the side of a compartment will similarly indicate how far forward the compartment extends as well as whether it is on either side or on the centerline, or further. Doors on the forward side of compartments, however, will bear the same frame number as the forward side of the compartment and thus will not indicate its size.

c. If the ship's centerline passes through the compartment, its side number will be 0. Compartments to starboard of the centerline have odd side numbers, 1, 3, 5, 7, 9, etc. Compartments to port of the centerline have even numbers, 2, 4, 6, 8, 10, etc.

d. Passenger staterooms have an additional label plate located below the regular label plate. This additional plate has 3 or 4 numbers, depending upon the deck number. The first one or two numbers indicate the deck number and the last two numbers indicate the location of the stateroom. This label is for the convenience of passengers in readily locating their staterooms. Steward department personnel should explain this marking system to passengers. For example, 0102 is a stateroom on the 01 level, port side, first stateroom from the centerline. Staterooms to port and aft of this room are 0104, 0106, 0108, etc.

e. Ladder trunks have label plates on each deck at each of their doors indicating the decks and compartments to which they lead. For example, in the ladder trunk inside FSD 01-126-2, this label plate appears:

02 LEVEL
SHIP'S OFFICERS' SR
DAMAGE CONTROL LOCKER NO. 1
OFFICER'S BAGGAGE ROOM
01 LEVEL
SHIP'S OFFICERS' SR
MIL DEPT OFFICE
PASSENGERS' SR
SHIP'S OFFICERS' LOUNGE
CHIEF ENGINEERS' OFFICE
MAIN DECK
----------etc.
2nd DECK
----------etc.
3rd DECK
----------etc.
4th DECK
----------etc.

6. Other Markings. Other general markings are specified in marking instructions. These are for compliance with USCG regulations,

VENT FAN

SUPPLY 1-105-2

2-105-0-1
2-114-2-Q
3-105-1-1
3-105-2-1
4-110-0-E

VENT MARKINGS

safety, information or instructional purposes. Examples of such markings are:

a. Direction, embarkation and exit signs for passengers, as TO LIFEBOATS or TO BOAT STATIONS Nos. 2, 4, 6.

b. Bulkhead labels. These are generally combined with other markings but may have individual label plates. Examples are: MVZB 128, ZONE AREA 3, WTB.

c. Piping markings. All piping is marked with black stencilled letters to indicate its contents. Direction of flow is also indicated by arrows.

d. Fire systems. Fire extinguishing systems are marked in red letters as appropriate--AUTOMATIC SPRINKLING SYSTEM, CARBON DIOXIDE FIRE APPARATUS, STEAM FIRE APPARATUS, etc. Firemain cutout valves are marked FMCOV and the deck, frame and side number.

e. Operating wheels' handles and gear for the remote control of valves, WT doors and CO2 systems have plates on or near them showing their use, operating directions and indicators. Remote-control reach rods have labels indicating the system and compartment they serve, the location of the reach rod, and the location of the valve. For example:

BILGE SUCTION	REACH ROD 1-118-1
No. 5 HOLD	VALVE 6-102-1

This indicates a bilge suction remote-control reach rod located at 1-118-1, which operates the bilge suction valve located at 6-102-1 for No. 5 hold.

f. Ventilation, heating and air conditioning systems have labels on their major components, such as controls, supply or exhaust, WT closures, weather openings, compartments served, ventilating fans and fire dampers. For example:

AUTO FIRE DAMPER 1-118-2
Sup. Sys. 02-141-1

This is a fusible link automatic fire damper at 1-118-2 serving supply system 02-141-1. Manual fire dampers passing through MVZB also show open and closed positions.

VENT FAN	2-28-2
CONTROLLER	2-36-2
SUPPLY	1-18-2-L, 3-14-2A, 3-18-2A, 3-19-2A, 2-25-2L.

This fan is on the 2nd deck, frame 28, port side, and supplies air to the compartments listed. Its controller and push button have identical labels.

g. Repair lockers (damage control lockers) are marked REPAIR LOCKER No. 1 or No. 2 in red letters and have the inside of the locker doors painted international orange. Damage control equipment is also painted orange, with one black stripe for repair No. 1 equipment and two black stripes for repair No. 2 equipment. Ships with only one repair locker mark equipment with one stripe.

h. Emergency lights are marked with a red "E".

i. Patrol clock stations are marked as KEY STA No. 6, ROUTE A.

j. Lockers containing oxygen breathing apparatus or gas masks are marked OBA or GAS MASK, with the number of masks in the locker.

k. Decontamination stations are numbered from forward to aft and their routes are marked with red arrows with "D's".

l. The locations for securing sea painters are marked, as SEA PAINTER No. 6 & No. 6A BOATS.

m. Lifeboats and boat stations are marked in accordance with USCG regulations. Boats are numbered from forward to aft, odd numbers on the starboard side and even numbers on the port side. The boat nested under No. 3 is numbered 3A. Lifeboat release levers are painted red, with white bands and raised letters "DANGER-LEVER RELEASES HOOKS." In new boats, the release lever is marked "DANGER-LEVER DROPS BOAT."

n. Emergency steering gear changeover instructions are posted in the steering engine room.

o. Safety and other markings are as required by USCG and operating practices. These include propeller warning notice, passenger warning plates and signs such as on doors "CAUTION-DON'T LET DOOR CLOSE ON HANDS". Others are general alarm bells, carbon dioxide alarm, manual fire alarm break-glass boxes, fire detecting and alarm stations, life-jacket stowage, etc.

p. Decals are used for specified warning signs such as smoke signals, wear safety goggles, keep off, no smoking, or open lights, danger-high voltage, etc.

q. Label plates are as prescribed in marking instruction,

which specify their size, color and location. Standard names and abbreviations are used throughout.

V. SUMMARY.

A. Purpose. The MSTS marking system is standard in all ships. It provides a ready means of locating any fitting, compartment or location in the ship and of finding your way from one place to another. While the former method of "A, B, and C decks" served well, it did not pinpoint a location without identification near some known spot such as "the crew's day room". Further, it was confusing because A-deck was not always the main deck or the same deck in all ships.

B. Marking System. Under the present marking system, you can board any MSTS civil-service-manned ship and find your way around simply by deck, frame and side number. You can look up your fire station, as FE 2-150-1 and know that it is on the 2nd deck, the deck below the main deck, at frame 150, starboard side. If you learn these simple markings, you can get a great deal of information from a label plate such as:

01-138-2
PASSAGEWAY
01-125-1-L

You will know that this passageway is on the level (deck) above the main deck, at frame 138, port side and that the passageway leads through on the same deck to frame 125, that it crosses the ship's centerline and that it leads to living spaces. Learn and use these markings and you'll find them very handy. Basically they consist of just the deck-frame-and side number and are easy to remember.

C. Drill. Instructor should list representative fitting and compartment numbers on the blackboard and indicate the locations and purposes on the ship's profile chart.

VI. TEST AND APPLICATION.

A. Test. Use these and additional questions as an oral test.

1. Q. What is the main deck?
   A. The highest deck extending from stem to stern.

2. Q. What are levels; what is the 01 level?
   A. Levels are decks above the main deck; the 01 level is the first level above the main deck.

3. Q. What is the number of the 2nd deck below the main deck?
   A. 3rd deck.

4. Q. What is the basis for the MSTS marking system?
A. Identification of locations by deck-frame-and side numbers, with an additional letter indicating the use of compartments.

5. Q. Refer to our ship's plans or station bill and determine the highest frame number in this ship.
A. Depends upon the ship, in P-2s about 230.

6. Q. How are side numbers indicated in markings?
A. 1 indicates locations to starboard of the centerline, 2 is for locations to port, and 0 is locations on the centerline or with the centerline passing through them.

7. Q. How is the primary use of compartments indicated in compartment label plates?
A. By a capital letter which is the fourth and last part of the compartment number. A is stowage space, E is for machinery spaces, L is for living spaces, Q is for galleys, laundries, offices, shops, utility rooms, etc.

8. Q. What and where is:

a. FS 1-183-1
b. FS 1-214-2
c. FS 4-82-1
d. FE 4-63-2

A. a. Fire station, main deck, frame 183, starboard side.
b. Fire station, main deck, frame 214, port side.
c. Fire station, 4th deck, frame 82, starboard side.
d. Fire extinguisher, 4th deck, frame 63, port side.

9. Q. What and where is:

a. WTD 4-60-1
b. WT. BHD. 76, ZONE AREA No. 2
c. MVZB 60
d. FSD 01-125-3

A. a. Watertight door, 4th deck, frame 60, starboard.
b. Watertight bulkhead at frame 76, in zone area 2.
c. Main vertical zone bulkhead at frame 60.
d. Fire screen door, 01 level, frame 125, starboard side. Note that the "3" indicates it is the second door outboard from the centerline on the starboard side. The first door from the centerline would be numbered 1.

10. Q. What do the following labels indicate:

a. 2-27-2
REMOTE CONTROL
4-27-2
b. 3-99-2
ENGINE ROOM
6-98-0-E
c. 2-110-2
REMOTE CONTROL
WTD 6-112-1
d. 1-147-1
SALOON PANTRY
1-136-0-Q
e. 4-60-1
TROOP BERTHING
4-42-0
f. 1-181-1
LADDER TRUNK
5-182-0-L
g. 1-206-2
FAN ROOM
1-206-0-Q

A. a. Probably a scupper valve with remote control on the 2nd deck, frame 27, port side, operating the valve which is located on the 4th deck, frame 27, port side.

b. An entrance to the engine room on the 3rd deck, frame 99, port side. The engine room extends down to the 6th deck, with its forward bulkhead at frame 98; the compartment crosses the centerline and is engineering space.

c. Remote control located on the second deck, at frame 110, port side, for the WT door which is on the 6th deck, at frame 112, starboard side.

d. Entrance to pantry on main deck, at frame 147, starboard side. Pantry is on the same deck, extending forward to frame 136 and also across the centerline. Q indicates galleys, pantries, shops and utility spaces.

e. Entrance on 4th deck, at frame 60, starboard side, to troop berthing compartment on the same deck, extending to frame 42 and crossing the centerline.

f. Ladder trunk on main deck, frame 181, starboard side, extending down to the 5th deck, with forward bulkhead at frame 182; the compartment crosses the centerline and is living space.

g. Entrance on main deck, at frame 206, port side,

to the fan room which is on the same deck with its forward bulkhead at frame 206. The compartment extends across the centerline and is a utility space.

B. Application. The instructor should take the group on a tour of the ship, pointing out label plates and markings and asking individuals to explain their purpose, location and meaning.

VII. HANDOUT---COMPARTMENT NUMBERING.

COMPARTMENTS	Each compartment number has four parts separated by hyphens, as 02-91-3-C and 6-40-0-AA. The first part is the deck number. The second part is the frame number at the forward bulkhead of the compartment. The third part indicates where the compartment is in relation to the centerline. The fourth part indicates the usage of the compartment.
DECKS	The first part of compartment markings is the deck number. The main deck is numbered 1. As you go down from the main deck, decks are numbered 2, 3, 4, etc. As you go up from the main deck, they are termed levels and numbered 01, 02, 03, etc. in order.
FRAMES	The second part of compartment markings is the frame number. Frames are usually numbered from 0 at the bow toward the stern. The first frame at the bow is numbered 1, the next 2, etc. up to about 230 in a P-2. Spacing and number of frames vary in different ships.
SIDE NUMBER	The third part of compartment markings indicates where the compartment is in relation to the centerline. If the centerline passes through the compartment, the third part is 0. Compartments completely to starboard of the centerline have odd numbers. Compartments completely to port of the centerline have even numbers. Where two or more compartments have the same deck and frame numbers and are entirely to starboard or entirely to port of the centerline they have consecutively higher odd or even numbers, as the case may be, numbering from the centerline outboard. Where the centerline passes through more than one compartment with the same deck and frame numbers, the compartment having that part of the forward bulkhead through which the centerline passes will have the number 0. The other compartments will be numbered 01, 03, 05, etc. if to starboard and 02, 04, 06, etc. if to port.

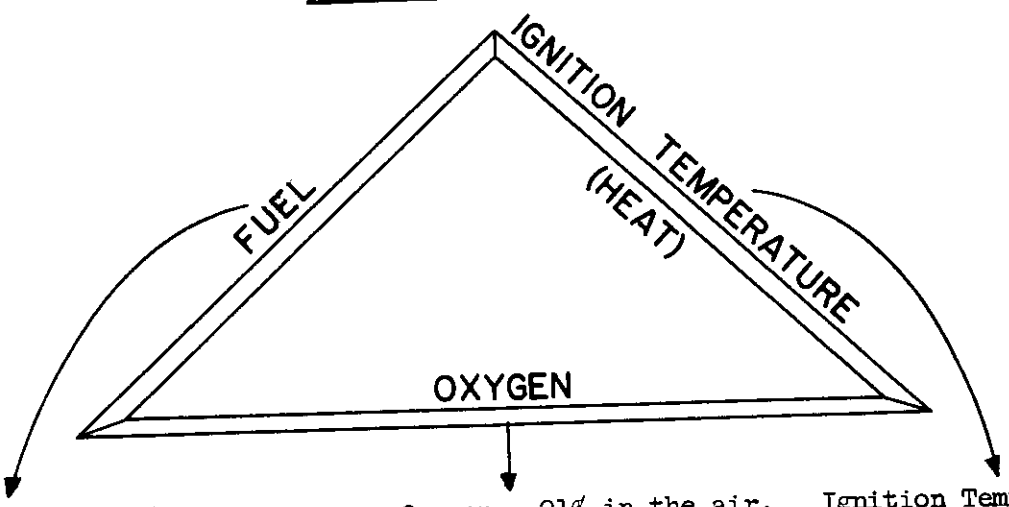
COMPARTMENT USAGE

The fourth part of compartment markings is a capital letter which indicates the primary use of the compartment:

A - Stowage (storerooms, reefer boxes, issue room, lockers).
AA - Cargo holds.
C - Control Spaces (radio, radar, crypto rooms, IC room, wheelhouse).
E - Engineering spaces which are normally manned.
F - Oil.
FF - Cargo Oil.
G - Gasoline.
K - Hazardous Storage.
L - Living. (cabins, heads, showers, lounges, passageways, messrooms).
M - Ammunition.
Q - Shops, office, laundry, galley, pantry and engineering and electrical spaces not normally manned.
T - Vertical access trunks.
V - Voids.
W - Water.

VII. HANDOUT.

THE FIRE TRIANGLE



Fuel (vapor) - any material that will produce a flame or burn.

To eliminate this leg - remove the fuel or let it burn itself out.

Oxygen - 21% in the air.

To eliminate this leg - smother fire with foam, CO_2, or dry chemical.

Ignition Temperature (Heat)

Transmission of heat by:
Radiation - heat radiated in all directions.
Conduction - heat transmitted through liquid or gases.

To eliminate this leg - cool or quench fire with water.

The three elements in contact in proper proportion to form the fire triangle, will result in a fire. Since all these three elements are required to support a combustion condition, the removal of any one element will destroy the combustion condition.
NOTE: These principles will be applied in later subjects.

CHAPTER 2

BASIC DAMAGE CONTROL - For All Hands (Lesson Plans)

Section 2.4

CHEMISTRY OF FIRE

I. OBJECTIVES.

A. To present the fundamentals of the chemistry of fire.

B. To develop the basic understanding necessary for effective prevention and control of fire.

II. MATERIAL.

A. Training Aids.

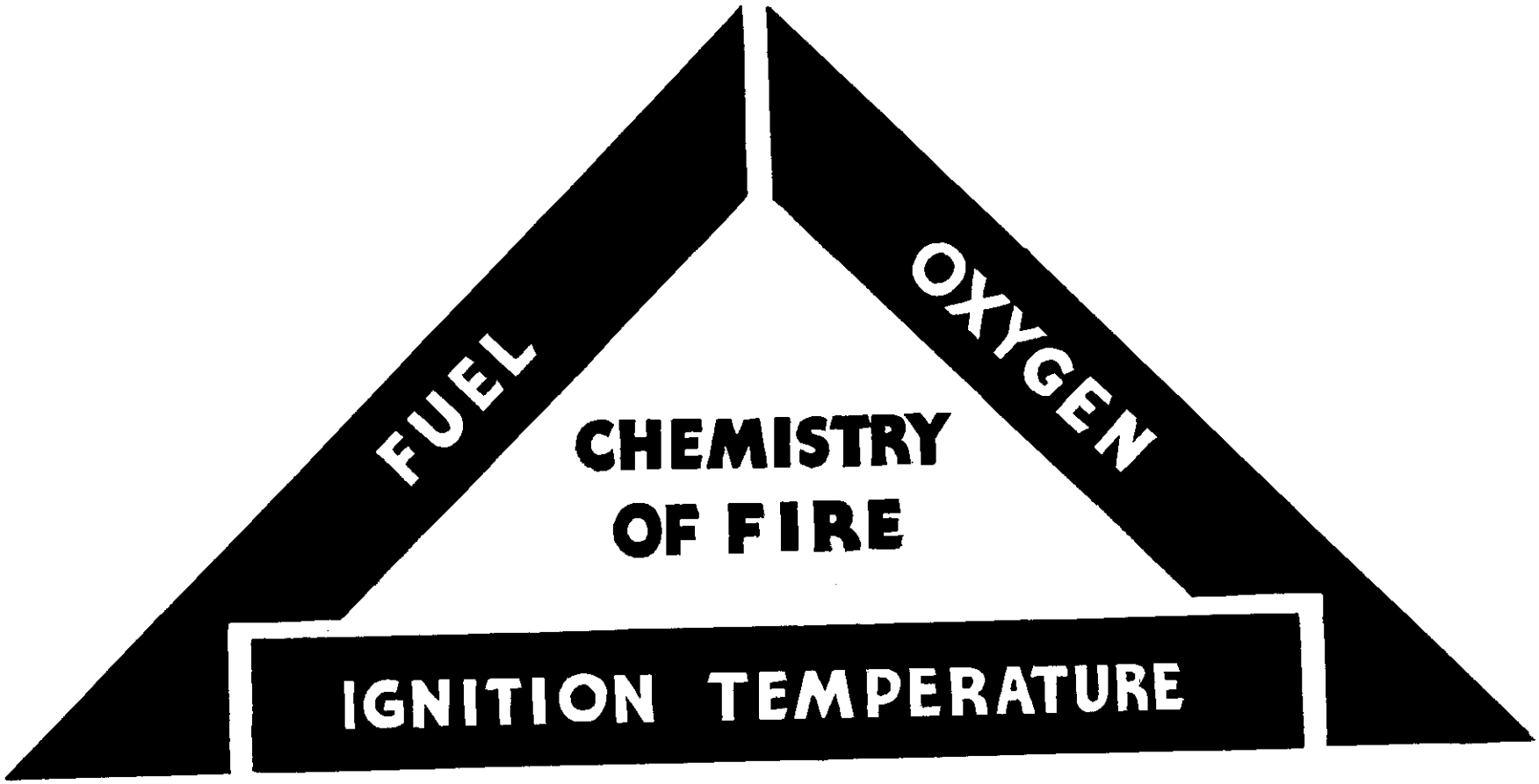
1. Film MN-61A, "Chemistry of Fire" (45 minutes) or MN-8330A, "Fire Prevention - The Nature of Fire" (14 minutes).

2. Charts or blackboard drawings - "The Fire Triangle".

B. References.

1. BUSHIPS Manual, Chapter 93, page 1-4.

2. Damage Controlman 1 & Chief, NAVPERS 10572.


FUEL
OXYGEN
CHEMISTRY
OF FIRE
IGNITION TEMPERATURE

III. INTRODUCTION.

A. Introduce self and subject (Chemistry of Fire).

B. Arouse interest by demonstration and questions. Light a candle, pinch out the flame, and relight the vapors.

1. Why does this happen?

2. Why does the candle burn?

3. In how many ways can we extinguish this burning candle?

4. What is necessary for burning (combustion) to take place?

5. Let's find out.

IV. PRESENTATION.

A. We will discuss the elements of fire and heat transmission, see and discuss a film on the chemistry of fire, and then check our understanding of why things burn. Later we will see how these principles are used in controlling and extinguishing fires.

B. Definition of Terms.

1. Burning - to unite chemically with oxygen (gas in air) so rapidly as to produce heat and light.

2. Flame - a stream of vapor or gas made luminous by heat.

3. Combustion - the continuous combination of a substance with oxygen, accompanied by heat and light.

4. Heat - a form of energy generated by transformation of some other form of energy, as in combustion or burning.

C. Fundamentals of the Chemistry of Fire.

1. The elements of fire are illustrated by the three legs of the fire triangle. (Show chart of fire triangle or draw it on the blackboard.)

a. Fuel is one leg of the fire triangle.

(1) Fuel is any material that will produce a flame or burn.

(2) The wood of a log in a fireplace does not actually burn.

(3) Instructor should light a candle, pinch out the flame and relight the vapors to demonstrate this.

(4) To eliminate this fuel leg of the fire triangle, remove the fuel or let it burn itself out.

b. Oxygen is another leg of the fire triangle.

(1) Air is a mixture of gases containing approximately 21% oxygen and 79% nitrogen.

(2) Pure oxygen will produce a much hotter flame (as in a cutting torch).

(3) Thermite, celluloid and gun powder contain their own oxygen.

(4) Instructor should demonstrate extinguishing a lighted candle by placing a glass over it; by exhaling on it.

(5) To eliminate the oxygen leg of the fire triangle, smother the fire by cutting off its oxygen supply or by applying foam, CO2, or dry chemical. CO2 is heavier than air and therefore displaces the air.

c. Ignition Temperature is the third leg of the fire triangle.

(1) Flash point. This is the temperature at which the material (fuel) will flash, but will not continue to burn.

(2) Fire point. This is the temperature at which the material will continue to burn steadily.

(3) Ignition point. This is the temperature at which the material will burn of its own accord without being ignited by some other source.

(4) Flash points and ignition points of different materials (fuels) vary.

2. Heat transmission. Heat can be transmitted in various ways, by:

a. Radiation which is heat radiated in all directions; no solid medium is required to radiate it, for example: The feeling of heat when standing near a fire; the warmth of the sun; the heat of a lighted candle.

b. Conduction which is heat transmitted through solids. For example: Fire transmits heat through a bulkhead to the other side. Demonstrate by heating one end of a metal rod with a candle and having someone hold the other end.

c. Convection which is heat transmitted through liquids or gases by setting up heat currents or motion. This is based on the principle that "hot air rises". For example: Gas or smoke is carried

through the natural exhaust ventilating system; updrafts, downdrafts, and winds are generated on the earth's surface by unequal heating of land and water areas.

d. Show either film listed as training aids.

e. Review key points of the film.

V. SUMMARY.

A. Review key points of the fire triangle:

1. Fuel (vapor).

a. Any material that will produce a flame or burn.
b. Remove fuel or let it burn itself out.

2. Oxygen.

a. Air contains approximately 21% oxygen and 79% nitrogen.
b. Remove oxygen by smothering agents.

3. Ignition temperature.

a. Heat.
b. Remove by cooling or quenching.

4. These three elements when mixed in the proper proportion will cause fire.

B. Review key points of heat transmission.

1. Radiation - heat radiated in all directions as evidenced by the feeling of heat when near a fire.

2. Conduction - heat transmitted through solids, as a bulkhead heated by fire transmits heat by conduction to the next compartment or to the other side.

3. Convection - heat transmitted through liquids and gases setting up currents.

a. Gas or smoke carried through exhaust or ventilating system.

b. Convection currents around a forest fire.

VI. TEST.

A. Use these and additional questions as an oral quiz.

1. Q. Name the three legs of the fire triangle.
A. Fuel, oxygen, ignition temperature (or required heat).

2. Q. By using water to extinguish burning wood, what leg of the fire triangle would be eliminated?
A. The ignition temperature or heat.

3. Q. What effect does CO2 have on the oxygen leg of the fire triangle?
A. CO2 smothers the fire by reducing or removing oxygen.

4. Q. Give a good example of heat transmission by conduction aboard a ship.
A. Some of the heat from a fire on one side of the bulkhead is transmitted through the bulkhead to the adjoining space on the other side.

5. Q. Give a good example of heat transmission by convection.
A. Fire in a paint locker or other area will cause hot gases to rise. This heat will cause the paint on the overhead to burst into flame.

CHAPTER 2

BASIC DAMAGE CONTROL - For All Hands (Lesson Plan)

Section 2.5

CLASSES OF FIRES

I. OBJECTIVES.

A. To acquaint all-hands with the importance of identifying classes of fires as an aid in extinguishing them.

B. To familiarize all-hands with classes of fires and how to use this information in taking prompt and proper damage control action.

II. MATERIAL.

A. Obtain the illustrations listed below from your Training Division, or reproduce them from the illustrations in this section.

1. Classes of Fires.

2. Meaning of Terms used for Classes of Fire.

3. Basic Principles for Extinguishing Class A, Rubbish or Trash Fires.

4. Basic Principles for Extinguishing Class B, Oil Fires.

5. Basic Principles for Extinguishing Class C, Electrical Fires.

COMSTSINST 3541.5A
18 December 1958

B. References.

1. BUSHIPS Manual, Chapter 93, "Fire Fighting - Ship".

2. "U. S. Navy Safety Precautions", OPNAV 34P1.

3. "Explosives or Other Dangerous Articles on Board Vessels", CG-187.

III. INTRODUCTION.

A. Introduce self and subject, Classes (or types) of Fires.

B. State the objectives of this session.

C. Outline the scope of this discussion as follows:

1. To explain the importance of knowing classes, or types of fires.

2. To learn the classes of fires.

3. To show how fire classification is used in fighting fires afloat.

4. To present methods of extinguishing fires of multiple classes (combined classes or types of fires).

D. Arouse general interest. Before World War II and during early periods of that war, fire fighting was a hit-or-miss proposition in many cases. Since straight-stream fire nozzles and steam smothering systems were the primary fire defense, the success of the fire fighter depended on the type of fire he was fighting. The limitations in equipment proved costly when fires refused to confine themselves to certain types.

E. Develop personal interest. There are various classes of fires and each must be handled differently. Most of you already know that you might be electrocuted if you tried to put out an electrical fire with a stream of water, or that a stream of water will only agitate an oil fire, or that a carbon tetrachloride extinguisher discharged in a confined space might kill you. This lesson will benefit you in several ways:

1. What you learn here may some day save a life, possibly your own, because almost everybody has to fight fires some time. Knowing how to do it safely can be very important to you.

CLASSES OF FIRES

FIRES ARE CLASSIFIED INTO THREE BASIC TYPES

CLASS A - RUBBISH OR TRASH FIRES

CLASS B - OIL FIRES

CLASS C - ELECTRICAL FIRES

NOTE: RUBBISH AND OIL FIRES DESCRIBE THE FUEL SOURCE. ELECTRICAL FIRES OCCUR IN, OR NEAR, LIVE ELECTRICAL EQUIPMENT.

2. This knowledge should give you the confidence you'll need to fight fires with caution but without fear.

IV. PRESENTATION.

A. Classes of Fires. Show illustration, "Classes of Fires," and read it slowly. Invite questions and explain that the letters A, B, and C describe classes of fires. Names are also used for clarity, as an "oil" fire in addition to a "class B" fire. Emphasize note on the illustration relative to fuel source. Fires are classified so that:

1. Anyone can quickly and accurately report the type of fire without need for translation.

2. Knowing the type of fire, fire fighters can use the safest and most effective methods of extinguishing it.

B. Terms used for Classes of Fires. Show illustration, "Meaning of Terms used for Classes of Fires."

1. Explain Class A, rubbish or trash fires, and give several examples of rubbish, such as paper, wool, cotton, rags, wood, etc.

2. Explain Class B, oil fires, and suggest alcohol as a product which burns so much like oil that it must be extinguished in the same way.

3. Explain Class C, electrical fires. Point out how burning rubbish or oil could be considered electrical fires if located near live electrical equipment.

C. Extinguishing Class A, Rubbish Fires. Show illustration, "Basic Principles for Extinguishing Rubbish or Trash Fires."

1. Explain item 1, relative to removal of the "heat" leg from the fire triangle. Draw the fire triangle on the board, review the fire triangle of heat, fuel and oxygen and how a fire can be put out by removing any one of these items or sides of the triangle. Amplify item 1 by stating that cooling methods are used on rubbish fires because the irregular surfaces and depth of heat defies smothering by foam, CO_2 gas, or chemical extingushers. Also, water must be used to soak smouldering materials. These should be broken up before soaking in buckets of water, in sinks, or by wetting down.

2. Explain item 2 on the chart by relating it to the fire triangle and showing that the fire can be put out by removal of the fuel leg, or by reduction of its volume.

MEANING OF TERMS USED FOR CLASSES OF FIRE

CLASS A - RUBBISH OR TRASH FIRES USE AS FUEL SOURCE ALL MATERIALS EXCEPT:

a. Petroleum liquids

b. Combustible gases, both petroleum and chemical

c. Electrical appliances installed or connected to a power source

CLASS B - OIL FIRES USE AS A FUEL SOURCE: SOLIDS, SEMI-SOLIDS, AND LIQUIDS. THESE LIQUIDS USUALLY HAVE A PETROLEUM BASE OR BURNING CHARACTERISTICS OF AN OIL PRODUCT.

CLASS C - ELECTRICAL FIRES ARE FIRES IN, OR NEAR, LIVE ELECTRICAL APPLIANCES. THEIR AREA EXTENDS TO A POINT WHERE DANGER OF ELECTRICAL SHOCK NO LONGER EXISTS.

BASIC PRINCIPLES FOR EXTINGUISHING CLASS A, RUBBISH OR TRASH FIRES

1. REMONE "HEAT" LEG FROM THE FIRE TRIANGLE.

   Do this by cooling with water or water fog and soaking smouldering materials in water before disposal. This will prevent flare-back.

2. REDUCE CAPACITY OR VOLUME OF THE "FUEL" LEG OF THE FIRE TRIANGLE.

   Do this by removing flammobles from the fire areo ond from bulkheods and overhead surrounding the orea.

BASIC PRINCIPLES FOR EXTINGUISHING CLASS B OIL FIRES

1. REMOVE "OXYGEN" LEG FROM THE FIRE TRIANGLE.

   Do this by:

   a. smothering fire with thick layer of foam, or

   b. smothering fire by displacing oxygen with a blanket of carbon dioxide (CO_2) gas.

2. REMOVE "HEAT" LEG FROM THE FIRE TRIANGLE.

   Do this with low-pressure water fog from applicators attached to all-purpose nozzles.

3. REDUCE "FUEL" LEG OF THE FIRE TRIANGLE, IF PRACTICABLE.

   Do this by pumping cooler under-layers of oil into separate tanks, in which (CO_2) or other ready fire extinguishing equipment exists.

D. Extinguishing Class B Oil Fires. Show illustration "Basic Principles for Extinguishing Class B Oil Fires." Oil fires are extinguished by removing either the "oxygen" or "heat" leg of the fire triangle.

1. Mention that 6" of foam is usually enough to smother oil fires.

2. Show why different quantities of CO2 may have to be used to extinguish oil fires.

a. 25% by volume of CO2 gas is sufficient to extinguish a fire in an airtight compartment.

b. 100% may be necessary in an engine room or other space where all ventilation cannot be secured promptly.

3. Explain that cooling procedures can be used on oil fires when the cooling agent (water) is used as a fine spray or water fog. Solid streams of water merely spread and intensify oil fires and should never be used.

E. Extinguishing Class C Electrical Fires. Show illustration, "Basic Principles for Extinguishing Class C Electrical Fires."

1. Shut off the electricity, if possible.

2. Explain that CO2 gas or dry chemicals are non-conductors of electricity and are therefore safe to use on or near live electrical equipment.

3. Emphasize and re-emphasize the danger in using straight streams of water or foam on electrical fires.

F. Methods of Fighting Multiple-class Fires.

1. Class A and C rubbish/electrical fires.

a. Shut off the electricity, if possible, and extinguish as a rubbish fire by cooling with water or water fog.

b. If above cannot be done, try to extinguish fire near electrical equipment with CO2 or dry chemical extinguishers. With OBA on and fire axe, attempt to break up rubbish and try to remove to a safe area for cooling. However, general understanding of your shipboard electrical systems will place you in a position to fight the simple rubbish fires by cutting out dangerous electrical circuits first.

2. Class B and C oil/electrical fires.

BASIC PRINCIPLE FOR EXTINGUISHING CLASS C ELECTRICAL FIRES

REMOVE "OXYGEN" LEG FROM FIRE TRIANGLE.

Do this by smothering fire with carbon dioxide (CO_2) gas.

SAFETY PRECAUTION: NEVER USE WATER, WATER FOG, OR FOAM ON ELECTRICAL FIRES BECAUSE ANY HEAVY CONCENTRATION OF WATER, AND MOST LIQUIDS, WILL CONDUCT ELECTRICITY.

a. Shut off electricity, if possible, and extinguish as an oil fire.

b. If not possible to secure the electricity, smother the fire with CO2 or dry chemical extinguishers.

3. Class A, B, and C Rubbish/Oil/Electrical Fires.

a. Shut off the electricity, if possible.

b. Fight fire with low-velocity fog applicators.

G. "How to Classify Fires: - (Handout). Distribute and explain to group that the handout summarizes the lesson.

V. SUMMARY. Review key points in the handout. Explain that classes of fires were designated A, B, and C by portable extinguisher manufacturers and that these classes were adopted for industry use. For awhile MSTS procedure was to designate fires and report them as rubbish, oil, or electrical fires on the basis that it was best to call a spade a spade. However, the Class A, B, C designation was so commonly used that MSTS returned to use of A,B, and C class fires. However, it is best to report fires in both ways. For example:

Class A, trash (or bedding) fire.
Class B, oil (or paint) fire.
Class C, electrical fire.

VI. TEST

A. Use these and additional questions as an oral quiz.

1. Q. Why are fires classified?
A. To insure safe, effective methods for reporting and extinguishing fires.

2. Q. Name the three classes of fires.
A. Class A - rubbish, Class B - oil, and Class C - electrical fires.

3. Q. A class A rubbish fire is extinguished under what principle?
A. Under the principle of cooling.

4. Q. An class B oil fire is extinguished under what principle?
A. By cooling with low-velocity water fog and smothering with foam, CO2 gas, or dry chemical extinguishers.

5. Q. With what do you extinguish class C electrical fire?
A. Only with CO2 or dry chemical extinguishers.

6. Q. Suppose you saw a fire in a waste paper basket, what class of fire would it be?
A. Probably a class A rubbish fire.

7. Q. If you had a fire in the bilges, what class of fire would it probably be?
A. A class B oil fire.

8. Q. Give examples of class C electrical fires. Where could electrical fires occur aboard ship?
A. Electrical fires could occur in the main distribution board, in the emergency board, in the supply or exhaust fans, in the motor generator room, in the windlass control room, in the steering engine gyro controls, and in the power panels.

9. Q. What single type of extinguishing equipment could you use on a combination Class A and B, rubbish/oil fire?
A. Use firehose and low velocity water-fog applicator.

10. Q. What is the best way to handle a combination Class A and C, rubbish/electrical fire?
A. Secure the electricity and fight the fire only as a Class A rubbish fire.

11. Q. What single method would you use for extinguishing a combination Class B and C, oil/electrical fire?
A. CO2 or dry chemical extinguishers.

B. Application. Have crew members:

1. Identify and simulate reporting the various classes of fires.

2. State how they would extinguish each class of fire.

3. Demonstrate how they would utilize each type of extinguisher.

NOTE: Dry-runs will be appropriate-extinguishers need not be discharged although they may be discharged for practical demonstration purposes if desired.

VII. HANDOUT. How to classify fires.

A. Purpose of Fire Classification. Fires are classified so that the firefighter will have prompt, safe and effective methods for reporting and firefighting.

B. Classes of Fires are:

1. Class A - Rubbish or Trash Fires, describes the fuel source of the fire. Rubbish or trash includes most ordinary flammable materials such as wood, cotton, wool, paper, leather, and similar products.

2. Class B - Oil Fires, a term used to describe the fuel source or oil-type, burning characteristics of the fuel. Oil includes various solids, semi-solids, and liquids which usually have a petroleum base. However, some liquids derived from chemical processes, such as alcohol, have burning characteristics so much like oils that they must be fought in the same way.

3. Class C - Electrical Fires, a term used to describe either the heat source of the fire or the proximity of live electrical equipment.

NOTE: Most combustible gases and nitrate products, such as gunpowder, burn so rapidly that they cannot be treated as a source of fuel. For practical purposes in fire fighting, they are considered as the heat source since the damage caused by these explosive substances is often fought in terms of one or more of the above clases of fire. However, when slower burning gases, such as acetylene, are extinguished, CO2 is used as the extinguishing agent.

C. Basic Principles for Extinguishing each Class of Fire:

1. Class A - Rubbish Fires are extinguished by removing the "heat" leg from the fire triangle and reducing the "fuel" leg as much as possible.

a. Remove the "heat" leg by cooling the fire with water or water-fog.

b. Reduce the "fuel" leg by removing flamables from the fire area, from bulkheads surrounding the area, and from the overhead above the area.

c. Cool smouldering materials by soaking in or with water to prevent flare-up from further accumulation of heat.

2. Class B - Oil Fires are extinguished by:

a. Removing the "oxygen" or "heat" legs of the fire triangle.

(1) Smothering the fire with not less than a 6" layer of solid foam.

(2) Smothering the fire with not less than 25% CO2 by volume of a completely airtight compartment or up to 100% in compartments (such as engine rooms) in which some loss of gas may be expected.

(3) Using dry chemical extinguishers where available.

(4) Cooling the fire below its ignition point with water-fog from low velocity applicators.

b. Remove the fuel leg by pumping the cool underlayers of the fuel into separate, CO2 protected, tanks in cases where other fire fighting equipment fails or cannot be brought to effective use.

3. Class C - Electrical Fires are extinguished only by CO2 or dry chemical extinguishers because danger of electric shock exists when foam or water is used. CO2 extinguishes electrical fires by smothering (removing the "oxygen" leg from the fire triangle).

D. Examples of Typical Single-class Fires:

1. Class A Rubbish or Trash Fire. Passenger drops burning cigarette into waste paper basket; no live electrical applicances are nereby.

2. Class B - Oil Fire. Deep fat fryer on galley stove ignites; no live electrical appliances are nearby.

3. Class C - Electrical Fire. Short circuit in panel of main distribution board in engine room causes fire to ignite flammables near the board.

E. Examples of Multiple-class Fires and Required Action:

1. Class A and B - Rubbish/Oil Fire. Oil spill from after emergency diesel pump catches fire and flows into laundry, igniting clothing. Priority of extinguishing methods is:

a. Extinguish by cooling with low-velocity fog from applicators.

b. Use CO2 or foam to smother oil fuel, and saturate bulk materials with water or water-fog.

2. Class A and C - Rubbish/Electrical Fire. Arc from an electrical connection ignites a bundle of rags. Priority of extinguishing methods is:

a. Disconnect electrical plug and fight fire as a rubbish fire.

b. Reduce the volume of fire with CO2 and, with OBA and fire axe, break up smouldering rubbish and isolate for extinguishment by cooling.

NOTE: By proper knowledge of your shipboard electrical systems, most compartments can be de-energized within a few minutes. After complete de-energization, fires are no longer electrical.

3. Class B and C - Oil/Electrical Fire. Heavy short in main distribution board ignites oil in engine room. Priority of extinguishing methods is:

a. Cut off electricity to distribution board, if possible.

NOTE: Any heavy short or hot fire will automatically trip the circuit breaker on the distribution panel.

b. Smother oil with CO2 from hose-reel, if possible. Dry chemical extinguishers are also appropriate, if available.

c. Smother oil with foam, being careful to cascade it down bulkheads bare of live electrical appliances, and then fight electrical area of fire with CO2. Dry chemical extinguishers, where available, are also appropriate.

NOTE: If all classes of fires are combined, start extinguishing with CO2, or dry chemical extinguishers, followed by application of low-velocity water-fog from applicators.

*CAUTION: Petroleum products are dangerous because of the explosion hazard in explosive vapor-air mixtures above the petroleum or in tanks or containers from which petroleum products have been emptied. This hazard can be controlled by ventilation since the explosive range is very small -- from 1.4 to 6 percent for gasoline vapors. This means that above or below this range the mixture will be too rich or too lean to explode -- 98.6 to 94 percent of air is necessary for an explosion in gasoline. However, new types of explosion hazards are arising from the much wider explosive ranges, from the instability, and from the reactivity of the many new chemicals now being transported. For some of these new chemicals, air is no longer required for explosion and therefore the simple traditional fire triangle of fuel, heat, and oxygen no longer applies. For example, ethylene oxide has an explosive range of 3 to 100 percent and requires no air - thus the explosion hazard exists at all times.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