PROCEEDINGS
OF THE MARINE SAFETY COUNCIL

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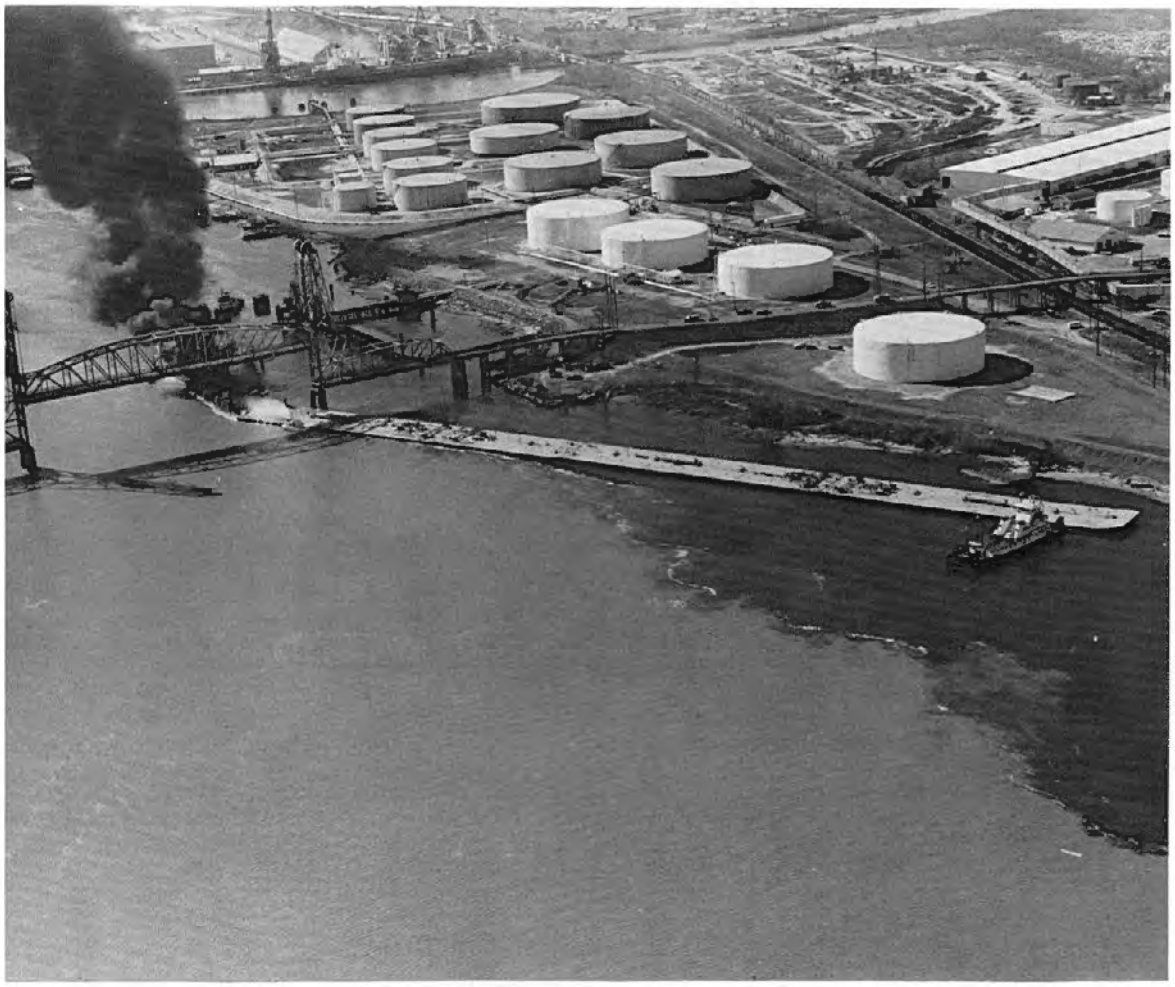

U.S. Department of Transportation

United States Coast Guard

PROCEEDINGS

OF THE MARINE SAFETY COUNCIL

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On February 5, 1977 a [illegible]-carrying lead barge, PATCO 202, collided with the Cochrane Bridge in the Mobile River. The ensuing fire and explosion posed a threat to the safety of shore facilities, as well as to the bridge and barge. Oil storage tanks along one side of the river and a paper plant on the opposite side were prime targets for a potential disaster. Fortunately, damage was limited to the bridge and barge and no one was injured.

As fire prevention receives special attention each October, this issue of the Proceedings emphasizes fire safety--especially at sea. You will find several articles containing fire safety information. It is, however, a subject deserving awareness every month of the year!

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THIS COPY FOR NOT LESS THAN 20 READERS— PLEASE PASS IT ALONG

Fire Prevention Week, 1978

The following Presidential Proclamation appeared in the Federal Register, Vol. 43, No. 155 on Thursday, August 10, 1978.

* * * *

Fire causes more loss of life and property in the United States than all other natural disasters combined. In the home, fire is the second most frequent cause of accidental death. Volunteer and professional firefighters bear a disproportionate burden of the human costs of fire; firefighting is still America's most hazardous profession.

Every year in this decade 7,500 U.S. citizens have died, 310,000 have been injured and more than $4 billion worth of personal property has been destroyed. America's fire incidents, casualties, and dollar loss per capita are among the very highest in the industrialized world.

As evidence of my strong personal concern about our fire problem, I have proposed a reorganization plan that would put the federal government's principal fire programs in a new Federal Emergency Management Agency. This agency would coordinate America's disaster preparedness, mitigation and response efforts. But the federal government cannot reduce America's fire losses by itself. The public and private sector--all individuals, organizations and governmental entities--must help. Together we can eliminate this unnecessary life-threatening destruction.

NOW, THEREFORE, I, JIMMY CARTER, President of the United States of America, do hereby designate October 8-14, 1978, as Fire Prevention Week.

Because fire deaths most often occur in homes, I call upon American families and other property owners to install smoke detectors, to practice exit drills, and to be especially vigilant in guarding against fires caused by cooking and fires caused by smoking materials, which cause the greatest number of fires and greatest proportion of losses in homes.

I support and encourage the cooperative efforts of private enterprise and government in developing low cost residential sprinkler systems and I urge commercial and government property owners to install sprinklers in both new and older buildings, especially those buildings in which large numbers of people gather.

I urge all agencies of Federal, state and local government involved in the planning and implementation of programs directed to finding solutions to such national concerns as energy conservation, environmental protection, and economic well-being to fully consider the effects of their programs on the fire safety of the environment in which Americans live and work.

I encourage the fire service, police, prosecutors, the insurance industry, and government to work together to remove incentives for arson, and to improve arson detection and prosecution so that we can begin to eliminate this costly, often life-threatening crime.

I urge officials in private industry and in government who are responsible for using or regulating hazardous materials to seek and implement measures to significantly reduce the possibility of life loss in the event of manufacturing, transportation, or storage accidents and to assist the fire services in preparing for such disasters should they occur.

Finally, I call upon the members of the Joint Council of National Fire Service Organizations, the National Fire Protection Association, all other organizations concerned with fire safety, and the National Fire Prevention and Control Administration to provide the leadership, planning, and innovation necessary for an effective national fire prevention and control effort.

IN WITNESS WHEREOF, I have hereunto set my hand this eighth day of August, in the year of our Lord nineteen hundred seventy-eight, and of the Independence of the United States of America the two hundred and third.

(signed)
JIMMY CARTER

Coast Guard Implementation of Title I of the Ports and Waterways Safety Act

By Lieutenant Commander Edward H. Bonekemper III, USCG Assistant Chief, Port Safety Branch, U.S. Coast Guard Headquarters

(The opinions expressed in this article are solely those of the author and do not necessarily reflect those of the U.S. Department of Transportation or the U.S. Coast Guard.)

In 1972, the United States Congress passed a major piece of maritime legislation, the Ports and Waterways Safety Act (PWSA).[1] The major thrust of Title I of the PWSA is the promotion of safety and preservation of environmental quality in U.S. ports and waterways. This article discusses the manner in which the Coast Guard has implemented the powers delegated by this act.

Coast Guard District Commanders and Captains of the Port are responsible, through PWSA-delegated powers, to prevent loss of or damage to any vessel, bridge or other water or waterfront structure, and to prevent environmental damage to the navigable waters and the resources in those waters. These responsibilities are executed through five major processes:

(1) Vessel Traffic Services: establishment and operation of vessel traffic services in ports, harbors, and other congested waters.

(2) Vessel Traffic Management: control of vessel traffic in especially hazardous areas and during potentially dangerous circumstances (reduced visibility, bad weather, etc.).

(3) Waterfront Facilities Regulation: establishment of procedures for the handling of hazardous materials, and prescribing safety equipment requirements for vessels and waterfront structures.

(4) Safety Zones: establishing safety zones for the protection of vessels, waterfront structures, waters and shore areas.

(5) Waterfront Incident Investigations: investigation of waterfront incidents which threaten safety or the environment.

VESSEL TRAFFIC SERVICES (VTS)

The PWSA authorized the Coast Guard to establish, operate, and maintain vessel traffic services and systems for ports, harbors, and other waters subject to congested vessel traffic. As a result, mandatory and voluntary vessel traffic services have been established in several areas.

When the Coast Guard begins planning and installation of a VTS in an area, local maritime operators and interests are usually indifferent or opposed. However, once the VTS begins operations, the service being provided has been appreciated and support has grown. Vessel pilots have become one of the most cooperative local marine groups concerning VTS; this is evidenced by the high percentage of cooperation received in voluntary systems.

There are currently five vessel traffic services in operation pursuant to the authority granted in the PWSA. These are:

Houston-Galveston VTS, in operation since February 1975. This voluntary system incorporates an automated vessel reporting system, low light level television and radar coverage.

San Francisco VTS, the first U.S. VTS, operational since August 1972. This voluntary system is dependent on radar surveillance and a traffic separation scheme.

Puget Sound VTS, which became operational in September 1972. This is a mandatory VTS utilizing radar coverage of congested areas and a traffic separation scheme.[2]

Prince William Sound VTS was required by the Trans-Alaska Pipeline Authorization Act (Public Law 93-153). It is the second mandatory system and involves a traffic separation scheme, radar coverage, and nationally recommended tracks for offshore routing of Trans-Alaska Pipeline System tankers.[3]

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[1] 86 Statutes at Large 424, Public Law 92-390, 33 United States Code, Sections 1221-1227.
[2] Federal regulations requiring vessel compliance with the VTS are in 33 CFR Part 161, Subpart B.
[3] See footnote number 2.

New Orleans VTS, the most recent service, is a voluntary automated vessel movement reporting system.

Surveillance system expansions are planned for the vessel traffic services at Prince William Sound, Puget Sound, and New Orleans into areas not previously covered. A study is underway to determine whether a VTS is needed for the Intra-coastal Waterway in the vicinity of the Gulf of Mexico. New York VTS, incorporating an automated vessel movement reporting system, radar coverage, and low light level television, is scheduled to become operational in January 1979.

A 5-year VTS Research and Development Program is underway with completion planned for 1982 or 1983. System requirements are being stndied, in addition to equipment development and computer programming. This stndy should help reduce fntnre system costs and improve effectiveness and reliability.

VESSEL TRAFFIC MANAGEMENT

Title I of the PWSA increased the Coast Guard's authority to regulate vessel traffic.[4] This authority is delegated by the Secretary of Transportation through the Commandant of the Coast Gnard to be exercised by District Commanders, Captains of the Port, or their authorized representatives.[5] The Code of Federal Regulations validates their powers of:

"(1) Specifying times of vessel entry, movement, or departure to, from, within, or through ports, harbors, or other waters;

"(2) Establishing vessel traffic routing schemes;

ABOUT THE AUTHOR

LCDR Ed Bonekemper is a direct commission lawyer with more than 10 years of Coast Guard service. He holds a B.A. from Mnhlenberg, a J.D. from Yale, and an M.A. from Old Dominion University. At present, he is on an out-of-specialty tour as Assistant Chief of the Port Safety Branch in the Office of Marine Environment and Systems, Coast Guard Headquarters. He has served as both a law instructor and staff legal officer at the Coast Guard Academy.

LCDR Bonekemper recently served as Chairman of the Federal Bar Association's Council on the Federal Lawyer and Lawyer in Uniform Committee, and is a member of the American Bar Association's Standing Committee on Legal Assistance for Military Personnel.

"(3) Establishing vessel size and speed limitation and vessel operating conditions; and

"(4) Restricting vessel operation, in a hazardous area, or under hazardous conditions, to vessels which have particular operating characteristics and capabilities he considers necessary for safe operation under these circumstances."[6]

These powers are restricted, however, to application in an especially hazardous area or under hazardous circumstances. Compliance with directions and orders issued under these regulations is mandatory;[7] failure to obey such an order or direction could lead to fine or imprisonment.[8] Fortunately, violations are rare. In order to protect against abuse of the broad vessel traffic management authority granted to each District Commander and Captain of the Port, the Coast Guard has provided that orders or directions issued under this authority may be appealed.[9] In the event of an appeal, the decision of the Commandant is considered final--although independent review by a court is always a possibility.

An extremely valuable tool in the management of vessel traffic is the advance notice of vessel arrivals and departures, hazardous conditions and certain dangerous cargoes. For safety and environmental protection purposes, new advance notice regulations are being issned.[10] More notifications will be required, particularly concerning the movement of hazardous materials and the existence of hazardous conditions. A notice of proposed rulemaking to this effect was published in June 1978.

These vessel notifications are extremely important because they

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1 86 Statutes at Large 424, Public Law 92-390, 33 United States Code, Sections 1221-1227.
2 Federal regulations requiring vessel compliance with the VTS are in 33 CFR Part 161, Subpart B.
3 See footnote number 2.
4 Section 101(3) of Title I of the PWSA.
5 Cited in 49 CFR 1.46(n)(4) and 33 CFR 160.35.
6 33 CFR 160.35(b).
7 33 CFR 160.39.
8 33 USC 1226 and 1227.
9 33 CFR 160.45.
10 The current 33 CFR Part 124 Advance Notice Regulations under the Magnuson Act are being replaced hy new regulations in 33 CFR Part 161.

trigger Captain of the Port requests to the computerized Marine Safety Information System (MSIS) for an immediate printout of each incoming vessel's casualty, pollution and violation histories, and other pertinent data. Based upon this information, the Captain of the Port can make a well-informed decision whether to board and inspect a particular vessel.

A related regulations package published in April 1978 proposed that all oil tankers of 20,000 tons deadweight or more that call at U.S. ports report to the Coast Guard information concerning their owners and charterers. Also required would be all registered names by which the vessel has been known and the current nation of registry. This information would be retained in the MSIS for ready access by Captains of the Port.

WATERFRONT FACILITIES REGULATION

Title I of the PWSA authorizes the Coast Guard to prescribe minimum safety equipment requirements for waterfront structures.[11] This is to assure adequate protection from fire, explosion, natural disasters, and other serious accidents or casualties. District Commanders and Captains of the Port have authority under the PWSA, as delegated by the Commandaut, to direct the handling of dangerous substances on waterfront facilities in their areas--as long as their directions do not conflict with those issued by the Commandant.[12]

Because of the Coast Guard's concern about the need to update and consolidate its waterfront facility regulations, an interoffice waterfront facilities task force was established in June 1977. The outcome of their work was an advance notice of proposed rulemaking concerning waterfront facilities, published in the Federal Register in April 1978. This advance notice summarized the Coast Guard's desire to completely rewrite all of its waterfront facility regulations to make them more relevant to present-day marine practices. It indicated that facility environmental protection regulations and facility safety regulations might be combined, and contained proposed across-the-board waterfront facility regulations. A related advance notice on LNG waterfront facilities was published in August 1978.

Marine industry, environmental groups, Coast Guard field commands, government agencies, and other interested parties are providing input into the task force's work on several more detailed regulatory packages. These deal with liquid and solid bulk facilities, intermodal container facilities, bulk liquefied gas facilities and explosive facilities. Each subject will be covered in one or more notices proposed rulemaking which may lead to the issuance of final regulations. At the termination of this massive undertaking, the Coast Guard would have fully exercised its authority under the PWSA to regulate waterfront facilities.

SAFETY ZONES

The Coast Guard has publicized water and waterfront safety zone regulations through the Code of Federal Regulations. The PWSA authorized establishment of such zones for the protection of vessels, structures, water or shore areas.[13] These regulations supplement the security zone regulations created under the Magnuson Act to reinforce weak areas of enforcement and thereby reduce incidents harmful to environment, people and property.[14]

Safety zones may be stationary or transitional, as when encircling a vessel underway. They are established upon the initiative of a Captain of the Port, District Commander, or upon request. Requests, in most cases, must be written justification including details of location, boundaries, date, time and duration of the zone. Once a safety zone is established, unauthorized persons, vessels and vehicles are forbidden to enter the zone.

Notification of the establishment of safety zones is made by marine broadcasts, local notices to mariners, local news media, leaflet distribution, on-scene verbal notices or publication in the Federal Register. Notification normally contains the physical boundaries, the reasons for, and estimated duration of the zone, and the method of obtaining authorization to enter it. Procedures of notification may vary depending on circumstances and emergency conditions.

As in the vessel traffic management area, individuals may appeal the establishment of a safety zone or any orders issued under the authority of the safety zone regulations.

WATERFRONT INCIDENT INVESTIGATIONS

Under authority granted by the PWSA, the Secretary of Transportation may investigate any incident which might affect the safety or environment of U.S. ports, harbors, or navigable waters.[15] Regulations concerning these investigations are being drafted. These draft investigation regulations authorize the investigation of incidents on waterfront facilities, including those which have damaged the environment. As such, they would provide subpoena power and payment of travel fees to witnesses in oil pollution and similar investigations. The proposed regulations should be published in the near future.

(Continued on next page)

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[11] Section 101(7) of Title I, PWSA.
[12] Applicable regulations: 33 CFR Part 126; 50 USC 191-21 Section 101(6) 9 of Title I, PWSA.
[13] Section 101(8), PWSA; 33 CFR Part 165.
[14] 33 CFR Part 127; 50 USC 192.
[15] Section 103, Title I of PWSA.

SUMMARY

Although limited resources have precluded immediate implementation of all the broad powers created by Title I of the Ports and Waterways Safety Act, the foregoing activites demonstrate that the Act has provided the Coast Guard with several important port safety tools.

The development of several quite different and distinct types of vessel traffic services has demonstrated the feasibility of this formal means of vessel traffic management. The use by Coast Guard Captains of the Port of other broad, ad hoc vessel traffic control powers has demonstrated the workability of that type of management.

The ability to create safety zones has provided local Coast Guard officials with the necessary tools to unconditionally or conditionally regulate specific geographical areas about which there is safety or environmental concern. Finally, the ability to effectively investigate waterfront facility and environmental casualties should enable the Coast Guard to reduce the likelihood of occurrence of similar incidents.

In summary, the Ports and Waterways Safety Act is the source of several different but complementary types of governmental authority which have been and are being utilized by the U.S. Coast Guard to promote port safety and marine environmental protection.

Test of fire-fighting foam at the USCG Fire and Safety Test Detachment, Mobile, Alabama.

Coast Guard Fire and Safety Test Detachment

Fire at sea has always been one of the calamities most dreaded by seamen. Marine fires and explosions cause numerous deaths and injuries each year, not to mention millions of dollars' worth of damage. In an effort to control debilitating shipboard fire disasters, fire tests are performed on actual vessels. Data gathered from such tests provide valuable information as to what will probably occur on ships in the event of a fire and, therefore, what measures can best prevent or control marine fires.

The Coast Guard is concerned with all aspects of safety at sea, including fire disasters. For this reason the Fire and Safety Test Detachment was established in Mobile, Alabama. The detachment evaluates, full-scale, possible improvements to the safety of the maritime community. Testing techniques, small-scale tests and performance criteria are developed at this fire test site. Areas of investigation include compartment burnout, flammable liquids in drums, cargo and machinery space fires, container fire protection, hatch cover fire resistance, explosion suppression and deck foam systems.

Active testing at the Mobile detachment began in 1969. At present the test site includes two vessels, the tanker A. E. WATTS and the victory ship MAYO LYKES, plus a fire test area on the island.

Testing is guided by an Ad Hoc Test Advisory Group composed of marine and fire protection experts. The members of this group include: Office of Merchant Marine Safety; Office of Research and Development; Coast Guard Research and Development Center; Fire and Safety Test Detachment; American Institute of Merchant Shipping; American Petroleum Institute; U.S. Maritime Administration; National Bureau of Standards; National Fire Protection Association; Naval Ships Engineering Center; and Underwriter's Laboratories, Inc. Testing equipment used includes gas analyzers which measure oxygen, carbon monoxide and carbon dioxide concentrations. Sensors are available to measure any combination of temperature, heat flux, fuel level, weight, pressure, flow, wind speed, wind direction, air flow and relative humidity. Data reduction and compilation is provided by computers of the Research and Development Center.

Test programs are developed by the Coast Guard. Often they are initiated by an outside party and include several participants. PARTICIPATION IS ENCOURAGED so that the best inputs to planning may be obtained and so that the widest distribution and use of the results is assured. Proposals for programs are evaluated for their value to the marine industry and the fire protection community, their completeness, and the practicalities of using the full-scale facilities.

A brochure entitled "Fire and Safety Test Detachment" is now available upon request. Also, a film describing the interrelationship between the detachment and other Coast Guard functions has been prepared for interested groups. Inquiries concerning these materials, additional information, or program participation should be directed to: Commanding Officer, USCG Research and Development Center, Avery Point, Groton, Connecticut, 06340; or you may call (203)445-8501.

Cool It!

(Prompt and Proper Treatment of Burns)

If it's been awhile since you took a first aid course, read on!

How would you react to a burn victim? That victim could be you as well as anyone else. Burns are among the most painful and disfiguring types of injuries--and are the second leading cause of accidental death in the United States. Super-fast proper treatment can significantly improve chances of recovery for burn victims by arresting progressive skin damage and reducing healing time. Most important, it can save lives.

There are varying "degrees" of burns: first-, second-, and third-degree are really descriptions of how deeply the skin is damaged. It makes sense that there are different treatments for differeut degrees of burns. The types of burns and first aid measures are:

First Degree Burns. These involve only the outer layer of skin. There is redness, stinging and some swelling of the injured area. The chance of infection is slight, so treatment is aimed at relieving discomfort. Use ice water or ice packs immediately for both first- and second-degree burns. Cloths soaked in ice water are good; if possible, immerse the injured area in ice water--or jump under a cold shower! Besides providing relief, cooling the wound is of greatest importance in stopping further tissue damage. Just as a roast in the oven continues to cook awhile after it is taken out, the layers of skin will "cook" until cooled. With any burn, it is wise to remove jewelry--rings, bracelets, etc. --that might be difficult to remove later if swelling occurs. A cooling antiseptic spray or lotion is okay to use afterward for pain relief.

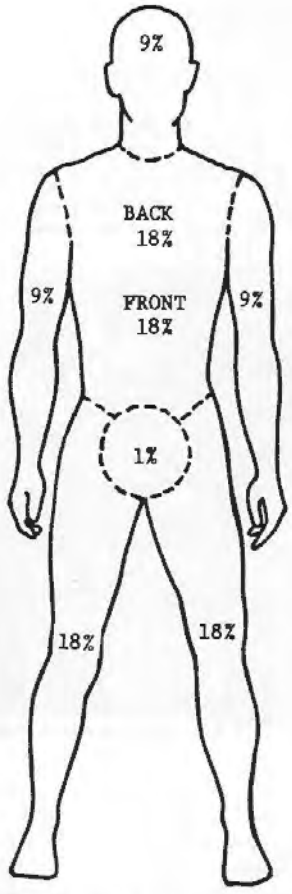
Second-Degree Burns. Characterized by severe pain and blistering, secoud-degree burns involve the outer layers of skin and, to some exteut, inner skin layers too. Blisters should never be willfully popped! They provide a sterile covering for the wounded area, thereby reducing chances of infection. Infection is not uncommon with second-degree burns, so keeping the burn clean is very important. As with first-degree burns, cold water is an immediate measure and may need to be reapplied for several hours. Blot dry with sterile cloth--not cotton, or anything that might stick to the skin--and cover with a sterile gauze or cloth to protect from germs. If burn area is extensive, seek medical attention.

Third-Degree Burns penetrate the skin more deeply than the other degrees of burns. However, pain may not be as severe as with second-degree burns, since nerves are damaged. First and second-degree burns often accompany third-degree burns. The affected area may appear white (as if scalded, though the burn might not be caused by hot liquid) or black (charred). Victims need immediate

medical help! You may cover the burn with clean linen to keep out as many germs as possible. DO NOT apply water or medication to the burn, or try to remove clothing that sticks to the injury. There is great danger of infection and shock, so a doctor should be reached as soon as possible.

Burns of the face and neck are especially dangerous, as they may cause breathing problems. The respiratory tract may be burned by inhalation of hot air or noxious gases. Such burns are extremely serious, as swelliug of the respiratory passages may cause suffocation. Treatment by non-medical persons is very limited, so get the victim to a doctor IMMEDIATELY, as the person is in extreme danger of dying.

Naturally, the more body surface burned, the more serious the injury. In general, an adult with burns over 15 percent or more of his body requlres hospitalization. Burns covering over 20 percent of body tissues endanger life, and those affecting over 30 percent are almost always fatal. The "Rule of Nines" is used to determine the percentage of body surface affected, as illustrated on this page.



RULE OF NINES FOR ESTIMATING PERCENTAGE OF BURNED AREAS

Chemical burns are the same as burns caused by flame, steam, or hot liquids and should be treated similarly. Cool water is essential. The burned area needs continuous flooding for at least 10 to 15 minutes to wash away all traces of the chemical. If an eye is burned, wash as above and get to a doctor as quickly as possible! Seconds count in preventing partial or total blindness.

Prevention is, of course, the most effective "first aid." Accidents will happen, though, in spite of safety precautions. Your best bet is to be ready for accidents before they occur--at that point, it's too late to run for the first aid manual! With prompt and proper help, burn victims can be spared unnecessary pain and scarring--and lives can be saved.

* * * * * *

Basic iuformation and diagrams are taken from CG-516, Syllabus of First Aid and Health Lesson Plans.

QUICK REFERENCE CHART

The following quick reference chart gives first aid advice for burns according to classification.

BURN	DO	DON'T
First Degree (redness, mild swelling and pain)	Apply cold water and/or dry sterile dressing or additional commerical or home medication.	Apply butter, oleomargarine, etc.
Second Degree (deeper and blisters develop)	Immerse in cold water, blot dry with sterile cloth for protection. Treat for shock. Obtain medical attention.	Break blisters. Remove shreds of tissue. Use antiseptic preparation, ointment, spray or home remedy on severe burns.
Third Degree (deeper destruction, skin layers destroyed)	Cover with sterile cloth for protection. Treat for shock. Watch for breathing difficulties. Obtain medical attention quickly.	Remove charred clothing that is stuck to burn. Apply ice. Use home medication.

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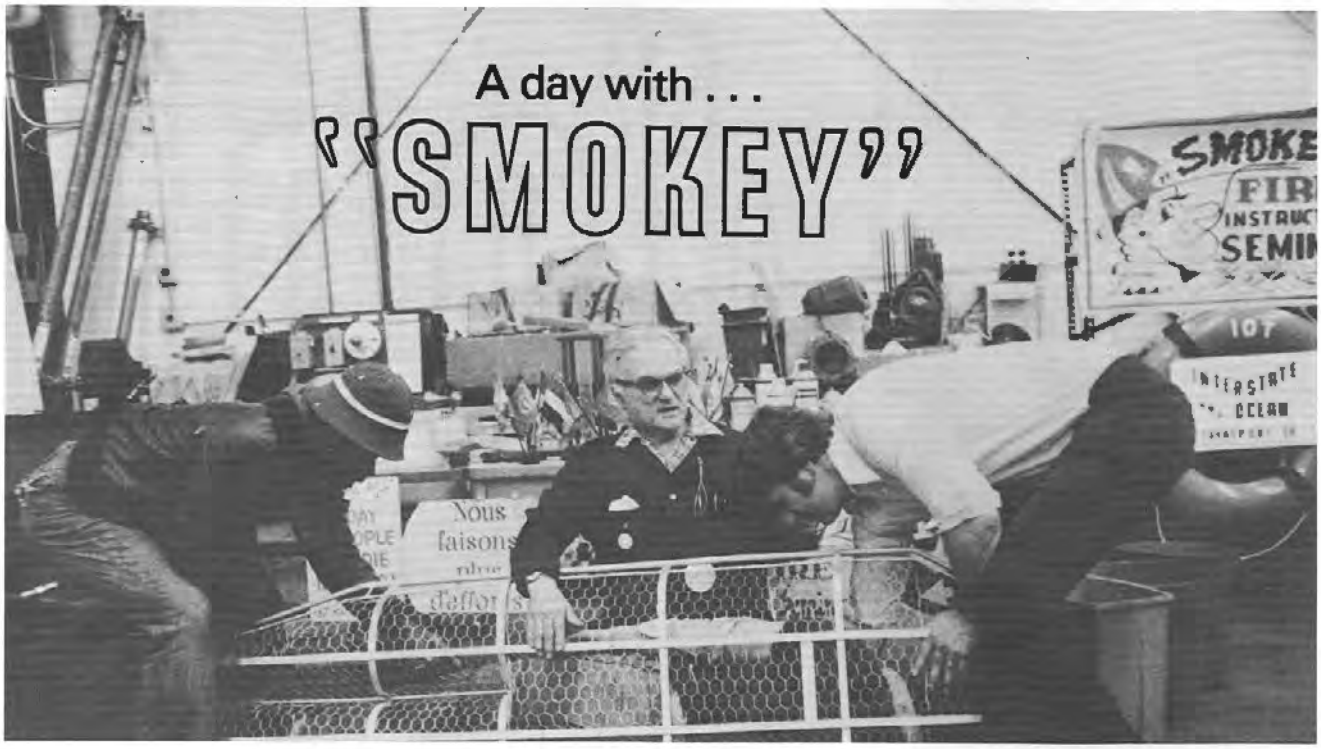
A day with . . . "SMOKEY"



The opinions or assertions contained herein are the private ones of the author and are not to be construed as official or reflecting the views of the Commandant or the Coast Guard at large.

By Captain D. Wade Smith,
USCG Ret.

Safety is a word which receives a lot of thought, concern, and "lip service" in our daily lives. Recently I met a man whose livelihood is safety--the teaching of safety at home, at work, in the air, and at sea. His name is M. M. "Smokey" Batzer, and he lives in Philadelphia, but he works around the world. An ex-Coast Guard officer, he has more than a particular liking for ships. This includes their different crews, and the fire and damage control problems of marine operations.

"Smokey" is an independent, on-the-job fire prevention, fire fighting, and damage control instructor. He develops procedures and then helps implement them as part of the same training process on a ship or a facility ashore. His seminars have been used during the past 25 years by operators of high-rise office and apartment buildings, hotels, airlines, universities, for air crash fire rescue training by the United Nations International Civil Aviation Organization, at airports, port grain elevators in the United States and Canada, by the U.S. Navy, merchant ship lines, and oil pipe lines, to mention a few. As "Smokey" says, "Since no one to date has been able to develop a fire control asbestos pill, education and on-the-job instruction demonstrations are the only reliable known preventatives for warding off the unfriendly, destructive fire."

"Smokey" invited me to join him one day for a visit on a U.S. vessel. As a Coast Guard officer, I have been involved in a multitude of training sessions, and I have never been more impressed with the practical, down-to-earth business of emergency safety training than I was at the end of that day. "Smokey" is what you would call a "going concern." The stocky, gray-haired former naval fire fighter in his coveralls, once on board, is all business. He is there to show the crew how to prevent or extinguish fires and care for the injured. His arrival may be unannounced, but it does not take long for the word to spread fast that this flamboyant man is here for a purpose. His training methods are unique, and to some people might even seem a little forceful. However, as "Smokey" told me, "I'm not out here to win a popularity contest . . . I'm trying to motivate them to remember something that might save their lives. If I can do this, my time is well spent."

"Smokey's" concept is that the human element is the important thing in safety, and he involves the students to the nth degree--so much so that the students really feel that they have had an experience when he finishes one of his hustling, driving refresher shipboard seminars. Over and over again he keeps pointing out that fire prevention pre-planning, its related procedural steps and equipment can deal with all types of emergencies, providing there has been adequate training and motivation. "Smokey" instructs the crew how to make an instant effective attack on any possible shipboard fire outbreak. His teaching methods are fast, furious and unforgettable. "You can't stop to read directions on a fire

extinguisher at 2:00 a.m.," he shouts. "You've got to know what to do ahead of time, i.e., NOW." He simulates actual emergency conditions, and deals with them so vividly that his listeners feel as if they were right there. When he is finished, the participants feel that they are prepared to handle just about anything that might turn up, within the scope of the exposures he covers.

Every available piece of emergency equipment on board is discussed, operated as feasible, and completely explained so understood by all. "Stop me anytime anything I say is not clear," he keeps saying. I was surprised by the number of crew members who did not understand the use and capabilities of their equipment. On this particular vessel, as he observed, the galley range was oil fired--yet none of the cooks when asked knew the location of the remote emergency fuel shut-off valve, nor did they vaguely know the use of the hose reel fire extinguisher located outside of the galley door. The cooks knew the answers before "Smokey" left the area, and were happy that they did.

"Every fire is small at some point," "Smokey" tells the crew. "Therefore, it is essential to know what to do at once. The first 30 seconds are the most critical if you want to be the boss. An average fire is at least 10 times bigger at the end of two minutes than it was at the end of the first minute. At the end of four minutes, it is 50 to 100 times larger than it was at the end of two minutes. At the end of 10 minntes, there is no telling how big it will become or whether at that or any later stage it can be controlled by the gear found available on board."

At one point, before anyone knew what was happening, the fast-moving "Smokey" grabbed a crew member, sboved a CO_2 fire extinguisher in his hand and yelled, "I'm on fire! I'm burning up! Do something!" It was a few seconds before the startled crew member pnlled the safety pin and let loose a billow of white spray, and there were a few shouts from the crew. "That's to show you that if any of the CO_2 gets on you, you need not panic, you won't get hurt." Then several of the officers and crew took turns spraying CO_2 on each other to prove the lesson further and to pass on what they had learned.

The fire fighting portion was followed by trying on the self-contained air packs and the other masks; lying flat on the deck to demonstrate basic approved artificial respiration methods; and the proper way of placing an injured crew member in a stretcher, as well as how to carry it safely.

Included in "Smokey's" vessel training is ship inspection that includes storage of material, electrical wiring, fittings, equipment hazards and all conditions that could possibly contribute to injury, loss of life, fire or other damage to the vessel. His ship inspection has often discovered potential fire hazards such as an empty gasoline can which, he explains, is more dangerous than a full one. He checks over the built-in detecting and CO_2 systems which are too often taken for granted as being easily or automatically operable, yet are all too frequently neglected by the crew. The annual inspection by an independent contract servicing facility is not alone sufficient to insure its proper care and functioning, especially where operational vibration and high pressures are involved, he points out.

"Smokey's" demonstrations have been seen by crews on tugs, freighters, Mississippi river boats, ocean tankers, dredges, and recently on oil drill-ships operating above the Arctic Circle. Many of you have already met "Smokey" and are familiar with the motivation he inspires in those with whom he comes in contact during his very realistic shipboard seminars. Once you have seen "Smokey" in action, you will never forget him.

ABOUT THE AUTHOR:

Captain D. Wade Smith is a 1953 graduate of the U.S. Coast Guard Academy. He has served in both deck and engineer officer capacities aboard the cutters RAMSDEN, GRESHEM, and WILLOW in the Pacific area and the ANDROSCOGGIN, HUMBOLDT, and AURORA in the Atlantic area. He has served ashore as Assistant Chief, Naval Engineering Section for the Ninth Coast Guard District in Cleveland, Ohio; Marine Inspector in the Marine Inspection Office, Philadelphia, Pennsylvania; Chief of the Special Projects Branch in the Merchant Vessel Inspection Division at Coast Guard Headquarters in Washington, DC; and Senior Inspector, Material in the Marine Inspection Office, Boston, Massachusetts. Before his retirement this past June, Captain Smith was the Officer-in-Charge, Marine Inspection Office, Philadelphia, Pennsylvania.

UPGRADING THE MARINE CHEMIST PROGRAM

The opinions or assertions contained herein are the private ones of the writer and are not to be construed as official or reflecting the views of the Commandant or the Coast Guard at large.

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Introduction

The April 1978 Proceedings summarized the official marine casualty report on the fire and explosion aboard the tank barge B-924 on November 13, 1975. Four men were killed in this tragic accident, including the marine chemist who was present at the scene of the hot work repairs. The proximate cause of the explosion was that welding repairs were being performed on a tank barge which was not in a gas free condition. Because these repairs were being accomplished in the presence of a marine chemist who evidently had not issued a valid gas free certificate for the job, many questions have arisen regarding the professional qualifications of marine chemists in general and the procedures by which they certify an enclosed space as "safe for man - safe for fire." Indeed, the Coast Guard Marine Board recommended that the Coast Guard conduct a complete review of the certification of marine chemists and their equipment, and the standards under which they operate to complete and issue a marine chemist certificate. The National Transportation Safety Board, which issued its own Marine Accident Report (NTSB-MAR-78-2 of February 2, 1978) on the same casualty, went so far as to recommend that the Coast Guard "establish a program for licensing or documenting marine chemists, which includes the latest methods and materials to safely insure that all marine chemisrs demonstrate a working knowledge of all necessary regulations pertaining to the repair of vessels."

"... many questions have arisen regarding the professional qualifications of marine chemists ... and the procedures by which they certify an enclosed space as 'safe for man- safe for fire' ..."

This article examines several aspects of the existing marine chemist program and how recent internal changes have been instituted to strengthen it, partially as a result of the B-924 casualty and its aftermath of criticism directed toward marine chemists.

Marine Chemist Program

The National Fire Protection Association (NFPA), headquartered in Boston, Massachusetts, administers the marine chemist program. Briefly, this program is organized as follows:

The NFPA Qualification Board certifies marine chemists as having met specific educational, professional and experience qualifications.

The NFPA Sectional Committee on Gas Hazards is responsible for updating and revising NFPA Standard No. 306 "Control of Gas Hazards on Vessels to be Repaired" - the standard which governs the professional activities of all marine chemists.

The NFPA Marine Field Service Specialist coordinates the day-to-day activities and provides staff support to the marine chemist program. He also serves as technical secretary to both the Qualification Board and Sectional Committee on Gas Hazards.

The Marine Field Service, composed of major maritime industry representatives, provides overall technical and budgetary direction to the program, via NFPA.

The NFPA Qualification Board

A 5-man NFPA-appointed Qualification Board closely examines each marine chemist applicant in order to determine if he has fulfilled all requirements necessary for NFPA certification. These certification rules are set forth in Appendix A of the current Marine Chemists Directory, an annually published pamphlet available directly from NFPA.

The current (1978) edition of the Marine Chemist Directory contains a revised and more stringent set of Rules for the Certification of Marine Chemists. These currently effective revised rnles, drafted by the Qualification Board during the past year and snbsequently approved by the NFPA Board of Directors, require a higher level of professional qualification and performance on the part of marine chemists. Some of the more significant changes appearing in the revised rules include:

(1) Extensive additions to the required professional qualifications such as training/knowledge in combustion and explosion technology, properties of toxic gases, entry into confined spaces, and test instruments and their calibration.

(2) Comprehensive prerequisites for renewal of a marine chemist's certification at 5-year intervals.

(3) Increased powers of the Qualification Board with regard to reducing, suspending or canceling the certification of a marine chemist for due cause.

(4) Phasing out the limited certification of marine chemists by requiring that all new marine chemist applicants meet all requirements for marine chemist certification, regardless of geographic area where they intend to practice.

"The Coast Guard liaison can relay to the Board either praise or criticism received from marine safety field units regarding an individual marine chemist's performance."

Additionally, at the invitation of NFPA, both the Coast Guard and the Occupational Safety and Health Administration have designated non-voting liaison officers to the Marine Chemist Qualification Board. These liaison officers attend all Quallfication Board meetings and function as a federal government-NFPA working level interface for marine chemist policies and problem areas. For example, the Coast Guard liaison can relay to the Board either praise or criticism received from marine safety field units regarding an individual marine chemist's performance. Thus, the Board both screens the credentials of new applicants and then contiuuously monitors the quality of work of all active marine chemists.

NFPA Sectional Committee on Gas Hazards

The standard or official NFPA guidelines under which marine chemists practice is NFPA No. 306 "Control of Gas Hazards on Vessels to be Repaired 1975." Each marine chemist, when certified by NFPA, signs a "Memorandum of Agreement" affirming that he will perform all of his marine chemist activities in accordance with the requirements of NFPA No. 306. Therefore, the technical content and precise wording of this standard is critical in terms of the discretion allowed to marine chemists when assessing the hazards on vessels to be repaired. Both the Coast Guard and the NTSB investigation reports of the tauk barge B-924 explosion mention the need to "tighten up" the wording of NFPA No. 306 so as to provide the marine chemist with explicit criteria to be met before a gas free certificate is issued.

The NFPA Sectional Committee on Gas Hazards is currently in the last stages of revising NFPA No. 306. This committee is composed of representatives from major oil and chemical companies, salvage associations, American Institute of Merchant Shipping, major shipyards, Americau Bureau of Shipping, and federal maritime agencies. Due to the lengthy review, public comment and approval process, however, the revised version of NFPA No. 306 will not he effective until at least 1979. The current edition can be purchased directly from NFPA, Boston, Massachusetts.

A partial preview of the proposed changes to NFPA-306 is as follows:

(1) The required oxygen concentration in an enclosed space is increased from 18 percent to 19.5 percent in order to meet the "safe for men" safety designation.

(2) Prior to issuing a gas free certificate for an enclosed space, the marine chemist must:

a. Determine the three previous cargoes carried in a cargo tank.

b. Test the space for oxygen, combustible gas and toxic substances coutent prior to entry.

c. Perform similar tests and visually inspect all parts of the space to be certified.
(Note: this is only a partial listing of required inspection criteria.)

"The NFPA Sectional Committee on Gas Hazards is composed of representatives from major oil and chemical companies, salvage associations . . . major shipyards . . . and federal maritime agencies."

(3) Calibration checks are required before and after each day's use on all instruments used by marine chemists. Records are mandatory for all calibration checks.

(4) The safety designatiou "safe for men" will not be allowed for spaces that have carried material of unknown chemical hazards. In other words, for chemicals having no known threshold limit value, the exact concentration of the vapor as determined by the marine chemist must be noted on the gas free certificate, but the "safe for men" designatiou cannot be used.

(5) Regarding issuing and posting gas free certificates--the marine chemist must complete and issue the gas free certificate before any hot work may begin. He must obtain a signed receipt from the vessel's owner, repairer or his representative to whom he gives the gas free certificate. The vessel's owner, repairer or representative is responsible to securely post the gas free certificate in a conspicuous place aboard the vessel.

The above are only a few of the numerous and extensive revisions to NFPA No. 306. Your comments regarding these proposed revisions will be solicited by NFPA when the revised draft of this standard has been completed. It will then be published in the Federal Register, NFPA's Fire News, and numerous business/industry publications with an accompanying request for public comment. It will also be distributed to all active marine chemists.

" NFPA is presently developing a short-term training program for marine chemist applicants who otherwise possess proper academic credentials."

Marine Chemist Training

Much of the variety of specialized knowledge required by new marine chemists--ranging from basic marine shipyard safety to properties of tank coatings and preservatives--is not readily available in conventional academic institutions or courses. Because of this, NFPA is presently exploring training programs for marine chemist applicants who otherwise possess proper academic credentials. A similar training package is being considered for active marine chemists, to provide them with the latest training/technology for dealing with new, complex problem areas such as monitoring for low level concentrations of chronic toxic agents.

Marine Chemists' Association

No summary of the marine chemist program would be complete without mention of the Marine Chemists' Association (MCA). This professional association functions independently of NFPA and seeks to foster a high standard of ethics and performance by marine chemists. MCA holds annual technical seminars and circulates periodic information bulletins to bring individual marine chemists into the mainstream of current problems and policies which might affect them.

5. "The marine chemist operates in an environment that is potentially deadly--from both a physical and legal liability standpoint."

Conclusion

The marine chemist operates in an environment that is potentially deadly--from both a physical and a legal liability standpoint. His responsibilities to himself and to others who place their trust in his professional judgement are tremendous. In order to perform his duties satisfactorily, the marine chemist must utilize a unique blend of education and training, experience and common sense. The highest qualifications must be required of those who would be marine chemists, and stringent measures employed to ensure that all practicing marine chemists continue to maintain their proficiency. In addition, a comprehensive, well-defined set of guidelines governing marine inspections must be developed and maintained.

During the past year the existing NFPA marine chemist organization has initiated widespread changes to improve the quality of its program. How well these planned improvements will be implemented still remains to he seen; however, a satisfactory beginning has been made.

ABOUT THE AUTHOR

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Upon completion of a tour in the Office of Research and Development at Headquarters, he served as engineering officer of the cutter HAMILTON during 1974-1975.

The History and Development of Shipboard Structural Fire Protection

by Randy Eberly
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Sad but true: often, it takes tragedy to stimulate the implementation of safety measures. So began the development of merchant vessel structural safety in the early 20th century--spurred by the sinking of the SS TITANIC on April 14, 1912. The heavy loss of life experienced in this tragedy was a primary cause for the calling of an international conference for life safety on the high seas.

In 1914, the first International Conference on Safety of Life at Sea was held in London. The recommendations of the conference concerned vessel subdivision and minimum requirements for life-saving devices, but no mention was made of structural fire protection. Because of the First World War, the provisions of this conference were never fully implemented.

In 1929, a second conference promoting the safety of life at sea was held in London to continue the development of international standards for the construction and arrangement of passenger vessels. On May 31, 1929 the Convention for the Safety of Life at Sea was signed. A small segment of this convention did address structural fire protection. Regulation XVI of the convention required the fitting of fire resisting bulkheads above the weather deck. These were to be constructed of metal or other fire resisting materials effective to prevent for one hour, under the conditions for which the bulkheads were to be fitted in the ship, the spread of fire generating a temperature of 1500°F at the bulkhead.

Seven years passed before the convention was put into law by the United States. Impetus toward the ratification of this document and the consequent development of shipboard structural fire protection measures was supplied in 1934 when the U.S. flag passenger vessel MORRO CASTLE burned off the coast of New Jersey, causing the deaths of 124 persons. Public reaction to this tragedy was sufficient to cause the creation of a special committee under the United States Senate Committee on Commerce. This subcommittee was tasked with investigating the MORRO CASTLE incident and developing recommendations for life safety standards aboard U.S. vessels. It was divided into groups assigned to deal separately with the various elements affecting life safety at sea. The investigation of fire protection measures was assigned to this Subcommittee on Fireproofing and Fire Prevention under the leadership of George C. Sharp. In its report the subcommittee noted: "The first problem confronting the committee was the question as to what general method of fire control might be the most practical combination of effectiveness and simplicity. Past experience having demonstrated the vulnerability of complex automatic and manually controlled systems of detectiou and extinction, widely spaced fire doors, etc., it was agreed that, if possible and economically practicable, the most foolproof solution to the problem would be construction of such nature that it would confine any fire to the enclosure in which it originated."

The 1929 SOLAS Convention required "fire resisting bulkheads"; however, a precise definition or standard test for such was not included in those regulations. To develop an adequate definition of "fire resisting bulkheads," the subcommittee therefore decided to conduct a series of full-scale shipboard tests to evaluate several different methods of construction. A test ship, the SS NANTASKET, was procured from the Reserve Fleet on the James River, and in mid-1936 numerous tests were run which proved the effectiveness of one type construction which made use of steel plate and asbestos composition panels. This construction technique was recommended by the Marine Section of the National Fire Protection Association (NFPA) and involved two types of "fire resistive" bulkheads: Class A-1 bulkheads, intended for use as firescreen or main vertical zone bulkheads, and Class B bulkheads for use in forming stateroom boundaries. Class A-1 bulkheads were to he metal bulkheads lined or insulated effectively to maintain structural integrity and prevent the spread of fire on the unexposed side of the test panel when exposed to a standard fire test for one hour. Class B bulkheads were to consist of incombustible material effective to maintain structural integrity and prevent the spread of fire on the unexposed side of the test panel when subjected to the standard fire test for 30 minutes. The standard fire test recommended by the Marine Section of the NFPA was the laboratory fire endurance rating test used by the National Bureau of Standards, which had been adopted as a standard test method in 1918 (ASTM E-119).

During the SS NANTASKET tests, temperature data was recorded for the purpose of comparing the tem-

peratures in the test room to the temperatures generated in the standard laboratory test furnace. Initially, the SS NANTASKET tests were conducted using clothing and furnishings as a fuel source. Very poor combustion was produced, and cord wood was then substituted as a fuel source in the remainder of the tests. To approximate the Btu content of the clothing and furnishings, a fuel load of 5 lbs/ft^2 was used. With this configuration, fires equivalent to the standard laboratory tests of 15 and 30 minutes were noted.

Based upon the test results, the subcommittee reported to Congress that "it would be impossible to fireproof a modern passenger ship by the methods used ashore. During the NANTASKET testing, it was determined that certain materials commonly used for building construction gave off such quantities of fumes that it was impossible to approach even a minor fire to extinguish it. During the course of experiments, a form of construction was developed in which combustible material was eliminated to such an extent that combustion could not be sustained by any part of the ship's structure." This was accomplished by using steel and asbestos composition test panels, which had proven far superior to fire retardant wood and steel-faced wood panels in the test series.

As a result of the recommendations presented by the subcommittee, Congress ratified the 1929 Convention for the Safety of Life at Sea. The United States Code (USC) was amended to require U.S. flag vessels to employ fire retardant material in their construction so far as was reasonable and practicable. Although it was not clearly defined, the type construction that had proven successful in the NANTASKET tests was intended. This construction, consisting mainly of steel and asbestos composition panels, could be considered incombustible by most test methods, and provided little additional fuel loading.

Under the authority of USC 369, the Secretary of Commerce promulgated Order #42 on July 17, 1940, creating Part 144 of Title 46 of the Code of Federal Regulations (Subchapter M). Paragraph 144.4(a) of Subchapter M required interior boundaries to be constructed of Class A-1, A or B fire retardant materials. Class A-1 bulkheads were required to be steel, lined or insulated with incombustible materials to prevent the average temperature on the unexposed side of the test bulkhead from rising more than 250°F, or any single point temperature from rising more than 325°F in one hour when subjected to the standard fire test. Class A bulkheads were required to be steel able to withstand the standard fire test for one hour with no temperature rise limitetions. Class B bulkheads were required to be incombustible materials capahle of withstanding the standard fire test for 30 minutes, and also capahle of preventing the aforementioned temperature rise limitations for 15 minutes. Again, the terms "fire retardant" and "incombustibla" were used without precise definition. Unfortunately, there were materials that could be considered fire retardant and which could pass the standard fire test, but did not have the equivalent noncombustibility properties of steel or asbestos. Because of the lack of a specific test method, certain materials could be approved which had the potential to greatly contribute to the fuel load of a protected space. It was not until the end of World War II that a specific test was developed to classify materials as incombustible. In 1949 the Coast Guard adopted a standard for incombustible materials, based upon research conducted at the National Bureau of Standards by N. P. Ketchkin and S. H. Ingberg (46 CFR 164.009).

During the Second World War, the need for lighter weight ships had brought about the use of aluminum bulkheads; afterward, these were proposed for use aboard passenger vessels. It was argued that aluminum bulkheads would be an acceptable substitute for the heavier asbestos composition panels, even though these panels could not withstand the standard fire test. The basis for this argument was the fact that aluminum has a very high thermal conductivity that will tend to dissipate heat rapidly. Secondly, the advocates of aluminum felt the intensity of the fires in the NANTASKET tests was due to the cord wood fuel source. It was maintained that the typical contents of a stateroom could not constitute a sufficient fuel load to cause melting of the bulkheads. Therefore, in 1947 a full-scale stateroom burnout test was conducted in conjunction with Gihbs & Cox, Inc. and the National Bureau of Standards. The stateroom test was conducted in a mock-up stateroom using typical furnishings and the personal belongings of three passengers as a fuel source. This test verified the results of the NANTASKET tests, and showed that a fire involving only typical stateroom furnishings is capable of generating the same temperatures as the standard fire test laboratory furnace. The stateroom test also showed that uninsulatad aluminum bulkheads could not provide the same degree of fire protection as asbestos composition panels.

The new marine technology created during World War II was the cause for a third International Conference on the Safety of Life at Sea, held in London during April 1948. The United States proposed the incorporation of fire protection techniques as listed in Subchapter M. Because the materials used for U.S. flag structural fire protection were not available world-wide, and because certain nations felt that active fire protection systems were equivalent to passive fire protection, three alternate methods of shipboard fire protection were listed in the 1948 convention. Method I was the technique proposed by the United States. Method II, proposed by the United Kingdom, advocated the use of sprinklers with no restriction on the combustibility or fire endurance of compartment bulkheads. Method III, proposed by France, made use of a limited amount of fire resisting bulkheads in conjunction with a fire detection system. The 1948 convention came into effect in the United States

on November 19, 1952. To implement the provisions of this document, and to revise the passenger vessel inspection regulations into one subchapter, the Coast Guard withdrew Part 144 and created a new Part 70 or Subchapter H in Title 46. The regulations written for this new subchapter are basically those in effect today.

It is interesting to note the changes made regarding bulkhead fire endurance ratings in the new subchapter. The old Class A-1 bulkheads were changed to A-60, the Class A became A-0 and the Class B bulkheads were not B-15. Two uew categories of bulkheads were created: Class A-30 bulkheads were an intermediate A-class bulkhead; B-0 bulkheads were created because the former B-class bulkhead panels had an inherent 15-minute fire endurance rating. However, unless certain connectors or "H-posts" were used, a heat transfer through the connectors occurred. It was felt that if these bulkheads were installed next to spaces with very low fuel loads, such as toilet spaces, a B-0 rating would be acceptable.

The 1948 convention was followed by SOLAS '60 and SOLAS '74, which added further improvements to international structural fire protection requirements. The present-day Coast Guard structural fire protection regulations, as well as those of SOLAS, are based upon the principles summarized as follows:

(a) division of passenger vessels into main vertical zones by thermal and structural boundaries;

(b) separatiou of accommodation spaces from the remainder of the ship by thermal and structural boundaries;

(c) restricted use of combustible materials;

(d) detection of any fire in the zone of origiu aboard passenger vessels;

(e) containment and extinction of any fire in the space of origin;

(f) protection of means of escape or access for fire fighting.

Hopefully, the correct application of these principles will serve to limit both the incidence and consequences of fires at sea. The life safety of merchant seamen must not be compromised.

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The opinions or assertions contained herein are the private ones of the writer and are not to be contrued as official or reflecting the views of the Commandant or the Coast Guard at large.

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Mr. Eberly is a member of the NFPA committee on portable extinguishers and the NFPA committee on halogenated fire extiuguishing agent systems. He is also a member of the Beta Chapter of the Salamander Honorary Fire Protection Engineering Fraternity.

Where do we go from here?

Modern cargo vessels are about as safe as naval architects can design them--limited as they are by the fact that the vessels must load aud discharge large quantities of cargoes of various kinds. Safety also has been engineered into the propulsion, housing and navigational systems of the vessels, yet we continue to have accidents. Where then is the area we have not reached in our never-ending efforts in accident prevention?

We regret to say that we believe that the vast majority of accidents result from human failure or oversight. People--the ones who suffer most from accidents--unfortunately cause most of them. We must, wherever we are, be aware of our surroundings, of what we are doing, and of the possible hazards of our actions. We firmly believe that never-ending vigilance will reward us by keeping accidental injury from us. We promise you that if you wear proper clothing and protective gear and stay alert on the job, you will not end up as an accident statistic.

Let's put the foregoing statement to the test. Let's prove to ourselves that we, as thinking human beings, can be as safe as mindless machinery and operating gear. Give it a fair test--wear foot, hand, eye and head protection when possible hazards indicate their use; watch what we do and where we go; and keep in mind the old seaman's adage, "a hand for the ship, a hand for me and mine."

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Nautical Queries

The following items are examples of questions included in the Third Assistant Engineer and Third Mate through Master examinations.

DECK

1. Which of the following factors determine(s) the strength and flexibility of wire rope?

I. The number of wires per strand
II. The type of center used

A. I only
B. II only
C. Both I and II
D. Neither I nor II

2. Indications of the master gyrocompass are sent to remote repeaters by the

A. follow-up system.
B. transmitter.
C. phantom element.
D. azimuth motor.

3. The brightest fixed star in the heavens is contained in the constellation

A. Ursa Minor.
B. Canis Major.
C. Cancer.
D. Argus.

4. As the temperature for a given mass of air increases, the

A. dew point increases.
B. dew point decreases.
C. relative humidity increases.
D. relative humidity decreases.

5. A fire in trash and paper waste would be classified as class

A. A
B. B
C. C
D. D

ENGINEER

1. The side pressure resulting from the angularity of the motion of the connecting rod depends primarily on the

A. weight of the piston.
B. length of the piston.
C. speed of the engine.
D. length of the cylinder liner.

2. The ignition quality of a diesel fuel is generally expressed by an index called the

A. cetane number.
B. volatility number.
C. viscosity index.
D. octane number.

3. In an air-conditioning system, moisture is removed from the air by

A. filters.
B. separators.
C. dehumidifiers.
D. ducted traps.

4. The purpose of a wire gauge is to measure wire

A. tensile strength.
B. diameter.
C. current carrying capacity.
D. insulation thickness.

5. An accumulation test measures

A. lifting pressure of the boiler safety valves.
B. total relieving capacity of the boiler safety valves.
C. steam generating capacity of the boiler.
D. blow down pressure of the boiler.

ANSWERS

Deck
1. C, 2. B, 3. B, 4. D, 5. A

Engineer
1. B, 2. A, 3. C, 4. B, 5. B

CORRECTION: A typographical error was included in deck question number 4 of the "Nautical Queries" department in our April 1978 magazine. The question should have read: "Which of the following groups should be used to send the signal longitude 109° 34' west? A. D 0934; B. Lo 10934W; C. G 0934; D. L 10934." The correct choice is C.

MERCHANT MARINE SAFETY PUBLICATIONS

The following publications may be obtained from the nearest marine safety office or marine inspection office of U.S. Coast Guard. Because changes to the rules and regulations are made from time to time, these publications can be kept current between revisions only by referring to the Federal Register. (Official changes to all federal regulations are published in the Federal Register, printed daily except Saturday, Sunday, and holidays.) Following the title of each publication in the table below are the date of the most recent edition and the dates of the Federal Registers affecting each.

The Federal Register may be obtained by subscription ($5 per month or $50 per year) or by individual copy (75 cents each) from SupDocs, U.S. Government Printing Office, Washington D.C. 20402.

CG No.	TITLE OF PUBLICATION
101-1	Specimen Examinations for Merchant Marine Deck Officers (2d and 3d Mate) (4-1-77).
101-2	Specimen Examinations for Merchant Marine Deck Officers (Master and Chief Mate) (4-1-76).
108	Rules and Regulations for Military Explosives and Hazardous Munitions (4-1-72). F.R. 7-21-72, 12-1-72, 6-18-75.
115	Marine Engineering Regulations (8-1-77). F.R. 9-26-77.
123	Rules and Regulations for Tank Vessels (8-1-77); Ch-1, 4-28-78). F.R. 8-17-77, 9-12-77, 10-25-77, 12-19-77.
169	Navigation Rules - International - Inland (5-1-77). F.R. 7-11-77, 7-14-77, 9-26-77, 10-12-77, 11-3-77, 12-6-77, 12-15-77, 3-16-78.
*172	Rules of the Road - Great Lakes (7-1-72). F.R. 10-6-72, 11-4-72, 1-16-73, 1-29-73, 5-8-73, 3-29-74, 6-3-74, 11-27-74, 4-16-75, 4-28-75, 10-22-75, 2-5-76, 1-13-77, 11-3-77, 12-6-77.
174	A Manual for the Safe Handling of Flammable and Combustible Liquids and Other Hazardous Products (9-1-76).
176	Load Line Regulations (2-1-71). F.R. 10-1-71, 5-10-73, 7-10-74, 10-14-75, 12-8-75, 1-8-76.
182-1	Specimen Examinations for Merchant Marine Engineer Licenses (2d and 3d Assistant) (2-1-78).
182-2	" " " " " " " (First Assistant) (3-1-78).
182-3	" " " " " " " (Chief Engineer) (3-1-78).
184	Rules of the Road - Western Rivers (8-1-72). F.R. 9-12-72, 12-28-72, 3-8-74, 3-29-74, 6-3-74, 11-27-74, 4-16-75, 4-28-75, 10-22-75, 2-5-76, 3-1-76, 6-10-76, 7-11-77, 12-6-77, 12-15-77.
*190	Equipment Lists (5-1-75). F.R. 5-7-75, 6-2-75, 6-25-75, 7-22-75, 7-24-75, 8-1-75, 8-20-75, 9-23-75, 10-8-75, 11-21-75, 12-11-75, 12-15-75, 2-5-76, 2-23-76, 3-18-76, 4-5-76, 5-6-76, 6-10-76, 6-21-76, 6-24-76, 9-2-76, 9-13-76, 9-16-76, 10-12-76, 11-1-76, 11-4-76, 11-11-76, 12-2-76, 12-23-77, 4-4-77, 4-11-77, 4-21-77, 5-19-77, 5-26-77, 6-9-77.
191	Rules and Regulations for Licensing and Certification of Merchant Marine Personnel (11-1-76). F.R. 3-3-77, 8-8-77.
227	Laws Governing Marine Inspection (7-1-75).
239	Security of Vessels and Waterfront Facilities (5-1-74). F.R. 5-15-74, 5-24-74, 8-15-74, 9-5-74, 9-9-74, 12-3-74, 1-6-75, 1-29-75, 4-22-75, 7-2-75, 7-7-75, 7-24-75, 10-1-75, 10-8-75, 6-3-76, 9-27-76, 2-3-77, 3-31-77, 7-14-77, 7-28-77, 9-22-77, 9-26-77, 12-19-77, 1-6-78, 1-16-78, 3-2-78.
257	Rules and Regulations for Cargo and Miscellaneous Vessels (9-1-77). F.R. 9-26-77, 9-29-77, 12-19-77.
258	Rules and Regulations for Uninspected Vessels (4-1-77); Ch-1, 3-17-78). F.R. 9-26-77.
259	Electrical Engineering Regulations (7-1-77). F.R. 9-26-77.
268	Rules and Regulations for Manning of Vessels (7-1-77).
293	Miscellaneous Electrical Equipment List (7-2-73).
323	Rules and Regulations for Small Passenger Vessels (Under 100 Gross Tons) (7-1-77): Ch-1, 3-17-78). F.R. 9-26-77, 12-15-77, 12-19-77, 7-17-78.
329	Fire Fighting Manual for Tank Vessels (1-1-74).
439	Bridge-to-Bridge Radiotelephone Communications (12-1-72). F.R. 12-28-72, 3-8-74, 5-5-75, 7-11-77.
467	Specimen Examinations for Uninspected Towing Vessel Operators (10-1-74).
497	Rules and Regulations for Recreational Boating (7-1-77). F.R. 7-14-77, 8-18-77, 3-9-78. 4-27-78, 8-17-78.

*Temporarily out of stock.

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