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BMC Everette H. Langford wears a breathing apparatus to protect against respiration hazards. Official photo by CWO3 Dale L. Puckett, U.S. Coast Guard Public Information Assist Team.

Respiration Hazards in Shipyard Inspection Duties

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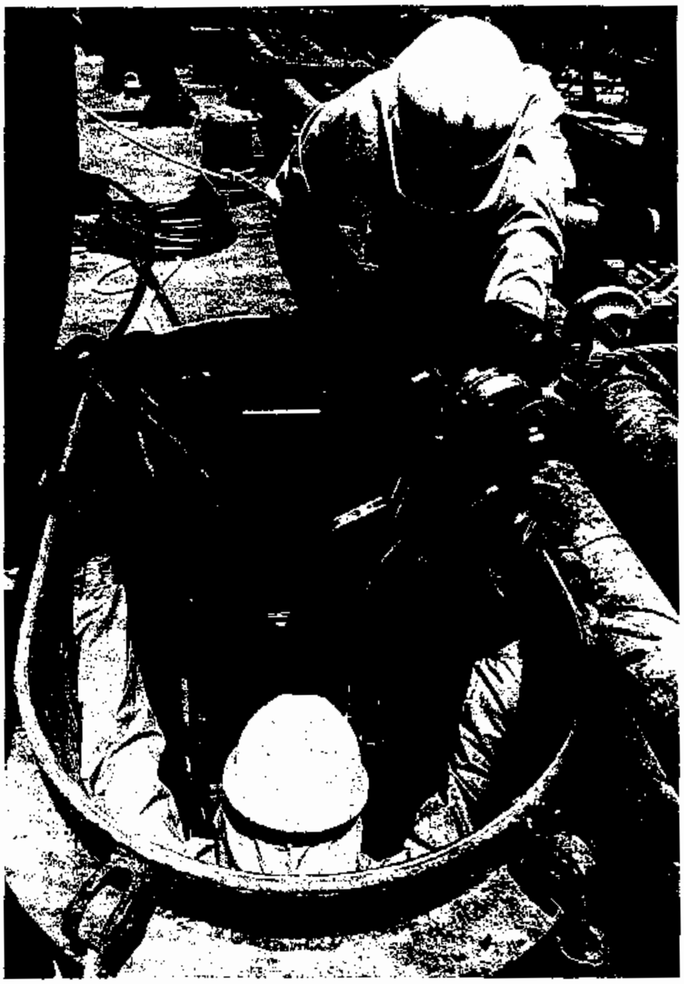
Cargo and Hazards Branch
Marine Technical and Hazardous Materials Division
U.S. Coast Guard



Official U.S. Coast Guard photographs courtesy of the Public Information Assist Team.

Confined Space Entry

Federal regulations require that all enclosed spaces on vessels in shipyards be tested to ensure they are safe to enter.[1] The tests, normally performed by a certified marine chemist, are used to evaluate the level of oxygen in confined spaces, the level of combustible gases, and the level of toxic gases, if present. (The procedures for these tests are found in the National Fire Protection Association Publication number 306.)

Before allowing entry into any enclosed spaces, the marine chemist performs several tests from the open deck. The oxygen reading, normally the first measurement, is assessed by dropping an oxygen sensor or sampling line close to the bottom of the enclosed space (tank) to draw an atmosphere sample through the measuring instrument. The minimum acceptable level of oxygen is 19.5 percent by volume. If the oxygen content is above the minimum, then the combustible gas level is established. The level of combustible gases must be below 10 percent of the lower flammable limit (LFL). If the cargo tank previously contained a toxic material, the marine chemist will also check for toxic vapor. Current permissible limits are found in the publication, **Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment.**[2] In most situations, the marine chemist will use direct-reading gas and vapor detector tubes when testing for toxic vapor. Tubes are available to test for about

230 substances, including most common bulk commodity chemicals.

If no adverse information is obtained from the deck reading, the marine chemist generally enters the confined space (tank) for an internal examination. Additional instrument testing may be done to ensure safe conditions in the space. When the marine chemist is satisfied the atmosphere is safe to enter, he or she will issue a marine chemist's certificate stating which areas are safe to enter, which are "safe for workers" and any special precautions that should be observed.

Exposures to vapor can generally be classifed into two types: (1) **Acute** exposure occurs when a large dose is delivered at once and is rapidly absorbed into the body. (2) **Chronic** exposure occurs when a substance is encountered at low concentrations over a long period. Chronic exposure is likely to occur more frequently with marine inspectors because they may inspect many tanks contaminated with the same product in the course of a day. They may also inspect a series of tanks with different products in successive tanks. Since tank inspection is a continuous procedure and involves very little time on deck, inspectors also face the possibility that some of these absorbed substances could interact in the body with devastating consequences.

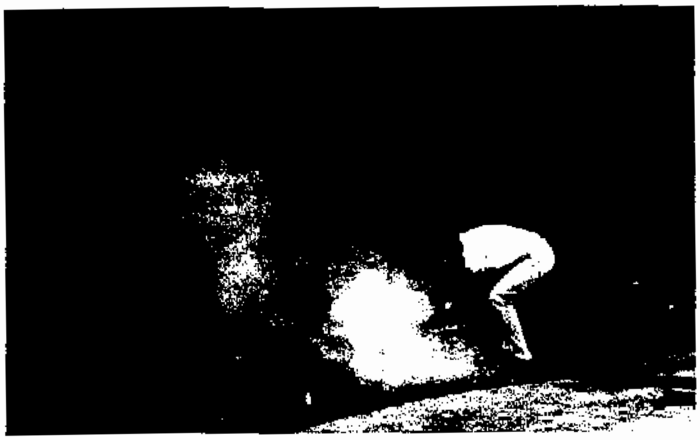


Photo courtesy LCDR James M. Garrett, U.S. Coast Guard.

Welding Fumes and Gases

Cargo residues are not the only sources of toxic vapor hazards in marine inspection work. Shielded metal-arc welding, the most popular form of welding since it was introduced in the 1920s, is normally used aboard vessels to complete repairs required by the marine inspector. The fumes and gases produced during shielded metal-arc welding orginate from the base metal, the electrode or filler metal, the electrode coating, from heat reactions that occur during welding, or from the arc's ultraviolet radiation. The potential products from this process are shown in figure 1. Phosgene can be produced if the steel has been cleaned with a chlorinated hydrocarbon (methylene chloride). In the same manner, phosphine can be produced if the steel has been treated with a phosphate rustproofing agent.

Vessel superstructures made of steel frequently are being replaced with aluminum to conserve weight. Aluminum welding in enclosed spaces can result in heavy exposures to toxic vapors. The inert gas-shielded arcs used in this process tend to produce more oxides of nitrogen and ozone. Carbon dioxide, widely used as the inert gas component, can accumulate in significant levels.[3] In addition, various coatings on the welding rods may pose dangers from fluorine compounds, asbestos, and silica.

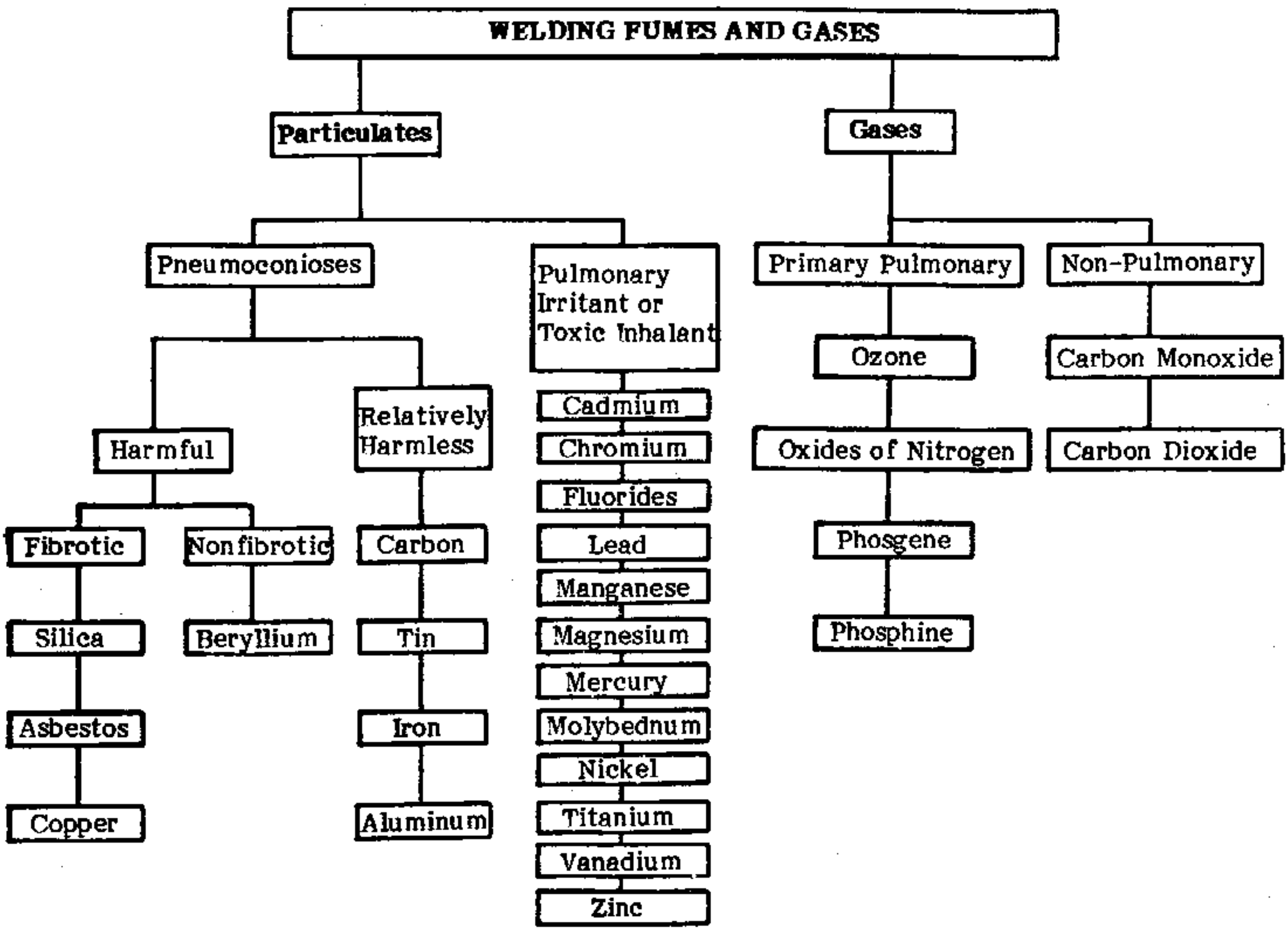
Cutting steel or aluminum is a major activity in ship repair or conversion. The steel is likely to be covered with various paints to protect it from corrosion or to act as an antifouling substance. These paints may contain lead, chromium, or mercury which can contaminate the air during cutting or welding. Air concentrations of zinc can be 3 to 12 times the threshold limit value when cutting or welding galvanized steel in areas of poor ventilation.[4]

Sandblasting

Sandblasting is often employed to prepare metallic surfaces for paint or other coatings. This method of abrasive cleaning produces high concentrations of respirable sand (silica) within

Figure 1

Possible Constituents of Welding Fumes



Source of figure: American Welding Society, The Welding Environment. AWS, Florida, 1973.

the working atmosphere. It is widely reported in the general literature that inhaling free silica can cause silicosis in an individual. This disease is the permanent deposition of particulate material in the lungs which lead to reduced lung function (emphysema).

Although marine inspectors are not directly involved in sandblasting operations, they can still be exposed to silica. The presence of suspended silica has been reported in various areas of a shipyard during non-blasting periods. Yard workers were exposed to various levels of silica dust depending on the proximity of job sites to blasting sites and wind conditions. In many instances where the job sites were located close to or downwind from the blasting site, the workers were exposed to levels of respirable silica dust several times greater than the threshold limit value (TLV).[5]

Asbestos

Ships require large amounts of thermal insulation materials for cold-water pipes and refrigerator units, as well as for steam and heating pipes and for boilers. Insulation is also placed under open decks to reduce solar heat transfer below decks. Fire-resistant materials have been required for many years by the Coast Guard to retard the spread of fire aboard vessels. Asbestos generally had been used throughout the marine industry for these purposes. When the substance was recognized to cause chronic lung disease and lung cancer, the industry reduced asbestos use, and other materials have since replaced it.

During some inspections, lagging is removed from various locations (normally the engine room) for the inspector to determine the condition of the steel. If marine inspectors and other workers believe they may be exposed to respirable asbestos fibers, then respiratory equipment and protective clothing should be used.

Occupational health studies in shipyards generally have been confined to the hazard evaluations of specific job tasks such as welding or sandblasting. Marine inspectors and ships' personnel do not perform these tasks, yet there is no doubt the inspectors and others face occupational hazards where typical shipyard operations are conducted. The duration of an inspector's exposure to respiration hazards is normally brief and infrequent, but the combined effect of these exposures over time has not been determined. Ship crews and shipyard workers face these same dangers on a prolonged basis. All personnel who risk breathing a potentially toxic or harmful substance should take adequate precautions. ⟂

Footnotes

[1]Title 29, Code of Federal Regulations, Part 1915.10. U.S. GPO: Washington, DC, 1982.

[2]American Conference of Governmental Industrial Hygienists, *TLVs: Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1982*. ACGIH: Cincinnati, OH, 1982.

[3]Burgess, W.A., *Recognition of Health Hazards in Industry*. Wiley-Interscience, 1981.

[4]Pegues, W.L., "Lead Fumes from Welding on Galvanized and ZN-Silicate Coated Steels," *American Industrial Hygiene Association Journal*. 21: 252, 1960.

[5]Samimi, J.B., H. Weill, and M. Ziskind, "Respirable Silica Dust Exposure of Sandblasters and Associated Workers in Steel Fabrication Yards," *Archives of Environmental Health*. 29: 61, 1974.

Carbon Monoxide

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The Coast Guard has been concerned over the possible toxic effects of carbon monoxide from engine exhaust on power boats. Carbon monoxide can cause headaches, vertigo, nausea, and in extreme cases, death. Since it is odorless, colorless, and tasteless, carbon monoxide may not be suspected. But is is likely that when boaters blame the sun, seasickness, or alcohol for feeling ill, the real culprit often may be carbon monoxide.

The Coast Guard's Boating Safety Division recently conducted tests with the assistance of Coast Guard Auxiliarists in the Tampa Bay, Florida, area, which gave insight into the relative risks from carbon monoxide and how boaters can protect themselves from this invisible hazard. The Coast Guard offers these conclusions for boaters:

- The potentially greatest carbon monoxide hazard involves the operation of gasoline-powered boats at high altitudes.
- The least hazardous is a diesel-powered boat at sea level.
- The more blunt-shaped the boat at the stern end, the more likely that exhaust gases, including carbon monoxide, will be drawn into the hull and occupied areas.
- Regardless of weather conditions, enclosed, gasoline-powered boats should have fresh air forced into the hull, preferably from the front, at all times the boat is underway.

On the basis of the limited test results, Donald W. Ellison of the Coast Guard Boating Safety Division says it should be possible to operate all gasoline-powered boats at sea level without posing a threat to life from carbon monoxide. Mr. Ellison, a safety defect specialist, was in charge of the tests.

The test program began as a result of several incidents involving one boat in Colorado. In all, 11 persons who had been aboard on three separate outings showed signs of carbon monoxide poisoning. One who had a history of heart problems died shortly after one outing.

Tests to record carbon monoxide levels on this boat were carried out at 7,500 feet, where two of the incidents occurred. At this elevation, atmospheric pressure is 75 percent of sea level pressure, and the boat's internal combustion engines experienced a 22 percent power loss.

The test boat, about 31 feet long, had a long deckhouse, a short afterdeck, and full flying bridge. There was a large sliding door at the rear of the salon. Side windows opened, but the windshield did not.

Carbon monoxide concentrations were measured at various locations in the cabin, afterdeck, and flying bridge. Test runs were made with the boat's hatches, windows, and salon door in various combinations of open and closed positions and while moving into and with the prevailing wind. Runs were made at both cruise and trolling speeds.

In the first test, the boat performed poorly. For following tests, it was modified by installing new propellers and trim planes, by correcting improperly installed exhaust relief valves, and by opening the port hull side engine air intake system and drilling holes in the air intake box. These changes improved the boat's performance and lowered its carbon monoxide readings.

Subsequent modifications included installation of high altitude jets in the carburetors and advancing the timing of each engine beyond the sea level setting by 4 degrees.

The presence of carbon monoxide at specific locations on the test boat is explained by aerodynamic principles. Boats moving forward generate areas of lower atmospheric pressure immediately behind those parts of the boats which have large surfaces at right angles to the boat's direction of movement. This is sometimes called the "station wagon effect." This same phenomenon makes it possible for a race car to get a free ride by "drafting" close behind another car.

This condition worsens as the velocity of air movement from bow to stern increases relative to the velocity of the boat. The lower atmospheric areas are the result of the air streamlines being unable to flow in smooth lines around the hull and deckhouse and beyond; their smooth, laminar flow is disrupted as they reach the rear end of the deckhouse and the hull sides at the transom. As a result, the rate of airflow into the area behind the deckhouse and transom is insufficient to maintain ambient pressure, the atmospheric pressure in these turbulent flow areas drops, and additional air is drawn from the surrounding areas to fill the low pressure areas. This brings in exhaust gases and other air.

If the deckhouse air volume is connected only to the air volume directly behind it through the open salon door, low pressure will also develop within the deckhouse and draw exhaust gases, including carbon monoxide, into all areas having reduced air pressure.

It was in this condition, with all openings closed except the salon door, that a high reading of 794 ppm (parts per million) of carbon monoxide was taken in the salon during the first test. After modifications to the boat, the reading was 345 ppm. However, the lowest reading of 7 ppm was recorded in the salon when the salon aft door and stairwell hatch was closed, the forward hatch and side windows were opened, and the boat was running into the wind at 3,000 rpm.

There is no general agreement on a "safe" level of carbon monoxide exposure for humans. However, various published "acceptable concentration levels" indicate that an occupational day exposure average of 50 ppm would be acceptable for sea level conditions and exposures of 25 ppm for altitudes above 5,000 feet.

At the exposure level of 50 ppm for a day, a person's CoHb (carboxyhemoglobin)[1] level might reach 10 percent. This may be the threshold for experiencing physical effects from carbon monoxide, such as headaches, dizziness, and diminished coordination. Between 10 and 15 percent CoHb, there may also be nausea, while a level of 40 percent is associated with collapse, and levels over 60 percent are usually fatal.

Persons with cardiovascular disease are subject to much greater risk from adverse effects of carbon monoxide. These effects are further aggravated at higher altitudes where available oxygen is reduced. Cigarette and cigar smokers have a higher level of CoHb than non-smokers and also are more likely to suffer from the adverse effects of carbon monoxide.

Since the first series of tests involved one boat operating at an unusual altitude, the Coast Guard Boating Safety Division arranged a second series at sea level. In all, seven boats provided by Coast Guard Auxiliarists were sampled in the Tampa Bay area. They ranged in size from a 20-foot, single gasoline-powered, open-cockpit runabout to a 41-foot, twin screw gasoline-powered double cabin cruiser.

The instrumentation and sampling procedures were the same as on the first series.

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[1] *Carboxyhemoglobin is a very stable, pinkish-red combination of carbon monoxide and hemoglobin (red blood cells) formed in the bloodstream when carbon monoxide is inhaled. It inhibits the blood's ability to combine with oxygen, resulting in oxygen deficiency.*

Test results varied by carbon monoxide concentrations and were, on an average, greatly reduced from the levels found on the first series. The lowest readings were found on a 32-foot, gasoline-powered, side exhaust, center cockpit cutter sailboat; on the 41-foot double cabin, flush afterdeck cruiser; and on the 20-foot, inboard/outboard runabout. A 32-foot, twin screw diesel-powered sedan also did not register any significant levels of carbon monoxide.

Higher concentrations were recorded on a 32-foot, twin screw gasoline-powered sedan with V-drive engines aft; on a 32-foot, twin screw gasoline-powered sedan with engines under the salon; and on a 28-foot, single gasoline-powered, inboard/outboard, raised bridge express cruiser.

In each case, the higher reading occurred when cruising upwind with the forward hatch and windshield windows closed. Low levels were achieved by opening the hatch or windows. Interestingly, concentrations on the flying bridges in all cases remained at acceptable levels, even when they were enclosed.

The tests raised a question as to whether the type of drive train used (inboard-straight shaft, or inboard-outdrive propulsion) makes a difference in promoting carbon monoxide concentrations in the transom area. Additional tests will be needed to find the answer.

*This article originally appeared in **The Navigator**, the national publication of the U. S. Coast Guard Auxiliary, Vol. 11, No. 2.*

Avoid Delays and Errors on Your Tax Returns

Many simple errors that can cause weeks of delay in the processing of federal income tax returns could be avoided if taxpayers used the labels and envelopes that accompany their tax packages, the Internal Revenue Service says.

The peel-off label, which contains the taxpayer's name, address, and social security number, is designed to expedite processing at IRS service centers and prevent common errors that can delay issuance of refund checks.

A common misconception is that using the peel-off address label will trigger an audit. Actually, coding on the label identifies the taxpayer and the kinds of forms contained in his or her tax package. It does not in any way indicate the return should be audited.

One of the common and yet most troublesome errors that can be averted by using the label is the listing of an incorrect or illegible social security number. Such an error can take weeks or even months to correct and is one of the major causes of delayed refund checks.

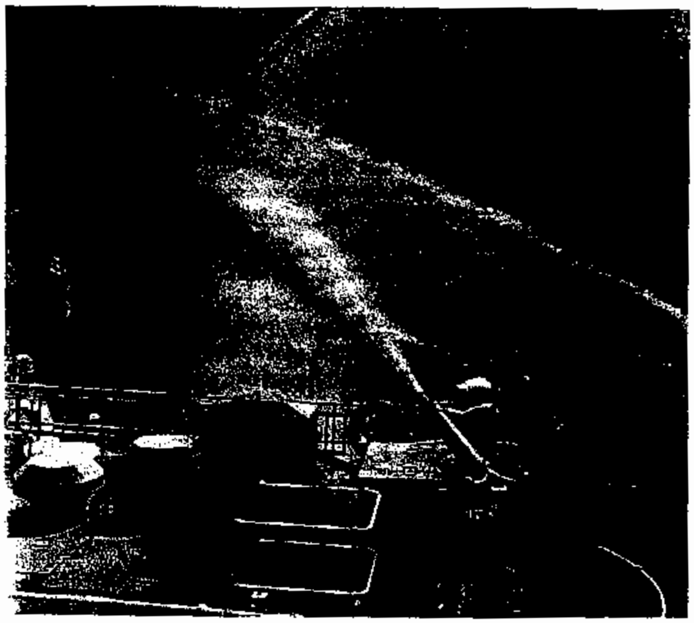
The IRS advises taxpayers to use the label, even if corrections are necessary. For example, in the case of a change of address, the correction should be made directly on the label.

Errors can also be averted if taxpayers use the special pre-addressed envelope, which speeds sorting of tax returns during the annual deluge of mail that arrives at the 10 IRS service centers.

IRS also advises taxpayers to round off cents to the nearest dollar when figuring federal income taxes. However, taxpayers should be consistent. If you do round off, do so for all amounts. Drop amounts under 50 cents and increase amounts from 50 to 99 cents to the next dollar. Taxpayers are likely to make fewer math errors by rounding off.

3 Smoke

Alan L. Schneider
Ship Design Branch
Marine Technical and
Hazardous Materials Division



This article is the third in a series of intermittently appearing articles on workplace hazards. It was adapted from a paper delivered by the author at the Thirteenth Intersociety Conference on Environmental Systems, held in San Francisco July 11-13, 1983, and is printed here with the permission of the Society of Automotive Engineers, Inc., which released the paper in its SAE Technical Paper Series as a copyrighted publication.

In a fire, few people are actually killed by flames. Rather, we hear most often that fatalities occur due to smoke inhalation. Asphyxiation from smoke can occur in a vessel fire just as easily as it does on land.

Currently, this area is addressed in the Coast Guard's structural fire protection regulations. The regulations specify that bulkheads, decks, and ceilings must meet certain standards (A, B, and C classes). When considering smoke development, the most important requirement for all three classes is that these materials be non-burning and meet a rigorous international standard for noncombustibility. The selection of the class depends on the type or use of adjacent spaces. In passenger vessels, for example, bulkheads between stairways and staterooms must prevent the passage of flame and smoke for 1 hour (A Class). However, bulkheads between two staterooms need only prevent this for half an hour (B Class). There are no minimum flame and smoke requirements for C Class bulkheads, but they must be made of approved noncombustible materials. These boundary fire-protection requirements, which are really much more involved and cover aspects other than smoke (e.g., thermal insulation), will reduce smoke transfer from one area to another. In addition, at various locations the structural fire protection regulations provide for automatic and manual fire dampers in ventilation ducts and draught stops to inhibit flame and smoke movement.

Of course, avoiding or reducing smoke production in the first place would be very useful. While it is feasible to require noncombustible (and hence non-smoke-producing) bulkheads, esthetics often require finishing materials that may be combustible (veneers, paints, enamels, etc). Also, the means of mounting these materials - glue, for instance - may be flammable as well.

Small-scale smoke tests conducted jointly by the U.S. and Canadian Coast Guards show significant differences in the amount of smoke produced by various materials. A careful choice in furnishings may reduce the smoke problem. The U.S. and Canadian Coast Guards have also tested deck and ceiling finishing materials for their smoke-producing qualities.

The Coast Guard has regulations which are effectively governing the smoke problem aboard ship. Nevertheless, work is underway to improve the technical understanding of smoke generation. ⚓

Hydrogen Sulfide Gas Hazards:

The VERACRUZ I

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The Accident

During the evening of September 30, 1984, the Panamanian passenger ship, SS VERACRUZ I, arrived in Norfolk, Virginia. The ship, 485 feet in length with a gross tonnage of 9,914, was built in 1957. At her arrival in Norfolk, she carried a 142-man crew. The ship was soon lifted out of the water and placed into a floating drydock.

All was peaceful that evening and into the early morning hours. But at 3:39 a.m. the following day, October 1, 1984, a shipyard security watchman heard a sudden, loud noise coming from the drydock. That sound was made by the SS VERACRUZ I as, without warning, she rolled sharply to starboard and came to rest against the wingwall of the drydock. The vessel reached a maximum list of 35 degrees before the wingwall stopped her roll.

The crew scrambled to evacuate the vessel, and the officers took muster on the dock. Two crewmen were unaccounted for. Search parties quickly began combing the vessel and located one of the missing crewmen asleep in his berthing area. He had slept through the entire incident and was not injured. The search party awakened the crew member and hastily evacuated him from the vessel.

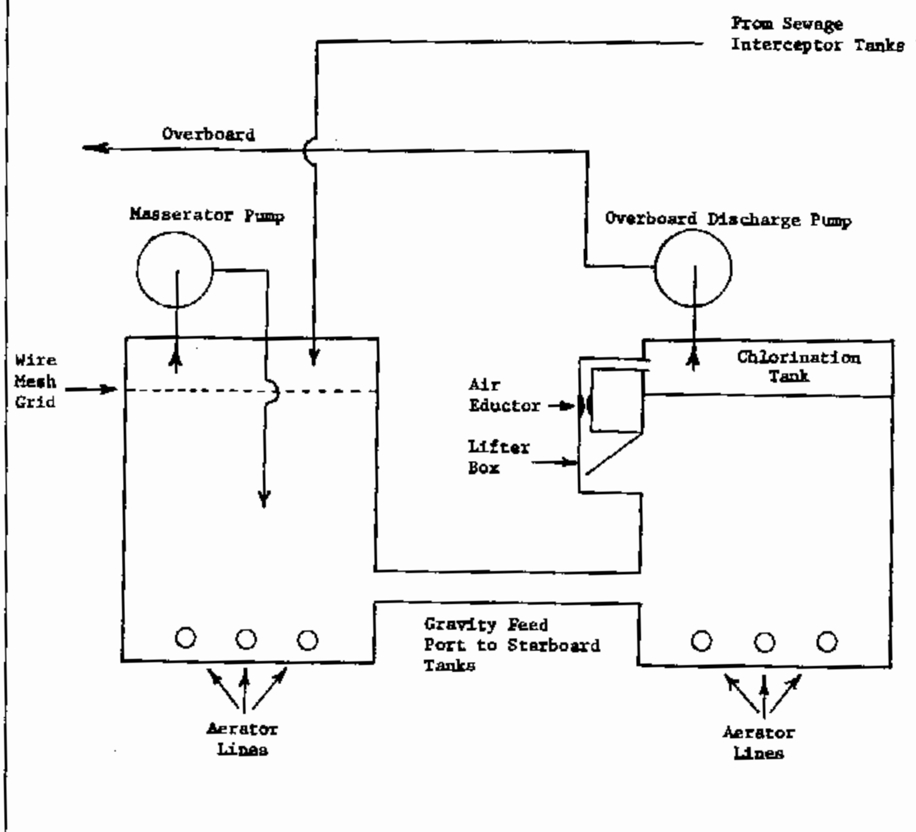
Hoping that luck would hold, the searchers proceeded to the second crewman's berthing area. Luck did not hold. The crewman was found lying on the deck outside his room with his legs twisted under him. He was gasping for air, his teeth were clenched, and he was frothing lightly. Although the man's eyes were open, his pupils did not react when a flashlight was played on his eyes; neither did he blink. Verbal questioning got no response. Because the search party believed these symptoms indicated a head or back injury, they decided not to move the crew member until medical assistance arrived. Searchers also noted that several large boxes had wedged against the door to this crewman's room during the vessel's roll. Searchers theorized that the crewman had managed to kick out the top panel of this door and crawl out the top. He was found next to the door.

It took 40 minutes to find the crewman after the vessel had rolled in drydock. The injured crewman was transported from the vessel to a local hospital about 30 minutes after he was found and after having been seen by a medical doctor and a rescue squad paramedic. Despite all efforts, the crewman died in a local hospital the next day, 39 hours after the casualty.

Cause of Death

Subsequent investigation revealed that the cause of this crewman's death was not traumatic injury, as had been originally reported. The medical examiner's office ruled that the cause of death was "hypoxic brain damage due to oxygen deficiency." The personnel who found the man were interviewed in depth concerning the circumstances in which he was found. Additionally, his berthing area and the surrounding locations were examined in minute detail.

The crewman's berthing area was located immediately above two large, final-stage sewage treatment tanks. The search personnel reported to investigators that, when the crew member was found, they had noticed a strong smell of sewage. The ship's chief engineer, one of the personnel who found the crewman, estimated that approximately 10 metric tons of sewage had flooded into the berthing area from the starboard sewage treatment tank during the vessel's roll. The level of sewage was 2 to 3 feet high on the outboard side of the vessel. The flooding came from the sewage treatment tanks through two toilets on the same deck as the berthing area.



Sewage Treatment System

SS VERACRUZ I

The sewage treatment system on the SS VERACRUZ I consists of five sewage interceptor tanks which collect waste from throughout the vessel. The waste is then sent to the sewage treatment tanks via float-actuated pumps (see diagram). The sewage then enters the port treatment tank where the solids are collected on a wire mesh screen and broken up by a masserator pump. The sludge is then aerated and flows by gravity into the starboard treatment tank. In that tank, sludge is again aerated, lifted into a chlorination tank by an air eductor, and pumped over the side by a float-actuated, overboard discharge pump.

There are two lines which gravity-feed sewage from the port to the starboard treatment tanks. These lines, 8 inches in diameter, are located at the bottom portion of the tanks and do not prevent free transfer of sewage between the two tanks. The centers of the tanks are each approximately 7.9 feet off the centerline of the vessel. Each tank has a maximum capacity of 60 metric tons.

The Gas Hazard

Untreated or partially treated sewage contains a number of gas hazards which arise from sewage decomposition. These include carbon monoxide, methane, and hydrogen sulfide. Methane and carbon dioxide pose hazards in their ability to displace oxygen; methane is also an explosion hazard. In sewage decomposition, hydrogen sulfide is one of the gases most likely to cause problems.

In the SS VERACRUZ I case, the medical examiner was not able to determine the fatal agent because the victim received oxygen from the time he was removed from the ship until his death. However, because of the circumstances in which the victim was found, hydrogen sulfide is suspected to have caused his death.

From **Occupational Diseases; A Guide to Their Recognition:**[1]

Hydrogen sulfide is used in the synthesis of inorganic sulfides, sulfuric acid, and organic sulfur compounds, as an analytical reagent, as a disinfectant in agriculture, and in metallurgy. It is generated in many industrial processes as a by-product and also ***during the decomposition of sulfur-containing organic matter,*** *so potential for exposure exists in a variety of situations...It may also be encountered...in* ***sewers and sewage treatment plants...***

Acute exposure ***may cause immediate coma*** *which may occur with or without convulsions. Death may result with extreme rapidity from respiratory failure.*

Hydrogen sulfide's strong odor, noticeable at low concentrations, is a poor warning sign as it may cause olfactory paralysis, and some persons are congenitally unable to smell H_2S. **(Emphasis added.)**

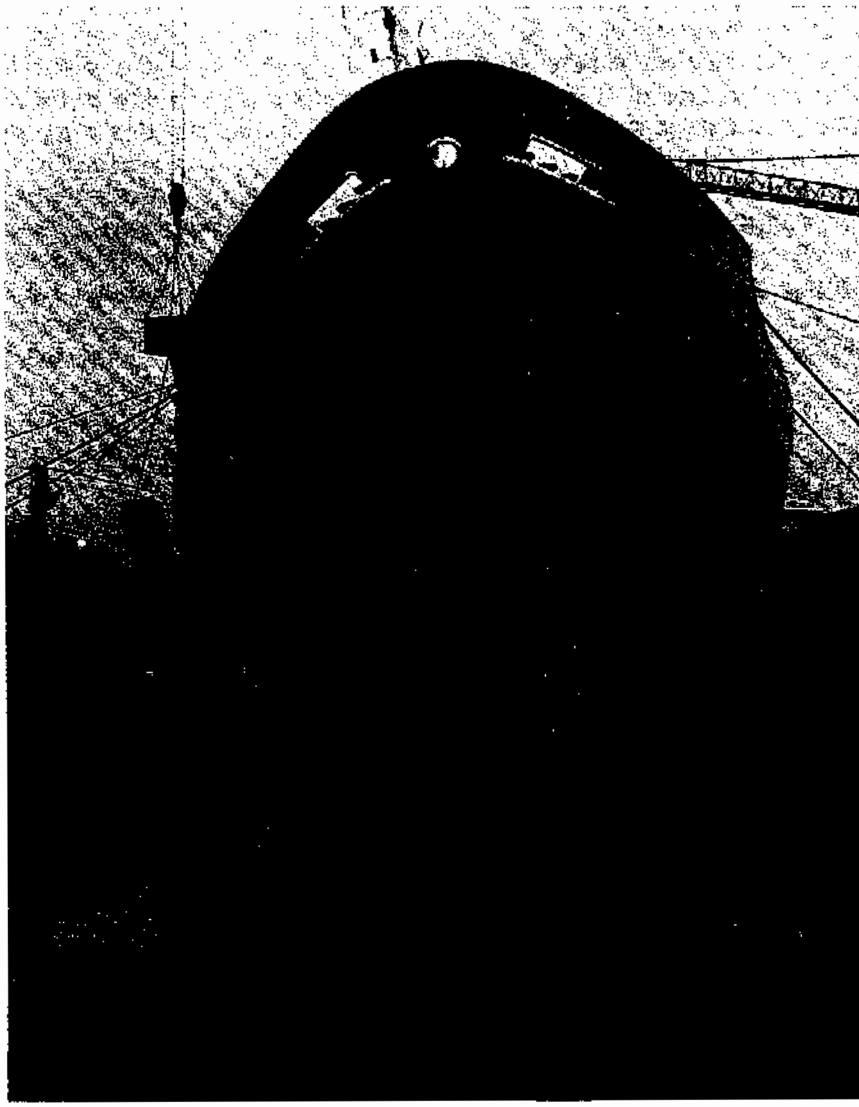


Photo of the SS VERACRUZ I by the author.

Hydrogen sulfide is a deadly gas which is formed by the decomposition of organic material which contains sulfur. It has a characteristic rotten-egg odor which cannot be relied upon as a warning since it temporarily destroys the sense of smell. This may give potential victims a sense of security when the odor is no longer noticeable.

Spaces which may or do contain organic compounds capable of decomposing and forming hydrogen sulfide should be treated with extreme caution. These areas include sewage treatment tanks, lines to and vents from these tanks, voids and cofferdams which may have organic material stored in them (wood, natural fiber rope, etc.), and flooded reefers. If in doubt, do not enter the space until it has been checked by competent personnel, preferably a certified marine chemist.

[1] *National Institute for Occupational Safety and Health, U.S. Department of Health, Education and Welfare.* ***Occupational Diseases: A Guide to Their Recognition.*** *Washington, DC: U.S. Government Printing Office, 1977, pp. 422-23.*

Marine Safety Manual, Volume IV, Now Available

The **Marine Safety Manual (MSM)** is a 10-volume publication which provides information and guidance to Coast Guard personnel assigned to marine safety duties. First published in 1978, the **MSM** is being completely revised to update the subject matter and to conform with the policies of the Coast Guard Directives System.

Seven of the volumes will be available to the general public when revision has been finalized (two volumes are being developed, and one is classified):

Volume No.	Title	COMDTINST No.
I	Administration and Management	M16000.6
II	Material Inspection	M16000.7
III	Marine Industry Personnel	M16000.8
IV	Technical	M16000.9
V	Investigations	M16000.10
VI	Port and Waterways Activities	M16000.11
X	General (NVICs, MOUs, Acronyms)	M16000.15

The first of the **MSM** volumes, Volume IV, "Technical," is now available from the U.S. Government Printing Office (GPO). For your convenience, we are including a GPO order form for this publication.

Volume IV describes the federal program for assuring that commercial vessels and their equipment are designed in accordance with federal safety and pollution abatement standards. Discussed in detail are the technical standards for engineering systems, survival systems, vessel design, ship stability, subdivision, structures, welding, load lines, maneuverability, and the tonnage measurement program.

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Ship and Equipment Design

How well are mariners' requirements taken into account when ships are designed and fitted out? On the premise that feedback from professionals could forestall future problems, a London-based organization solicited the views of its seafaring members.

Part VII
Stores

Compiled by E. J. Riley
from responses to the
Nautical Institute questionnaire

The general opinion of storerooms was that they were sited in areas where it was inconvenient to site anything else. It seems there was little thought given to loading stores, access to the rooms, frequency of use, and preparation required in the storeroom. Insufficient and poor lighting, with the various storerooms scattered around the ship, were other causes for complaint.

1. Access

Main accesses should be sited close to the loading crane/derrick and should be large enough for whole pallets to be passed through to avoid "breaking up" on deck first. Central stores access should be designed to avoid vertical ladders; it is suggested that solid steps with adequate handrails be installed.

2. Bulkheads

Bulkheads between storerooms should be gas-tight to prevent insect infestation.

3. Central stores

It was suggested that there should be a centralized stores area with one central access and an area where pallets may be broken up. This central area should have doors to the respective storerooms. Each storeroom should be located so that it has direct access to its specific department. Easy and safe means must be provided for transferring stores from storerooms to locations, i.e., galley, engine room, etc.

4. General

The poor lighting reported in the survey sometimes caused personal injury and mix-up of the stores. Switches were often located in awkward places. There was a lack of storage space and insufficient ventilation of the storerooms.

5. Hazardous stores

A specific area should be allocated for hazardous stores, well away from the main stores area and particularly the galley stores.

6. Loading stores

Inadequate loading facilities for stores present a major problem with small crews. Often there is no crane/derrick allocated specifically for loading stores. Frequent delays result. A stores crane should be provided specifically for loading stores, and it should be able to lift heavy weights. The crane should be able to reach shore or a barge as well as the ship's central access. ⚓

Standard Hand Signals While On Safety Patrols

for Use by Crewman in Bow to Communicate with Skipper in Cockpit

"I understand your request, but I am unable or unwilling to comply with it."

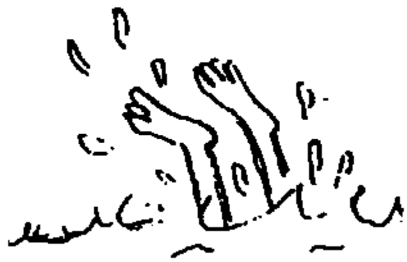
"I have reason to doubt your judgment in this matter."

"Turn to port" or "Turn to starboard," "Increase speed" or "Reduce speed," "Reverse engines," "Proceed" or "Do not proceed," "Danger ahead," or "All clear."

"We have inadvertently given offense to sailors bigger and/or more numerous than ourselves."

"Prepare for unanticipated rendezvous with distressed vessel.

"I am disassociating myself from this safety patrol.



We wish to thank Ken Thompson, editor of **The Navigator,** official magazine of the U.S. Coast Guard Auxiliary, for allowing us to reprint this bit of levity.

Notice of Proposed Rulemaking

CGD 77-140	Miscellaneous Changes to Parts 50 and 56	Jan. 9

These proposed regulations would amend several sections of 46 CFR Part 56 of the Coast Guard's Marine Engineering Regulations for vessels piping systems to clarify technical requirements, correct errors and revise the lists of acceptable standards and specifications.

CGD 83-047	Compatibility of Cargoes	Jan. 11

This proposed rule updates 46 CFR Part 150 which deals with the requirements for compatible storage of bulk liquid hazardous materials on tank vessels.

CGD 80-113	Lifesaving Equipment, Improved Standards for the Stability of Inflatable Liferafts	Jan. 11

This notice proposes regulations for improving the stability of inflatable liferafts used aboard merchant vessels and drill rigs of U. S. registry. The proposed regulations would make the rafts more resistant to capsizing from upsetting forces produced by wind and waves.

CGD 84-022	Bridge Lighting and Other Signals	Jan. 31

The Coast Guard proposes to revise the bridge sign regulations by adding standards for retroreflectors, daymarks, fog signals, vertical clearance gauges, and other signals. These proposals are intended to promote safe navigation through bridges across the navigable waters of the United States.

Final Rule

CGD 83-067	Updates of References to 46 U.S.C. in 46 CFR Subchapter S	Jan. 11

Numerous general maritime shipping laws related to vessels and seamen have recently been codified and enacted into positive law as Subtitle II of Title 46. The purpose of this final rule is to amend the authority citations and references in 46 CFR Subchapter S to conform with the changes to Title 46 U.S.C.

Requests for copies of NPRMs should be directed to the Marine Safety Council. The address is Commandant (G-CMC), U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; telephone (202) 427-1477. The office, Room 2110, is open between the hours of 9:00 a.m. and 4:00 p.m. Monday through Friday. Comments are available for inspection or copying during those hours.

Nautical Queries

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

ENGINEER

1. The air vent filter on the oil reservoir in a nonpressurized hydraulic system must be kept clean to prevent

A. air pressurization of the reservoir.
B. combustible vapors from forming in the reservoir.
C. overheating of the fluid in the reservoir.
D. air from becoming entrapped in the hydraulic fluid.

Reference: Oster, Basic Applied Fluid Power

2. Excessive oil foaming in the crankcase of a refrigeration compressor can cause

A. compressor damage from improper lubrication.
B. refrigerant absorption by the lubricant.
C. increased viscosity in the lubricant.
D. carbon deposit on compressor suction valves.

Reference: Priester, Refrigeration and Air Conditioning, 2nd ed.

3. Which is a characteristic of a governor operating isochronously?

A. Zero speed droop
B. Positive speed droop
C. Negative speed droop
D. Adjustable speed droop

Reference: Maleev. Diesel Engine Operation and Maintenance

4. Conductors are stranded to

A. increase the current carrying capability for a given size wire.
B. increase flexibility.
C. decrease the weight for a given size wire.
D. assure good conductivity at junction points.

Reference: Lister, Electric Circuits and Machines

5. The safety valve on a coil type auxiliary boiler is installed on the

A. thermostat tube.
B. topmost coil.
C. water tank.
D. flash chamber.

Reference: Osbourne, Modern Marine Engineering Manual, Vol. I

DECK

1. When a vessel is stationary and in a hogging condition, the main deck is under

A. compression stress.
B. tension stress.
C. shear stress.
D. racking stress.

Reference: Baker, Introduction to Steel Shipbuilding, 2nd ed.

2. A towing light will be carried above a vessel's sternlight

A. only if she is towing astern.
B. only if the tow exceeds 200 meters.
C. any time when towing.
D. if the vessel is restricted in her maneuverability.

Reference: International Rules

3. What type of vessel or operation is indicated by a vessel showing two cones with the apexes together?

A. Sailing vessel
B. Vessel trawling
C. Mineclearing
D. Dredge

Reference: International Rules

4. Which is the lifesaving signal for "This is the best place to land?"

A. Red star rocket
B. Orange smoke signal
C. Green star rocket
D. Horizontal motion of a flag

Reference: H.O. 102

5. A "dog" is a

A. wedge.
B. crowbar.
C. device to force a watertight door against the frame.
D. heavy steel beam.

Reference: Baker, Introduction to Steel Shipbuilding, 2nd ed.

ANSWERS

ENGINEER
1-A;2-A;3-A;4-B;5-D
DECK
1-B;2-A;3-B;4-C;5-C

If you have any questions about "Nautical Queries," please contact Commanding Officer, U.S. Coast Guard Institute (mvp), P.O. Substation 18, Oklahoma City, Oklahoma 73169; telephone (405) 686-4417.

Committee on Merchant Marine and Fisheries Approved

The recommendations of the Democratic Caucus and the Republican Conference for membership on the House Merchant Marine and Fisheries Committee have been approved by the U.S. House of Representatives.

The House confirmed Walter B. Jones (D-NC) to serve his third term as Chairman of the Committee and Norman Lent (R-NY) as the new Ranking Minority Member.

The Committee membership was expanded to 42 for the 99th Congress, an addition of two Members. The ratio of Democratic to Republican Members is 25 to 17, a change from the 98th Congress when the ratio was 26 to 14.

Following is the Committee membership for the 99th Congress (new Members are designated by an asterisk; Mike Lowry is returning to the Committee after a leave of absence).

Democrats

Walter B. Jones (NC)
Mario Biaggi (NY)
Glenn Anderson (CA)
John Breaux (LA)
Gerry Studds (MA)
Carroll Hubbard, Jr. (KY)
Don Bonker (WA)
James L. Oberstar (MN)
William Hughes (NJ)
Barbara Mikulski (MD)
Mike Lowry (WA)
Earl Hutto (FL)
W.J. (Billy) Tauzin (LA)
Thomas Foglietta (PA)
Dennis Hertel (MI)
Roy Dyson (MD)
William Lipinski (IL)
Robert Borski (PA)
Thomas Carper (DE)
Douglas Bosco (CA)
Robin Tallon (SC)
Robert Lindsay Thomas (GA)
Solomon Ortiz (TX)
Charles Bennett (FL)
Thomas Manton (NY)*

Republicans

Norman Lent (NY)
Gene Snyder (KY)
Don Young (AK)
Robert Davis (MI)
William Carney (NY)
Norman Shumway (CA)
Jack Fields (TX)
Claudine Schneider (RI)
Herbert Bateman (VA)
John McKernan, Jr. (ME)
Webb Franklin (MS)
Thomas Hartnett (SC)
Eugene Chappie (CA)*
Jim Saxton (NJ)*
H.L. (Sonny) Callahan (AL)*
John Miller (WA)*
Helen Bentley (MD)*

CDR Wayne R. Gronlund

Aniline

Aniline, or aminobenzene, is the oldest of our commercial synthetic organic chemicals. It was first produced in quantity about 1858 as an intermediate in the manufacture of the world's first synthetic dye, mauve (violet). Aniline itself is highly toxic, but many of its products are quite innocuous and are used for many things, including rubber-processing agents, resins and plastics, petroleum additives, propellants, paper, metallurgical and metal treating agents, corrosion inhibitors, catalysts, stabilizers, pesticides, repellents, pharmaceuticals, photographic agents, and dyes. Aniline has also been used in producing low-calorie sweetening agents known as cyclamates.

Aniline is an aromatic primary amine. The term "aromatic" refers to the "benzene-like" chemical bonding present in the compound, not to any odor produced. (See Phenol, "Chemical of the Month," **Proceedings,** September/October 1984.) Aniline is an oily liquid ranging in color from colorless to pale yellow. It darkens on exposure to air. Aniline is produced by heating indigo (a blue dye) with an alkali (e.g., sodium hydroxide). In fact, the name aniline is derived from the Portuguese word for indigo, **anil.**

Aniline is a highly toxic chemical but can be handled safely if proper precautions are taken. It is readily absorbed through the skin in dangerous amounts and may be fatal if swallowed or if its vapors are inhaled. The chemical is also irritating to the eyes and may cause eye damage.

Aniline affects the blood's ability to carry oxygen. Moderate exposure may cause only a bluish discoloration of the skin (cyanosis). At early stages of aniline intoxication, an individual may feel well, have no complaints, and may insist that nothing is wrong, although cyanosis is evident to observers. As oxygen deficiency increases, the blue discoloration may be associated with headache, weakness, irritability, drowsiness, shortness of breath, and unconsciousness. If not treated promptly, death can occur. The onset of symptoms may be delayed. Chronic poisoning can occur with repeated exposure to low concentrations. Early symptoms in these cases are pallor, secondary anemia, and fatigue.

If contaminated with aniline, an individual's contaminated clothing must be removed at once. Speed in removing aniline from the skin is of prime importance, followed by an immediate, thorough shower with plenty of soap and lukewarm water. Oxygen may be administered by trained personnel, but it is imperative to get medical help at once. Ingestion of alcohol in any form should be avoided.

On a scale of 0 to 4 (4 being the worst). the National Fire Protection Association (NFPA) assigns aniline the following hazard classifications: health, 3; flammability, 2; reactivity, 0.

The Coast Guard regulates aniline as a Subchapter O commodity for bulk shipment by tank barge and tankship (Parts 151 and 153, respectively, of Title 46 of the Code of Federal Regulations). The U.S. Department of Transportation regulates it as a Class B poison. It is listed as a hazardous substance by the Environmental Protection Agency. The IMO regulates it as Class 6.1 (Poison); it is found on page 6016 of the International Maritime Dangerous Goods (IMDG) Code.

Note: Some of the health information in this article was taken from the "Occupational Health Guideline for Aniline" issued by the U.S. Department of Health and Human Services and the U.S. Department of Labor.

Chemical name:	Aniline
Formula:	$C_6H_5NH_2$
Synonyms:	benzeneamine aniline oil phenylamine aminobenzene aminophen kyanol blue oil
Physical Properties:	
boiling point:	184.4°C (364 °F)
freezing point:	-6.2°C (21°F)
vapor pressure:	
50°C (122°F)	2.4 mm Hg
100°C (212°F)	45.7 mm Hg
Threshold Limit Values (TLV)	
time weighted average:	2 ppm; 10 mg/m^3
short term exposure limit:	5 ppm; 20 mg/m^3
Flammability Limits in Air	
lower flammability limit:	1.3% by volume
upper flammability limit:	11% by volume
Combustion Properties	
flash point:	70°C (158°F) closed cup 75.6°C (168°F) open cup
autoignition temperature:	615°C (1139°F)
Densities	
liquid (water=1):	1.022
vapor (air=1):	3.22
U.N. Number:	1547
CHRIS Code:	ANL
Cargo compatibility group:	9 (Aromatic Amines)

This month's article was written by guest author CDR Wayne R. Gronlund, Associate Professor of Chemistry, U.S. Coast Guard Academy, New London, Connecticut.

From the Editor

As I complete my first 6 months as editor of the **Proceedings**, I'd like to acknowledge the efforts of many "behind-the-scenes" folks who make each issue of this magazine possible.

Typesetting, graphics, and artistic advice: ENS R.L. Birthisel, MCPO Dave Cipra, and PA3 Pete Grossetti.

Photography and photographic research: PA2 Charles Powell.

Printing administration: Printing specialist William Gibson (USCG) and printing assistant Pola McCorkle (DOT).

Computer matters: Martin Fish, computer systems analyst.

Mailing list updates and administrative assistance: Nancy Tarbox and Janet Walton.

Writers and reviewers: ENS Mark Devino (Keynotes); LCDR Thomas Haas and Curtis Payne (Chemical of the Month); LCDR Tony Hart and MMI-3 staff (Lessons from Casualties); CDR George Naccara and MVP-3 staff (Maritime Licensing, Certification, and Training); LCDR M.T. Woodward, Jerry Askin, Barry Farnsworth, LCDR Art Adkins, LT Don Grushey, and staff from the MVP Division of the Coast Guard Institute (Nautical Queries).

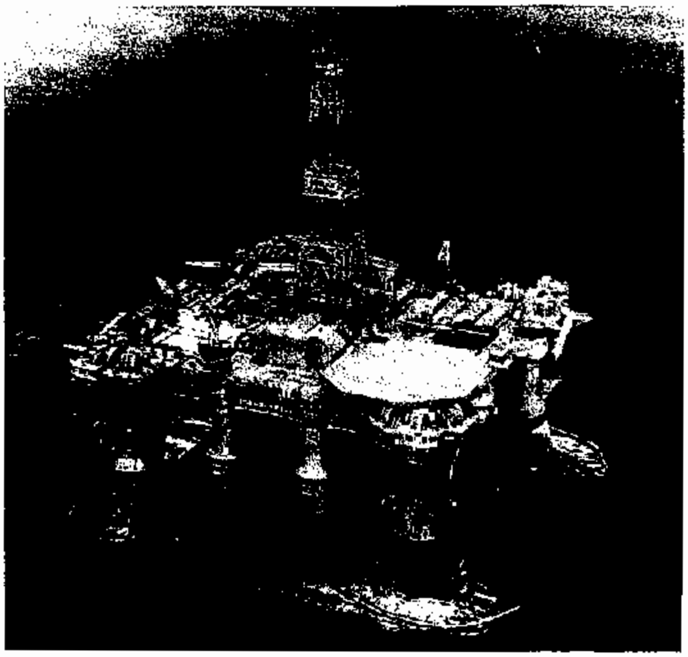
Guidance: Bruce Novak, Deputy Executive Secretary, Marine Safety Council.

Sharon Chapman

New Merchant Mariner Document Endorsements Created

Merchant mariners working on mobile offshore units (MOUs) can now apply for documents endorsed as able seaman-(MOU) or lifeboatman-(MOU). The qualifications, examination topics, and career paths for these unlicensed personnel employed aboard MOUs have been developed as a result of a joint Coast Guard and industry working group. For this program's purposes, the term mobile offshore unit includes non-self-propelled and self-propelled mobile offshore units while under tow or at the exploration or exploitation site operating exclusively in mineral and oil exploration and exploitation. This includes drilling, accommodation, construction, maintenance, pipelaying, and firefighting vessels. This does not include supply and towing vessels. On the basis of the working group's recommendation and as an interim measure pending a regulatory change to 46 CFR 12, a letter from the Coast Guard's Merchant Vessel Personnel (G-MVP) Division to all Regional Examination Centers authorized the issuance of merchant mariner's documents endorsed as "able seaman-(MOU)" and "lifeboatman-(MOU)." Both certificates are considered lesser included ratings of able seaman-special and lifeboatman, respectively. All Regional Examination Centers were directed to implement this new program upon receipt of the necessary examination. All interested applicants should contact the local Regional Examination Center for specific details. Following is a description of this new program.

Qualifications, Examinations, and Career Paths for Able Seaman-(MOU)



Service or training requirements

You must have 12 months of service on deck on board vessels of 65 feet or more in length serving on ocean, coastwise, or inland routes. An approved training program may be substituted for up to one-third of the service requirement. Such a course should include realistic survival craft and survival equipment training. (For the purpose of qualifying service, 12 months equals 360 8-hour days.)

Other qualifications

You must be at least 18 years of age, speak and understand the English language as would be required in performing able seaman and emergency duties, and pass a physical examination as required for other able seamen.

Manning

Personnel rated as able seaman-(MOU) may constitute all of the able seamen on non-self-propelled mobile offshore units. They may also constitute all of the able seamen on self-propelled units of not more than 500 gross tons and not more than 50 percent of the number of able seamen required on board all other self-propelled mobile offshore units.

Examination topics

a. Complete the examination and practical demonstration for lifeboatman-(MOU) if not previously qualified.

Part I

b. Basic knots and splices.
c. Care and capacity of lines.
d. Ratings of slings, hardware, and hoists.
e. Basic anchoring.
f. Towing.
g. Personnel transfer basket.
h. Securing attending vessels.
i. Deck terminology.
j. Safety procedures (i.e., power tools).
k. Oil pollution.

Part II

l. First aid.
m. Firefighting.
n. Rules of the road (international only).
o. Survival and abandonment procedures.
p. Personal flotation devices (including exposure suits).
q. Station bills.

Career paths

Able Seaman-Unlimited. You must show an additional 2 years' qualifying service and pass the able seaman-unlimited examination, including the conventional lifeboat examination and practical demonstration.

Able Seaman-Limited. You must show an additional 6 months qualifying service and pass the able seaman-limited examination, including the conventional lifeboat examination and practical demonstration.

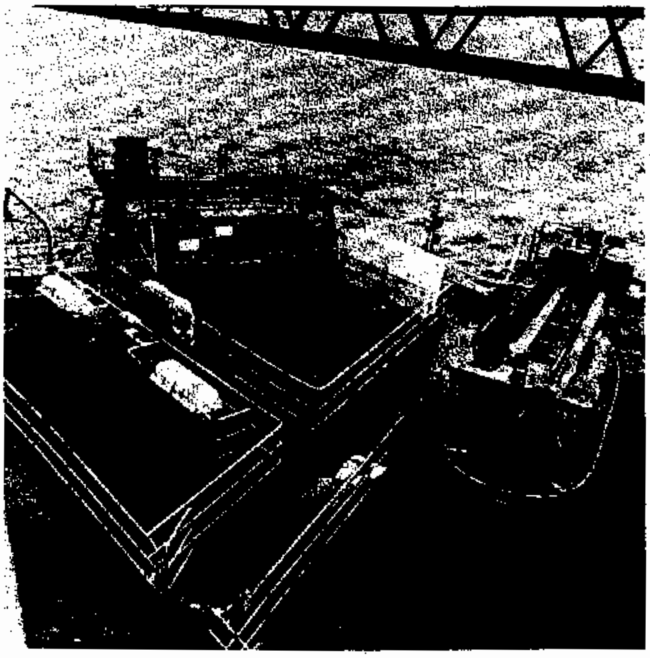
Able Seaman-Special. You must pass the able seaman-unlimited examination, including the conventional lifeboat examination and practical demonstration.

Able Seaman-(OSV). You must pass the able seaman-(OSV) examination.

Lifeboatman. You must pass the conventional lifeboat examination and practical demonstration.

An able seaman - limited, unlimited, or special - is qualified as an able seaman-(MOU) without additional testing, service, or endorsement. A licensed individual **not** holding a merchant mariner's document endorsed as able seaman **is not** qualified to serve as able seaman-(MOU).

Qualifications, Examinations, and Career Paths for Lifeboatman-(MOU)



Service or training requirements

You must have twelve months service on deck on board vessels of 65 feet or more in length serving on ocean, coastwise, or inland routes; service other than on deck will be counted as half time (i.e., 1 day credit for every 2 days service). Service on fixed structures (i.e., platforms) is acceptable in meeting the service requirements for this document provided (1) the structure is equipped with Coast Guard-approved lifeboats/survival capsules, (2) all regular drills are held on the structure as evidenced in the company log, and (3) the applicant shows evidence of having been trained in using and maintaining that equipment. Service on platforms meeting these criteria will be considered as half time. An approved training program may substitute for all except 30 days of the sea service requirement. Such a course should include realistic survival craft and survival equipment training. (Note: Service gained on fixed structures as mentioned above in addition to equivalent service as a result of attending an approved school may substitute for up to one-third of the service requirement for any able seaman rating.)

Other qualifications

You must be able to speak and understand the English language as would be required in performing lifeboatman and emergency duties.

Manning

Personnel rated as lifeboatman-(MOU) may constitute all of the required number of lifeboatmen on self-propelled and non-self-propelled mobile offshore units.

Examination topics

a. Station bill (abandon vessel).
b. Covered lifeboats and equipment.
c. Survival capsules and equipment.
d. Life rafts and equipment.
e. Basic survival at sea.
f. Distress/lifesaving signals.
g. Pesonal flotation devices.
h. Practical demonstration using installed survival equipment.

Career paths

Able Seaman-Unlimited. You must show an additional 2 years' qualifying service and pass the able seaman-unlimited examination, including the conventional lifeboat examination and practical demonstration.

Able Seaman-Limited. You must meet the total service required for this rating and pass the able seaman-unlimited examination, including the conventional lifeboat examination and practical demonstration.

Able Seaman-Special. You must meet the total service required for this rating and pass the able seaman-unlimited examination, including the conventional lifeboat examination and practical demonstration.

Able seaman-(MOU). You must meet the total service required for this rating and pass the able seaman-(MOU) examination.

Able Seaman-(OSV). You must meet the total service required for this rating and pass the able seaman-(OSV) examination.

Lifeboatman. You must meet the total service required for this rating and pass the conventional lifeboatman examination and practical demonstration.

An able seaman (limited, unlimited, special, or MOU) or a lifeboatman is qualified as a lifeboatman-(MOU) without additional testing, service, or endorsement. A licensed individual **not** holding a merchant mariner's document endorsed as able seaman or lifeboatman **is not** qualified to serve as a lifeboatman-(MOU).

Examination and Practical Demonstration

The Coast Guard Institute (mvp) has developed appropriate examinations for able seaman-(MOU) and lifeboatman-(MOU), and Regional Examination Centers have been directed to examine qualified applicants for these certificates upon receipt of the examinations. Once an applicant is qualified insofar as the service, physical, and application requirements are concerned, the applicant may submit evidence of completion of the practical demonstration. The practical demonstration may be performed using one of three different types of primary survival equipment (a lifeboat, survival capsule, or a liferaft). This recognizes that many of the units within the definition of MOU are required to have able seamen aboard but are equipped only with liferafts as primary lifesaving equipment. Also, current training facilities for this type of training are very limited, and the three types of primary lifesaving equipment are tested on the written lifeboatman-(MOU) examination.

Administration of the appropriate written examination will follow this sequence:

lifeboatman-(MOU),
able seaman-(MOU), Part I, and
able seaman-(MOU), Part II.

The written module for lifeboatman-(MOU) must be completed with a minimum passing score of 70 percent before continuing with the able seaman-(MOU) modules. The able seaman-(MOU) modules Part I and II are graded as a single examination with a minimum passing score of 70 percent. All other lower level examination procedures apply to these examinations.

Lifeboatman-(MOU) and Able Seaman-(MOU) Practical Demonstration

To facilitate completion of the requirements to obtain a merchant mariner's document endorsed as able seaman-(MOU) or lifeboatman-(MOU) and to provide a more realistic test of a mariner's proficiency in the use and handling of survival craft, a practical demonstration of lifeboatman knowledge may be performed on units to which a mariner is assigned. If the liferaft alternative is selected, the liferaft must be inflated.

To complete this portion of the requirements for these documents, a letter in this format (see illustration) should be submitted to the Coast Guard Regional Examination Center to which application is made. You must obtain the signatures of the master, Coast Guard marine inspector, or approved training course instructor witnessing each of the three practical requirements, together with the other indicated information. Once the three practical requirements have been approved, the signature of a responsible member of the company or the head of the facility which sponsors the Coast Guard-approved training course should be displayed at the bottom of the form along with the individual's title and the name of the company or school. When the mariner's proficiency has been witnessed by a Coast Guard marine inspector, the company's or school representative's signature is not necessary.

The sample letter, as illustrated, should be typed on company or school letterhead.

Dear Sir:

The bearer, ______________________ (Name), ______________________ (Social Security No.) has satisfactorily demonstrated his/her ability to carry out, in a competent manner the following evolutions associated with a practical demonstration of proficiency in the use and handling of motor propelled covered lifeboats, survival capsules or liferafts:

1. Operations connected with the launching of lifeboats, survival capsules, or liferafts, including the carrying out of the usual orders given.

______________ (Signature), ______________ (Title), ______________ (Vessel), ________ (Date)

2. Practical handling of lifeboats, capsules, or liferafts including operation of equipment installed in the craft.

______________ (Signature), ______________ (Title), ______________ (Vessel), ________ (Date)

3. Ability to take command of a survival craft.

______________ (Signature), ______________ (Title), ______________ (Vessel), ________ (Date)

I understand that demonstration of this practical knowledge constitutes a portion of the requirements prescribed for the issuance of a merchant mariners document for lifeboatman-(MDU) and able seaman-(MDU) in accordance with 46 CFR 12.10-5.

______________________ ________
Signature of Appropriate Company or School Representative (Date)
NAME, TITLE, COMPANY/SCHOOL

All mariners who think they may be qualified for these new ratings can apply to a local Regional Examination Center for evaluation. Questions that can't be answered by the local office may be directed to the Merchant Vessel Personnel (G-MVP-3) Staff, U.S. Coast Guard Headquarters, (202) 426-2240.

MARAD's "Port Risk Management Guidebook"

The Maritime Administration has published a "Port Risk Management Guidebook," a 127-page "how-to" reference book designed to provide ports with basic information needed to establish and maintain appropriate and cost-effective insurance and risk-management programs.

While written from a port's point of view and geared toward the basics of insurance and risk management, the publication is expected to be generally useful to other organizations in the maritime and shipping industries.

It was produced under a cost-shared research contract with the Wyatt Company of Washington, DC, with assistance and guidance from a study committee comprised of representatives of MARAD and other federal agencies, trade associations, and U.S. ports.

Limited copies of the guidebook are available from the Office of Port and Intermodal Development, Maritime Administration, U.S. Department of Transportation, Room 7201, 400 Seventh Street, SW, Washington, DC 20590; telephone (202) 426-4357.

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