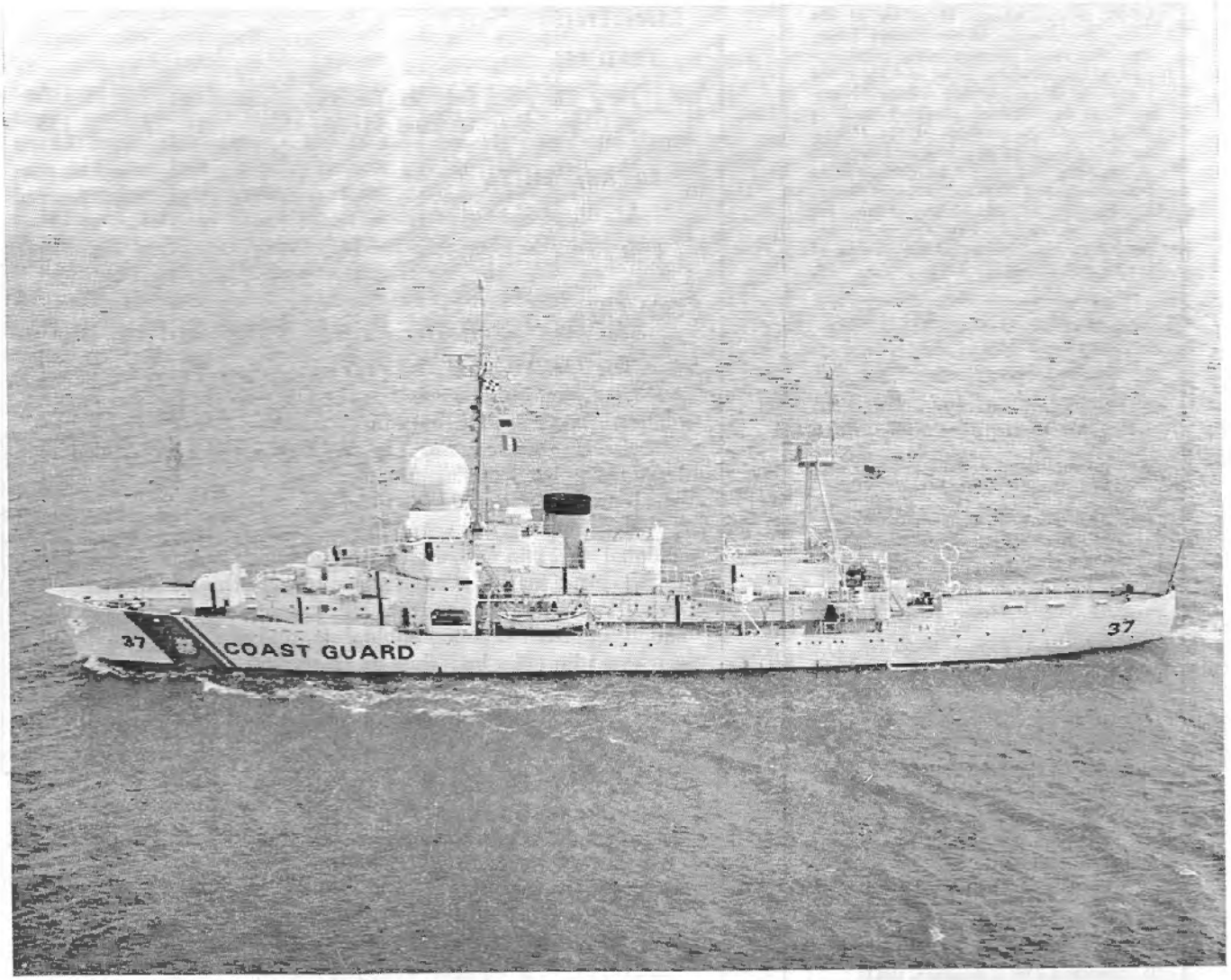
PROCEEDINGS
OF THE MARINE SAFETY COUNCIL



DEPARTMENT OF TRANSPORTATION **UNITED STATES COAST GUARD**

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PROCEEDINGS

OF THE MARINE SAFETY COUNCIL

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COVER

The Coast Guard Cutter *Taney*, equipped with special storm-tracking radar dome. For the past 4 years, the *Taney* has manned ocean weather station "Hotel," 200 miles off the Maryland/Virginia coast. The 327-foot vessel is scheduled to leave her post for the last time next month as the Coast Guard's ocean station program comes to an end.

The program was begun in the 1940's, primarily as an internatiooal effort io support of transoceanic aviation. Since that time, ocean station vessels have collected and transmitted weather information, served as aids to navigation and communication, gathered oceanographic data, and provided search and rescue readiness for both ships and aircraft.

Over the years, technological developments in these areas have made it possible to accomplish the same functions without the expense of manned stations.

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Lists TCG–06, CG–13

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maritime sidelights

SAFETY SENSES

While most accidents are caused by mistakes of people, a few involve failure of equipment. However, even those mechanical failures can be traced back to someone's mistake, such as his not being alert to defects in equipment, not reporting such defects, or failure to take corrective action.

Your senses can help you to spot something wrong:

Sight: Be on the lookout for accidents in the making.

Hearing: Listen for the off-beat sounds of defective or improperly adjusted equipment.

Smell: Your sense of smell can help you detect most gas or chemical leaks, fire, or arcing electricity.

Touch: Your hands can warn you of such things as excessive vibration or overheating.

And for good measure, there's your "common" sense—your good judgment and know-how in performing your normal duties in an efficient and safe manner.

—Courtesy of Lykes Lines Safety Bulletin

A FOOL FOR COMPANY

Any man who goes alone into any isolated space on a ship, without first telling some responsible shipmate, has a fool for company. Here are a couple of "for instances."

The plunger rings on the cargo stripping pump had to be renewed, and the First and the Pumpman were to do the job. At 8:00 in the morning, the Pumpman, without waiting for the First, went down into the pumproom and started to pull the piston rod packing on the liquid end. He then took off the cylinder cover, slid it up on the piston rod, canted it so that it would stay up, and reached down into the cylinder with both hands. About this time, the cylinder cover slid down the rod and pinned his arms. There he was caught, and there he stayed, until the First came down and released him. Now, if there had been any gas vapors around that pump, that Pumpman would have been in a bad way.

In another case, an Electrician, who was brand new aboard, took a walk around the ship to see where things were. He found the emergency generator room and, without asking or telling anyone, decided to familiarize himself with the automatic transfer circuits on the emergency board. He caused a short circuit which flash-burned his face and blinded him temporarily. He did quite a bit of panic shouting and groping before he made it out of the room and attracted help. If he had been shocked unconscious or paralyzed, he could have been a long, long time alone.

There are a lot of isolated places on a ship where a man can be out of sight and sound, and out of reach of help if he has an accident, unless he has the common sense to tell people beforehand where he is going and when.

And, of course, pumprooms, tanks, cofferdams, and voids must never be entered without permission, proper preparation, and someone in attendance at the entrance.

—Courtesy of Chevron Safety Bulletin

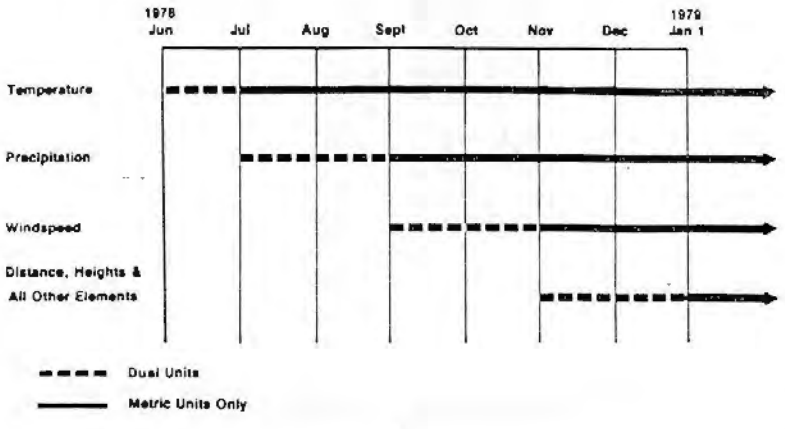
METRIC WEATHER

The National Weather Service (NWS) has proposed that January 1, 1979, be set as the date when the news media report weather, including river and flood information, entirely in metric units. After that date NWS issuances would be completely in metric units.

Beginning in June 1978, a comprehensive program of public awareness will be undertaken by NWS, concentratiug first on temperature, with other weather elements following at 2-month intervals. July 1978 has been chosen to introduce wind speed in metric, corresponding to the time the Federal Highway Administration proposes to begin erecting speed limit signs in kilometers per hour.

NWS is encouraging the media and all other interested parties to take the initiative in education and begin using metric units as soon as possible, keeping in mind that once the metric units have been introduced they should be retained.

NWS provides weather information to the public through the NOAA Weather Wire Service, which serves the mass media by teletype; NOAA Weather Radio, a 24 hour a day broadcast system; and recorded Weather by Phone systems.



New Developments in Benzene Regulations

by Lieutenant Commander John E. Lindak and Lieutenant Thomas J. Haas

Cargo and Hazardous Materials Division, Office of Merchant Marine Safety

In recent years, ever-increasing attention has been given to the hazards associated with the manufacture and handling of the vast array of chemical substances in use today. The acute *hazards of these substances—flammability, toxicity, etc.—though all too often underestimated, are well known. But we are only beginning to discover the long term effects of many chemicals. Recently, such terms as polyvinyl chloride, Kepone, and PBB's have become familiar in the news, as each came under suspicion of causing cancer, nervous disorders, or other grave health problems.*

One substance currently at the center of much controversy is benzene, an apparent cancer-causing agent. Medical studies on the subject have prompted Federal regulatory action to establish safe limits on exposure to benzene, and, as the authors point out, many other chemicals now under study are likely to be the subject of similar actions in the future.

Recent proposed benzene regulatory developments have generated a great deal of controversy and confusion among major petroleum industry trade organizations, workers' unions, and Federal agencies. Just how serious are the hazards of exposure to benzene vapors? What are the present and proposed regulatory safeguards protecting merchant marine personnel and Coast Guard marine inspectors aboard benzene tank vessels?

The purpose of this paper is threefold: to describe the acute and chronic hazards of benzene; to summarize the proposed changes to Federal benzene exposure regulations; and to explore the nature of the present public controversy regarding these proposed changes.

Physical Properties

Benzene is a light yellow or colorless liquid having a strong yet pleasant aromatic odor. However, it cannot be detected by smell by most humans until it is present at a vapor concentration of 75–100 parts per million (ppm). It is virtually insoluble in water, and will float at the water's surface since it has a specific gravity of 0.88.

A low boiling point of 176° F and a high vapor pressure of 75 mm of mercury cause liquid benzene to vaporize rapidly under normal atmospheric conditions. The vapor density of benzene is 2.8; thus, benzene vapors will not disperse readily but will tend to collect in the lowest accessible levels of any enclosed space or cargo tank.

Acute Hazards

Benzene is classed as a flammable liquid, with a 12° F (closed cup) flashpoint and flammable limits of 1.3–8.0% by volume for the vapor in air. The low-level clinging characteristics of the dense benzene vapor pose a significant delayed-ignition and flashback hazard.

Human health hazards of benzene include both acute and chronic forms of poisoning, primarily by inhalation of the vapor. Coast Guard publication CG–482, "Benzene Safe Handling Practices," points out that breathing air containing 2% by volume (20,000 ppm) of benzene vapor is lethal to humans within 5 to 10 minutes. Exposure to these acute concentration levels can occur at the site of an accidental benzene spill or a transfer equipment leak or failure.

The adverse effects of breathing benzene vapor concentrations result

from the narcotic action of benzene on the human central nervous system. Initial symptoms of acute exposure include feelings of exhilaration followed by deep emotional depression.

The adverse effects of breathing benzene vapor concentrations result from the narcotic action of benzene on the human nervous system.

Ultimately, death will result from respiratory failure.

Several exposure level readings are listed below to give the reader an approximate idea of instantaneous vapor concentrations which have been measured during barge loading/transfer operations.

It must be emphasized that these exposure levels fluctuate drastically during benzene transfer/loading operations because of site variables (wind strength and direction, loading rates, etc). Therefore, the readings given could well be peak values and not indicative of the true average benzene vapor concentration present.

Chronic Hazards

A more common and subtle problem is chronic benzene toxicity, which results from prolonged exposure at relatively low concentrations (0–75 ppm). Toxicity is a relative property of a chemical and refers to a harmful effect on some biological mechanism and the condition under which this effect occurs.

Among the aromatic hydrocarbons, benzene is unique in its ability to selectively damage the blood-forming system. Depression of the bone marrow activity results in anemia (a decrease in the red cell count), leucopenia (a decrease in the white cell level), or thembocytopenia (a decrease in the platelet count). When all three elements of the blood are suppressed a condition known as aplastic anemia (pancytopenia) results.

However, it is the cancer-producing property of benzene which is of greatest concern today. Cancer is a general term which encompasses a large number of diseases having certain common characteristics. Cancers involve changes in the cells of a body such that the affected cells grow and reproduce at an unregulated rate. If untreated, this abnormal growth continues until the individual eventually dies.

This definition also describes leukemias. Leukemias are a certain class of cancer involving the cells which produce the white blood cells in the body. There are a number of different kinds of leukemia, depending on which of the various white-blood-forming cells are affected. There are indications that acute myelogenous leukemia (attributed to benzene exposure) is a stem cell disease, since the red blood cell line may also be affected. Stem cells are the preliminary form of both red and white cells.

A suspected association between benzene exposure and leukemia has been reported in scientific literature for many years. Only recently has the causal nature of this relationship been more fully investigated—with emphasis on whether low level benzene vapor exposure does indeed cause leukemia.

Concrete results are extremely difficult to obtain for a number of reasons. First, available records indicate that the incidence of suspected benzene-caused leukemia is exceedingly low: approximately 8 per 100,000 workers exposed (and this number includes workers exposed to 100 ppm or greater concentrations). Thus, the number of leukemia cases resulting from solely *chronic* benzene exposure will be even smaller and even more difficult to verify. Also, the possible latent period of many years between benzene exposure and occurrence of leukemia makes the proof of a direct scientific link almost impossible. As a result, honest disagreement does exist in the scientific arena because of the complexity of the prohlem. The extensive body of testimony presented at the OSHA Public Hearing on Benzene (discussed later) vividly illustrates this.

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How does breathing benzene vapor cause leukemia? Many unvalidated theories on the mechanism of chemical carcinogenesis exist. One theory is that certain body cells are in a potential pre-cancerous state, and when exposed to a carcinogen (such as benzene) will continue in this state for a long time—perhaps years. Then, after this latency period, they become cancerous.

A second theory is that a chemical carcinogen damages certain specific genes in the cell, and if the essential

Location or activity	*Exposure level (ppm)*
10–20 ft. from vent stack	7–20
ullage at breathing level of gauger (about 2 ft.)	130
at vent line	1,400
ullage port	600
connecting load line	3
disconnecting load line	10
barge personnel downwind	30
8-hour time weighted avg. (estimated)	1–5

Source: U.S. Department of Labor (OSHA), Economic Impact Statement—Benzene, May 1977, Vol. I, p. 4.25.

gene is affected, the cell eventually becomes cancerous. Both theories attempt to explain the lengthy latent period and its variability.

Conceivably then, if these theories are valid, it is possible for a single short exposure to any concentration of a chemical such as benzene to induce cancer. There is a one-in-a-million chance that a trip into a benzene tank, resulting in exposure to a hypersensitive individual, may result in leukemia later in life. This is called

If these theories are valid, it is possible for a single short exposure to any concentration of a chemical such as benzene to induce cancer.

the "single hit" theory, because a "single hit" by a carcinogen on a specific cell gene is all that is needed to produce damage. Note, however, that the probability of this happening is so low as to be practically nonexistent. This example was included to illustrate the tremendous potential destructive power of a carcinogen.

Recent Federal Regulatory Developments

The Occupational Safety and Health Act of 1970 was signed by President Nixon on December 29, 1970, and became effective on April 29, 1971. This Act enables mandatory Federal health and safety standards to be applied to the job environment of virtually every working man and woman in the nation. Section 5 of the Act places on each employer the responsibility to provide his employees with a workplace that is free from recognized hazards which cause, or are likely to cause, death or serious physical harm.

The Occupational Safety and Health Administration (OSHA), under the Department of Labor, promulgates the standards and enforces them. Failure to comply with the OSHA standards will subject an employer to heavy fines, and/or possibly imprisonment.

The Occupational Safety and Health Act also established the National Institute for Occupational Safety and Health (NIOSH) under the Department of Health, Education, and Welfare. NIOSH provides the scientific background and experimental studies necessary for OSHA to use as a basis for formulating new, or updating old, standards.

In August of 1976, NIOSH submitted to OSHA a report which summarized the results of recent studies of the low level exposure hazards of benzene. This report concluded, on the basis of current data, that benzene was indeed leukemogenic and recommended that since no safe level for benzene exposure could be established, no worker should be exposed to benzene in excess of 1 ppm in air.

Again in January 1977, NIOSH submitted additional survey data to OSHA which tended to reinforce their previous conclusion—that low level, chronic exposure to benzene could eventually result in leukemia.

On the basis of this information, OSHA published in the May 3, 1977, Federal Register a benzene emergency temporary standard. This standard, which was to become effective on May 21, 1977, reduced the

The day prior to the effective date of the OSHA emergency temporary standard, a stay was issued by the U.S. Fifth Circuit Court of Appeals.

permissible time-weighted average exposure over an 8-hour day from 10 ppm to 1 ppm. Also, the benzene ceiling limit was reduced from 25 to 5 ppm. (The ceiling limit is the maximum allowable exposure in ppm over any 15-minute period during an 8-hour workday.) Monitoring, respiratory equipment, medical examinations and recordkeeping requirements were also included in the OSHA emergency temporary standard.

On May 20, 1977, the day prior to the effective date of the OSHA emergency temporary standard, a stay was issued by the U.S. Fifth Circuit Court of Appeals in New Orleans. Several petroleum companies had petitioned the court, saying that compliance with the requirements of the ETS was not possible by the effective date of May 21. Due to subsequent legal action, the ETS still has not become effective.

The notice of proposed rulemaking for OSHA's permanent benzene occupational exposure standard was published in the Federal Register on May 27, 1977. Public hearings on the proposed standard began on July 19, and lasted for over 3 weeks. The provisions of the proposed standard were hotly debated, with witnesses from labor unions, the scientific community, OSHA, NIOSH, and various petroleum organizations testifying.

OSHA Public Hearings

OSHA called on NIOSH researchers to describe their studies relating benzene exposure to leukemia. Labor unions such as the Oil, Chemical, and Atomic Workers and the United Rubber Workers called for lowering the proposed 1 ppm allowable benzene exposure level to a 0.5 ppm ceiling limit, to assure worker safety. Organizations critical of the proposed standard included the American Petroleum Institute, American Iron and Steel Institute, and the Manufacturing Chemists Association.

The principal conflict during the hearings centered on the proposed reduction of the permissible workplace exposure limit for benzene from 10 ppm to 1 ppm. The basic OSHA po-

sition was that there is enough scientific evidence to indicate that benzene is a carcinogen; therefore, to protect the worker's health, employee exposure should be reduced to the lowest possible level. This level should be the lowest level technically feasible.

The principal conflict centered on the proposed reduction of the permissible workplace exposure limit for benzene from 10 ppm to 1 ppm.

OSHA also raised the question that perhaps 1 ppm is *too high*—any exposure to benzene might be enough to cause cancer.

Opponents of the proposed standard argue that there is no "dose-response" relationship between cancer and benzene at the levels proposed.[1] All available experimental data or survey results are taken from high-level exposure experience. Opponents argue that there are no studies which justify a lowering from 10 ppm to 1 ppm. In fact, there are no data, human or animal, which show cancer at the 10 ppm level. Only at high levles (100 ppm or higher) of benzene exposure are there statistically significant increases in the occurrence of cancer.

The opponents believe there are no demonstrable effects of cancer at the 10 ppm level of exposure. Therefore, no decrease is necessary; the workers' health and well-being is not in jeopardy; and it would be extremely costly, if not impossible in some cases, to comply.

Union testimony indicated that some benzene employees might not be willing to undergo a medical surveillance program for fear of losing their jobs if leukemia symptoms were discovered. In general, however, the unions overwhelmingly supported the OSHA standard and desired even more protection than the proposed standard provided. In addition, the unions wanted the law to reflect protection of the economic security of their membership.

Future of the OSHA Proposed Standard

The benzene hearings were completed on August 10 without any public determination of the final form of the standard. Would the standard remain the same, be reduced, or even lowered past the 1 ppm suggested by NIOSH? The hearing record will be reviewed by the Assistant Secretary of Labor for OSHA who will then resolve any conflicts in the proposed regulation. The standard will then be forwarded to the Secretary of Labor for his approval.

Barring any delays, either internally or in the courts, the standard in its final form will become law on November 3, 1977. At this time, it is still difficult to say what the final standard will be. However, it is a good bet that it will be 1 ppm or lower. How low? We will know on November 3.

Coast Guard Benzene Regulations

The Occupational Safety and Health Act does not apply to working conditions of workers whose safety and health considerations are within the active jurisdiction of other Federal agencies. Thus, the Coast Guard retains regulatory responsibility for the everyday health and safety conditions of shipboard personnel aboard Coast Guard-inspected vessels.

The NIOSH benzene update criteria initiated a Coast Guard effort to upgrade the protection that its regulations afforded its own marine inspectors, Captain of the Port boarding teams, and maritime personnel. On December 23, 1976, an advance notice of proposed rulemaking concerning benzene carriage requirements was published in the Federal Register.

Citing the NIOSH benzene update criteria as evidence that benzene is indeed leukemogenic, the Coast Guard notice proposed several measures to reduce the exposure hazards to shipboard personnel. Among the measures proposed were: requiring the use of vapor return lines during benzene cargo transfer operations; requiring the use of filter respirators on deck areas during tank cleaning operations; and requiring the use of pressure-demand, self-contained breathing apparatus when entering any benzene tank not certified "Safe for Man" by a NFPA-certified marine chemist. Numerious comments and additional suggestions to this proposal have been received and are being used in drafting permanent Coast Guard benzene carriage regulations.

The Coast Guard retains regulatory responsibility for the everyday health and safety conditions of personnel aboard Coast Guard - inspected vessels.

The May 3, 1977, publishing of the OSHA benzene emergency temporary standard immediately generated numerous queries from Coast Guard field units and the maritime industry. Does the Coast Guard have the authority and the intention to apply the OSHA emergency temporary standard to the maritime industry? Who will provide monitors and

[1] A toxicologist or epidemiologist will use a dose-response relationship to determine specific effects of a chemical at specific exposure levels. With benzene, however, this method falls short, due to the extremely low levels that may be necessary to induce the cancer, the lengthy latent period required to observe this effect, and the resulting small number of exposed organisms that contract the disease.

respirators for CG inspectors? What kinds and how many? Does the NFPA marine chemist have the capability to detect benzene vapor concentrations as low as 1 ppm?

To provide interim guidance until permanent Coast Guard regulations could be formulated, a message was sent to all Marine Safety Offices, Marine Inspection Offices, and Captains of the Port, with subsequent distribution to the marine industry. The message *recommended* the following precautionary actions for both Coast Guard and maritime industry personnel:

Coast Guard benzene regulations presently under development will parallel the OSHA benzene exposure requirements.

1. Warning signs required by 46 CFR 35.30–1 and 151.45–2 should be marked to include the words "Benzene—Cancer Hazard."

2. Personnel engaged in transfer operations should wear fresh air or self-contained breathing apparatus unless monitoring shows that exposure levels will not be exceeded or unless closed gauging and vapor return lines are used.

3. Personnel should wear protective clothing where skin or eye contact with benzene is likely.

4. Personnel should wear pressure-demand, self-contained breathing apparatus when entering any tank carrying or previously containing benzene.

Commandant Instruction 6260.5, "Occupational Health Monitoring," dated June 28, 1977, provides guidance regarding medical examinations and recordkeeping requirements to Coast Guard personnel who may be exposed to benzene. Commandant Instruction 6260.7, "Emergency Temporary Benzene Standard," will require Coast Guard personnel to *implement* OSHA's emergency temporary standard whenever benzene exposures cannot be eliminated.

Protection of the maritime personnel under Coast Guard jurisdiction will be addressed by new Coast Guard benzene regulations presently under development. These regulations will parallel the OSHA benzene exposure requirements. The maritime industry must be afforded the same level of protection as that provided for the shore-based benzene industry workers.

Lieutenant Commander John Lindak *is Chief of the Hazardous Materials Training Branch at Coast Guard Headquarters in Washington, D.C. Commander Lindak was graduated from the Coast Guard Academy in 1963 and served on board the Cutters* McCulloch *and* Eastwind. *He earned a Master of Science degree in chemical engineering in 1969 from the University of Maryland.*

After a tour in the Office of Research and Development at Headquarters, Mr. Lindak served as engineering officer of the Cutter Hamilton *during 1974–75.*

Prior to his present assignment, he was stationed at the Marine Safety Office in Boston.

Lieutenant Tom Haas *is presently Chief of the Occupational Safety and Health Section of the Cargo and Hazardous Materials Division at Coast Guard Headquarters.*

Following graduation from the Coast Guard Academy in 1973, he served as operations officer on board the buoy tender Acacia, *home-ported in Port Huron, Mich. Lieutenant Haas was then selected for postgraduate study at the University of Michigan from which he holds Master of Science degrees in Chemistry and Environmental Health Sciences–Toxicology.*

He was recently assigned to Headquarters to assume his present duties.

The Coast Guard is mandated to insure the safety and health of those in the maritime community. Exposures to the vapors of any hazardous material, not just benzene, should be zero. If this cannot be accomplished, the lowest level technically achievable must be the goal. Sloppy practices which lead to high levels of contamination of the air cannot be tolerated. When work procedures result in personnel exposure, these procedures should be upgraded or prohibited. Proper preventative measures taken now will ensure that workers will enjoy long and healthful lives in the years ahead.

Conclusion

In many ways, benzene can be considered to be the prototype for a whole series of chemicals which, due to their chronic toxic nature, require updated Coast Guard regulations. The responsibilities of the Coast Guard require it to protect its own personnel and the maritime industry to the same degree provided by OSHA to the rest of this nation's workers. NIOSH presently plans to study the toxic hazards of styrene, aniline, cresols, ethylene chlorohydrin, acrylonitrile, vinyl compounds, methyl chloride, and hydrogen chloride, to name a few. Any OSHA rulemaking as a result of these studies will inevitably affect the Coast Guard standards for maritime carriage of these commodities. These new, more stringent requirements will undoubtedly be expensive to implement and require greater awareness and personnel protection training, but are necessary to protect human health and life itself. ⚓

Any OSHA rulemaking as a result of these studies will inevitably affect the Coast Guard standards for maritime carriage of these commodities.

Marine Safety Council Membership

The new Chief of the Office of Operations is Rear Admiral Norman C. Venzke. A native of Baltimore, Md., Venzke was graduated from Baltimore Polytechnic Institute in 1946 and from the U.S. Coast Guard Academy, New London, Conn., in 1950.

During his first 2 years of duty Venzke served as deck watch officer first on the Cutter *Ingham* and then on the *Chincoteague*, both operating out of Norfolk, Va., on ocean station patrol and search and rescue. In 1952–53 he served a tour as watch officer at the Rescue Coordination Center at San Juan, P.R., and then returned to sea duty as Executive Officer of the Cutter *Pandora* out of the same port.

After next commanding a ship training detachment at Miami, Fla., Venzke was selected for postgraduate study at the U.S. Naval Postgraduate School, Monterey, Calif., where he earned a Bachelor of Science degree in electronics engineering.

In September 1957 he reported for duty as Operations Officer on board the icebreaker *Westwind*, based at New York. In that assignment he participated in Operation Deep Freeze III, the 1958 support mission for Antarctic scientific stations, and later made a trip to the Arctic.

From December 1958 to August 1961, Venzke was stationed at Coast Guard Headquarters in Washington as Chief, Operational Readiness Branch. During the next 4 years, as a lieutenant commander, he was assigned to the Coast Guard Academy as an instructor and chief of the weapons section.

Between September 1965 and January 1967, he served as Executive Officer of the icebreaker *Edisto* which operated out of Boston on missions to the Arctic.

During the following year, Commander Venzke was stationed in South Vietnam where he was assigned the triple role of Commander, Coast Guard Division Eleven, Commander, Gulf of Thailand Surveillance Group, and Fourth Coastal Zone Advisor. For that tour of duty he was awarded the Legion of Merit Medal with Combat "V" device, and the Republic of South Vietnam Honor Medal First Class.

Upon his return to the United States Venzke served another tour as Chief, Operational Readiness Branch at Headquarters. In May 1970 he was assigned as Ship Operations Officer for the U.S. Naval Support Force, Antarctica, in Washington and at Christchurch, New Zealand, and in August 1971 assumed command of the icebreaker *Northwind* based at Seattle, Wash.

In 1973–74 Captain Venzke was a student at the Industrial College of the Armed Forces in Washington, D.C. Upon graduation he was assigned as officer-in-charge of the precommissioning detail for the new 399-foot icebreaker *Polar Star* being built in Seattle, and in January 1976 became the vessel's first Commanding Officer.

By nomination of the President and approval of the Senate, Venzke was appointed Rear Admiral effective February 24, 1977. From April to June of this year, before assuming his present post, he served temporarily as Chief, Office of Public and International Affairs.

Admiral Venzke's wife is the former Delores E. Erickson of Hillsboro, Oregon. They have one daughter, Erica. ⚓

Nautical Queries

The following are examples of questions included in the Chief Engineer and upper and lower level deck examinations. The deck questions pertain to the new International Rules of the Road which became effective July 15, 1977.

Engineer

1. Liquid soluble oxidation products that accumulate in hydraulic systems have what effect on system operations?
   A. They form sediment in the heat exchangers.
   B. They increase the hydraulic fluid viscosity.
   C. They cause immediate seizure of moving parts.
   D. They clog system filters and strainers.

2. Wear on the internal valve parts of a pneumatic controller will cause
   A. value stem breakage.
   B. reduced controller offset.
   C. erratic controller operation.
   D. increase the set-point.

3. Boiler drum feedwater regulating systems commonly employed with burner management systems utilize
   A. reset control.
   B. two position control.
   C. single speed floating control.
   D. proportional control.

4. If a magnetic controller relay fails to drop out when coil voltage is removed from the relay, the probable cause may be
   A. welded contacts.
   B. overvoltage.
   C. mechanical binding.
   D. excessive current.

5. When the opening pressure of a diesel engine fuel injector is lower than that specified by the engine manufacturer, the
   A. start of injection will always be retarded.
   B. quantity of fuel injected tends to be increased.
   C. duration of injection will always be decreased.
   D. quantity of fuel injected will always be decreased.

Deck

1. A sailing vessel is overtaking a steam vessel in a fairway on International waters, so as to pass on the steam vessel's port side. The sailing vessel is the
   A. privileged vessel and would sound two short blasts.
   B. burdened vessel and would sound no whistle signal.
   C. privileged vessel and would sound no whistle signal.
   D. burdened vessel and would sound two prolonged blasts followed by two short blasts.

2. Which vessel may use the danger signal in International waters?
   A. The vessel to port when two power-driven vessels are crossing
   B. A vessel engaged in fishing, crossing the course of a sailing vessel
   C. Either of two power-driven vessels meeting end on
   D. Any of the above

3. A vessel engaged in towing where the tow prevents her from changing course shall carry
   A. only the lights for a vessel towing.
   B. only the lights for a vessel restricted in her ability to maneuver.
   C. the lights for a towing vessel and the lights for a vessel restricted in her ability to maneuver.
   D. the lights for a towing vessel and the lights for a vessel not under command.

4. The navigation lights prescribed by the Rules MUST be exhibited
   I. from sunset to sunrise.
   II. from sunrise to sunset in restricted visibility.
   A. I only
   B. II only
   C. Both I and II
   D. Neither I nor II

5. A vessel must show the identifying lights for being not under command unless her length is less than
   A. 5 metres.
   B. 7 metres.
   C. 10 metres.
   D. 20 metres.

Answers

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

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

MERCHANT MARINE SAFETY PUBLICATIONS

The following publications of marine safety rules and regulations may be obtained from the nearest marine inspection office of the U.S. Coast Guard.* Because changes to the rules and regulations are made from time to time, these publications, between revisions, must be kept current by the individual consulting the latest applicable Federal Register. (Official changes to all Federal rules and regulations are published in the Federal Register, printed daily except Saturday, Sunday, and holidays.) The date of each Coast Guard publication in the table below is indicated in parentheses following its title. The dates of the Federal Registers affecting each publication are noted after the date of each edition.

The Federal Register will be furnished by mail to subscribers, free of postage, for $5.00 per month or $50 per year, payable in advance. The charge for individual copies is 75 cents for each issue, or 75 cents for each group of pages as actually bound. Remit check or money order, made payable to the Superintendent of Documents, 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.
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CG–123, Federal Register of June 27.
CG–190, Federal Register of June 9.

*Due to budget constraints or major revision projects, publications marked with an asterisk are out of print. Most of these pamphlets reprint portions of Titles 33 and 46, Code of Federal Regulations, which are available from the Superintendent of Documents. Consult your local Marine Inspection Office for information on availability and prices.

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