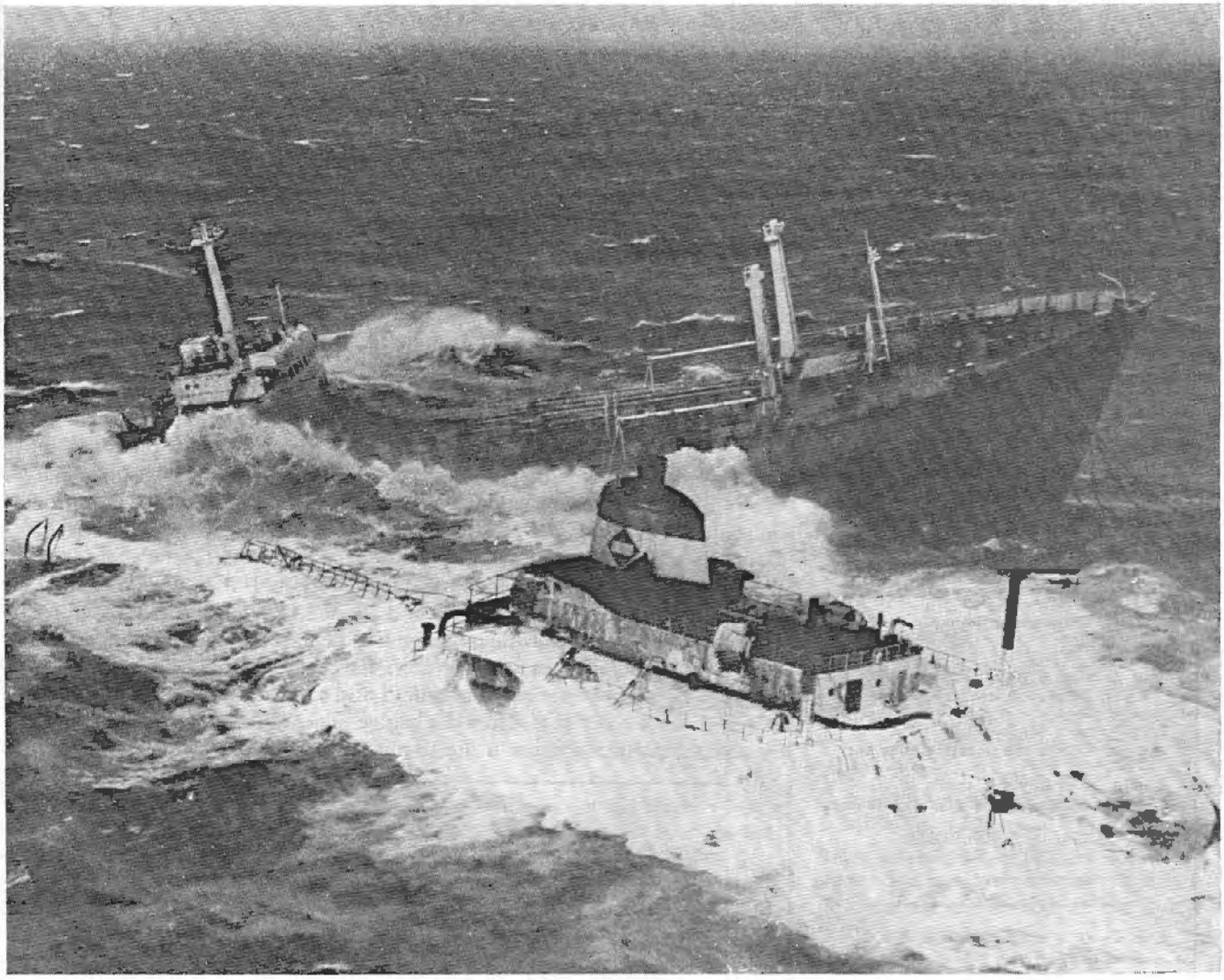
PROCEEDINGS
OF THE MARINE SAFETY COUNCIL



DEPARTMENT OF TRANSPORTATION UNITED STATES COAST GUARD

Vol. 34, No. 2 CG-129 February 1977

PROCEEDINGS

OF THE MARINE SAFETY COUNCIL

Published monthly by the Commandant, USCG, in the interest of safety at sea under the auspices of the Marine Safety Council. Special permission for republication, either in whole or in part, with the exception of copyrighted articles or artwork, is not required provided credit is given to the Proceedings of the Marine Safety Council. All inquiries and requests for subscriptions should be addressed to Commandant (G–CMC), U.S. Coast Guard, Washington, D.C. 20590. Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget, March 12, 1974.

CONTENTS

COVERS

Front: Seas wash over the broken hulk of the SS *Argo Merchant* which ran aground December 15 in international waters off Nantucket Island. That incident was followed during the next several weeks by an extraordinary rash of tanker accidents in and around U.S. waters. All of this has focused new public attention on regulatory efforts to ensure that vessels entering our waters are adequately equipped and are operated in accordance with accepted standards of good seamanship. The recently promulgated "Navigation Safety Regulations," first proposed in May 1976, are directed at that well-demonstrated need.

Back: Two days after the *Argo Merchant* grounding, the SS *Sansenina* exploded at an oil terminal at San Pedro, California. Eight persons died and about 50 were injured. Unloading of the vessel's crude oil cargo had been completed and ballasting was in progress when a flash flame started aft of the midship house near the cargo manifold and carried into the No. 10 tanks. Smoke at right is from the bridge house and a large section of the deck which fell into the terminal yard.

DIST. (SDL No. 104)
A: acde(2); fghklmntuv(1)
B: n(50); c(16); e(5); f(4); ghj(3); r(2); bkipq(1)
C: eglmp(1)
D: i(5); adgklm(1)
E: mn(1)
F: kp(1)
Lists TCG–06, CG–13, CG–20, CG–52

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

maritime sidelights

TEST FOR SAFETY?

In May of 1976 a casualty, resulting in 1 death, occurred aboard the USNS *American Explorer* which was undergoing annual repair at a shipyard in Norfolk, Virginia. A review of this casualty provides an important reminder of the hazards associated with testing CO_2 fire extinguishing systems and the need to have emergency gear aboard a vessel at all times.

An authorized fire equipment servicing company was conducting tests on the CO_2 system protecting the forward pumproom. The remote pull controls which discharge the CO_2 bank were disconnected and the mechanical parts were freed up and checked. Then, with the piping of the six 75-pound cylinders still connected to the system, the servicing representative attached a 15-pound CO_2 between the pressure operated electrical switch and the discharge delay. This bottle, when discharged, would send CO_2 both toward the discharge nozzles and back toward the main CO_2 bank, to test the warning siren and time delay release mechanism.

Before the test, the service representative went halfway down into the pumproom. He saw no one but yelled a warning to disregard the siren, as this was only a test. The 15-pound CO_2 was released, the siren sounded, and the main CO_2 bank discharged, filling the pumproom. Surprised by this apparent mechanical failure, the service representative checked the pumproom and saw a shipyard worker lying at the base of the ladder. This man, who had been working out of sight from the upper level, could not be rescued for approximately 25 minutes due to the fact that all portable breathing apparatus had been removed from the vessel for storage ashore during the yard period. By the time help arrived, the man was dead.

The Coast Guard investigation of the casualty revealed that:

(a) The instruction manual for this fire extinguishing system directs that the piping attaching the discharge heads and pressure operated control heads of the CO_2 cylinders to the system be disconnected prior to testing with a separate cylinder.

(b) The discharge time delay release valve may have been opened manually at some time prior to the test in that the manual stop pin was disengaged. Without insuring that this valve is closed, the delay cannot be properly tested.

(c) A high velocity CO_2 discharge nozzle, a type not intended for this system, was located at the base of the ladder and may have hampered the shipyard worker's attempt to escape.

(d) The servicing personnel were unfamiliar with the extinguishing system on this vessel, and did not follow the test procedure outlined in the system service manual.

The errors contributing to this casualty are many, and the results were tragic, but they do serve to emphasize the dangers of:

(1) testing a CO_2 system without disconnecting the cylinders from the system.

(2) removing emergency gear from a vessel during yard periods, and

(3) allowing unauthorized alterations to approved equipment or systems.

TRANSHURON

In the October 1976 edition of the PROCEEDINGS we published a synopsis of the Marine Board of Investigation report and Commandant's action in the case of the SS *Transhuron*. The complete report, along with the National Transportation Safety Board's action on the casualty, is now available. Single copies may be obtained without charge from Commandant (G–MMI–1), U.S. Coast Guard, Washington, D.C. 20590.

In September 1974, while underway in the Arabian Sea, the converted T–2 tankship suffered a fire in the propulsion switchboard which left the vessel adrift for 63 hours. Finally it grounded off Kiltan Island and was abandoned without injury.

The NTSB's analysis of the casualty focused on five aspects:

(1) The role of plan approval and inspections in preventing casualties;

(2) engineering casualty control and qualifications of licensed officers;

(3) inspection and operational readiness of onboard firefighting equipment;

(4) role of the master in decision-making in critical situations; and

(5) maintenance of navigational equipment on merchant vessels.

The NTSB recommended that the Commandant:

(1) insure that required specifications and plan-approved documents for ship modification are transmitted to the inspectors before equipment is installed or construction and modification is begun;

(2) expedite the issuance of regulations to require spray shield protection when saltwater piping must be in the vicinity of switchboards or other open electrical equipment;

(3) expand either the Merchant Marine Safety Manual or other suitable instructions to include aids for inspection and repair of firefighting equipment, particularly CO_2 semi-portable equipment;

(4) continue to disseminate to Coast Guard inspectors and licensed Merchant Marine officers the information that all concerned are responsible for the compliance of any vessel with the regulations and that this responsibility is found in and protected by law and regulations;

(Continued on page 41)

Pumprooms Are Deadly!

by Lieutenant Commander Fred H. Halvorsen
and Lieutenant (jg) Tom Perry

Cargo and Hazardous Materials Division, Office of Merchant Marine Safety

On September 9, 1974, the *Chemical Venturer,* a British flag chemical tanker, was preparing to transfer cargo in Philadelphia. What started out as a routine tanker operation on a balmy summer afternoon soon proved fatal to one crewmember.

The chief mate sent two pumpmen into the No. 2 pumproom to drain and dry a cargo line which had been cleaned while enroute from Puerto Rico where the vessel had discharged benzene. When they entered they noticed a slight odor of benezene but still proceeded to the lower part of the pumproom. As they purged the line with compressed air and vented the line into the pumproom bilges, both men were overcome and collapsed. A short time later, a seaman looking for the two men discovered them in an incapacitated condition in the bottom of the pumproom and immediately summoned help. The chief mate and master both donned self-contained breathing apparatus and removed the pumpmen from the pumproom. One was eventually revived at a nearby hospital; the other was not so lucky.

During the investigation of the casualty it was determined that the chief mate had drained 10 to 15 gallons of benzene into the bilges of the pumproom after offloading in Puerto Rico. When the cargo line was charged with compressed air, the stream of air impinged directly on the benzene in the bilges, vaporizing it and exposing the men to very high benzene concentrations. The theoretical maximum concentration of benzene which could be present at the temperature in the pumproom exceeded 10% by volume. This concentration is *immediately* toxic to human life, besides being well above the upper flammable limit of 8% by volume.

A Dangerous Place

As inherently dangerous as the pumproom might be, it remains a location onboard ship that must be regularly visited and worked in.

"The pumproom is the most dangerous place on a ship. . . . No one should ever descend into the pumproom without first notifying someone on deck. The possibility that the person who enters . . . may be overcome by fumes and may need assistance can never be overlooked." This simple precaution appears in the "Manual for the Safe Handling of Inflammable and Combustible Liquids and Other Hazardous Products" (CG-174).

Petroleum Tanker Pumproom Requirements

Coast Guard regulations (See 46 CFR 32.60-20 and 111.85-10) recognize that pumprooms are inherently dangerous areas. Pumproom requirements for vessels carrying flammable liquids (Grades A through C) are essentially aimed at removing cargo vapors before they reach the flammable range and excluding ignition sources. Specifically:

1. Ventilation to remove cargo vapors. The basic intent is to provide a laminar (non-turbulent) flow of air moving gently downward to extract the air from the bottom of the space. The vast majority of petroleum products and chemicals have vapor densities greater than that of air. Thus the greatest concentration of cargo vapors would most likely be encountered at the bottom of the pumproom and the ventilation system is designed accordingly. Power extraction ventilation to remove cargo vapor from the bilge area is required. The capacity of the system must be such that a complete change of air is effected within the pumproom and vertical access space in not more than 3 minutes. Supply ventilation may be power or natural but must be such that air turbulance is minimized to prevent mixing cargo vapors with air. The capacity requirement for the system must be met with the access opening to the pumproom closed. The ventilation system must also be arranged to avoid or minimize vapors spreading from pumproom to interior parts of the vessel such as living or working spaces.

2. Easy access to remove personnel. Pumproom access must be from

the main deck. The intent here is that rescue of personnel from within the pumproom can be more easily effected from the main deck.

3. Stringent control of ignition sources. The pumproom is a space where flammable concentrations of cargo vapor are expected during normal operations or as a result of leakage or equipment failure. Therefore all potential sources of ignition must be excluded and all electrical equipment must be explosionproof or intrinsically safe. Prime movers for pumps must be steam driven (with steam temperature limited to 500°F (260°C) to prevent autoignition) or be located in an adjacent space and be connected through a gas- and liquid-tight bulkhead. The bulkhead penetration must be fitted with a stuffing box or shaft seal gland. As a final precaution, the termination of the pumproom exhaust ventilation must be at least 6 feet from any opening to an interior portion of the vessel and also be located such that recirculation of vapors into the pumproom is prevented. The electrical requirements are stringent. No circuit-interrupting devices (switches, fuse boxes, distribution panels, etc.) can be located in the pumproom. Lights must be mounted in an adjacent space behind a permanently fixed glass lens which is water- and gas-tight as well as being (a) inaccessible from the pumproom, (b) vented to a nonhazardous area and (c) not reach a surface temperature in excess of 255°F (180°C). On specific approval, explosionproof fixtures must be used on the main deck for all electrical fixtures within 10 feet of the cargo pumproom entrance or cargo pumproom ventilation openings.

Proposed Chemical Tanker Pumproom Requirements

The proposed regulations for cargo handling spaces for chemicals (see Federal Register, Part II, of 24 June 1976, "Carriage of Bulk Dangerous or Extremely Flammable Liquid Cargoes—Proposed Safety Standards for Self Propelled Vessels") recognize that many products are extremely toxic by inhalation. These proposed regulations require a change of air every 2 minutes in the cargo handling space and, for especially toxic products, a change of air every 80 seconds. The same concept for ventilation is again used—power extraction ventilation from the bottom of the space.

These new requirements for cargo pumprooms include easy accessibility for a man wearing a self-contained breathing apparatus. Pumproom ladders must not be greater than 60° from the horizontal and must be fitted with railings. A 2- by 2-foot cross sectional vertical clearance for hoisting an unconscious person from the pumproom floor to the main deck access must also be provided, together with a fixed hoisting system capable of lifting 550 pounds.

There are some cargoes which are so toxic that only intank (deepwell) pumps are permitted. For example, some representative cargoes are listed in table 1 together with pumproom ventilation and location requirements.

Table 1.—*Representative pumproom requirements for representative chemicals from proposed 46 CFR 153*

Cargo	Pumproom ventilation rate (changes/hr.)	Pump/cargo control room location restriction
Acetic acid	30	No restriction
Benzene	45	Intank/ondeck
Isobutylamine	45	Intank/ondeck
Hydrochloric acid	30	No restriction
Oleum	45	Intank/ondeck
Phenol	30	No restriction
Styrene	30	No restriction

The Hazards

In addition to miscellaneous hazards like trips, falls, noise, and poor lighting that can be encountered in any part of the ship, the pumproom presents a number of especially grave cargo-related dangers. For a seaman to effectively protect himself he must first be able to recognize and fully understand the nature of the hazards.

Small Cargo Leaks. A small cargo leak in the pumproom such as a leaking packing gland may result in the buildup of toxic vapors within the pumproom. The degree of hazard depends upon the vapor pressure and the threshold limit value (TLV) of the particular cargo leaking. It takes very little leakage of a cargo with a low TLV and a high vapor pressure to create a hazardous condition. On the other hand a greater amount of a cargo with a low vapor pressure and high TLV must leak to create an equally hazardous condition.

TLV's are hazard ratings, expressed in terms of parts per million (ppm) by volume, assigned to various chemicals. A table of threshold limit values is published by the American Conference of Governmental Industrial Hygienists. These TLV's represent maximum concentrations of various chemicals which most people can tolerate without harmful effects for 8 hours a day, 40 hours a week.

High Vapor Concentrations. Other cargo leaks in the pumproom may result in hazardous conditions which could threaten health and life immediately. High concentrations of chemical vapors in an inadequately ventilated pumproom might have an anesthetic effect on an individual and render him susceptible to dangerous trips and falls.

Fire and Explosion Hazards. Fire and explosion hazards may exist in the event of a major pumproom leak. Such high concentrations of flammable vapors will generally present conditions immediately dangerous to health and life, but the explosion hazard represents an even greater threat to the safety of the ship with all of its crew.

Human Error. As always, the hazards presented by a given set of circumstances can be increased many times over by the addition of one other element—human error. As we have seen in the case of the *Chemical Venturer,* improper or careless procedures in the pumproom can lead to tragic results.

Protection

There are no requirements for anyone such as the marine chemist to certify a pumproom safe prior to entry. However, there are certain things which can be done to minimize the hazard potential of pumproom entry.

Ventilation system energized? Ventilation which effectively replaces cargo vapors with fresh air provides the best protection from all vapor hazards. Before entering a pumproom, one should observe that the ventilation system is operating and moving the air effectively. The ventilation system should be run a minimum of 30 minutes prior to eutry.

Electrical fixtures in good condition? Are the electrical fixtures explosionproof and are they properly installed? Are fixtures broken or cracked? Is there wiring which terminates without entering a junction box? Electrical items are very important. Defective electrical components and equipment should always be regarded as dangerous and, when they are found, transfer operations should be immediately terminated.

Pumps or bulkhead shaft seals leaking? Are pumps leaking cargo at an unacceptable rate? A few drops per minute can be tolerated. A stream of liquid cargo cannot be tolerated. Are the pumproom/engineroom bulkhead seals in good condition? If light can pass through the seal, it is defective and represents an inherently unsafe condition.

Pumproom bilges full of water? Are the bilges full of water? Remember that most hydrocarbon liquids are less dense than and do not mix with water and can be expected to be found floating on the water's surface. Be aware that a film of cargo floating on water will produce the same quantity of vapor (exert the same vapor pressure) as if the total quantity of water/cargo were *all* cargo. Vapor evolution is dependent on liquid *surface area* and not upon liquid *depth*. Therefore, it is very important to keep chemical cargo pumproom bilges clean and dry.

Lighting/Housekeeping. Are the ladders safe and free from obstructions? Is the lighting in good order? Is there an accumulation of cargo-soaked rags or drip cans lying around?

Instrument monitoring. The sense of smell cannot be relied upon to warn of dangerous conditions. Many chemicals defy detection by smell until well above safe working concentrations. Other chemicals impair the sense of smell. Permanently installed gas detection instruments in the pumproom could be employed to provide a continous guard against excessive buildup of chemical vapors. Portable vapor detection and measuring devices could be carried into the pumproom. Even the simple detector tubes could be used to roughly determine a safe or unsafe condition within a pumproom. Of course a certain amount of training in the use, calibration, and interpretation of such instruments would be required for those using them.

Respirators. In uncertain conditions and in all cases of known hazardous conditions, suitable respiratory protection should be worn. Pressure-demand, self-contained breathing apparatus provides the maximum amount of protection against inhalation of toxic vapors.

Rescues

Despite warnings and efforts to reduce pumproom hazards, some people will inevitably miss or ignore the warnings and consequently end up as an accident victim. In the incident described at the beginning of this article, the two men were discovered in the bottom of the pumproom by a seaman. Instead of foolishly attempting to rescue these men without assistance, he immediately summoned help and was joined by the chief mate and master, who were both equipped with respirators. The rescue was made and no one else was overcome by the benzene vapors. Had the seaman attempted the rescue unassisted and without a respirator it is likely that he and both of the pumpmen would have perished in the pumproom.

Planning ahead for all possible emergencies cannot be beat for saving lives. A hoisting arrangement should be permanently erected above any belowdeck pumprooms which could be used to quickly hoist out victims more quickly from the pumproom. An established and practiced rescue plan should be in effect to provide instantaneous rescue capabilities for victims discovered in pumprooms, cargo tanks, or other enclosed spaces. Rescue equipment should be periodically checked and readily available. Personnel should be assigned to specific rescue tasks and receive periodic training.

And Finally . . .

It should go without saying that a safe pumproom may be made unsafe by such practices as smoking, using other than non-sparking tools, and using flashlights not designed for explosive atmospheres. Play it safe. The shipping industry has its hazards. To live to a ripe old age in this business one must recognize the hazards of the trade, follow safe working procedures, and always be alert for unusual or suspicious conditions. ⚓

Navigation Safety Regulations

In the Federal Register of 31 January, the Coast Guard published rules for navigation procedures and equipment for vessels of 1600 gross tons and over when operating in U.S. waters. For the considerable number of operators of such vessels among our readers, and in view of the great public interest shown in the problems addressed by this rulemaking, we are reprinting the document here in its entirety. The new rules become effective on 1 June 1977.

TITLE 33—NAVIGATION AND NAVIGABLE WATERS

Chapter I—Coast Guard, Department of Transportation

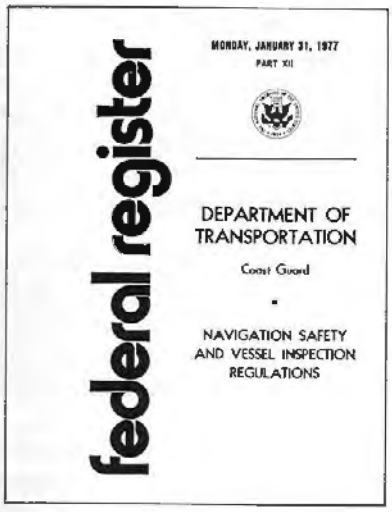
[CGD 74–77]

PART 164—NAVIGATION SAFETY REGULATIONS

Navigation Procedures, Testing, and Equipment Requirements

The purpose of these amendments to Title 33 of the Code of Federal Regulations is to add a new Part 164 prescribing rules for navigation procedures, preliminary tests, and minimum equipment for vessels of 1600 gross tons or more when operating on the navigable waters of the United States, except the Panama Canal and St. Lawrence Seaway.

On page 18766 of the Federal Register of May 6, 1976, the Coast



Guard published a notice of proposed rulemaking for these amendments. Operation of vessels that are as large as 1600 gross tons or more within coastal and harbor regions, where 80 percent of vessel casualties occur, regularly creates hazardous conditions with risks to persons, property, and the environment, especially if proper navigation procedures are not followed, essential vessel equipment is not operating properly, or a vessel does not have necessary equipment. As discussed in the preamble of the proposal, most vessels follow proper procedures, have the necessary equipment, and keep that equipment operating properly. It is those vessels that do not follow proper procedures or do not have properly operating, necessary equipment that aggravate the hazard. The hazard is compounded not only by the recurring problems of reduced visibility, adverse weather, and vessel congestion, but by the increasing speed and size of vessels, especially when carrying hazardous cargoes or other cargoes that can adversely affect the environment. The number of vessels involved in reported collisions, rammings, and groundings is increasing. Vessel casualties, such as those involving the *Torrey Canyon*, the *Tamano*, the *Oregon Standard*, and certain of those that have occurred in December of 1976 and January of 1977, might not have occurred if proper navigation procedures had been followed or if the vessels had had properly operating essential equipment. The purpose of these amendments is to prevent future casualties by requiring, for those larger vessels, that proper navigation procedures are followed, that necessary equipment is on board, and that all essential equipment is operating when those vessels are navigating in the coastal waters and harbors of the United States.

The public was invited to comment in writing on the proposed rules from May 6, 1976, through August 6, 1976, and at public hearings in Washington, D.C. on June 11, 1976, and in San Francisco, California on June 17, 1976. A discussion of comments re-

ceived and changes in the proposed rules follows:

General comments: Fifteen commenters suggested that more and better training, not regulation, is needed. More and better training is desirable and the Coast Guard is considering many ways to help improve it; however, that training would not preclude the need for the proper navigational procedures and vessel equipment that these amendments address. Furthermore, these rules do apply to the large number of foreign flag vessels operating within our navigable waters, while licensing and certification requirements, including training, promulgated by the Coast Guard now do not. Five commenters recommended increasing the difficulty of license exams or establishing a higher license, such as the United Kingdom's "Extra Master". The Coast Guard is considering these recommendations for possible future action.

Ten commenters stated that the proposal includes nothing that is not already addressed in statute or regulation. The rules in this new part require navigation procedures that are not included in the statutory "rules of the road." The rules also require equipment for all U.S. and foreign vessels of 1600 gross tons or more that is not required under statute or other regulations for all those vessels and under all the operating conditions to which this part applies. Some of the proposed rules, such as those for lights, day signals, and fog signals, were duplicative and have not been included in these final rules.

One commenter stated that the proposed operating procedures would restrict a master's use of good judgment. The operating procedures in these amendments are safe operating procedures that most masters follow. If these rules are restrictive, the restriction applies to those few masters who in the past have not followed these minimally safe practices.

As one commenter observed, most vessels that operate exclusively upon rivers will not be affected by these rules because they are smaller than 1600 gross tons.

One commenter suggested that the Coast Guard should require, instead of the rules in this part, that shipping companies issue an operating manual. Although an operating manual consistent with these rules might be desirable, a rule requiring it could be applicable only to U.S. companies and would not be as comprehensive as these amendments, especially the equipment requirements, nor have the force of regulations.

Several commenters stated that some of the rules were vague. Some of the rules do not include detailed standards because all of the practical variables are not quantifiable. Those rules that could be more detailed have been changed, such as a detailed description of the maneuvering information that is required under paragraph (g) of § 164.35, paragraph (f) of the proposal.

Section 164.01 Applicability. Nine commenters requested a definition of "navigable waters of the United States." "Navigable waters of the United States" is defined in 33 CFR 2.05–25.

Applicability to tug and barge combinations that have large aggregate tonnages was suggested by seven commenters, to tugs and towing vessels by five commenters, to all vessels by one commenter, and to small passenger vessels by one commenter. These regulations are not appropriate for all of the vessels in each of those classifications. The Coast Guard is considering regulations for these vessels that would be the subject of separate rulemaking actions.

Section 164.11 Navigation underway: general. Ten commenters stated that the proposed operating procedures would create a heavy workload that would require additional manning. Changes in this section, which are discussed later in this preamble, should eliminate the need for any unnecessary manning in addition to that normally required upon vessels to which these rules apply.

Two commenters suggested that the rules be published as a code of navigational practices and not as mandatory regulations. As stated at the beginning of this preamble, the navigation procedures in these rules are followed by most masters. The Coast Guard is making them mandatory, instead of publishing a voluntary code, to reach those who now do not follow good navigation procedures.

One commenter stated that the regulation requires the master or person in charge to be guarantor of compliance and that he could not always, in his capacity, ensure compliance. The Coast Guard agrees that this would be especially true for equipment requirements. Therefore, the final rule is changed to include the "owner" of the vessel as an ensurer of compliance. Although this change is included in these amendments, any interested person may submit written comments on this particular change to the Commandant (G–CMC/81), U.S. Coast Guard, Washington, D.C. 20590. Each person submitting a comment should include his name, address, identify the notice (CGD 74–77), and give reasons in support of his comments. The Coast Guard will consider comments received before May 2, 1977 and may change the requirement in light of them. Copies of the comments received will be available for examination in Room 8117, Department of Transportation, Nassif Building, 400 Seventh Street, S.W., Washington, D.C.

Section 164.11(a). Six commenters requested a definition of "adequate number" of persons required to constantly man the wheelhouse to direct and control the movement of the vessel and fix the vessel's position. The intent of the paragraph is that the wheelhouse be "constantly manned" and that those functions be performed. Because of the variety of vessels to which this part applies, quantitative definition of "adequate num-

ber" is not practical. Therefore, to avoid confusion, the phrase "adequate number" is deleted.

Section 164.11(b). This paragraph requires the owner, master, or person in charge to ensure that persons performing the duties required under paragraph (a) be competent. Six commenters stated that the Coast Guard is responsible for ensuring competency through licensing and certification. "Competent" means more than qualified through licensing and certification. It also mean physical and mental capacity to do the job at the time the person assumes the duty.

Section 164.11(c) in the proposal. This paragraph would have required the vessel's position to be fixed every 15 minutes. After further consideration, the Coast Guard has determined that this would not be practicable in all navigable waters. Therefore, it is not included in this final rule.

Section 164.11(c). This was paragraph (d) of the proposal which would have required the plotting of the vessel's position at each fix and the revised track on a chart of the area and that the person directing the movement of the vessel is informed of the vessel's position. Ten commenters stated that compliance would not be possible at present manning levels. Ten more commenters stated that the requirement is superfluous on rivers and in channels. Four others said this plotting would distract watch officers who are performing other duties. It is necessary for safety that the appropriate vessel's officers be aware of the vessel's position to supplement the functioning of a pilot; however, the Coast Guard has determined that the plotting of the track is unnecessarily burdensome in consideration of practical manning levels and the necessities of other duties. Therefore, the track plotting requirement is not included in the final rule.

Section 164.11(d). This was paragraph (e) in the proposal. This paragraph does not require specific navigation equipment, but requires the use of the electronic and other navigational equipment that is on a vessel plus geographic reference points and hydrographic contours for fixing positions. It should be read with the next paragraph which prohibits sole reliance on buoys.

Section 164.11(e). This was paragraph (f) in the proposal. Eight commenters suggested that buoys should be used to fix a position if no other aids are available. Buoys may be used to establish an estimated position if no other aids are available; however, they cannot be relied upon to establish a fix. Four commenters suggested that the Coast Guard spend more money on buoy maintenance. Three more stated that several buoys could be used to establish a fix. As stated in the note to this paragraph (e), strong currents, heavy seas, ice, and collisions with vessels can move, sink, or set adrift a buoy. "Spending more money" would not solve these problems. It is also not likely under these circumstances that several buoys could be used to establish a fix, but could only be used to establish an estimated position. The charted position of a buoy is approximate.

Section 164.11(g) in the proposal. This proposed requirement, to maintain a proper lookout, is included in the Federal "rules of the road", which are applicable to all vessels. Since it is therefore redundant, it is not included in the final rule.

Section 164.11(f). This was paragraph (h) in the proposal. Four commenters stated that the requirement to evaluate each closing radar contact conflicts with the radar Annex to the International Regulations for Preventing Collisions at Sea, 1960. That Annex cautions against reliance solely upon "scanty information" such as radar contacts and states what actions should be taken under certain circumstances. Paragraph (f) of these rules requires that each closing radar contact be evaluated, but does not require sole reliance upon radar and does not suggest what action should be taken once a contact is evaluated. One commenter stated that the rule was "pointless" in rivers and channels. The rule does not require plotting of course, speed, and closest point of approach of closing visual or radar contacts, which might not be effective in rivers and channels. The rule does require that the person directing the vessel's movement be aware of the actions of those contacts and the evaluation of how they may affect the navigation of that person's vessel.

Section 164.11 (g) and (h). These were paragraphs (i) and (j) in the proposal. These rules require that rudder, engine speed, and direction orders be executed as given. One commenter stated that these rules would not prevent errors. Another commenter suggested that the requirement should be that the person directing the vessel's movement have a "positive indication" of proper execution. The intent of the rule is that the person directing the vessel's movement does what is necessary to ensure that these orders are being executed correctly, such as watching the direction the helmsman turns the wheel, the rudder angle indicator, and the engine order telegraph, so that person can respond immediately to correct any error being made. Some "positive indications," such as the movement of the vessel's head or change in vessel speed or engine vibrations, may not occur in time for correction of an error, especially on "very large" vessels.

One commenter suggested that the engine speed and direction orders be given using terms such as "ahead one-third" instead of terms such as "slow ahead," because there is less chance that the orders would be heard incorrectly. Application to foreign vessels to which this part applies of a rule requiring the use of this specific terminology would not be practicable.

Section 164.11(i). This was paragraph (k) in the proposal. One com-

menter stated the requirement that magnetic variation and deviation be known and correctly applied was "ridiculous" because the deviation changes can be so frequent. A survey of 300 randomly selected vessels showed that the deviation tables on many of these vessels were so out of date that the tables were of little use. The intent of this requirement is that a person directing the movement of a vessel be aware of the vessel's deviation. If that person has reasonably up to date tables or acts to verify deviation, such as by gyrocompass or celestial comparison, the requirement of this paragraph would be met and the safe navigatinn of the vessel enhanced.

Section 164.11(j). This was paragraph (1) in the proposal which would have required a qualified person to be at the steering position at all times. Six commenters stated that requiring the person to be at the steering position when a vessel was on automatic pilot was unreasonable. In light of this comment, the final rule requires only that the person be in the wheelhouse at all times. "Qualified person" has been changed to "competent" for the same reasons discussed earlier in this preamble for paragraph (a) of this section.

Section 164.11(k). This was paragraph (m) in the proposal. This paragraph requires a master and pilot conference to familiarize the pilot with the vessel because, although a pilot may be familiar with the type of vessel, each vessel has its own characteristics that often change with draft, trim, and speed. Furthermore, the pilot may not be familiar with the bridge layout and equipment and it would be too late to learn these things when risk of collision exists. Two commenters thought that the requirement was too vague. The paragraph is a clear expression of the intent of the requirement as just discussed. Further detail would be impractical because of the great variety of vessels to which this part applies. Three commenters asked about possible language barrier problems. If the pilot is unable to communicate somehow with the master, the Capitan of the Port should be contacted under § 164.53 of this new part.

Paragraph (m) (2) in the proposal, which would have required the pilot to inform the master of abnormal characteristics of the area, is not included in this final rule. It may be the subject of a separate rulemaking at another time.

Section 164.11(l). This was paragraph (n) in the proposal. This paragraph requires the person directing the movement of the vessel to know the current velocity and direction for the area. One commenter stated that river current predictions are often inaccurate. The intent of the paragraph is that the person directing the movement of the vessel know as much about current velocity and direction as is possible.

Section 164.11(m). This was paragraph (o) in the proposal. One commenter stated that the predicted set and drift are unpredictable upon rivers. The intent of this paragraph is that the person directing the movement of the vessel use whatever data on current that is available to predict set and drift.

Section 164.11(n). This was paragraph (p) in the proposal. The words "tidal value" are replaced by "tidal state," as used in tide tables, to clarify the intent of the paragraph.

Section 164.11(q) in the proposal. This was to be a requirement for minimum net bottom clearance. It is not included in this final rule, but is to be the subject of a future rulemaking action.

Section 164.11(o). This was paragraph (r) in the proposal. It requires that the vessel's anchors be ready for letting go. Seven commenters suggested that application of the rule be limited to waters that are shallow enough for anchor use. Trying to narrowly define areas where the rule should apply would be impractical. The intent of the rule is that the anchor be ready for use if necessary, such as when a vessel sheers suddenly into an area where it may ground. Nor should the rule be limited to confined or congested waters, as three commenters suggested, for the same reason. Six persons asked what "ready for letting go" means. "Ready for letting go" means that stoppers, covers, jackasses, and similar items are removed from the ground tackle and that the chain be rigged for quick release. It does not mean that the anchor should be walked out.

Section 164.11 (s) and (t) in the proposal. These proposed requirements were for the proper display of lights and day signals and the sounding of proper fog signals. These are included under the Federal "rules of the road," which are applicable to all vessels, and are therefore not included in this final rule.

Section 164.11(p). This was paragraph (u) in the proposal. Five commenters suggested that the Coast Guard coordinate this rule for setting a vessel's speed with the new Rule 6 of the International Regulations for Preventing Collisions at Sea. 1972. The Coast Guard has done so and the rules are consistent. Since Rule 6 applies to international waters, it is supplemented by this paragraph (p), which is more appropriate for the coastal and inland waters to which it applies.

Section 164.11(q). This was paragraph (v) in the proposal. The proposed paragraph, in part, required that the results of the tests required under § 164.25 be recorded in the vessel's "pilot house log." Two commenters suggested that the entry be in the "deck log." The intent of the rule is simply that the results be recorded in an official log of the vessel. To avoid confusion, the words "pilot house" are not included in the final rule.

Section 164.11(r). This was paragraph (w) in the proposal. This paragraph is the requirement that equipment required by this new part be maintained in operable condition. Four commenters suggested a "best

effort" criterion. Two others stated that compliance is not always possible because of lack of parts and available technical ability. One commenter stated that radar, gyro, or depth finder malfunction should not be a reason to delay departure from a port where there are inadequate repair facilities. Notwithstanding these considerations, the intent of the rule is that this necessary equipment should be operating.

Section 164.15 Navigation underway: confined or congested waters and *Section 164.16 List of confined or congested waters.* These are special rules for the hazards of navigation in confined or congested waters. The substantive rules in § 164.15 are promulgated in this final rule as discussed in this preamble. The practical application of § 164.15, however, will not occur until specific geographic areas in which they would apply are included under § 164.16. The definition of "confined or congested waters," as requested by nine commenters, would be implicit in the naming of those waters. Those waters would be particularly hazardous because of restricted maneuvering room or a high volume of vessel traffic. The Coast Guard will conduct separate rulemaking actions for the listing of specific waters under § 164.16. A discussion of the rules in § 164.15 follows.

Section 164.15(a). The proposed rule stated that propulsion machinery is to be in the "maneuvering mode". One commenter requested a definition of "maneuvering mode." To clarify the intent of the requirement, the final rule requires propulsion machinery to be ready to "respond immediately through its full operating range."

Section 164.15(b). This paragraph requires that the engine room be manned to operate the propulsion machinery as required under paragraph (a) of the section. Four commenters suggested that vessels that are designed for "unmanned" engine rooms be exempted. The intent of the paragraph is to require no more manning than is necessary to meet paragraph (a) of this section. "Engine room" also includes the main engine control station, even if it is not physically in the "engine room."

Section 164.15(c). This paragraph requires the availability of persons to anchor the vessel rapidly in an emergency. One commenter suggested that vessels with remote control of anchors be exempted. If there is remote control of anchors, the requirement is met by having persons at the remote control.

Section 164.15 (d) and (e) in the proposal. Paragraph (d) would have required the manning of the steering engine room to shift steering control from the pilot house to the steering engine room. Seventeen commenters stated that the requirement would be ineffective because a steering casualty cannot be so remedied quickly enough. In light of these comments, the requirement is not included in these final rules but will be considered further. Because of this, paragraph (e) of the proposal, which would have required communication between the pilot house and the person manning the steering engine room, is also deleted.

Section 164.15(d). This was paragraph (f) in the proposal. This paragraph prohibits the use of the automatic pilot device in confined or congested waters. Two commenters stated that automatic pilot is better than manual steering in certain situations. One suggested that the requirement be for use of the safest steering mode for a particular situation. One commenter stated that component failure in an auto pilot often causes a sudden sheer and that in confined or congested waters, there may be no time to shift. Furthermore, he stated that many companies have standing orders to use hand steering in "tight quarters." The last commenter's statements are consistent with intent of the rule and the concept of the confined or congested waters in which it would apply. The paragraph is included in this final rule.

Section 164.17 of the proposal. The proposal stated that a rule for tug assistance in confined waters would be developed. This is to be the subject of a future rulemaking action.

Section 164.19 Requirements for vessels at anchor. To be chronologically consistent, paragraphs (a) and (b) of the proposal are interchanged in this final rule.

Section 164.19(a). This was paragraph (b) in the proposal. This paragraph requires the maintenance of a proper anchor watch. The proposed wording was "lookout". "Anchor watch" replaces it in this final rule in agreement with a comment, which stated that "anchor watch" was more appropriate.

Section 164.19(c). This paragraph combines paragraphs (c) and (d) in the notice. One commenter stated that veering chain or dropping a second anchor may solve the problem and that if repairs are being made to the vessel at anchor, it may not be able to get underway. Depending upon the severity of conditions, veering chain or dropping a second anchor may solve an anchor dragging problem; however, if conditions warrant, the vessel should be ready for getting underway if the other actions do not solve the problem. If the vessel has no propulsion, standby tug assistance may be appropriate.

Section 164.19 (e) and (f) in the proposal. These paragraphs would have required the display of proper light and day signals and sounding fog signals while at anchor. Since these are already required under the Federal "rules of the road", which are applicable to all vessels, they are not included in this final rule.

Section 164.23 in the proposal. This section would have required notification to the Captain of the Port or the Vessel Traffic Service of an area before getting underway under conditions that may abnormally affect vessel movement. There were 27 comments about the impracticality of

this requirement. After consideration of these comments, the Coast Guard has determined that the practical value of this requirement is outweighed by its impractical aspects and it is not included in this final rule.

Section 164.25 Tests before entering or getting underway. Five commenters stated that the equipment tests required by this section are normal practice on "well-run" vessels and one commenter stated that the requirements are already included in parts of 46 CFR. The intent of the section is that these tests also be made on all those vessels to which this new part applies and not just the vessels to which the requirements in 46 CFR apply. 46 CFR is being amended to be consistent with this new rule. One commenter stated that compliance with this requirement is "impossible" for short inland or coastal voyages. These tests are as necessary for vessels of 1,600 or more gross tons that make short inland or coastal voyages, such as between Philadelphia and Baltimore, as they are for vessels that make longer voyages. If this seems impractical for a particular vessel, the Captain of the Port should be contacted under the requirement of § 164.55 of this new part.

Section 164.25(a). This paragraph requires the testing of primary and secondary steering gear. One commenter stated that careful inspection by a chief engineer or other qualified person would be sufficient. Visual inspection does not always disclose whether the system will fail and is less reliable than actual testing. One commenter suggested that testing a "trick wheel" is not practical while a vessel is underway. If this system is the only backup steering system, the test is necessary. Vessels to which this new part applies usually have at least two means of steering. To enhance safe navigation, both should be tested to ensure that they are operable.

Section 164.25(b). This paragraph requires the testing of internal vessel control communications and vessel control alarms. One commenter suggested that this apply only when necessary for safe maneuvering. These systems should be ready for all circumstances, including the unforeseen, for the purposes of safe navigation. One commenter stated that "all" of these systems on a highly automated vessel is a large number. Nevertheless, it is necessary for the purposes of safe navigation that these systems operate properly.

Section 164.25(c). The proposed paragraph (c) required the testing of "each emergency generator for at least fifteen minutes." Four commenters stated that once a week is sufficient. These are critical systems and whether or not they are working should be known at the time of actual vessel operation. Since the intent of the section is that there be a second working electrical power source, the final rule allows a standby or emergency generator. One commenter correctly suggested that, instead of a fifteen minute requirement, the test be as long as necessary to show proper functioning, including steady state temperature and pressure readings. The final wording has been changed accordingly.

Section 146.25(d). One commenter suggested that this requirement for the testing of storage batteries for emergency lighting and power systems to vessel control and propulsion machinery spaces not apply to vessels for which there is a regular testing program. The necessity of testing these critical systems at the time of entering or getting underway in the navigable waters of the United States is as discussed for the systems required under paragraphs (a) through (c) of this section.

Section 164.25(e). This paragraph requires the testing of main propulsion machinery, ahead and astern. Five commenters stated that backing engines in coastal waters might be dangerous. The Coast Guard assumes that reasonable masters would not do this test where it might be dangerous, such as in close proximity to other vessels. Two commenters suggested that the machinery be required to be tested only as is necessary to show that it can respond. That would meet the paragraph's requirement. One commenter suggested that the backing test of the engines be made when the vessel slows to pick up a pilot. This machinery must be tested, both ahead and astern, before entering the navigable waters of the United States, which is consistent with intent of all the regulations in this new part as discussed in the beginning of this preamble.

Section 164.30 Charts, publications, and equipment: general. This section prohibits the operation of a vessel by any person unless the vessel has the charts, publications, and equipment as required by §§ 164.33 through 164.37 of this new part. Six commenters suggested a "due diligence" criterion for this requirement. That concept is reasonably included under the charts and publication requirements in § 164.33 as this section is rewritten in this final rule.

Section 164.33 Charts and publications. Seven commenters stated that the requirement to have the "most recently published" charts under paragraph (a)(1) is unreasonable under the present distribution system. Three commenters stated the same for the requirement under paragraph (a)(2) to have the "current" copy of the listed publications. Accordingly, the requirements are changed to require the "most recently published and available" charts and the "most recent, available * * *" copy of the publications.

Section 164.35 Equipment: all vessels. Seventeen commenters suggested that there be a requirement for "collision avoidance" device. Five commenters suggested a Loran C requirement for "large" vessels. Both will be the subject of a rulemaking action in the near future. Two commenters suggested that radio direction finding equipment be required. This equipment is now required for certain U.S. vessels. The Coast Guard is considering requiring it for all ves-

sels of 1600 or more gross tons operating on the navigable waters of the United States.

Four commenters suggested that the burden of compliance for these equipment requirements be affirmatively placed upon vessel owners. Under the requirement of § 164.30 of this new part, if the owner, through his action or general policy, can reasonably be expected to ensure that the requirements of this equipment section are met, then the burden of compliance would be upon the owner.

Section 164.35(a). This paragraph requires a marine radar system for surface navigation. Four commenters suggested the requirement of gyro stabilization with north up capability. Three commenters suggested the requirement of reflection plotters. One comment suggested the requirement of a minimum 16 inch Plan Position Indicator (PPI) scope with moveable range rings. The Coast Guard has determined that these types of specifications are unnecessary at this time and that the usual radars that are available are sufficient for basic navigational safety. If further experience shows that more specification is necessary, the Coast Guard would conduct appropriate rulemaking actions.

Section 164.35(b). This paragraph requires an illuminated magnetic steering compass. Two commenters stated that many inland vessels do not use a compass. As stated earlier in this preamble, this part does not apply to most inland vessels because they are not 1600 gross tons or more. If an inland vessel is of 1600 gross tons or more and the compass is unnecessary for that vessel, a deviation may be requested under the requirements of § 164.55 of this new part.

Section 164.35(c). This paragraph requires a current magnetic compass deviation table or graph or compass comparison record for the steering compass. The comments on this requirement are discussed earlier in this preamble for § 164.11(i).

Section 164.35 (d) and (e). These were paragraph (d) in the proposal. For clarity, the two requirements, that there be a gyrocompass and that it or a repeater be illuminated and be at the main steering stand, are divided into two paragraphs.

Section 164.35(g). This was paragraph (f) in the proposal. It requires the display of maneuvering information on a fact sheet in the wheelhouse. To be consistent with a similar requirement in 46 CFR 35.20–40 and to clarify the intent of the requirement, the specific information required is stated in the paragraph in this final rule.

Section 164.35(h). This was paragraph (g) in the proposal. It requires an echo sounding device. Two commenters stated that the requirement was unnecessary in pilot waters and two other commenters stated that it was unnecessary for the Great Lakes. It is as important to know the depth of water in these waters as it is in any others. The requirement is unchanged.

Section 164.35(i). This was paragraph (h) in the proposal. It requires a device that can continuously record the depth readings of a vessel's echo sounding device. Nine commenters stated that the device serves no navigational purpose. The recorder is useful for navigational purposes as a valuable positioning device. One commenter stated that the requirement conflicted with IMCO Resolution A.224, which recommends a 15 minute recording capability. The requirement is that the device be one that can record continuously and not a requirement that it run continuously.

Section 164.35(j) in the proposal. This paragraph would have required an illuminated device that displays vessel speed, such as a pitometer log, revolutions-per-minute counter with speed equivalent table, or a direct read out device, such as a doppler indicator. Two commenters stated that such a device would not be useful on rivers. One commenter suggested that direct reading indicators, such as dopplers, be required on "large" vessels. After consideration of these comments and the facts that pitometer log swords would not be extended in shallow waters and revolutions-per-minute counters and speed equivalent tables are only valid in a steady state situation, the Coast Guard has determined that the requirement is insufficient as proposed. Because of the potential value of a direct speed indicating device, the Coast Guard is considering it as the subject of a future rulemaking action after more study; however, the requirement is not included in this final rule.

Section 164.37 in the proposal. This proposed section would have required two marine radar systems on vessels of 10,000 or more gross tons. As stated in the discussion of § 164.35 in this preamble, "collision avoidance" devices for vessels of 10,000 or more gross tons will be the subject of a rulemaking action in the near future. Since a radar system is a component part of some "collision avoidance" devices, this proposed requirement for a second radar is not included in this final rule; however, if after rulemaking procedures a requirement for collision avoidance devices is not promulgated as a final rule, the proposed requirement for a second radar would be reinstated.

Section 164.39 in the proposal. This proposed section would have required an illuminated rate of turn indicator on vessels of 35,000 gross tons or more. Two commenters stated that the device was not necessary on vessels of 100,000 gross tons or more. One commenter stated that the device was designed for use on rivers and was not appropriate for seagoing vessels. One commenter stated that the device had been insufficiently accurate when used on several of his vessels. The Coast Guard has determined that, although the rate of turn indicator may be useful on vessels of this size, further study is necessary and there is insufficient basis for requiring it in these rules.

Section 164.51 Deviations from rules: emergency. This section allows

emergency deviations from these rules to avoid endangering persons, property, or the environment. Five commenters stated that this section only repeats the substance of Rule 29 of the International Regulations for Preventing Collisions at Sea, 1960, and Article 29 of the statutory inland "rules of the road" (33 U.S.C. 221). Although this section is consistent with those provisions, it applies specifically to the rules in this new part and not just to general navigation practices governed by the international regulations and inland "rules of the road." Proposed paragraph (b) of this section would have required a report of any deviation under this section to the Captain of the Port or Coast Guard District Commander. Two commenters stated this is unnecessary for brief emergency deviations. In light of these comments, the final rule is changed to require this report for only the failure of critical navigation equipment: the radar, gyrocompass, echo sounding device, or primary steering gear. This requirement is in paragraph (b) of new § 164.53. Paragraph (a) of this new section allows the person directing the movement of the vessel to continue a voyage if any equipment required by this new part stops operating properly, subject to the directions of the Captain of the Port under Part 160 of this chapter.

Section 164.55 Deviations from rules: continuing operation or period of time. This was § 164.53 in the proposal. Under this section, the Captain of the Port may authorize a deviation from these rules, if safe navigation is not impaired or the rules for preventing collisions at sea are not violated, for a vessel operating in the waters under his jurisdiction, for a continuing operation or for a period of time that he specifies. Two commenters stated that there would be "uneven enforcement" because Captains of the Port may interpret the rules differently. One commenter suggested that the section include a requirement that authorizations not be "unreasonably withheld." Another commenter suggested an internal procedure for informing Captains of the Port of the different deviations that have been authorized. The Coast Guard intends to issue internal guidelines so that this deviation authorization would be as consistent as is practicable. The intent of this section is to allow reasonable deviations from these rules if safe navigation of the vessel is not impaired and the rules for preventing collisions at sea are not violated. If a vessel operates in waters that include the jurisdiction of two or more Captains of the Port, an authorization from each is necessary. Deviation from the rules because of equipment failure on a particular voyage is covered under new § 164.53(a).

Section 164.61 Marine Casualty record retention. Two commenters stated that this requirement for record retention when a vessel is involved in a marine casualty is unreasonable. One commenter stated that the requirement is already included in 46 CFR. This section cross references the record retention requirement in 46 CFR 4.05–15 for the convenience of those persons using these rules, which will be in 33 CFR. That requirement in Title 46 is necessary for the purposes of the marine casualty investigations that the Coast Guard is required to conduct.

This rule has been reviewed for economic effects under Department of Transportation "Policies to Improve Analysis and Review of Regulations" (41 FR 16200). Because the operational rules in this new part are followed already on most vessels and can be met with most existing manning levels, there should be no cost increase due to increased manning. The Coast Guard estimates that there should be no more than 1,100 U.S. flag vessels and 5,000 foreign flag vesels of 1,600 or more gross tons navigating in the navigable waters of the United States in any year. The following is based, in part, on a 1975 random survey of 300 vessels. Where appropriate, annual cost is based upon a 10 year amortization period. All of the vessels had radar. Adding a good marine radar to 5% of the 6,100 vessels for approximately $15,000 each would result in a cost of $1,282,500 in the first year and $457,500 in each of the following nine years. All the vessels had a magnetic compass. Adding the compass to 5% of the 6,100 vessels for $2,000 each would result in a cost of $496,000 in the first year and $61,000 in each of the following nine years. One vessel did not have a rudder angle indicator. Adding this indicator to 5% of the 6,100 vessels for approximately $4,000 each would result in a cost of $342,000 for the first year and $122,000 in each of the following nine years. Two vessels did not have a gyrocompass. Adding a gyrocompass to 10% of the 6,100 vessels for approximately $60,000 each would result in a cost of $10,260,000 in the first year and $3,660,000 in each of the following nine years. One hundred and seventy-nine vessels did not have their maneuvering characteristics posted. All U.S. vessels, approximately 1,100, are required to have it posted. If all 5,000 foreign vessels did not have it posted, testing for the information would cost approximately $5,000 each resulting in an amortized cost of $2,500,000 each year for ten years. Two vessels did not have a recording fathometer. Adding the fathometer to 10% of the vessels for $20,000 each would result in a cost of $2,420,000 in the first year and $1,000,000 in each of the following nine years.

The economic impact on the U.S. economy from U.S. vessels is the total cost of compliance in the first year plus 10% passed to the consumer in each of the ten years. The cost of foreign vessel compliance will be passed to the U.S. consumer evenly over the 10 year amortization period. The estimated first year cost from compliance to the U.S. shipping industry is

$6,979,500. The estimated cost to the U.S. economy is $17,300,500 in the first year and $7,800,500 in each of the following nine years. The benefits from having this equipment and following the proper operating procedures would result not only in tangible savings, including less vessel damage or loss, less post vessel casualty costs, including investigation costs, and search and rescue costs, and less pollution clean up costs of which spill clean up costs alone are estimated at $30,000,000 to $35,000,000 per year, but significant intangible benefits, including less loss of life or injury, less pollution and resulting harm to the environment, and less hazards to navigation caused by abandoned vessels.

In consideration of the foregoing, Chapter I of Title 33, Code of Federal Regulations, is amended by adding a new Part 164 to read as follows:

Sec.

AUTHORITY: Sec. 104, 86 Stat. 427 (33 U.S.C. 1224); 49 CFR 1.46 (m) and (n)(4).

§ 164.01 Applicability.

This part applies to each self-propelled vessel of 1600 or more gross tons when it is operating in or on the navigable waters of the United States, except the Panama Canal and the St. Lawrence Seaway.

§ 164.11 Navigation underway: general.

The owner, master, or person in charge of each vessel underway shall ensure that:

(a) The wheelhouse is constantly manned by persons who—

(1) Direct and control the movement of the vessel; and

(2) Fix the vessel's position;

(b) Each person performing a duty described in paragraph (a) of this section is competent to perform that duty;

(c) The position of the vessel at each fix is plotted on a chart of the area and the person directing the movement of the vessel is informed of the vessel's position.

(d) Electronic and other navigational equipment, external fixed aids to navigation, geographic reference points, and hydrographic contours are used when fixing the vessel's position;

(e) Buoys alone are not used to fix the vessel's position;

NOTE.—Buoys are aids to navigation placed in approximate positions to alert the mariner to hazards to navigation or to indicate the orientation of a channel. Buoys may not maintain an exact position because strong or varying currents, heavy seas, ice, and collisions with vessels can move or sink them or set them adrift. Although buoys may corroborate a position fixed by other means, buoys cannot be used to fix a position; however, if no other aids are available, buoys alone may be used to establish an estimated position.

(f) The danger of each closing visual or each closing radar contact is evaluated and the person directing the movement of the vessel knows the evaluation;

(g) Rudder orders are executed as given;

(h) Engine speed and direction orders are executed as given;

(i) Magnetic variation and deviation and gyrocompass errors are known and correctly applied by the person directing the movement of the vessel;

(j) A person whom he has determined is competent to steer the vessel is in the wheelhouse at all times; [1]

(k) If a pilot other than a member of the vessel's crew is employed, the pilot is informed of the draft, maneuvering characteristics, and pecularities of the vessel and of any abnormal circumstances on the vessel that may affect its safe navigation;

(l) Current velocity and direction for the area to be transited are known by the person directing the movement of the vessel;

(m) Predicted set and drift are known by the person directing movement of the vessel;

(n) Tidal state for the area to be transited is known by the person directing movement of the vessel;

(o) The vessel's anchors are ready for letting go;

(p) The person directing the movement of the vessel sets the vessel's speed with consideration for—

(1) The prevailing visibility and weather conditions;

(2) The proximity of the vessel to fixed shore and marine structures;

(3) The tendency of the vessel underway to squat and suffer impairment of maneuverability when there is small underkeel clearance;

(4) The comparative proportions of the vessel and the channel;

(5) The density of marine traffic;

(6) The damage that might be caused by the vessel's wake;

(7) The strength and direction of the current; and

(8) Any local vessel speed limit;

(q) The tests required by § 164.25 are made and recorded in the vessel's log; and

(r) The equipment required by this part is maintained in operable condition.

§ 164.15 Navigation underway: confined or congested waters.

In the confined or congested waters

[1] See also 46 U.S.C. 672, which requires an able seaman at the wheel on U.S. vessels of 100 gross tons or more in narrow or crowded waters or during low visibility.

described in § 164.16, the master or person in charge of each vessel underway shall ensure that—

(a) Propulsion machinery can respond immediately through its full operating range;

(b) The engine room, including the main engine control station even if it is not in the engine room, is manned to operate the propulsion machinery as required by paragraph (a) of this section;

(c) Persons are available to rapidly anchor the vessel in an emergency; and

(d) The automatic pilot device is not in use.

§ 164.16 List of confined or congested waters. [Reserved]

§ 164.19 Requirements for vessels at anchor.

The master or person in charge of each vessel that is anchored shall ensure that—

(a) A proper anchor watch is maintained;

(b) Procedures are followed to detect a dragging anchor; and

(c) Whenever weather, tide, or current conditions are likely to cause the vessel's anchor to drag, action is taken to ensure the safety of the vessel, structures, and other vessels, such as being ready to veer chain, let go a second anchor, or get underway using the vessel's own propulsion or tug assistance.

§ 164.25 Tests before entering or getting underway.

No person may cause a vessel to enter into or get underway on the navigable waters of the United States unless, no more than 12 hours before entering or getting underway, the following equipment has been tested:

(a) Primary and secondary steering gear.

(b) All internal vessel control communications and vessel control alarms.

(c) Standby or emergency generator for as long as necessary to show proper functioning, including steady state temperature and pressure readings.

(d) Storage batteries for emergency lighting and power systems in vessel control and propulsion machinery spaces.

(e) Main propulsion machinery, ahead and astern.

§ 164.30 Charts, publications, and equipment: general.

No person may operate or cause the operation of a vessel unless the vessel has the charts, publications, and equipment as required by §§ 164.33 through 164.35 of this part.

§ 164.33 Charts and publications.

(a) Each vessel must have the following:

(1) Except as provided by paragraph (b) of this section, charts of the area to be transited published by the National Ocean Survey, U.S. Army Corps of Engineers, or a river authority that—

(i) are of a large enough scale and have enough detail to enable safe navigation of the area; and

(ii) are the most recently published and available for the area and currently corrected.

(2) Except as provided by paragraph (b) of this section, the most recent, available, and currently corrected copy of, or applicable extract from, each of the following publications, if it includes the area to be transited:

(i) U.S. Coast Pilot.

(ii) Coast Guard Light List.

(iii) Notices to Mariners published by Defense Mapping Agency Hydrographic Center and local Coast Guard Notice to Mariners.

(iv) The Tide Tables published by the National Ocean Survey.

(v) Tidal Current Tables published by the National Ocean Survey, or river current publication issued by the U.S. Army, Corps of Engineers, or a river authority.

(b) A vessel may have a chart or publication published by a foreign government instead of a chart or publication required by this section if the chart or publication contains similar information to the U.S. Government publication or chart. A vessel bound from a foreign port to a port in the United States may have the latest charts and publications that were available at previous ports of call.

§ 164.35 Equipment: all vessels.

Each vessel must have the following:

(a) A marine radar system for surface navigation.

(b) An illuminated magnetic steering compass, mounted in a binnacle, that can be read at the vessel's main steering stand.

(c) A current magnetic compass deviation table or graph or compass comparison record for the steering compass, in the wheelhouse.

(d) A gyrocompass.

(e) An illuminated repeater for the gyrocompass required by paragraph (d) of this section that is at the main steering stand, unless that gyrocompass is illuminated and is at the main steering stand.

(f) An illuminated rudder angle indicator in the wheelhouse.

(g) The following maneuvering information prominently displayed on a fact sheet in the wheelhouse:

(1) For full and half speed, a turning circle diagram to port and starboard that shows the time and the distance of advance and transfer required to alter the course 90 degrees with maximum rudder angle and constant power settings.

(2) The time and distance to stop the vessel from full and half speed while maintaining approximately the initial heading with minimum application of rudder.

(3) For each vessel with a fixed propeller, a table of shaft revolutions per minute for a representative range of speeds.

(4) For each vessel with a controllable pitch propeller, a table of

control settings for a representative range of speeds.

(5) For each vessel that is fitted with an auxiliary device to assist in maneuvering, such as a bow thruster, a table of vessel speeds at which the auxiliary device is effective in maneuvering the vessel.

(6) The maneuvering information for the normal load and normal ballast condition for—

(i) Calm weather—wind 10 knots or less, calm sea;

(ii) No current;

(iii) Deep water conditions—water depth twice the vessel's draft or greater; and

(iv) Clean hull.

(7) At the bottom of the fact sheet, the following statement:

WARNING

The response of the (name of the vessel) may be different from that listed above if any of the following conditions, upon which the maneuvering information is based, are varied:

(1) Calm weather—wind 10 knots or less, calm sea;

(2) No current;

(3) Water depth twice the vessel's draft or greater;

(4) Clean hull; and

(5) Intermediate drafts or unusual trim.

(h) An echo depth sounding device.

(i) A device that can continuously record the depth readings of the vessel's echo depth sounding device.

(j) Equipment on the bridge for plotting relative motion.

§ 164.51 Deviations from rules: emergency.

Except for the requirements of § 164.53(b), in an emergency, any person may deviate from any rule in this part to the extent necessary to avoid endangering persons, property, or the environment.

§ 164.53 Deviations from rules and reporting: non-operating equipment.

(a) If during a voyage any equipment required by this part stops operating properly, the person directing the movement of the vessel may complete the voyage subject to the requirements in Part 160 of this chapter.

(b) If the vessel's radar, gyrocompass, echo depth sounding device, or primary steering gear stops operating properly, the person directing the movement of the vessel must report or cause to be reported that it is not operating properly to the nearest Captain of the Port or Coast Guard District Commander as soon as possible.

§ 164.55 Deviations from rules: continuing operation or period of time.

The Captain of the Port, upon written application, may authorize a deviation from any rule in this part if he determines that the deviation does not impair the safe navigation of the vessel under anticipated conditions and will not result in a violation of the rules for preventing collisions at sea. The authorization may be issued for vessels operating in the waters under the jurisdiction of the Captain of the Port for any continuing operation or period of time the Captain of the Port specifies.

§ 164.61 Marine casualty reporting and record retention.

When a vessel is involved in a marine casualty as defined in 46 CFR 4.03–1, the master or person in charge of the vessel shall—

(a) Ensure compliance with 46 CFR Subpart 4.05, "Notice of Marine Casualty and Voyage Records;" and

(b) Ensure that the voyage records required by 46 CFR 4.05–15 are retained for—

(1) 30 days after the casualty if the vessel remains in the navigable waters of the United States; or

(2) 30 days after the return of the vessel to a United States port if the vessel departs the navigable waters of the United States within 30 days after the marine casualty.

Effective date: This rule becomes effective on June 1, 1977.

The Coast Guard has determined that this document does not contain a major proposal requiring preparation of an Inflation Impact Statement under Executive Order 11821 and OMB Circular A–107.

Dated: January 26, 1977.

O. W. SILER,
Admiral, U.S. Coast Guard Commandant.

---

maritime sidelights

(*Continued from page 27*)

(5) include in the engineers' license examination, questions on all phases of damage control and engineering casualty control for various powerplants in addition to the existing firefighting and emergency equipment questions.

The Board also recommended

—that the State Department's Office of Maritime Affairs "introduce before IMCO a suitable resolution to reaffirm that masters are responsible to call for assistance based upon the immediate casualty situation and are not to depend solely on company arrangements or assume responsibility for potential salvage claims"; and

—that the Maritime Administration (1) "urge shipowners to install communications equipment to use MARISAT communications satellites"; and (2) "issue an advisory to restate the master's responsibility to call for assistance based upon the immediate casualty situation and to urge owners and operators to develop procedures and informational guides to assist masters and inform management personnel of potential communications and logistical problems."

Nautical Queries

The following items are examples of questions which are included in the First Assistant Engineer and upper and lower level deck multiple choice examinations.

Engineers

1. The athwartship hull structural members of a ship are
   A. stringers.
   B. girders.
   C. breasthooks.
   D. deck beams.

2. A serious loss of reserve buoyancy resulting from flooding any compartment of a ship will always
   A. increase the trim.
   B. change the free surface effect.
   C. cause a serious list.
   D. decrease ship stability.

3. When the opening pressure of a diesel fuel injector is greater than that specified hy the engine manufacturer, the
   A. start of injection tends to be advanced.
   B. duration of injection will alway be greater.
   C. quantity of fuel injected will always be increased.
   D. quantity of fuel injected tends to be decreased.

4. When using an ohmmeter to test a diode, a low resistance was found in both the forward and reverse directions. What would this indicate about the diode?
   A. Good resistive quality
   B. Good capacitive quality
   C. Open diode
   D. Shorted diode

5. Lubricating oil should enter a bearing
   A. at the middle of the journal.
   B. along the horizonal joint.
   C. at the bearing cap.
   D. at the point of minimum pressure.

Deck

1. In the United States system of buoyage, how is a mid-channel buoy, that can be passed close aboard on either side, painted and lighted?
   A. Black and white horizontal stripes with an interrupted quick flashing light
   B. Black and red vertical stripes with a Mo(A) light
   C. Black and red horizontal stripes with an interrupted quick flashing light
   D. Black and white vertical stripes with a Mo(A) light

2. If the Greenwich Hour Angle of a body is 180° and your longitude is 90° east. Which of the following statements is (are) correct?
   I. The local hour angle of the body is 090°.
   II. The meridian angle of the body is 90° east.
   A. I only
   B. II only
   C. Both I and II
   D. Neither I nor II

3. Which of the following groups should be used to send the signal longitude 109°34′ west?
   A. D 0934
   B. Lo 10934 W
   C. G0934
   D. L 10934

4. When underway in restricted visibility a sail-powered vessel must proceed at which of the following speeds?
   A. Less than half the wind velocity
   B. Bare steerageway
   C. Less than 4 knots
   D. Moderate speed

5. Structural members that fit between the floors of a vessel and stiffen the double bottom are called
   A. buckler plates.
   B. intercostals.
   C. boss plates.
   D. floor stiffeners.

Answers

Engineer
1. D 2. D 3. D 4. D 5. D.

Deck
1. D 2. B 3. C 4. D 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	Specimen Examinations for Merchant Marine Deck Officers (Chief Mate and Master) (1–1–74).
101–1	Specimen Examinations for Merchant Marine Deck Officers (2d and 3d Mate) (5–1–75).
108	Rules and Regulations for Military Explosives and Hazardous Munitions (4–1–72). F.R. 7–21–72, 12–1–72, 11–14–74, 6–18–75.
*115	Marine Engineering Regulations (6–1–73). F.R. 6–29–73, 3–8–74, 5–30–74, 6–25–74, 8–26–74, 6–30–75, 9–13–76.
*123	Rules and Regulations for Tank Vessels (1–1–73). F.R. 8–24–73, 10–3–73, 10–24–73, 2–28–74, 3–18–74, 5–30–74, 6–25–74, 1–15–75, 2–10–75, 4–16–75, 4–22–75, 5–20–75, 6–11–75, 8–20–75, 9–2–75, 10–14–75, 12–17–75, 1–21–76, 1–26–76, 2–2–76, 4–29–76, 9–30–76.
169	Rules of the Road—International—Inland (8–1–72). F.R. 9–12–72, 3–29–74, 6–3–74, 11–27–74, 4–28–75, 10–22–75, 2–5–76, 3–1–76, 6–10–76.
*172	Rules of the Road—Great Lakes (7–1–72). F.R. 10–6–72, 11–4–72, 1–16–73, 1–29–73, 5–8–73, 3–29–74, 6–3–74, 11–27–74, 4–16–75, 4–28–75, 10–22–75, 2–5–76.
174	A Manual for the Safe Handling of Flammable and Combustible Liquids and Other Hazardous Products (9–1–76).
176	Load Line Regulations (2–1–71). F.R. 10–1–71, 5–10–73, 7–10–74, 10–14–75, 12–8–75, 1–8–76.
182	Specimen Examinations for Merchant Marine Engineer Licenses (Chief Engineer and First Assistant) (1–1–74).
182–1	Specimen Examinations for Merchant Marine Engineer Licenses (2d and 3d Assistant) (4–1–75).
184	Rules of the Road—Western Rivers (8–1–72). F.R. 9–12–72, 12–28–72, 3–8–74, 3–29–74, 6–3–74, 11–27–74, 4–16–75, 4–28–75, 10–22–75, 2–5–76, 3–1–76, 6–10–76.
*190	Equipment Lists (5–1–75). F.R. 5–7–75, 6–2–75, 6–25–75, 7–22–75, 7–24–75, 8–1–75, 8–20–75, 9–23–75, 10–8–75, 11–21–75, 12–11–75, 12–15–75, 2–5–76, 2–23–76, 3–18–76, 4–5–76, 5–6–76, 6–10–76, 6–21–76, 6–24–76, 9–2–76, 9–13–76, 9–16–76, 10–12–76, 11–1–76, 11–4–76, 11–11–76, 12–2–76, 12–23–76.
191	Rules and Regulations for Licensing and Certification of Merchant Marine Personnel (11–1–76).
*200	Marine Investigation Regulations and Suspension and Revocation Proceedings (5–1–67). F.R. 3–30–68, 4–30–70, 10–20–70, 7–18–72, 4–24–73, 11–26–73, 12–17–73, 9–17–74, 3–27–75, 7–28–75, 8–20–75, 12–11–75, 5–6–76.
227	Laws Governing Marine Inspection (7–1–75).
239	Security of Vessels and Waterfront Facilities (5–1–74). F.R. 5–15–74, 5–24–74, 8–15–74, 9–5–74, 9–9–74, 12–3–74, 1–6–75, 1–29–75, 4–22–75, 7–2–75, 7–7–75, 7–24–75, 10–1–75, 10–8–75, 6–3–76, 9–27–76.
*257	Rules and Regulations for Cargo and Miscellaneous Vessels (4–1–73). F.R. 12–22–72, 6–28–73, 6–29–73, 8–1–73, 10–24–73, 12–5–73, 3–18–74, 5–30–74, 6–24–74, 1–15–75, 2–10–75, 8–20–75, 12–17–75, 4–29–76, 6–10–76, 8–5–76, 9–30–76.
258	Rules and Regulations for Uninspected Vessels (5–1–70). F.R. 1–8–73, 3–2–73, 3–28–73, 1–25–74, 3–7–74.
*259	Electrical Engineering Regulations (6–1–71). F.R. 3–8–72, 3–9–72, 8–16–72, 8–24–73, 11–29–73, 4–22–75, 6–24–76.
268	Rules and Regulations for Manning of Vessels (12–1–73).
293	Miscellaneous Electrical Equipment List (7–2–73).
*320	Rules and Regulations for Artificial Islands and Fixed Structures on the Outer Continental Shelf (7–1–72). F.R. 7–8–72.
*323	Rules and Regulations for Small Passenger Vessels (Under 100 Gross Tons) (9–1–73). F.R. 1–25–74, 3–18–74, 9–20–74, 2–10–75, 12–17–75, 9–30–76.
329	Fire Fighting Manual for Tank Vessels (1–1–74).
439	Bridge-to-Bridge Radiotelephone Communications (12–1–72). F.R. 12–28–72, 3–8–74, 5–5–75.
467	Specimen Examinations for Uninspected Towing Vessel Operators (10–1–74).

CHANGES PUBLISHED DURING DECEMBER 1976

CG–190, Federal Registers of December 2 & 23.

*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.