PROCEEDINGS
OF THE MERCHANT MARINE COUNCIL

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Season's Greetings

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

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Season's Greetings

To the mariner both at sea and ashore this Yuletide season, I extend my sincere best wishes for a peaceful and joyous Christmas and a New Year of happiness, good health and safety.

W. J. SMITH,
Admiral, U.S. Coast Guard,
Commandant.

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PROCEEDINGS

OF THE

MERCHANT MARINE COUNCIL

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EXPLOSIONPROOF?

CDR W. L. Aitkenhead, USCG
Assistant Chief, Merchant Marine Technical Division, Headquarters

The question mark in the title is used advisedly. How many persons in our marine industry appreciate the principles, the methods, and the hardware that go into an explosionproof electrical installation?

THERE IS ALWAYS concern over the possibility of igniting explosive gases when electrical equipment is installed in places where these gases can accumulate. This concern seems particularly justified for shipboard installations when the devastating effect of a shipboard explosion is considered. Some of the places where explosive atmospheres can exist on merchant vessels due to combustible gases or vapors are: Cargo pump rooms on tankers, battery rooms, paint lockers, paint mixing rooms, lamp lockers, and operating rooms on passenger vessels where anesthetics are administered. One of the biggest problems is identification and classification of ships' spaces as to explosion hazard. Once the hazard is identified, the design of the installation is fairly straightforward.

One might think that if electrical equipment were enclosed in a tight box which would not admit explosive gases, the electrical equipment inside could arc and spark but never cause an explosion. But can one trust the tightness of the box? Can the box withstand changes in atmospheric pressure and temperature without breathing through its cover gasket or through the cables or through cable terminal tubes? The answer is ABSOLUTELY NOT! There is always a chance that the box will become charged with explosive gas and become a potential bomb.

CDR W. L. Aitkenhead graduated from the Coast Guard Academy in 1946 and earned the degrees of Naval Engineer from MIT in 1953 and Master of Electrical Engineering from Pratt Institute in 1965. He has served on a number of Coast Guard cutters in both engineering and deck officer billets. He was assigned to the staff of the Electrical Engineering Branch of the Coast Guard Merchant Marine Technical Division in Washington from 1955 to 1960. In 1962, after a tour at sea, he was assigned to the newly formed Merchant Marine Technical Branch in New York City where he was Chief of the Electrical Engineering Section. In 1965 he returned to Coast Guard Headquarters as Chief of the Electrical Engineering Branch where he had served ten years before. He has recently become Assistant Chief of the Merchant Marine Technical Division.

Resigning oneself to the conclusion that there is no sure way to keep explosive gases out of an electrical enclosure short of hermetic sealing or continuous purging under pressure, neither of which is entirely practical, one concludes that electrical enclosures used in hazardous areas must be strong enough to contain an internal explosion and prevent it from propagating to the surrounding atmosphere. This is the explosionproof principle. In fact the definition of explosionproof equipment in U.S. Coast Guard Electrical Engineering Regulations is:

> ". . . equipment enclosed in a case which is capable of withstanding an explosion of a specified gas or vapor which may occur within it, and of preventing the ignition of the specified gas or vapor surrounding the enclosure by sparks, flashes, or explosions of the gas or vapor within."

In the definition you may note that the term "specified gas or vapor" is used several times. This is because different gases have different explosive properties, and an enclosure

CLASS I HAZARDOUS ATMOSPHERES

Group	Atmosphere	Ignition Temp. °F
A	Acetylene	571
B	Hydrogen	1085
	Manufactured Gas	
C	Ethyl-ether	356
	Ethylene	842
	Cyclopropane	928
D	Gasoline	536
	Hexane	502
	Naphtha	450-500
	Benzine	550
	Butane	761
	Propane	871
	Alcohol	650-900
	Acetone	1000
	Lacquer solvents	
	Natural Gas	

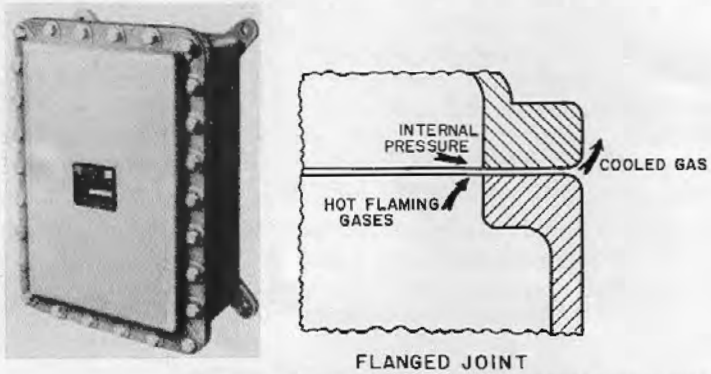
Figure 1. Summary of Hazardous Atmospheres.

which is explosionproof for, say, gasoline-air mixtures may not be suitable for ether-air-mixtures. Many gases and vapors are grouped according to ignition temperature, explosion pressure development effects, and propagation effects. Explosionproof equipment is certified for the specific gas or vapor groups in which it may be used. A tabulation of groupings of common explosive gases and vapors is shown in *Figure 1*. The designation "Class I" at the top of the table merely means that the hazardous material is explosive and is a gas or liquid in its natural state at room temperature and pressure. Classes II and III, which are not covered by this article, refer to combustible dusts and easily ignitible fibers respectively. Explosion propagating and pressure development effects and not the ignition temperature are the main considerations for grouping gases. To emphasize this fact, note that a number of Group D gases have lower ignition temperatures than some of the more hazardous Groups A, B, and C.

Explosionproof enclosures depend on close fitting joints of assembly to arrest and cool the hot gases of explosion so that by the time they reach the surrounding atmosphere they are too cool to propagate the explosion. The flanged-joint cover of the junction box shown in *Figure 2* depends on a precision machined metal-to-metal cover joint to accomplish this. The threaded-joint cover of another junction box in *Figure 3* cools the hot gases as they spiral along the threads.

The flanged-joint construction (often called ground-joint due to the way the joint is machined) is generally used for larger enclosures. Since the joint gives a straight line path from inside to outside, the width of the flange and the clearance between surfaces must meet certain required dimensions. The body and cover of the enclosure must be sufficiently stiff that distortion between fastening screws caused by explosion pressure will not increase the clearance. This explains the large number of cover screws on flanged-joint boxes. The metal-to-metal principle is also used for cylindrically shaped openings such as switch operating shaft and motor shaft openings.

The threaded joint has the inherent advantage of tending to seal the cover threads tighter against the body threads when an explosion occurs. The helical path along the threads thus created is always a long one insuring that only cool gas can escape. Other advantages of threaded-joints

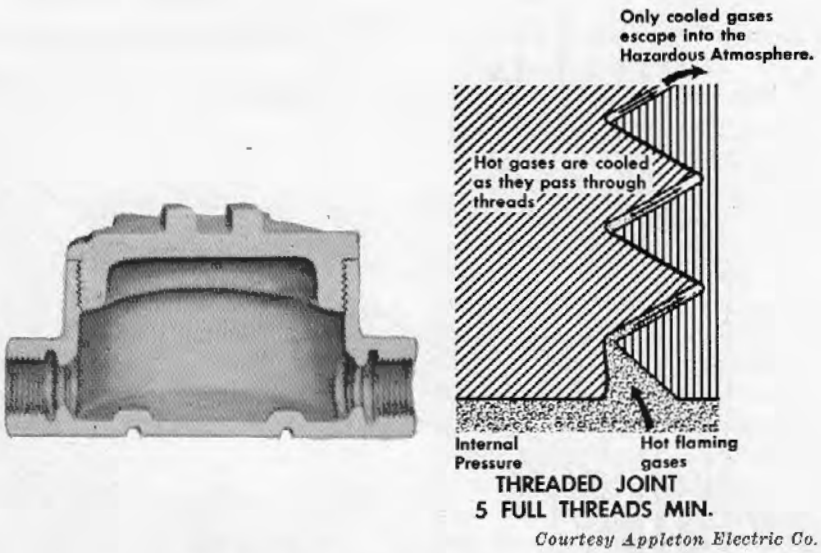


Courtesy Russell and Stoll Division, Midland-Ross Corp.

Figure 2. Flanged Joint Construction.

are ease of manufacture and, if a thread is damaged making the enclosure unsound, it cannot normally be assembled.

A pause to answer a question that marine people invariably ask is in order at this point. Are explosionproof enclosures waterproof? The answer is PROBABLY NOT. The principle of the explosionproof construction is based on the cooling effect of the metal-to-metal joint. Thus, the use of a gasket is impossible unless it is provided outside of the flame-arresting joint. Intentional omission of a gasket is contrary to what a marine person expects, and it is almost instinctive to cut a gasket to replace the "missing" one. A gasket on a flanged-joint enclosure completely nullifies its explosionproof integrity. On the other hand, waterproof and explosionproof threaded-joint type enclosures are quite common since the metal-to-metal contact of the threads is not affected by a gasket under the flange of a threaded cover. If a waterproof and explosionproof item of electrical equipment is desired, it should be purchased as such; modifications to the equipment should never be made.



Courtesy Appleton Electric Co.

Figure 3. Threaded Joint Construction.

No explosionproof enclosure is effective unless its cable entrances are sealed. Proper cable entrance sealing is entirely dependent on good workmanship and a thorough understanding of the technique and importance of the job. *Figure 4* shows a representative explosionproof seal fitting installation for a vertical cable rnn. The seal fitting is nippled to the explosionproof enclosure by not more than 18 inches of pipe or rigid conduit. This distance is important as will be seen later. At least five full threads of the nipple must be engaged at each end. All the cable covering except the individual conductor insulation is removed in way of the seal fitting and the cable is run through a terminal tube into the fitting and thence to the enclosure. The fitting is then filled with a sealing compound through the filling plug. When the compound hardens and the filling plug is in place, the cable entrance is explosionproof.

Several items regarding the use of explosionproof seal fittings are of interest. The marine explosionproof installation differs from the usual industrial installation in that industry uses single conductor wires run in conduit instead of multiconductor impervious jacketed and armored marine cable; however, the same type of seal fitting is used in both applications. Before pouring the sealing compound, which is usually a mixture of water and a powder very similar to cement that expands as it hardens, it may be necessary to form dams of fibrous material around the wires at the entrances to the fitting to hold the compound until it sets. These dams must be carefully made so that the sealing compound will be retained; otherwise it may run off and not form a seal. The individual insulated conductors inside the fitting should be arranged so that the sealing compound completely surrounds each one. When type MI cable is used, special explosionproof terminal fittings are substituted for the seal fittings. (For the uninitiated, type MI cable outwardly looks like copper tubing, but contains conductors solidly packed in rock-hard mineral insulation.)

Up to here the basic principles of explosionproof enclosures have been covered. *Figures 5, 6, and 7* show explosionproof designs which use these principles for specific items of equipment.

The fixture shown in *Figure 5* consists of two explosionproof compartments above and below the barrier to which the lampholder is fastened. This double compartment design is intended for use in a shoreside application where rigid conduit could be connected directly to the junction box without benefit of an explosionproof seal fitting. Omission of the seal fitting is permissible because the lamp compartment where ignition is most likely to occur is in a separate explosionproof space, and in the unlikely event of sparking on the junction box side, the rigid conduit system will contain the explosion. In the marine installation, seal fittings would be required because marine cable with no conduit is used, and

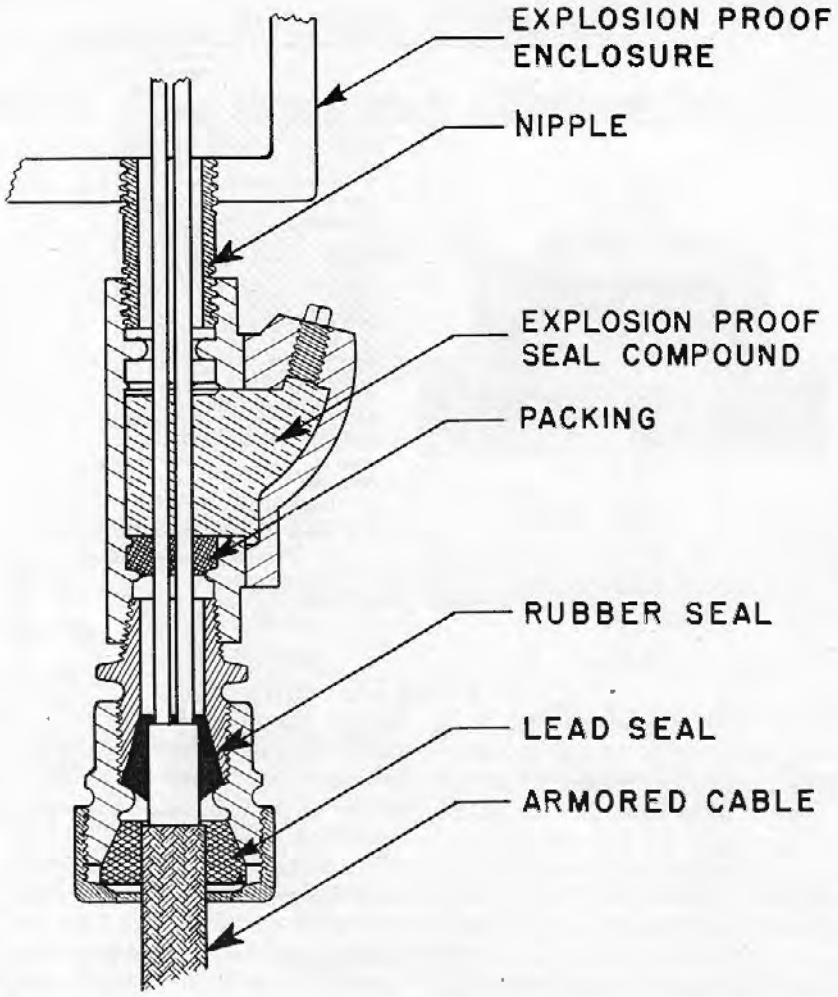


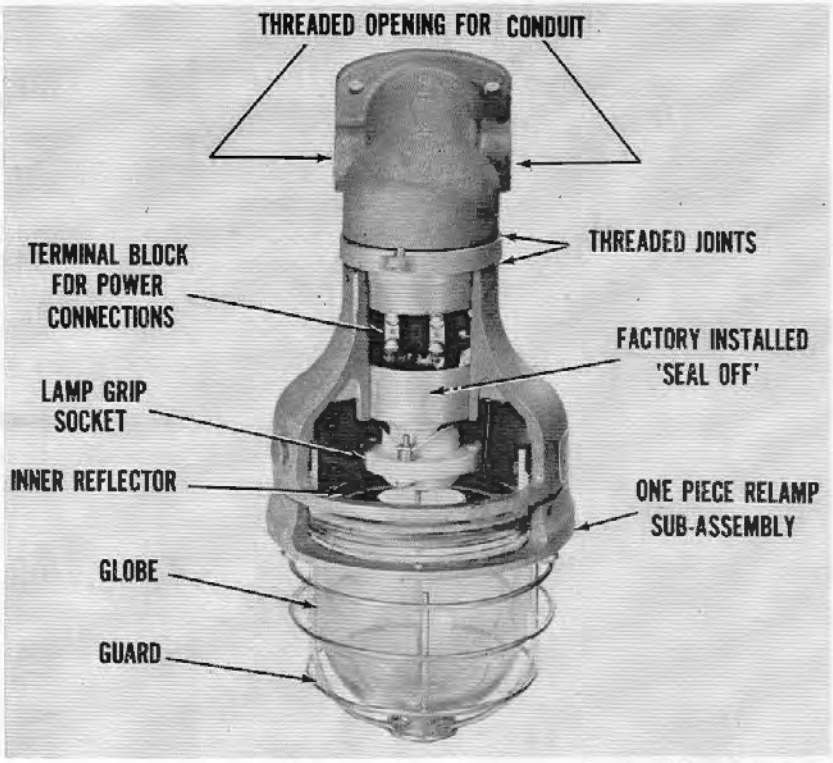
Figure 4. Explosionproof Cable Installation (the type of cable termination has no particular significance).

loose connections, chafing, and sparking in the junction box are more likely due to vessel motion and vibration. Another construction feature is the heavy explosion resisting glass globe which is locked into the ring assembly so that the globe seating is not disturbed when relamping. Since the lamp generates heat, special consideration has been given to limiting temperatures; therefore, the fixture size has been increased over the normal sized fixture to provide more heat dissipating surface.

Figure 6 illustrates an explosionproof motor. It is fan cooled by air blown over the outside of the motor as the windings must, of course, be encased in the explosionproof enclosure. Naturally, the fan is nonsparking. The shaft penetrations are through long sleeves with close clearances, and the motor end bells are rabbeted to the stator frame to provide the necessary long narrow metal-to-metal paths for arresting explosions. Terminal boxes must also be explosionproof.

Figure 7 is offered for academic reasons since the need for explosionproof receptacle outlets on merchant vessels is very questionable. The design of these receptacles is more sophisticated than any other explosionproof enclosure because an opening to receive the plug is necessary. The plug must be part of the design. The principle of operation is to provide mechanical interlocking between the plug and receptacle so that upon inserting the plug it is impossible to make electrical contact until explosionproof integrity has been established. Similarly, it is not possible to withdraw the plug so fast that heat from electrical arcing will not have time to cool. Many threads must be engaged before electrical contact is made or broken, thereby providing for quenching explosions. The pins of plugs are sealed so that the force of explosion does not act on the cord grip of the portable attachment cord.

One might think that any item can be made explosionproof by installing it in an explosionproof enclosure. There is no doubt that this has been done, but it is not recommended. For one thing, the structure of the enclosure can be weakened by drilling and tapping holes for mounting. A far more important consideration, however, is the phenomenon known as "pressure piling" associated with an explosion. Pressure piling occurs when the expanding explosion gas is restricted, channeled, or impeded. An explosion is actually very rapid burning, and there is a front between burning and unburned gas. Unburned gas is compressed ahead of the greatly expanded burned gas as the explosion propagates. By the time the flame ignites the unexploded gas it is compressed and explodes with greatly increased pressure. This is much the same effect which occurs when the compression ratio of an automobile engine is increased. The pressure piling effect can create pressures as much as 10 times higher than pressures which occur when there is no unusual impediment to expansion. Objects in-



Courtesy Pyle-National Co.

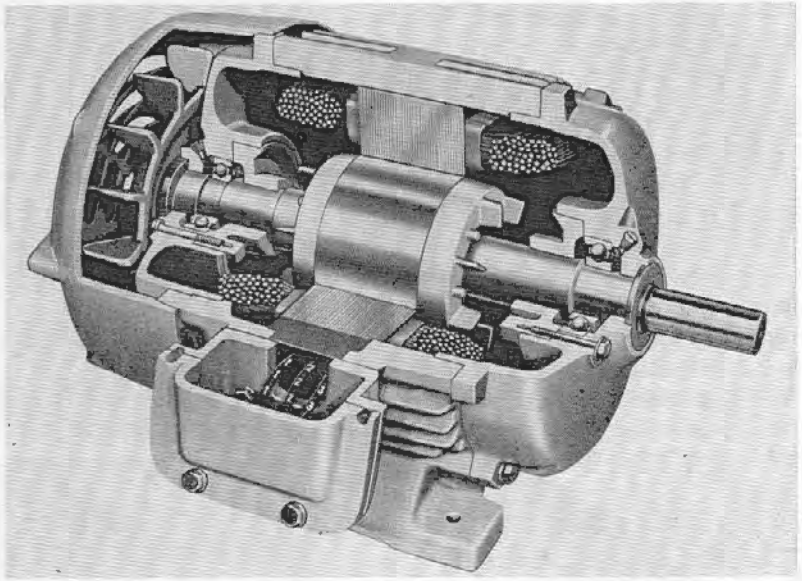
Figure 5. Explosionproof Lighting Fixture.

stalled in explosionproof boxes can cause startling increases in explosion pressure due to pressure piling. Pressure piling is particularly serious in pipes or conduit, and this is the reason why cable sealing fittings are required to be installed within 18 inches of enclosures.

Naturally, explosionproof equipment must be proved. In the United States, Underwriters' Laboratories, Inc., is generally recognized as the specialist in testing, and they have very elaborate facilities. Before any test is conducted, the equipment is examined for physical construction. Then, explosion tests are conducted wherein the equipment is placed in a test chamber and both the equipment and the chamber are charged with a specified gas. The gas in the enclosure is ignited by a spark plug and the explosion is observed for propagation to the atmosphere in the surrounding chamber; also, the pressure is recorded. The explosion tests are repeated over the explosive range of fuel-air mixtures of the specified gas to assure that all possible combinations of explosion pressures and temperatures have been tried. If the equipment generates heat, operating temperature is observed to assure that it is well below the ignition temperature of the specified gas. Equipment enclosures are hydrostatically tested to four times the maximum pressure observed during the explosion tests. Explosion damage to equipment inside the enclosure is considered reason for failure unless the damaged equipment can be readily replaced.

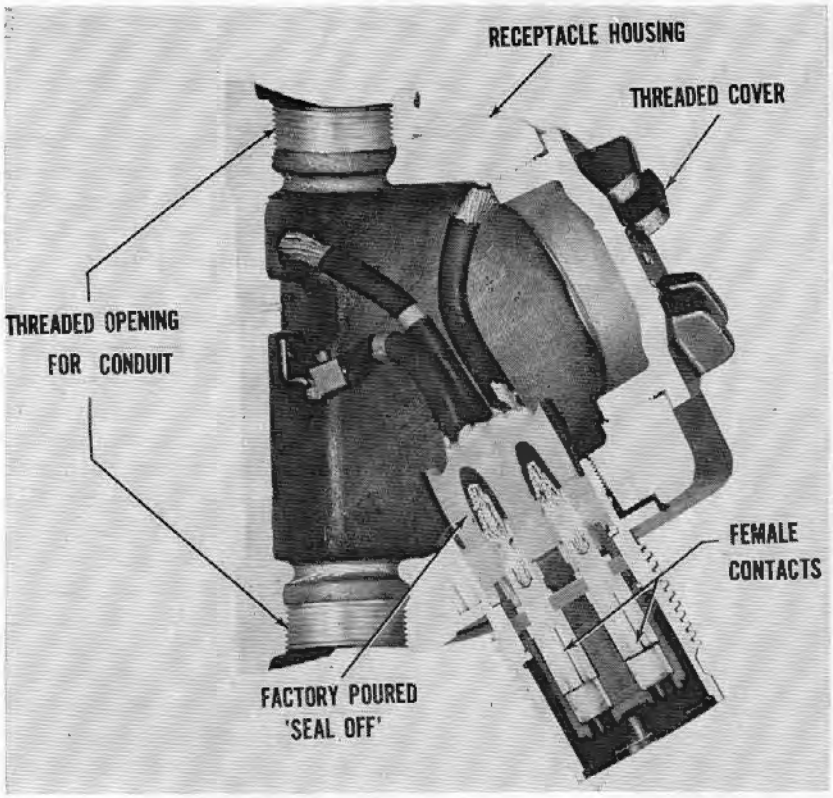
U.L. listed explosionproof equipment is easily identified by a label such as the one shown in *Figure 8*.

Having covered the fundamentals of explosionproof equipment and installations, the following points of special importance to merchant vessel personnel should be obvious.



Courtesy The Louis Allis Co.

Figure 6. Explosionproof Motor.



Courtesy Pyle-National Co.

Figure 7. Explosionproof Receptacle.

3. Hammers or prying tools must not be allowed to damage threaded joints or flat machined surfaces of flanged joints. Protect all surfaces that form part of the flame path from scratches and other mechanical injury.

4. Particles of foreign material and old grease should be removed from the surfaces of flanged or threaded joints by brushing with kerosene or solvent, and a film of light oil or lubricant should be applied to both sides of the joint immediately before assembly. Care should be taken to assure there are no particles of foreign material adhering to joint surfaces when reassembling.

5. The close tolerances of shaft and bearing surfaces must be maintained.

6. Threaded covers, flat joints, surfaces, rotating shafts, bearings and operating shafts should be well lubricated to prevent corrosion. If corrosion products have accumulated on

1. Electrical equipment should be serviced only after first deenergizing the electrical supply circuits. This also applies when lighting fixtures are partially disassembled for relamping. All electrical enclosures should be tightly reassembled before the supply circuits are again reenergized.

2. All cover screws and bolts intended to hold explosionproof joints firmly together must always be tight while circuits are alive. Leaving one screw or bolt loose can render the equipment unsafe. Only bolts or screws provided with the equipment should be used, as substitution of other types may weaken the assembly. The threaded joints should be tightened sufficiently to prevent loosening due to vibration, but should not be forced.

Figure 8. Typical Label for U.L. Listed Explosionproof Equipment.

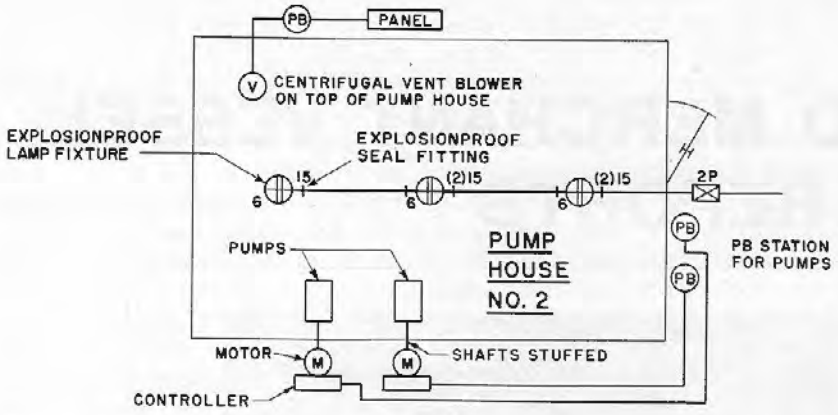


Figure 9. Explosionproof Electrical Installation in Shipboard Hazardous Area.

explosionproof joints which cannot be removed with solvents, the parts affected should be replaced. Never use abrasives or files to remove corrosion products from threaded or flanged joints. Equipment which may be structurally weakened by corrosion should be replaced.

7. The extra-hard-usage portable cord used with portable equipment should he inspected frequently and replaced at the first sign of damage or deterioration. Terminal connections must be properly maintained.

8. Never modify explosionproof equipment in any way and never obscure the nameplate of explosionproof equipment.

In conclusion, let us take a look at a typical hazardous area on a merchant vessel (*Figure 9*). Notice that all electrical equipment not essential in the hazardous space has been installed outside the space making the installation almost trivial. When explosionproof equipment is necessary, the rules are strict, yet the safest explosionproof installation contains no electrical equipment at all. ⚓

Ladders and Boats

James F. Drahos, Third Mate S/S ESPARTA

During a lifeboat drill, the embarkation ladder is used for access to and from the lifeboat in the water. But, when the lifeboat is hoisted aboard, the seamen will frequently attempt to bring the ladder aboard at the same time by pulling it into the lifeboat as it ascends. The basic inherent danger in this practice lies in the fact that the man tending the ladder as the lifeboat is hoisted up cannot, at the same time, safely grasp the manrope. Should the falls part or some other similarly unexpected accident take place, it is immediately apparent that the man tending the ladder is in a very bad position. In addition, should it become necessary to lower the boat with the ladder aboard, the position of the man tending the ladder becomes doubly dangerous in the event that the ladder should catch on the gunwale and capsize the entire boat above the water. It should be obvious that two seamen on board the ship can haul the ladder up by "Swedish steam" much easier, faster, and SAFER than one man in the lifeboat.

When a pilot ladder is used for personnel boarding a vessel from small craft, it is sometimes necessary to raise the ladder to prevent the lower rungs from being crushed. A very common, and very dangerous, practice has evolved wherein the ladder has a light line made fast to the bottom rung, and this line is used to haul up the bottom of the ladder when small boats are alongside. This, in itself, is innocent enough, however, the danger in this practice is that the ladder is hauled up and secured in this position when it is being used to board the vessel. This necessitates the user to either place his weight on the lower section of the ladder which has been hauled up and secured, and therefore place his entire weight on a small line of dubious strength, or to put his feet through the hauled up section of ladder to reach that part of the ladder which is securely made fast to the ship, and risk entanglement which could result in a broken or twisted ankle or worse. Furthermore, the hoisting line may catch aboard the small craft causing damage there or may cause the ladder to be carried away or damaged. Although not as "easy," it is by far safer to rig the ladder so that it may be adjusted for each boat coming alongside, and thus avoid the twin-pronged danger confronting the user. ⚓

THE EASY WAY IS NOT ALWAYS THE SAFEST WAY

AUTOMATED MERCHANT VESSEL REPORTS

Two members of the watchstanding crew at work in the U.S. Coast Guard's Automated Merchant Vessel Report (AMVER) Center on Governors Island in New York Harbor. The man on the left is operating the card read punch, entering data into the electronic computer, while the second man is seated at the remote inquiry station, through which he communicates with the computer. Immediately to his right is the central processing unit, the heart of the AMVER system. A computerized merchant vessel plotting system, AMVER aids in the coordination of search and rescue efforts in offshore areas of the world by providing locations of vessels in areas of interest when distresses occur.

Atlantic Medicos

THE MASTER of a ship at sea, hundreds of miles from the nearest hospital, is faced with a grave responsibility if a member of his crew should become ill or injured. With him rests the final decision of whether the ship should make for the nearest port so the patient can be hospitalized, or if it should continue the voyage in hopes the illness or injury is not too serious. Luckily, there are agencies and facilities, such as the International Radio Medical Center in Rome or the Public Health Service in the United States, to offer guidance to the master when he is faced with such a decision. In the end, however, the decision is still his alone to make.

Should he decide the man must be hospitalized, the services of AMVER are made available to help accomplish this. Through the use of doctor surface pictures, nften a costly return to port by the ship can be avoided, and the patient can still receive the needed medical attention. Although actual evacuation was not required in either of the following cases, both serve to illustrate how AMVER doc-

tor surface pictures may be used when illness or injury strikes at sea.

On the morning of April 13, the first engineer aboard the 436-foot Norwegian cargo ship *Havtroll/Laue* was taken ill, while the vessel was on a passage from New York to Antwerp. He was suffering from severe pain in the abdomen. A request for a doctor surface picture was forwarded to AMVER, and, according to the vessel's master, Capt. O. Gjersvik, "Your prompt reply to my request enabled me to establish radio contact with the Belgian M/V *Montalto/Onmv* en route to Rotterdam from New York.

"As the situation did not call for an immediate transfer of the patient to *Montalto,*" Captain Gjersvik related in a letter of acknowledgment to AMVER, "we continued on our course towards Bishop Rock, keeping regular radio contact with M/V *Montalto.*

"On April 14th, the Medical Center in Bergen, Norway, recommended that the patient should be landed in the nearest port, and he was taken ashore in Cork, Ireland, on April 16th in fair condition."

A few days later, on the 19th, a 23-year-old engineman aboard the Coast Guard Cutter *Cook Inlet* was injured, while the vessel was manning Ocean Station Delta/4YD. He received superficial lacerations of the right elbow and upper arm, but following treatment the wounds appeared to be healing well. However, 4 days later, he began running a temperature and suffering from chills, and the area around his elbow became swollen, discolored, and painful.

Since cutters on Ocean Station Delta do not normally carry doctors, medical advice was provided to the *Cook Inlet* by the U.S. Public Health Service Hospital at Staten Island. The doctor prescribing recommended that the man be evacuated to a doctor ship, if possible. AMVER surface pictures listing doctor vessels within 300 miles of the cutter's position were provided every 12 hours, in case it was decided to evacuate the patient.

The next day the cutter advised that the crewman's condition seemed to be improving and that evacuation was not contemplated. It asked, however, that the surface pictures continue to be provided.

On the 25th, the ship advised that the patient was continuing to improve and requested that the medical case be closed.

Details of AMVER system operations may be obtained from Commander, Eastern Area, U.S. Coast Guard, Governors Island, N.Y. 10004, and Commander, Western Area, U.S. Coast Guard, 630 Sansome Street, San Francisco, Calif. 94126. AMVER instructions are available there, and at Coast Guard captain of the port and marine inspection offices in major Atlantic, Gulf, and Pacific ports of the United States. The instructions are published in the following languages: Danish, Dutch, English, French, German, Greek, Italian, Japanese, Norwegian, Portuguese, Russian, Spanish, and Swedish. Requests for instructions should state the language desired if other than English. ⚓

PRODUCT SPEED OF LOADING

Oil terminals are being built which will permit loading in excess of 100,000 barrels per hour. The terminal will urge vessels to load at the highest rate possible to speed up ship turn around. At one terminal, terminal operators write a letter of protest to the ship and to the owners if a master does not load at a rate which the terminal considers as fast enough.

Chevron has told its masters that they, not the terminal, are to decide the safe loading rate. The masters have been told to consider a number of factors in arriving at this decision. These are:

1. The ability of the wharf to shut down promptly if necessary.

2. The capability of the crew to handle fast loading. New crews or newly promoted officers influence the capability of the crew.

3. The capacity of the venting system. Loading is to be slowed down or more tanks are to be opened if the ullage plugs start to float.

4. Pressure at the ship's rail. Not to be excessive. Note that when pressure builds up, gate valves cannot be opened.

5. Vibration. If excessive vibration occurs in the loading system, loading is to be slowed down.

6. Weather. If abnormal weather conditions allow vapors to accumulate on deck or in the quarters, loading is to be slowed or stopped.

Chevron has received a letter of protest from an oil terminal stating that a master of a company tanker would not load at the rate the terminal considered desirable. The master's reason was that he had practically a new crew. Chevron rejected the letter of protest because the master was entirely correct in his action. ⚓

From: *Safety Bulletin, Chevron Shipping Co.*

Safety Awards

Winners of the American Merchant Marine Institute's Jones F. Devlin Awards pose with Rear Adm. Charles P. Murphy, Chief, Office of Merchant Marine Safety, U.S. Coast Guard, after he made presentations on Institute's behalf at a Ship Safety Awards Luncheon, June 6, 1967, at New York's Downtown Athletic Club, New York. The Jones F. Devlin Awards are presented to all American-flag merchant ships completing 2 years or more of accident-free operation. Accepting the awards are:

Top row left to right, J. M. Ajubita, United Fruit Co.; P. Neil, Mobil Oil Corp.; N. Schier, Mobil Oil Corp.; H. F. Staack, Mobil Oil Corp.; R. F. Albers, American Oil Co.; R. E. McCloskey, Sun Oil Co.; D. L. Butts, Texaco, Inc.; G. Wendelburg, Tidewater Oil Co.

Seated left to right, H. A. Grande, United States Lines Co.; W. T. Morris, Jr., Lykes Bros. Steamship Co.; R. E. Kratzert, Columbia Transportation Division, Oglebay Norton Co.; Rear Adm. C. P. Murphy; G. F. Beal, United Fruit Co.; M. L. Franklin, Humble Oil & Refining Co.; T. T. Wilkinson, Sinclair Refining Co. ⚓

Load Lines Convention

Intergovernmental Maritime Consultative Organization (IMCO) announced that the 1966 international convention on load lines will come into force on July 21, 1968. In general the convention which replaces the 1930 convention allows for a smaller freeboard for large ships but calls for more stringent protection of openings in decks and superstructures. Tabular freeboards for large tankers and bulk carriers have been reduced approximately 15 percent while those for dry cargo ships have been reduced about 10 percent. The new convention is expected to increase the cargo carrying efficiency of vessels while at the same time improving their watertight integrity. ⚓

Public Library of the High Seas

The "Public Library of the High Seas" is the only national organization providing a seagoing library service exclusively to the men who go to sea in American flag ships. In 1966 the American Merchant Marine Library Association delivered 5,536 library units requiring 4,996 services, compared with 4,959 library units being delivered through 4,608 ship services in 1965. Included in the above total is service to 50 Coast Guard and other Government vessels which received 121 seagoing library units through 107 individual services by an AMMLA port representative. Since the Association was founded in 1921, a total of 255,162 library units containing 15,299,052 books were distributed by port representatives from the Association's domestic port offices throughout the United States.

In addition to the seagoing library service, the Association also maintains shore library facilities at its eight U.S. port offices. At these locations not only are the standard library books available, but AMMLA specializes in technical material used to assist those studying for license preparation and advancement in grades. A unique feature of the shore libraries is the liberal borrowing periods to conform with the length of the respective sea voyages. In the event the borrower returns to another port upon completion of the voyage, the books borrowed may be returned to any of the AMMLA port offices. ⚓

nautical queries

DECK

Q. What is the ecliptic?

A. The ecliptic is the apparent annual path of the sun among the stars; the intersection of the plane of the earth's orbit with the celestial sphere. This is a great circle of the celestial sphere inclined at an angle of about 23°–27′ to the celestial equator.

Q. (a) Name some of the things that may produce changes in the deviation of a vessel's magnetic compass.

(b) Describe the effect of sound-powered telephones on the magnetic compass.

A. (a) Some of the things which can produce changes in the deviation of a vessel's magnetic compass are:

1. Structural alterations involving removal, addition, or movement of steel or other magnetic material in the vicinity of the magnetic compass.

2. Electric welding in the vicinity of the magnetic compass.

3. Magnetic treatment of the vessel (deperming or flashing).

4. Mooring on the same heading for long periods of time.

5. Gunfire or explosion.

6. Installation of major components of electrical equipment in the vicinity of the compass.

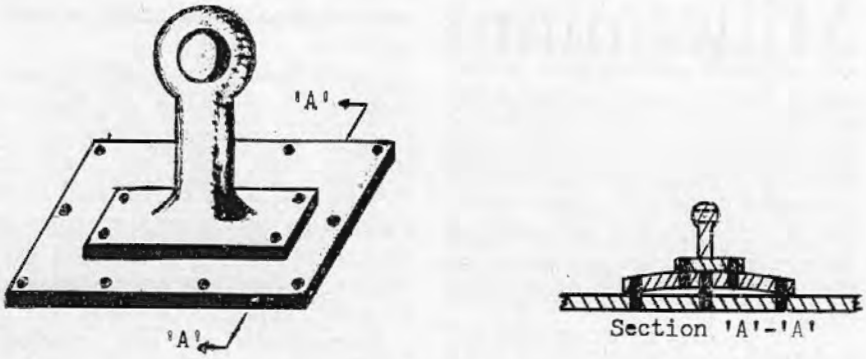
7. Change in setting of compass coil control resistors of the degaussing equipment (degaussing on deviations only).

8. Loading or discharge of magnetic cargo.

(b) Sound-powered telephones are a serious hazard to the stability of the magnetic compass, and should be kept at a distance of at least 4 feet when the compass is being read, checked, or adjusted.

LIFEBOATS

Q. In the sketch below is shown the method employed for fastening grab rails to the shell plating of a lifeboat. Why are more rivets employed for attaching the small plate to the shell than for attaching the bracket to the small plate?



A. To prevent rupture of the shell if the grab rail is carried away.

Q. What is meant by "fishing" a boom and when is it done?

A. When a boom is damaged or when a long slight boom is to be used to take on board a heavy weight, the boom is fished to guard against excessive stress. One or more timbers are placed around the boom and securely seized with good wire. The wire seizing must be hove taut and wedges driven home to take up any remaining slack.

ENGINE

Q. How do tip and axial clearances in impulse and reaction turbines compare? Give reasons.

A. In the impulse type, due to an equal pressure on both sides of the blades, the blade tip clearance may be comparatively large. In the reaction type, due to the difference in pressure through the different stages, the blade tip clearances should be as small as possible to keep leakage at a minimum. The axial clearance in the impulse should be comparatively close, so as not to allow spreading of the high-velocity steam jet. In the reaction the axial clearance is not so important, as the steam is of comparatively low velocity and spreads over the entire periphery.

Q. What is labyrinth packing? Where is it used, and how is it cared for?

A. It is a metallic packing made in segments and fitted to the turbine diaphragms, the steam sealing arrangement holding it in contact with the rotor and preventing the leakage of steam acting on the rotor blading into another rotor stage; it should be examined each time that the turbine is overhauled, cleaned, and reassembled, making certain that the ends of the segments do not butt against each other, as these must be free to move and maintain their contact with the rotor when in operation. This type of packing is generally made of a soft material, as aluminum or soft brass, and sometimes a combination of these two metals.

Tanker Millennium

After a tanker man has put in a good hard 20-hour day washing tanks, lining up, loading, and topping off a multigrade cargo and is able to stretch out for a few hours of well-deserved shuteye, he is very apt to dream of the tanker he would like to serve on someday.

A vessel which would load through a completely automatic system, at rates in excess of 100,000 barrels per hour, with all vapors piped back ashore to a safe point; a pumping system which operated from a central station; built-in tank-washing devices, and some kind of automatic contamination prevention.

The quarters would be completely sealed and air conditioned while decks, hulls, and tanks would have some miracle coating and be maintenance free.

These things are on the drawing board now, and in the not-too-distant future many tankers will have some of these features. Meanwhile because vessels now operating do not have such refinements certain things must be kept in mind. Some recent tanker explosions, occurring during loading operations in areas of high temperature and humidity, are worth reviewing.

A tanker was fitted with a stern discharge line, and during the loading of clean oil products a leak in the stern line near the galley caused a fire which did considerable damage before being extinguished.

In another fire amidships, it was believed that vapors from a cargo tank ignited when they were drawn into an individual air conditioning unit mounted in the midships house porthole.

In still another case, a tanker topping off crude, spiked with butane, caught fire amidships. One porthole in the ship's office was partially opened and a coffee pot had been plugged in just before the explosion took place. The conclusion was that vapors reached this coffee pot and exploded, killing 13 crewmen.

Very similar was the explosion which wrecked a foreign-flag tanker causing the death of 29 crewmembers during the topping off of a cargo of crude oil. While no definite source of ignition was indicated, it was thought that the vapors from the venting system and ullage hatches of No. 4 and No. 5 center tanks were ignited by a coffee pot, electric fan, or cigarette in one of the midship rooms.

Because air (oxygen) is ever present, we have to work on the other two sides of the fire triangle and prevent the vapors and ignition sources from getting together. With the high loading rates common in modern terminals and the fact that many tankers do not release vapors at the masthead, it can be seen why every precaution must be taken to shut doors to quarters, eliminate all potential ignition sources which conceivably might ignite vapors, and in the case of loading and discharging over the stern, shut down the galley and enforce no smoking. Electric fans, coffee pots, etc., are also potential ignition sources and if there is the slightest chance that vapors can somehow come into contact with them, they should be shut down too.

A good many vessels have worked out their own preloading safety checklist and while it varies from vessel to vessel and service to service, some of the items discussed above would likely appear on any checkoff list.

Why don't you sit down aboard your ship, write up your own preloading safety checkoff list and when everyone aboard agrees that each item on it is necessary, PUT IT INTO EFFECT. ⚓

Robert H. Smith, U.S. P. & I. Agency.

Devil Claws

The vessel was in a graving dock. The shipyard men were working on the anchor windlass. The devil claws were not secured to the chain. One man eased off the brake and the chain started to run. Another man threw over the pawl. This threw a tremendous strain on the pawl and its foundation. There are four retaining pins that hold the pawl mounting in place. The strain was too much for the pins and they sheared off. The entire unit flew forward and jammed in the hawse pipe. Fortunately, no one was injured. Examination of the broken pins showed that they were in good shape; they had not wasted away. The strain was just too much. This accident shows the reason for the regulation. Devil claws should be put on when the ship enters a drydock or a graving dock.

From: *Safety Bulletin, Chevron Shipping Company*

AMENDMENTS TO REGULATIONS

Circular

NVIC—5–67

This circular distributes a "Guide for Automatic Control Systems for Main and Auxiliary Machinery" to marine inspectors, shipbuilders, and designers. This circular with the enclosed guide supersedes NAVIGATION AND VESSEL INSPECTION CIRCULAR NO. 15–65.

Since the publishing of NAVIGATION AND VESSEL INSPECTION CIRCULAR NO. 15–65, new concepts in the control of main and auxiliary machinery have been presented by the marine industry and have been accepted by the Coast Guard. The enclosed guide is written to publish the current Coast Guard views on the subject. It is furnished for informational purposes and is not intended to be a directive or to limit in any way the use of different systems. The scope or arrangement of control systems is not intended to be specified, but rather to describe in general terms those features believed to be desirable. It is realized that a particular shipboard installation may have all or only portions of the systems described in the guide.

Coast Guard marine inspectors, shipbuilders and ship designers should consider the principles contained in enclosure (1) when developing and reviewing automatic control systems. Constructive comments and suggestions are desired.

Copies of this circular with Enclosure (1) may be obtained at the local marine inspection office or by writing Commandant CHS–2 U.S. Coast Guard, Washington, D.C. 20591.

NOTICE

UNITED STATES STEEL CORP.

(INTERCOASTAL FLEET)

Notice of Amendment of Registration of House Flag

The Commandant, U.S. Coast Guard, in accordance with the provisions of 19 CFR 3.81 (§ 3.81, Customs Regulations), issued under the authority of the Act of May 28, 1908, as amended (46 U.S.C. 49), has amended the registration of the house flag of the United States Steel Corp. described in Treasury Decision 56112 of February 13, 1964 (20 F.R. 2562) by substituting the words "Intercoastal Fleet and Great Lakes Fleet" for "Intercoastal Fleet" so that the house flag is registered as that of "United States Steel Corp. (Intercoastal Fleet and Great Lakes Fleet)."

The particulars of the house flag remain as described in Treasury Decision 56112.

(Federal Register of September 6, 1967)

PROPOSED CHANGES IN GULF DEMARCATION WITHDRAWN BY COAST GUARD

The purpose of this action is to withdraw certain proposed modifications set forth in the notice of proposed rule making published as document CGFR 67–40 in the FEDERAL REGISTER of June 20, 1967 (32 F.R. 8763–8765). These proposals concerned adding to or changing the Rules of the Road demarcation line in 33 CFR Part 82 to denote the areas of application of the "International Rules" and the "Inland Rules" in the Gulf of Mexico, starting from Cape St. George, Fla., and following the coastline to Mexico.

Interested persons were afforded an opportunity to submit written and oral comments at five public hearings held at Corpus Christi, Tex., on August 1; at Galveston, Tex., on August 2; at Morgan City, La., on August 3; at Mobile, Ala., on August 4; and at New Orleans, La., on August 7, 1967.

This withdrawal of certain proposals is made under the authority of section 2 of the act of February 19, 1895, as amended (33 U.S.C. 151), and subsection 6(b)(1) of the Department of Transportation Act (49 U.S.C. 1655). The delegation of authority for the Commandant, U.S. Coast Guard, to act under these laws is in Department of Transportation Order 1100.1, dated March 31, 1967 (49 CFR 1.4(a)(2), 32 F.R. 5606).

(Federal Register of October 25, 1967)

Approved Equipment

Commandant Issues Equipment Approvals; Terminates Others

By Commandant Action of September 29, 1967, Coast Guard approval was granted to certain items of lifesaving, firefighting, and other equipment and materials. At the same time approvals were terminated for certain items.

Those interested in these approvals and terminations should consult the Federal Register of October 7, 1967, for detail itemization and identification.

Title 46 Changes

RATES FOR GREAT LAKES PILOTAGE SERVICES

The purpose of this amendment is to adjust the rates for Great Lakes pilotage prescribed in Part 401 to conform to the rates contained in the Memorandum of Arrangements on Great Lakes Pilotage between the United States and Canada, as amended October 6, 1967.

On September 6, 1967, the U.S. Coast Guard published a notice of proposed rule making in the FEDERAL REGISTER (32 F.R. 13079) regarding changes in these rates. This notice was issued in response to requests for changes in the rates received from the St. Lawrence Seaway Pilots Association and the Great Lakes Advisory Association. A public hearing was held on the notice in Cleveland, Ohio, on September 21, 1967, the closing date for the receipt of comments on the notice of proposed rule making. This hearing provided an additional opportunity for all interested persons to present their views and arguments, orally and in writing, on the notice and to present additional facts supporting those views and arguments. At the conclusion of the hearing, the Presiding Officer extended a further opportunity to all persons attending the hearing to submit any supplemental written material they desired, with the express request that this material be submitted as soon as possible in order to facilitate a timely decision on the proposals contained in the notice.

After full consideration of the proposals and all the views, arguments, and materials received, representatives of the United States entered into discussions with representatives of Canada with the objective of revising the present pilotage rates as contained in the Memorandum of Arrangements of June 29, 1966, between the respective countries. As a result of these discussions, the Memorandum of Arrangements was amended on October 6, 1967, in order to prescribe new pilotage rates to be made effective October 12, 1967, by regulations issued by the respective countries.

These amendments may be found in the FEDERAL REGISTER of October 11, 1967.

TRANSFER OF FUNCTIONS TO COAST GUARD

There was transferred to and vested in the Secretary of Transportation all functions, powers, and duties of the Secretary of Commerce and other offices and officers of the Department of Commerce relating to the Great Lakes Pilotage Act of 1960, as amended (Public Law 86–555, 74 Stat. 259–262; 46 U.S.C. 216–216i) by subsection 6(a)(4) of the Department of Transportation Act (Public Law 89–670, 80 Stat. 931–950; 49 U.S.C. 1651–1659). Effective April 1, 1967, the Secretary of Transportation by Department of Transportation Order 1100.1, dated March 31, 1967 (49 CFR 1.4(a)(1), 32 F.R. 5606), delegated to and authorized the Commandant, U.S. Coast Guard, to exercise the functions, powers, and duties relating to Great Lakes Pilotage vested in the Secretary except those relating to the establishment or revision of fees under section 5 of the Great Lakes Pilotage Act (46 U.S.C. 216c).

It has been determined that overall administration of the Great Lakes Pilotage Act would be improved and facilitated by relocating its administrative facilities closer to the geographical area and the people it is intended to serve. The Great Lakes Pilotage Staff (CCS–3) is disestablished as a staff component under the Commandant effective October 1, 1967, and concurrently reestablished as a staff element, Commander, 9th Coast Guard District (dgp), under the direction and supervision of the Commander, 9th Coast Guard District, Federal Office Building, 1240 East Ninth Street, Cleveland, Ohio 44199. This document is effective on and after the date of publication in the FEDERAL REGISTER.

These amendments may be found in the FEDERAL REGISTER of October 13, 1967.

Title 33 Changes

OIL POLLUTION REGULATIONS

Implementation of International Convention for Prevention of Pollution of Sea by Oil, 1954, as Amended in 1962

Public Law 89–551, approved September 1, 1966 (80 Stat. 372–375), amended the provisions of the Oil Pollution Act, 1961 (33 U.S.C. 1001–1015), to implement the provisions of the International Convention for the Prevention of the Pollution of the Sea by Oil, 1954, as amended in 1962. Among the amendments in this law is the requirement that extensions or reductions of prohibited zones effectuated in accordance with the Convention shall be "* * * published in regulations prescribed by the Secretary" (33 U.S.C. 1011). The 1962 amendments to the International Convention for the Prevention of the Pollution of the Sea by Oil, 1954, became effective on May 18, 1967. The revised descriptions of these prohibited zones are set forth in this document.

There were transferred to and vested in the Secretary of Transportation by subsection 6(g) of the Department of Transportation Act (Public Law 89–670, 80 Stat. 931–950, 49 U.S.C. 1651–1659), certain functions, powers and duties previously performed by the Secretary of the Army and other officers and offices of the Department of the Army (Corps of Engineers) which included the administration of the Oil Pollution Act of 1961, as amended (33

U.S.C. 1001–1015). The Secretary of Transportation, by Department of Transportation Order 1100.1 dated March 31, 1967 (49 CFR 1.4(a)(3)(vii)), delegated to and authorized the Commandant, U.S. Coast Guard, to prescribe rules and regulations under the provisions of the Oil Pollution Act of 1961, as amended (33 U.S.C. 1001–1015).

The Commandant, U.S. Coast Guard, has assumed responsibility for the performance of the delegated functions, powers and duties of the Oil Pollution Act of 1961, as amended. By an order published in the FEDERAL REGISTER of April 5, 1967 (32 F.R. 5611), the Commandant, U.S. Coast Guard, announced the adoption and continuation of orders, rules, regulations, policies, procedures, privileges, waivers, and other actions which were issued, made, granted, or allowed prior to April 1, 1967, under the Oil Pollution Act of 1961, as amended. This notice also stated these actions shall continue in effect, according to their terms, until modified, terminated, repealed, superseded, or set aside by appropriate authority. Under the general superintendence of the Commandant, the administration of the Oil Pollution Act of 1961, as amended, and the implementing regulations in 33 CFR Part 212 (Corps of Engineers) are assigned to the Chief, Law Enforcement Division, Office of Operations, at Coast Guard Headquarters, and in each Coast Guard District under the District Commander to the Chief, Operations Division.

The purpose of this document is to revise the Oil Pollution Regulations in 33 CFR Part 212 as required to implement Public Law 89–551 (33 U.S.C. 1001–1015), and the amendments to the International Convention for the Prevention of the Pollution of the Sea by Oil, 1954, as amended, which became effective on May 18, 1967. Additionally, these regulations reflect the transfer of administrative authority from the Secretary of the Army to the Secretary of Transportation and his delegation to the Commandant, U.S. Coast Guard.

By virtue of the authority vested in me as Commandant, U.S. Coast Guard, by 14 U.S.C. 632 and Department of Transportation Order 1100.1 (49 CFR 1.4(a)(3)) the following actions are ordered:

A. Effective on the date of publication of this document in the FEDERAL REGISTER, the text of 33 CFR Part 212 is canceled and at the same time replaced by revised Oil Pollution Regulations which are established as a new "Subchapter O—Pollution" containing 33 CFR Part 151, entitled "Oil Pollution Regulations", as set forth below.

B. The rules and regulations in 33 CFR Part 212 pertaining to the functions, powers, and duties previously performed by the Corps of Engineers and which were adopted and affirmed by the notice published in the FEDERAL REGISTER of April 5, 1967 (32 F.R. 5611), shall govern all matters initiated or in process on or before the date of publication of this document in the FEDERAL REGISTER until completed unless the person or organization affected specifically requests a change to the rules and regulations in this document.

C. The actions and decisions made by the officers of the Corps of Engineers prior to April 1, 1967, which were adopted and affirmed by the notice published in the FEDERAL REGISTER of April 5, 1967 (32 F.R. 5611), and by the Coast Guard under the rules and regulations in 33 CFR Part 212 shall be continued in effect, according to their terms, until modified, terminated, repealed, superseded, or set aside by appropriate authority.

These amendments may be found in the FEDERAL REGISTER of October 18, 1967.

STORES AND SUPPLIES

Articles of ships' stores and supplies certificated from October 1 to October 31, 1967, inclusive, for use on board vessels in accordance with the provisions of Part 147 of the regulations governing "Explosives or Other Dangerous Articles on Board Vessels" are as follows:

CERTIFIED

Gamlen Chemical Co., 321 Victory Ave., South San Francisco, Calif. 94080. *Certificate No. 746,* dated October 16, 1967, Gamlen Degreaser 207C.

Petrolite Corp., 369 Marshall Ave., St. Louis, Mo. 63119. *Certificate No. 747,* dated October 17, 1967, MC–103; *Certificate No. 748,* dated October 17, 1967, MC–110; *Certificate No. 749,* dated October 17, 1967, MC–120; *Certificate No. 750,* dated October 17, 1967, MC–121; *Certificate No. 751,* dated October 17, 1967, MC–130; *Certificate No. 752,* dated October 17, 1967, MC–131; *Certificate No. 753,* dated October 17, 1967, MC–140.

West Chemical Products Inc., 42–16 West St., Long Island City, N.Y. 11101. *Certificate No. 754,* dated October 24, 1967, Bug-A-Bye.

Alex C. Fergusson Co., 44 East Oregon Ave., Philadelphia, Pa. 19148. *Certificate No. 756,* dated October 24, 1967, AFCO #5301; *Certificate No. 757,* dated October 24, 1967, AFCO #5302; *Certificate No. 758,* dated October 24, 1967, AFCO #5303; *Certificate No. 759,* dated October 24, 1967, AFCO #5305; *Certificate No. 760,* dated October 24, 1967, AFCO #9611.

AFFIDAVIT

The following affidavit was accepted during the period from October 15 to November 15, 1967:

Hills-McCanna Co.,[1] 400 Maple Ave., Carpentersville, Ill. 60110

Valves

[1] Diaphragm valves limited to Class II piping systems.

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 Sunday, Monday, and days following 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 may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D.G. 20402. Subscription rate is $1.50 per month or $15 per year, payable in advance. Individual copies may be purchased so long as they are available. The charge for individual copies of the Federal Register varies in proportion to the size of the issue but will be 15 cents unless otherwise noted in the table of changes below. Regulations for Dangerous Cargoes, 46 CFR 146 and 147 (Subchapter N), dated January 1, 1967 and Supplement dated July 1, 1967, are now available from the Superintendent of Documents, price basic book: $2.50; supplement: 40 cents.

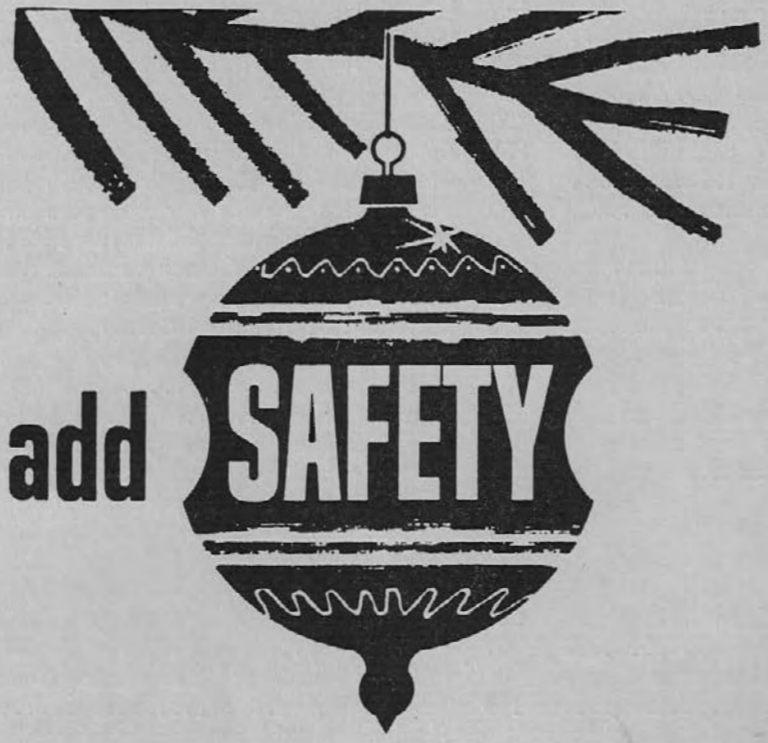
CG No.	TITLE OF PUBLICATION
101	Specimen Examination for Merchant Marine Deck Officers (7–1–63).
108	Rules and Regulations for Military Explosives and Hazardous Munitions (8–1–62).
115	Marine Engineering Regulations and Material Specifications (3–1–66). F.R. 12–6–66.
123	Rules and Regulations for Tank Vessels (5–2–66). F.R. 12–6–66.
129	Proceedings of the Merchant Marine Council (Monthly).
169	Rules of the Road—International—Inland (9–1–65). F.R. 12–8–65, 12–22–65, 2–5–66, 3–15–66, 7–30–66, 8–2–66, 9–7–66, 10–22–66.
172	Rules of the Road—Great Lakes (9–1–66).
174	A Manual for the Safe Handling of Inflammable and Combustible Liquids (3–2–64).
175	Manual for Lifeboatmen, Able Seamen, and Qualified Members of Engine Department (3–1–65).
176	Load Line Regulations (1–3–66). F.R. 12–6–66, 1–6–67, 9–27–67.
182	Specimen Examinations for Merchant Marine Engineer Licenses (7–1–63).
184	Rules of the Road—Western Rivers (9–1–66). F.R. 9–7–66.
190	Equipment Lists (8–1–66). F.R. 9–8–66, 11–18–66, 2–9–67, 6–6–67, 6–14–67, 6–30–67, 8–29–67, 10–7–67.
191	Rules and Regulations for Licensing and Certificating of Merchant Marine Personnel (2–1–65). F.R. 2–13–65, 8–21–65, 3–17–66, 10–22–66, 12–6–66, 12–13–66, 6–1–67.
200	Marine Investigation Regulations and Suspension and Revocation Proceedings (5–1–67).
220	Specimen Examination Questions for Licenses as Master, Mate, and Pilot of Central Western Rivers Vessels (4–1–57).
227	Laws Governing Marine Inspection (3–1–65).
239	Security of Vessels and Waterfront Facilities (3–1–67). F.R. 3–29–67.
249	Merchant Marine Council Public Hearing Agenda (Annually).
256	Rules and Regulations for Passenger Vessels (5–2–66). F.R. 12–6–66, 1–13–67, 4–25–67, 8–29–67.
257	Rules and Regulations for Cargo and Miscellaneous Vessels (1–3–66). F.R. 4–16–66, 12–6–66, 1–13–67.
258	Rules and Regulations for Uninspected Vessels (3–1–67.)
259	Electrical Engineering Regulations (3–1–67).
266	Rules and Regulations for Bulk Grain Cargoes (11–1–66).
268	Rules and Regulations for Manning of Vessels (5–1–67).
270	Rules and Regulations for Marine Engineering Installations Contracted for Prior to July 1, 1935 (11–19–52). F.R. 12–5–53, 12–28–55, 6–20–59, 3–17–60, 9–8–65.
293	Miscellaneous Electrical Equipment List (4–1–66).
320	Rules and Regulations for Artificial Islands and Fixed Structures on the Outer Continental Shelf (10–1–59). F.R. 10–25–60, 11–3–61, 4–10–62, 4–24–63, 10–27–64, 8–9–66.
323	Rules and Regulations for Small Passenger Vessels (Under 100 Gross Tons) (1–3–66). F.R. 12–6–66, 1–13–67.
329	Fire Fighting Manual for Tank Vessels (4–1–58).

CHANGES PUBLISHED DURING OCTOBER 1967

The following has been modified by Federal Register:
CG–190 Federal Register, October 7, 1967.

ANNUAL INDEX—VOLUME 24

U.S. GOVERNMENT PRINTING OFFICE: 1967



for a HAPPIER HOLIDAY!