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Sanitation. 1943.

SANITATION

UNITED STATES NAVY DEPARTMENT
BUREAU OF SHIPS
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CHAPTER 36

SANITATION

CONTENTS

SECTION I.—GARBAGE DISPOSAL

Trash burners and garbage grinders.

36–1. Garbage disposal, except on hospital ships, is accomplished by the combined use of two separate pieces of equipment; namely, a trash burner and a garbage grinder, in lieu of combined trash and garbage incinerators. The burner is designed for disposal by burning of easily combustible material such as wooden boxes and crates, cardboard cartons, papers, etc. The grinder is designed for disposal by grinding of material not easily combustible such as meat and vegetable scraps, bones, etc., discharging the finely ground material overboard.

36–2. Trash burners installed during 1940 to 1942 in converted ships and in newly constructed vessels, are of one size only and are fitted with separate spark arresters. Trash burners installed subsequent to 1942 will have no separate spark arresters (the spark arrester will be an integral part of the unit) and the size of the burner will vary according to requirements. It is intended that burners of this type shall eventually replace earlier types on all Navy ships. On hospital ships, garbage disposal is accomplished by the combined use of two separate pieces of equipment; an oil-fired forced-draft incinerator for disposal of wet bandages and dressings and other surgical and combustible wastes, and a grinder as described above.

Sizes of garbage grinders.

36–3. Garbage grinders are being furnished in two sizes. The large size, having a rated capacity of 1,600 pounds of garbage per hour, is furnished vessels having complements in excess of 500 men. The small size, having a rated capacity of 400 pounds of garbage per hour is furnished to ships having complements from 100 to 500 men.

Cleaning.

36–4. The interior of the grinder should be flushed out clean immediately after each use.

Precautions.

36–5. Garbage should be free from metallic objects such as bolts, rivets, etc.

SECTION II.—SHIPS' CLEANING EQUIPMENT

36–11. It has been found that rerolling and restowing of collapsible wash deck hose in such a manner that the old seam, or

line of crease, lies flat in the stowage, prolongs the life of the hose considerably (by avoiding continued flexing or creasing in the same line). This should be done periodically on all ships.

SECTION III.—FUMIGATION

Fumigation by hydrocyanic

36–21. Fumigation of a ship by hydrocyanic acid gas to be conducted by the U. S. Public Health Service is authorized when, in the opinion of the commanding officer, the conditions set forth in article 36–24 apply. The cost of the materials used by the Public Health Service for fumigating naval vessels will be borne by the Navy Department.

Disadvantages of hydrocyanic acid gas.

36–22. Hydrocyanic acid gas fumigation is very effective but the process has its disadvantages. The gas is extremely toxic and its use ordinarily requires the abandonment of the vessels for a more or less protracted period. It can be used only by experienced personnel. In some localities it has been necessary for the Navy to maintain a stock of this material for use by the Public Health Service in fumigating naval vessels.

Carboxide gas.

36–23. The Bureau of Medicine and Surgery investigated the practicability and efficiency of a new fumigant for ships' use. This new fumigant is known as carboxide gas. Exhaustive tests conducted on board certain naval vessels and merchant marine vessels conclusively showed it to be not only a very effective insecticidal fumigant but one of such low toxicity that it could be satisfactorily applied aboard ship by naval personnel without undue hazard, with a minimum of interference with ship's routine aboard and without interfering with the movements of the vessels.

Use of hydrocyanic gas; when permitted.

36–24. In view of the above, the use of carboxide gas as an insecticidal fumigant on naval vessels has been adopted. Hydrocyanic acid gas shall no longer be used on naval vessels for insect eradication, except under the following conditions:

(1) Where, in the opinion of the commanding officer, the conditions aboard ship are such as to necessitate immediate fumigation and carboxide gas for same is not immediately available.

(2) Where the rules of the Public Health Service require cyanide fumigation by the U. S. Public Health Service before docking at a United States port.

Carboxide gas—source of supply.

36–25. Carboxide gas shall not be carried on board naval vessels as a part of regular allowance equipment. When required, it should be obtained by requisition on the nearest navy yard or station. Need for the material should be anticipated as far in advance of actual use as possible in order that the supplying yards or stations may acquire the carboxide by the time required. Vessels on the west coast should obtain it from the Mare Island Navy Yard. Those in the Asiatic, from the Navy Yard, Cavite. Those at Pearl Harbor, from the Navy Yard, Pearl Harbor, which, in turn, should obtain it from the Mare Island Yard. Vessels on the Atlantic coast may obtain it from the New York Yard. Those in the Canal Zone may obtain it from the submarine base at Coco Solo which, in turn, should order it through the New York Navy Yard.

Carboxide gas containers.

36–26. The carboxide gas is delivered in steel cylinders of 30 pounds and 60 pounds capacity, respectively. In ordering, consideration should be given to the capacity of cylinders which can be most advantageously and economically utilized in the spaces to be fumigated.

Cost of carboxide gas.

36–27. The cost of the carboxide, when obtained, will be chargeable to ships' regular quarterly allotments. The following prices which have been quoted for this material may be of assistance to ships in calculating the cost of contemplated fumigation.

	60-pound cylinders per pound	30-pound cylinders per pound
F. A. S.	$0.19	$0.225
Panama C. I. F. Balboa	.245	.305
Panama C. I. F. Cristobal	.225	.28
Philippines, C. I. F. Manila	.24	.30
Hawaiian Islands C. I. F. Honolulu (min. B/L $5)	.225	.28
Mare Island Yard—Delivered	.19	.24
New York Yard—Delivered	.19	.22

Rental of carboxide gas cylinders.

36–28. Free rental of cylinders is allowed by the manufacturer of carboxide gas for 90 days except in cases of shipment to ports outside the United States. In the latter cases the free rental is for 6 months from the date of shipment by the manufacturer. Vessels obtaining this material should, accordingly, insure the prompt return of empty cylinders to the source from which they were obtained.

General data on carboxide gas.

36–29. (1) Composition and physical properties: 10 percent of ethylene oxide and 90 percent of carbon dioxide, both components being 1.5 times as heavy as air. The ethylene oxide is the insecticidal fraction, the carbon dioxide rendering the mixture noninflammable. The carbon dioxide also markedly accelerates the respiration of the insects and hence renders the ethylene oxide more effective by increasing the speed of its absorption by the insect. The pressure of a full cylinder is 725 pounds per square inch at 70° F., the mixture issuing as a liquid to a fine mist and completely vaporing within a few minutes. The gas has a faint but distinct etherlike odor easily recognized in the concentration set up for fumigation and is noninjurious to clothing, gold braid, furniture, or food products.

(2) Concentration for insects: 6 pounds per 1,000 cubic feet for an exposure period of 3 hours, based on the gross cubical contents.

(3) Hazard for man: The hazard in the concentration set up for fumigation is comparatively slight as compared with hydrocyanic acid gas, the toxicity as estimated from animal experiments being only about one-fiftieth of that for hydrocyanic acid gas. There is, however, risk of headache, nausea, and vomiting if personnel violate the simple precautions outlined hereunder in regard to the entering of spaces inadequately aerated following fumigation:

(4) Closure of ships' spaces: Closure should be as airtight as possible in order to reduce leakage of carboxide to a minimum.

This should be susceptible of quick accomplishment for watertight compartments.

(*a*) Ventilating system (supply and exhaust): Ventilating ducts should be disconnected at the point of entrance to compartments, wherever practicable, and the watertight covers applied. Otherwise, the dampers of all terminals must be closed and the louvers plugged with damp rags or waste.

(b) Special measure: Commercial masking tape should be utilized for the sealing of door seams and various cracks and crevices. It adheres effectively and leaves no residue on removal. Masking tape should be equivalent to that manufactured by the Minnesota Mining and Manufacturing Company, St. Paul, Minnesota. It should be obtained in rolls 2 inches wide and 60 yards in length. The quantity needed will naturally be dependent on the conditions encountered. An average estimate would be one roll of masking tape per 60 pounds of carboxide required. Wrapping paper coated with engine grease or vaseline and sealed at the edges with masking tape is satisfactory for the closure of larger openings such as door louvers, the grillwork of staterooms, and food-carrier openings. Masking tape may be replaced in an emergency by strips of ordinary paper and starch paste, but the application is time consuming and requires extensive cleaning to remove the material.

(5) Diffusion: Proper diffusion of the fumigant throughout the space or spaces is essential. This will be accomplished by the operation of ordinary fans alone, or combined with portable ventilating sets.

(6) Open-flame heaters or exposed-element electric heaters should not be used in areas being fumigated. In the presence of relatively high temperature, such as may be locally produced by such devices, the ethylene oxide content of carboxide may break down chemically, lose its fumigating properties, and create a condition of inflammability not existent in the original fumigant. This hazard is not involved in the use of electrical circulating fans or portable ventilating sets to promote diffusion of the fumigant throughout the area.

(7) Special carboxide vaporizing nozzles should be used whenever they can be obtained. The carboxide gas may be discharged through the control valves supplied with the gas cylinder when it is desired to proceed with the fumigation and vaporizing nozzles are not available. Under no circumstances should rubber tubing or rubber hose be used with carboxide. Any added connections must be of metal and suitable for working pressures of 800 pounds per square inch.

Instructions for use of carboxide gas.

36–30. (1) Preparation for fumigation:

(*a*) Penetration: Open wide all locker doors, furniture drawers, file cases, etc., and remove covers from mattresses and pillows in order to facilitate maximum access of the fumigant. For the same reason, clothing stowed in drawers and lockers should not be left tightly packed during fumigation.

(*b*) Ventilating system: Stop and seal as above indicated.

(*c*) All openings sealed: Seal any openings which might permit gas to escape. Utilize masking tape or a combination of

greased paper and masking tape for magazine vents, voice tubes, radio leads, enunciator chain leads, nonwatertight doors, natural ventilators, etc. Close all drains in heads and bathrooms. Dog down all watertight doors and airports.

(*d*) Diffusion: Start all fans in space or spaces to be fumigated. If desired to further facilitate diffusion, also utilize portable ventilating sets so arranged as to make suction from areas tending to contain dead air. This arrangement will also facilitate aeration following fumigation.

(*e*) Handling of carboxide cylinders: Determine the cubical content of the space or spaces to be fumigated. Calculate the weight of carboxide required on the basis of 6 pounds per 1,000 cubic feet. There is no objection to exceeding this concentration of the fumigant except the additional cost and greater time required for aeration. Place the cylinders, and so direct the nozzle, as to effect the maximum concentration of the gas at the beginning in the area known to be infested. Carboxide may stain fabrics or painted surfaces if projected directly on them. Accordingly, when being discharged, the cylinders should be so located and secured as to insure the carboxide not directly striking any fitting or structure within 5 feet of the gas outlet. Securely lash all cylinders in the upright position as the violent discharge of the contents tends to unbalance the containers. Cylinders must be grounded before discharging gas in order to avoid static sparks. In case the cylinder is standing on linoleum or other insulating deck covering, grounding may be effected through wire lashing to a bulkhead or to metal furniture which in turn is grounded to some metal structure of the ship. Make certain that all personnel in the area are accounted for. Test all cylinder valves in advance in order to be certain that there is no resistance to opening by hand. In some cases a wrench may be necessary. When all preparation is complete and all openings to the space are closed except the exit, open wide the valves of the cylinders successively, beginning with the unit farthest from the point of exit and with the nozzle directed away from the operator.

(2) Aeration after fumigation: Open the area fumigated at the end of 3 hours. Detail personnel wearing oxygen rescue breathing apparatus to open all airports or other connections to the outside air and reestablish supply and exhaust ventilation. Maintain fans and portable ventilating sets in operation during the period of aeration. The time for adequate aeration will necessarily vary according to the status of the ventilation, both natural or artificial, of the various parts of the area fumigated. It will ordinarily be safe for personnel to enter for their normal activities 2 hours after full ventilation has been in progress. This period, however, should be determined by the officer in charge of the fumigation in conjunction with the medical officer. Particular care should be taken to clear spaces containing dead-air pockets where the odor of carboxide tends to persist. Storerooms or other poorly ventilated spaces should not be entered until the following day.

(3) Precautions for personnel:

(*a*) Working party: Members of the working party detailed to open carboxide cylinders, or to handle details connected with

clearing of the area of gas after fumigation, shall wear oxygen rescue breathing apparatus. There is no risk of serious symptoms but this precaution will protect personnel against a possible attack of headache, nausea, and vomiting.

(*b*) General personnel: The personnel in general will not be permitted to resume their normal activities in the space or spaces following fumigation until so authorized by the fumigating authority.

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