NFPA No.

306

CONTROL OF GAS HAZARDS ON VESSELS TO BE REPAIRED 1969

$1.00

NATIONAL FIRE PROTECTION ASSOCIATION
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Official NFPA Definitions

Adopted Jan. 23, 1964. Where variances to these definitions are found, efforts to eliminate such conflicts are in process.

SHALL is intended to indicate requirements.

SHOULD is intended to indicate recommendations or that which is advised but not required.

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*Among the laboratories nationally recognized by the authorities having jurisdiction in the United States and Canada are the Underwriters' Laboratories, Inc., the Factory Mutual Engineering Division, the American Gas Association Laboratories, the Underwriters' Laboratories of Canada, the Canadian Standards Association Testing Laboratories, and the Canadian Gas Association Approvals Division.

LISTED: Equipment or materials included in a list published by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials, and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.

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AUTHORITY HAVING JURISDICTION: The organization, office or individual responsible for "approving" equipment, an installation, or a procedure.

Statement on NFPA Procedures

This material has been developed in the interest of safety to life and property under the published procedures of the National Fire Protection Association. These procedures are designed to assure the appointment of technically competent Committees having balanced representation from those vitally interested and active in the areas with which the Committees are concerned. These procedures provide that all Committee recommendations shall be published prior to action on them by the Association itself and that following this publication these recommendations shall be presented for adoption to the Annual Meeting of the Association where anyone in attendance, member or not, may present his views. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accepts any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

Standard for the

Control of Gas Hazards on Vessels to Be Repaired

NFPA No. 306 — 1969

1969 Edition of No. 306

The 1969 revision of this standard incorporates amendments recommended by the Sectional Committee on Gas Hazards and the Committee on Marine Fire Protection. It was adopted by the Association at its 73rd Annual Meeting, May 12–16, 1969, and supersedes all previous editions.

Origin and Development of No. 306

The original standard on this subject was developed by the NFPA Committee on Marine Fire Hazards in 1922 in cooperation with the NFPA Committee on Flammable Liquids. It was adopted by the Association and published as "Appendix A" of the "Regulations Governing Marine Fire Hazards." Further editions with minor changes were published in 1923, 1926 and 1930. In 1947, a completely revised standard was prepared by a joint committee of the American Bureau of Shipping and the National Fire Protection Association. This was adopted and published in 1948 by the NFPA. Amendments were adopted in 1949, 1950, 1951, and 1960. A revised edition was adopted in 1962, amended in 1963 and 1969.

Sectional Committee on Gas Hazards

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J. R. Lindgren, United States Salvage Assn., Inc.

Lee D. Miller, Institute of Scrap Iron & Steel, Inc.

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Sydney Swan, American Bureau of Shipping.

John M. Techton, Marine Chemists' Assn.

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Alternates.

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Capt. A. H. McComb, Jr., USCG (ret.), American Petroleum Institute. (Alternate to T. T. Wilkinson.)

Ralph W. Netterstrom, U. S. Department of Labor. (Alternate to Joseph J. LaRocca.)

SCOPE: To develop standards for the prevention of fire and explosion of flammable vapors on vessels undergoing repair.

Committee on Marine Fire Protection

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C. J. Bourke, Pacific Maritime Assn.

H. O. Buchanan, Canada Department of Transport.

Braxton B. Carr, The American Waterways Operators, Inc.

Joseph E. Choate, National Assn. of Engine & Boat Mfrs.

R. Cox, Fire Equipment Manufacturers Assn.

Frank W. Dunham, Jr., American Assn. of Port Authorities.

Frank Grafton, U. S. Department of Commerce.

George A. Hale, Marine Chemists Assn.

Vice Admiral James A. Hirschfield, USCG (ret.), Lake Carriers' Assn.

Edwin M. Hood (ex-officio), Chairman, Sectional Committee on Shipbuilding, Repair and Lay-Up.

J. R. Lindgren, United States Salvage Assn., Inc.

C. T. Mallory, National Automatic Sprinkler & Fire Control Assn.

Rear Admiral C. P. Murphy, Office of Merchant Marine Safety, United States Coast Guard.

Roy C. Petersen (ex-officio), Chairman, Sectional Committee on Operation of Marine Terminals.

E. S. Terwilliger (ex-officio), Chairman, Sectional Committee on Motor Craft.

Pierre R. Vallet (ex-officio), Chairman, Sectional Committee on Marinas and Boatyards.

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J. H. Birtwhistle, Canada Dept. of Transport. (Alternate to H. O. Buchanan.)

B. H. Lord, Jr., American Petroleum Institute. (Alternate to T. T. Wilkinson.)

SCOPE: This committee, together with the several sectional committees listed below, is organized to encourage the application of fire protection engineering to marine vessels and watercraft of all types and to develop such standards and recommendations as may be appropriate to this objective. The sectional committees are responsible for the initial development and revision of standards and recommendations dealing with their respective subjects and report to the Association through the Committee on Marine Fire Protection.

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Standard for the

Control of Gas Hazards on Vessels

NFPA No. 306 — 1969

PART I. GENERAL

101. Scope. This standard applies to vessels carrying or burning combustible or flammable liquids, carrying or having carried flammable compressed gases, or chemicals in bulk. It describes the conditions required before work may be started on any vessel under construction, alteration, repair or for shipbreaking. It is applicable to cold work, the application or removal of protective coatings and to work involving riveting, welding, burning or like fire producing operations. It is applicable to vessels while in the United States, its territories and possessions, both within and outside yards for ship construction, ship repair or shipbreaking. It is applicable specifically to those spaces in such vessels which are subject to concentrations of combustible or flammable liquids, vapors, gases, and chemicals as hereinafter described or which may not contain sufficient oxygen to permit safe entry.

102. Emergency Exception. Nothing in this standard shall be construed as prohibiting the immediate drydocking of a vessel whose safety is imperiled, as by being in a sinking condition or by having been seriously damaged, making it impracticable to clean and gas-free in advance. In such cases, however, all necessary precautionary measures should be taken as soon as practicable to provide safe conditions satisfactory to the Marine Chemist.

103. Governmental Regulations. Attention of owners, repairers and chemists is directed to the "Rules and Regulations for Tank Vessels" and other rules and regulations for vessel inspection of the United States Coast Guard and the "Safety and Health Regulations" of the United States Department of Labor which prescribe an inspection prior to making repairs involving riveting, welding, burning or like fire producing operations. Those regulations provide, under the conditions stated therein, for inspection by a Marine Chemist certificated by the National Fire Protection Association or alternatively, inspection by certain other persons. Nothing in this standard shall be construed as superseding existing requirements of any governmental or local authority. For particulars, those regulations should be consulted.

104. Standard Definitions. For the purpose of this standard the following definitions are to be recognized:

1041. Marine Chemist: The holder of a valid certificate issued by the National Fire Protection Association in accordance with its "Rules for Certification of Marine Chemists" establishing him as a person qualified to determine whether construction, alteration, repair or shipbreaking to vessels which may involve gas hazards can be undertaken with safety.

1042. Marine Chemist's Certificate: A written statement issued by a Marine Chemist in form and manner prescribed by the National Fire Protection Association. (See 306–22.)

1043. Flammable and Combustible Liquids:

a. FLAMMABLE LIQUID:[1] For the purpose of these requirements, a flammable liquid is any liquid which gives off flammable vapors (as determined by flash point from open cup tester, as used for test of burning oils) at or below a temperature of 80° F.

b. COMBUSTIBLE LIQUID: For the purpose of these requirements, a combustible liquid is any liquid having a flash point above 80° F. (as determined by means of open cup tester, as used for test of burning oils).

c. EQUIVALENT FLASH POINTS:

Open Cup Tester °F.	"Tag" Closed Cup Tester (ASTM) °F.	Pensky-Martens Closed Tester °F.
80	75	—
150	-	140

1044. Flammable Compressed Gas: For the purpose of these requirements, flammable compressed gas is defined as any flammable gas which has been compressed and/or liquefied for the purpose of transportation and has a Reid vapor pressure exceeding 40 psia.

1045. Chemical: For the purpose of these requirements, a chemical is any compound, mixture or solution in the form of a solid, liquid or gas, which may be hazardous by virtue of its properties other than, or in addition to flammability, or by virtue of the properties of compounds which might be evolved from hot work or cold work.

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[1] "Flammable" and "Inflammable" have the same meaning.

1046. Repair Classifications:

a. HOT WORK: Any construction, alteration, repair or shipbreaking involving riveting, welding, burning or similar fire producing operations. Grinding, drilling, sand or shot blasting, or similar spark producing operations shall be considered hot work except, when in the judgment of the Marine Chemist, circumstances do not necessitate such classification.

b. COLD WORK: Any construction, alteration, repair or shipbreaking which does not involve heat, fire or spark producing operations.

1047. Hollow Structure: Hollow rudders, rudder, stocks, skegs, castings, masts and booms, rails and any other hollow attachment to a vessel.

1048. Tanker Designations:

a. TANK VESSEL: A tank vessel is any vessel especially constructed or converted to carry liquid bulk cargo in tanks.

b. TANK SHIP: A tank ship is any tank vessel propelled by power or sail.

c. TANK BARGE: A tank barge is any tank vessel not equipped with means of self-propulsion.

105. Standard Safety Designations:

The following standard safety designations shall be used where applicable in preparing Marine Chemists' certificates, cargo tank labels and other references:

1051. Safe for Men — Safe for Fire: Means that in the compartment or space so designated and in the adjacent[2] compartments or spaces:

a. The gas content of the atmosphere is within a permissible concentration[3] and that;

b. In the judgment of the Marine Chemist, the residues are not capable of producing a dangerous concentration of gases under prevailing atmospheric conditions in the presence of fire and while maintained as directed on the Marine Chemist's certificate.

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[2]Except that adjacent compartments may be inerted and, in the case of fuel tanks, may be treated as deemed necessary by the Marine Chemist.

[3]An oxygen concentration of 16.5 per cent by volume shall be considered a minimum. As a guide to permissible concentration limits, refer to the current table of "Threshold Limit Values" of the American Conference of Governmental Industrial Hygienist, 1014 Broadway, Cincinnati, Ohio 44304. 25c per copy.

c. If in the judgment of the Marine Chemist a test for oxygen content is necessary and made, the oxygen content of the atmosphere is at least 16.5 per cent by volume.

1052. Safe for Men — Not Safe for Fire: Means that in the compartment or space so designated:

a. The gas content of the atmosphere is within a permissible concentration, and that;

b. In the judgment of the Marine Chemist, the residues are not capable of producing dangerous gases under existing atmospheric conditions in the absence of fire and while maintained as directed on the Marine Chemist's certificate.

c. If in the judgment of the Marine Chemist a test for oxygen content is necessary and made, the oxygen content of the atmosphere is at least 16.5 per cent by volume.

1053. Not Safe for Men — Not Safe for Fire: Means that in the compartment or space so designated:

a. The gas or oxygen content of the atmosphere is not within a permissible concentration,[3] or that;

b. Dangerous gases are present or, in the judgment of the Marine Chemist, the residues are capable of producing dangerous gases under prevailing atmospheric conditions, or that;

c. The compartment was not tested because it contained ballast, slops, bunkers, etc. In such cases this safety designation shall be followed by a statement of the condition of the compartment which prevented it from being tested.

1054. Not Safe for Men — Safe for Fire: Means that in the judgment of the Marine Chemist, the residues in the compartment or space so designated are not combustible or flammable, but are considered hazardous to personnel. In such cases this designation shall be followed by a statement explaining the condition of this space.

1055. Safe for Shipbreaking: Means that in the compartment or space so designated and in the adjacent[2] compartments or spaces:

a. The gas content of the atmosphere is within a permissible concentration[3] and that;

b. In the judgment of the Marine Chemist, the residues are not capable of producing dangerous gases under existing conditions

[2] See footnote on page 306–6
[3] See footnote on page 306–6.

while maintained as directed on the Marine Chemist's certificate, and that;

c. If in the judgment of the Marine Chemist a test for oxygen content is necessary and made, the oxygen content of the atmosphere is at least 16.5 per cent by volume, and that;

d. Residual combustible materials within the designated compartment are not capable of producing fires beyond the extinguishing capabilities of the equipment on hand.

1056. Inerted: Means that in the compartment or space so designated, either:

a. Carbon dioxide* or other nonflammable gas acceptable to the Marine Chemist has been introduced into the space in sufficient volume to maintain the oxygen content of the atmosphere of the space at or below 10 per cent or below 50 per cent of the LEL, whichever is the least, during the whole of the inerting period, and to insure that the volume of the inerting gas shall never be less than 50 per cent of that of the void space, or that;

b. The space has been filled to the top with water.

c. Flooding with water may be used as a method of inerting provided that any hot work is performed at least three (3) feet below the water level and further provided that the gas content of the atmosphere above the water does not exceed 10 per cent of the lower explosive limit (LEL) and when such procedure is approved by a Marine Chemist.

d. The kind of gas and the safe disposal or securing of gas inerting media shall be noted on the Marine Chemist's certificate by the Marine Chemist upon the completion of repairs. Closing and securing of hatches and other openings, except vents, may be considered as "safe disposal" by the Marine Chemist.

1057. Inerted for Flammable Compressed Gas: Means that individual pressure tanks with a working pressure of 50 pounds per square inch or over may be considered inerted when a positive pressure is maintained on the tanks by the flammable vapors remaining after the cargo has been discharged.

*The improper introduction of an inerting gas can generate sufficient static electricity for ignition.

PART II. MINIMUM REQUIREMENTS

200. MINIMUM REQUIREMENTS PRECEDENT TO THE ISSUANCE OF A MARINE CHEMIST'S CERTIFICATE — APPLICABLE IN ALL CASES.

201. The Marine Chemist Shall Personally Determine Condition. Before a Marine Chemist shall issue a certificate setting forth in writing that the prescribed work to a vessel can, in his judgment, be undertaken with safety, he shall personally determine that the applicable minimum requirements have been complied with to his satisfaction.

202. Preparation of Certificate. When the Marine Chemist has satisfied himself that the minimum requirements and any other requirements, deemed by him to be necessary in order that the prescribed work can be undertaken with safety, have been carried out, a Marine Chemist's certificate shall be issued by him setting forth in writing those facts. Such certificate shall be prepared in form and manner prescribed by the National Fire Protection Association. (See page 306–22.)

203. Certificate Shall State Qualifications. The Marine Chemist's certificate shall be qualified as may be necessary and shall include such qualifications and requirements as he deems necessary to maintain, insofar as can reasonably be done, safe conditions in the spaces certified.

2031. It shall include the frequency and type of such additional tests, inspections and other instructions as he considers required.

2032. It shall state conditions under which he should be consulted or recalled.

2033. Such qualifications and requirements shall include precautions including protective equipment and devices necessary to eliminate or minimize hazards that may be present from protective coatings or residues from cargoes.

204. Certificate Issued at Work Site. Inspection by the Marine Chemist shall be completed and the certificate issued at the same location or yard where the prescribed work is to be accomplished, unless approval for locally shifting the vessel is noted on the certificate.

2041. Except for shipbreaking operations, and unless otherwise determined by the Marine Chemist and so noted on his certificate, all certificates shall be issued within 24 hours prior to the time the prescribed work is commenced.

205. Responsibility for Obtaining Certificate. It shall be the responsibility of the vessel repairer or shipbreaker to retain the services of the Marine Chemist, to secure copies of his inspection certificate and to provide the Master of the vessel and the representatives of the vessel owner with copies of such certificate.

2051. Throughout the course of repairs or alterations, safe conditions shall be maintained on the vessel by full observance of all qualifications and requirements listed by the Marine Chemist.

PART III. SHIPBUILDING AND REPAIRING

300. MINIMUM REQUIREMENTS FOR VESSELS ENTERING A SHIPYARD.

301. Tank Vessels Entering a Repair Yard.

3011. Tank vessels may enter a repair yard when cleaned or cleaned and inerted in accordance with the provisions in Sections 321 or 322 respectively. Repairs or alterations shall not be undertaken until a Marine Chemist's certificate is obtained.

3012. Tank vessels may enter the repair yard for examination, afloat or in dry dock, provided that all bulk cargo compartments and cofferdams are kept closed.

3013. Tank vessels may enter the repair yard for scraping, washing down and painting, afloat or in dry dock, provided that all bulk cargo compartments and cofferdams are kept closed.

3014. Tank vessels may enter the repair yard for work (hot or cold) to be performed outside of the vessel, afloat or in dry dock, on the propeller, tailshaft or rudder (except hollow structures in which case a Marine Chemist's certificate shall be required) or for work to be performed off the vessel such as on the anchors or chains, provided that all bulk cargo compartments and cofferdams are kept closed.

3015. Tank vessels may enter the repair yard for work, afloat or in dry dock, within boiler and machinery spaces, and at other locations remote from the cargo compartments but not less than twenty-five (25) feet from the nearest cargo compartment which has not been cleaned or inerted to meet the appropriate designation requirements of Section 105; provided, that where hot work is to be undertaken a Marine Chemist's certificate shall be required and this certificate shall set forth each specific location for which such work is approved, and further provided, that all bulk cargo compartments and cofferdams are kept closed.

3016. Tank vessels which proceed to a dry dock or special berth selected with due regard to the hazards of the location and to hazards to adjacent property may undergo specific limited repairs of a local nature when the compartments or spaces involved and the adjacent compartments or spaces are prepared in accordance with the provisions of Section 323 and 324.

302. Requirements for Use of a Special Berthing Area for Cleaning, Gas Freeing or Inerting.

3021. Where such facilities are available, vessels which have not been cleaned, gas freed or inerted shall proceed to a special berth to be selected and set apart in the repair yard with due regard to the hazards of the location and to hazards to adjacent property.

3022. The degassing, cleaning or inerting of vessels at such special berths shall be carried out in accordance with the requirements of Sections 321 or 322 before they are shifted to other berths. No repairs involving hot work, other than in boiler or machinery spaces when specifically certified by a Marine Chemist, shall be undertaken on any vessel in such special berth until it has been degassed and cleaned or inerted in accordance with the requirements of Sections 321 or 322 nor shall such repairs be then undertaken if another vessel, which has not complied with these requirements, is in the special berth at the same time.

303. Vessels Carrying Flammable Compressed Gas. On any vessels which have carried flammable compressed gas in bulk, no repairs or alterations involving hot work shall be made unless the provisions of paragraph 3011 have been complied with; provided, however, individual pressure tanks, inerted in accordance with paragraph 1057, are considered in a safe condition for such work not directly involving these tanks or their pipelines or enclosed spaces in which the tanks are located.

304. Vessels Other Than Tank Vessels. On any vessels which have carried flammable or combustible liquid in bulk as fuel or cargo, no repairs involving hot work shall be made in and on the external boundaries (shell, tanktop or deck) of cargo tanks, fuel tanks, oil pipelines and heating coils or hollow structures, unless such compartments and pipelines, deemed necessary by the Marine Chemist, have been cleaned or inerted to meet the appropriate designation requirements of Section 105, except that the application of 1056(c) may be used only in the case of repairs not involving the tanktop or decks of tank boundaries. Repairs or alterations shall not be undertaken until a Marine Chemist's certificate is obtained.

305. Electric Welding Operations. For all electrical welding operations, ground cables shall be connected to the ship's structure as close as possible to the point of welding with a safe current carrying capacity equal to or exceeding the specified maximum output capacity of the unit which it services.

310. Minimum Requirements for Vessels Outside a Shipyard.

311. Tank Vessels Not Entering a Shipyard. Repairs or alterations shall not be made, unless the compartments or spaces involved and the adjacent compartments or spaces have been cleaned, in accordance with the provisions in Section 323 or unless the compartment or spaces involved have been cleaned and the adjacent compartments or spaces have been inerted in accordance with Section 324 and so certified by a Marine Chemist. Repairs or alterations shall not be undertaken until a Marine Chemist's certificate is obtained.

312. Vessels Carrying Flammable Compressed Gas Shall Comply with Section 303.

313. Vessels Other Than Tank Vessels Shall Comply with Section 304.

320. Minimum Requirements for Issuance of a Marine Chemist's Certificate.

321. Where a Safe Condition Is To Be Obtained Entirely by Cleaning.

3211. All cargo heater coils shall have been steamed and blown.[5] All cargo pumps, cargo lines, piped cargo fire extinguishing systems and vent lines shall have been flushed with water or blown with steam or air.

3212. Compartments shall be so cleaned that the gas content by volume of the atmosphere in all cargo compartments and other spaces subject to gas accumulation (with the exception of bunker tanks containing fuel oil[4]) shall be within a permissible concentration.[3]

3213. The residues in all cargo compartments and other spaces (with the exception of bunker tanks containing fuel oil[4]) shall not be capable, in the opinion of the Marine Chemist, of releasing gas which will raise the concentration in any such space above a permissible concentration.[3]

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[3] See footnote on page 306–6.

[4] If, however, the work involved is within or on the cargo compartment adjacent to fuel oil bunker boundaries, then the bunker tanks should be treated as deemed necessary by the Marine Chemist.

[5] Coils in cargo tanks that have been used for chemicals which may react with water or steam, shall be cleaned in accordance with the requirements of paragraph 4051.

3214. Satisfactory compliance with all the foregoing requirements shall be noted on the Marine Chemist's certificate.

322. Where a Safe Condition Is To Be Obtained by Both Cleaning and Inerting or Entirely by Inerting.

3221. A Marine Chemist shall approve the use of the inerting procedure. Except where water is the inerting medium, he shall supervise the control of the inerting medium and the hazards from the time the inerting medium is first taken aboard until the repairs and the safe disposal or securing of the inerting medium are complete. (Where gas inerting is being performed, a substitute for the Marine Chemist shall not be permitted as provided under other conditions in U.S. Coast Guard regulations.)

3222. Only authorized persons and those actually necessary in connection with the repairs should be permitted on board the vessel from the time the inerting gas is taken aboard until the repairs and the safe disposal or securing of the inerting gas are completed.

3223. All cargo heater coils, except those in the inerted spaces, shall have been steamed and blown. All piped cargo fire extinguishing systems and vent lines, except those in the inerted spaces, shall have been flushed with water, or blown with steam or air, or inerted. All valves to the inerted spaces shall have been closed and secured. All cargo pumps and cargo lines shall have been flushed with water, or blown with steam or air, or inerted.[5]

3224. All spaces to be inerted shall be sufficiently intact to retain the inerting medium. All valves, hatches and other openings to the inerted spaces, except those controlling the inerting medium, are to be closed and secured.

3225. Compartments or spaces in which internal repairs or alterations are to be undertaken shall be cleaned to comply with the requirements of Section 321 and all other spaces (with the exception of bunker tanks containing fuel oil[4]) shall be inerted in accordance with the requirements of paragraph 1056.

3226. Compartments or spaces on which external repairs or alterations are to be undertaken on the external boundaries (deck or shell) may be inerted by gas instead of being cleaned as described in paragraph 3225 and all other spaces (with the exception of bunker tanks containing fuel oil[4]) shall be inerted, such inerting to be in accordance with the requirements of paragraph 1056.

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[4] See footnote on page 306–13.

[5] See footnote on page 306–13.

3227. Satisfactory compliance with all the foregoing requirements shall be noted on the Marine Chemist's certificate.

323. Where a Safe Condition Is To Be Obtained Entirely by Cleaning Certain Compartments and by Securing the Other Compartments.

3231. All cargo heater coils to the spaces involved shall have been steamed and blown; all piped cargo fire extinguishing systems and vent lines to the spaces involved shall have been flushed with water or blown with steam or air; and the valves to all other compartments closed and secured. All cargo pumps and cargo lines shall have been flushed with water or blown with steam or air and the valves closed and secured.[5]

3232. Compartments or spaces in which internal repairs or alterations are to be undertaken and all adjacent compartments, including those diagonally adjacent thereto, shall be cleaned to comply with the applicable requirements of Section 321 and all other compartments shall be closed and secured.

3233. Satisfactory compliance with all the foregoing requirements shall be noted on the Marine Chemist's certificate.

324. Where a Safe Condition Is To Be Obtained by Both Cleaning and Inerting or Entirely by Inerting Certain Compartments and by Securing the Other Compartments.

3241. All cargo heater coils to the spaces involved, except those to the inerted spaces, shall have been steamed and blown; all piped cargo fire extinguishing systems and vent lines to the spaces involved, except those to the inerted spaces, shall have been flushed with water or blown with steam or air or inerted; and the valves to all other compartments closed and secured. All cargo pumps and cargo lines shall have been flushed with water, or blown with steam or air or inerted and the valves closed and secured.[5]

3242. Compartments or spaces in which internal repairs or alterations are to be undertaken shall be cleaned to comply with the requirements of Section 321 and all adjacent compartments, including those diagonally adjacent thereto, shall be inerted to comply with the applicable requirements of Section 322 and all other compartments shall be closed and secured.

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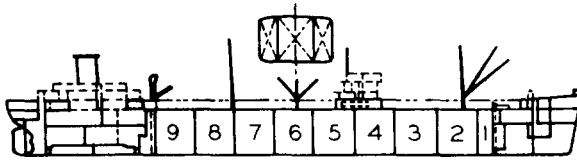
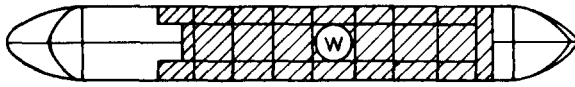
[5] See footnote on page 306–13.





PARAGRAPH 321--SAFE CONDITION OBTAINED ENTIRELY BY CLEANING.

PARAGRAPH 322--SAFE CONDITIONS OBTAINED BY CLEANING AND INERTING.

PARAGRAPH 323--SAFE CONDITION OBTAINED ENTIRELY BY CLEANING AND SECURING.

PARAGRAPH 324--SAFE CONDITIONS OBTAINED BY CLEANING, INERTING AND SECURING.

KEY: ////-CLEAN; XXXX-INERT; □-SECURED

Ⓦ-WORK

3243. Compartments or spaces on which external repairs or alterations are to be undertaken on the external boundaries (deck or shell) may be inerted by gas instead of being cleaned as described in paragraph 3242 and all adjacent compartments, including those diagonally adjacent thereto, shall be inerted to comply with the applicable requirements of Section 322 and all other spaces shall be closed and secured.

3244. Satisfactory compliance with all the foregoing requirements shall be noted on the Marine Chemist's certificate.

PART IV. CHEMICAL CARGOES

400. Standard for Certifying Cargo Tanks Which Have Been Used for Carrying Chemicals in Bulk.

401. Scope. The standard set forth in this Section describes the conditions required before making repairs in spaces that have carried or have been exposed to chemicals in bulk. The remaining spaces in the vessel shall comply with the applicable provisions in Sections 301 and 310.

402. Standard Definitions — Chemical: For the purpose of these requirements a chemical is any compound, mixture or solution in the form of a solid, liquid or gas which may be hazardous by virtue of properties other than, or in addition to flammability, or by virtue of the properties of compounds which might be evolved from hot work or cold work.

403. Standard Safety Designations:

4031. The standard safety designations set forth in paragraphs 1051 and 1052 may be used, provided that in the judgment of the Marine Chemist, the gas or vapor content in the compartments or spaces is within a permissible concentration for exposures not exceeding a total of 8 hours per day.[3]

4032. Where applicable, standard safety designations of paragraph 1053 may be used.

4033. In addition, for spaces that have contained noncombustible or nonflammable chemicals, the following safety designation shall be used where applicable in preparing the Marine Chemist's certificate:

NOT SAFE FOR MEN — SAFE FOR FIRE: Means that in the judgment of the Marine Chemist, the residues in the compartment or spaces so designated are not combustible or flammable, but are considered hazardous to personnel. In such cases this designation shall be followed by a statement explaining the condition of this space.

404. Minimum Requirements. Minimum requirements for a Marine Chemist's certificate for spaces that have carried or have been exposed to chemicals in bulk in all cases shall be as set forth in Part II of this standard.

[3] See footnote on page 306–6.

405. Minimum Conditions. Minimum conditions which shall prevail prior to the issuance of a Marine Chemist's certificate for spaces that have contained chemicals in bulk shall be as set forth in Sections 321, 322, 323 and 324 insofar as they are applicable, with the following additions:

4051. All pipelines including heating coils, fire extinguishing systems and vents, together with the cargo pumps and cargo lines serving the chemical-carrying spaces, shall be initially dealt with to the satisfaction of the Marine Chemist. Care should be exercised in the selection of methods and materials used for cleaning or inerting to avoid noncompatability with previous cargoes.

4052. Compartments having carried chemicals in bulk and which are to be cleaned shall be so cleaned that the gas content by volume of the atmosphere in those compartments shall be within the permissible limits set forth in paragraph 4031.

4053. The residues in the compartments shall not be capable, in the judgment of the Marine Chemist, of releasing vapors or gases which would raise the concentration above the limits set forth in paragraph 4031.

4054. The residues in compartments shall not be of sufficient concentration, in the judgment of the Marine Chemist, to endanger the life or health of personnel.

4055. The residues in compartments shall not be capable, in the judgment of the Marine Chemist, of releasing vapors, gases or decomposition products which would create hazards as set forth in paragraphs 4053 and 4054.