

# NFPA HISTORICAL

Regulations Governing the Control of  
**GAS HAZARDS ON VESSELS**  
to Be Repaired

Adopted by  
American Bureau of Shipping  
National Fire Protection Association

**1949**

*Price: Fifteen Cents*

NATIONAL FIRE PROTECTION ASSOCIATION  
International

60 Batterymarch St., Boston 10, Mass., U.S.A.

# National Fire Protection Association

## INTERNATIONAL

*The National Fire Protection Association was organized in 1896 to promote the science and improve the methods of fire protection and prevention, to obtain and circulate information on these subjects and to secure the cooperation of the public in establishing proper safeguards against loss of life and property by fire.*

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<sup>1</sup> Serving in a personal capacity in accordance with Par. 11-b-2 of the Regulations on Technical Committee Procedure.

<sup>2</sup> Committee personnel is shown as of Jan. 1, 1950. Since completion of technical committee work on this edition of the *Regulations*, Mr. L. C. Host has succeeded Mr. J. L. Wilson as Chairman and representative of the American Bureau of Shipping, and Mr. H. J. Wilson has replaced Mr. Moritz Jaehne as representative of The Pacific American Tankship Association.

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# Control of Gas Hazards on Vessels.

The original standards on this subject were developed by the NFPA Committee on Marine Fire Hazards in 1922 in cooperation with the NFPA Committee on Flammable Liquids. They were 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 then Marine Section of NFPA. The revised standard was adopted by the American Bureau of Shipping and in 1948 by the National Fire Protection Association and published as "Regulations Governing the Control of Gas Hazards on Vessels to Be Repaired." The present text which supersedes the 1948 edition was also prepared by the joint committee mentioned above. It has been adopted by the American Bureau of Shipping and following approval by the Executive Division of the NFPA Committee on Marine Fire Protection was adopted also by the NFPA Board of Directors in December, 1949.

## Regulations for Certifying Cargo Tanks, Fuel Tanks, and Other Compartments Before Making Repairs on Vessels Carrying or Burning Combustible or Flammable Liquids.

### SECTION 1.

**110. - General.** The following conditions are required before making repairs on any vessel carrying or burning combustible or flammable liquids :

**111. Tank Vessels Entering a Repair Yard.** Tank vessels shall not be allowed to enter a repair yard, except as provided in Section 4 of these regulations, unless cleaned or cleaned and inerted in accordance with the provisions in Section 3, paragraphs 320- or 330- respectively, and so certified by a Certificated Gas Chemist. Repairs or alterations shall not be undertaken until a Gas Chemist's Certificate is obtained.

**112. Tank Vessels Not Entering a Repair Yard.** 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 3, paragraphs 340- or unless the compartment or spaces involved have been cleaned and the adjacent compartments or spaces have been inerted in accordance with paragraphs 350- and so certified by a Certificated Gas Chemist. Repairs or alterations shall not be undertaken until a Gas Chemist's Certificate is obtained.

**113. Vessels Other Than Tank Vessels Anywhere.** On any vessels which have carried flammable or combustible liquid in bulk as fuel or cargo, whether in a repair yard or elsewhere, no repairs involving hot work shall be made in and on the external boundaries (shell, tank top or deck) of cargo tanks, fuel tanks, oil pipe lines and heating coils, unless such compartments and pipe lines, deemed necessary by the Certificated Gas Chemist, have been cleaned or inerted to meet the appropriate designation requirements of Section 2, paragraphs 220-. In no case shall internal hot work be permitted within any compartment or space unless the compartment in which the work

is to be performed is in such a condition as will meet the requirements of Section 2, paragraph 221. Repairs or alterations shall not be undertaken until a Gas Chemist's Certificate is obtained.

### 120. Emergency Exception.

Nothing in these regulations shall be construed as prohibiting the immediate dry-docking of a vessel whose safety is imperilled, 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 Certificated Gas Chemist.

### 130. Governmental Regulations.

Attention of owners, repairers and chemists is directed to the general regulations of the government covering repairs to vessels. Nothing in these regulations shall be construed as superseding existing requirements of any governmental or local authority.

## SECTION 2.

### 210. Standard Definitions.

For the purpose of these regulations the following definitions are to be recognized:

211. **CERTIFICATED GAS CHEMIST:** The holder of a valid certificate issued by the American Bureau of Shipping in accordance with its "Rules for Certification of Chemists" establishing him as a person qualified to determine whether repairs and alterations to vessels, which may involve gas hazards, can be undertaken with safety.

212. **GAS CHEMIST'S CERTIFICATE:** A written statement prepared and issued by a Certificated Gas Chemist in form and manner prescribed by the American Bureau of Shipping.

### 213. FLAMMABLE AND COMBUSTIBLE LIQUIDS:

- (a) **FLAMMABLE LIQUID\***. For the purpose of these requirements, a flammable liquid is any liquid having a flash point at or below a temperature of 75° F. as determined by means of a "Tag" closed tester in accordance with the standard method specified in A.S.T.M. Designation D56-36.
- (b) **COMBUSTIBLE LIQUID:** For the purpose of these requirements, a combustible liquid is any liquid having a flash point above 75° F. as determined by means of a "Tag" closed tester in accordance with the standard method specified in A.S.T.M. Designation D56-36.
- (c) **EQUIVALENT FLASH POINTS:**

"Tag" Open Cup Tester	"Tag" Closed Cup Tester (A.S.T.M.)	Pensky-Martens Closed Tester
°F.	°F.	°F.
80	75	—
150	—	140

\*Note: "Flammable" and "Inflammable" have the same meaning.

214. 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.

215. REPAIR CLASSIFICATIONS:

- (a) HOT WORK.—Any repair or alteration involving riveting, welding, burning or similar fire and spark-producing operations.
- (b) COLD WORK.—Any repair or alteration which does not involve heat, fire and spark-producing operations.

220. Standard Safety Designations:

The following standard safety designations shall be used in preparing Gas Chemists' Certificates, cargo tank labels and other references:

221. SAFE FOR MEN—SAFE FOR FIRE: Means that, in the compartment or space so designated and in the adjacent\* compartments or spaces:

- (a) The gas content of the atmosphere by volume is within the permissible limits given in Table I, and that;
- (b) In the judgment of the Certificated Gas Chemist, the residues are not capable of producing dangerous gases under atmospheric conditions and in the presence of fire.

**TABLE I.**  
**Permissible Concentrations for Exposure Not Exceeding a Total of 8 Hours Per Day.**

Item	†Number of Parts per 1,000,000 Parts of Air	Corresponding Percent. by Volume in Air
<b>Aromatic Hydrocarbons:</b>		
Benzene (Benzol) .....	100 (a)	.01
Toluene (Toluol) .....	200 (a)	.02
Xylene (Xylol) .....	200 (a)	.02
<b>Paraffinic Hydrocarbons:</b>		
Normal Petroleum Gases .....	1000 (b)	.10

\*Note: Except that adjacent compartments may be inerted and, in the case of fuel tanks, may be treated as deemed necessary by the Certificated Gas Chemist.

†Notes: The values indicated as (a) are standard toxicity limits of the American Standards Association. The values indicated as (b), half the usually accepted limit, is that adopted by the Marine Gas Chemists' Association.

222. **SAFE FOR MEN—NOT SAFE FOR FIRE:** Means that in the compartment or space so designated:

- (a) The gas content of the atmosphere by volume is within the permissible limits given in Table I, and that;
- (b) In the judgment of the Certificated Gas Chemist, the residues are not capable of producing dangerous gases under atmospheric conditions and in the absence of fire.

223. **NOT SAFE FOR MEN—NOT SAFE FOR FIRE:** Means that in the compartment or space so designated, either:

- (a) The gas content of the atmosphere by volume is not within the permissible limits given in Table I, or that;
- (b) In the judgment of the Certificated Gas Chemist, the residues are capable of producing dangerous gases under atmospheric conditions and in the absence of fire, 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.

224. **INERTED:** Means that, in the compartment or space so designated, either:

- (a) Carbon Dioxide or other nonflammable gas, approved by the American Bureau of Shipping, has been introduced into the space in sufficient volume to maintain the oxygen content of the atmosphere of the space at or below 10 percent during the whole of the inerting period, and to insure that the volume of the inerting gas shall never be less than 50 percent of that of the void space; or that
- (b) The space has been filled to the top with water.\*
- (c) The kind of gas and the safe disposal or securing of gas inerting media shall be noted on the Gas Chemist's Certificate by the Certificated Gas Chemist upon the completion of repairs. Closing and securing of hatches and other openings, except vents, may be considered as "safe disposal" of the gas by the Certificated Gas Chemist.

### SECTION 3.

#### **310. Minimum Requirements Precedent to the Issuance of a Gas Chemist's Certificate—Applicable in All Cases.**

311. Before a Certificated Gas Chemist shall issue a certificate setting forth in writing that the contemplated repairs and alterations to a vessel can, in his judgment, be undertaken with safety he shall personally determine that the minimum requirements of paragraphs 320-, 330-, 340- or 350- have been complied with to his satisfaction.

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\*Note: The vessel's cargo system may be used to fill the space but such use shall be discontinued when the liquid level reaches 12 inches below the deck and additional water shall be added slowly under a close supervision until the space is full to prevent gases or oil on the surface of the water being displaced into spaces in which the repair work is to be undertaken.

312. When the Certificated Gas Chemist has satisfied himself that these minimum requirements and any other requirements, deemed by him to be necessary in order that the repairs and alterations can be undertaken with safety, have been carried out, a Gas Chemist's Certificate shall be issued by him setting forth in writing those facts, qualified as may be necessary and prepared in form and manner prescribed by the American Bureau of Shipping.

313. It shall be the responsibility of the vessel repairer to retain the services of the Certificated Gas Chemist and to secure copies of his inspection certificate and provide the master of the vessel and the representatives of the vessel owner with copies for their information.

**320. Minimum Requirements Which Shall Prevail Prior to the Issuance of a Gas Chemist's Certificate, Where a Safe Condition Is to Be Obtained Entirely by Cleaning.**

321. All cargo heater coils and cargo smothering and vent lines shall have been steamed and blown. All cargo pumps and cargo lines shall have been flushed with hot water or blown with steam.

322. 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\*) shall be within the permissible limits of Table I.

323. The residues in all cargo compartments and other spaces (with the exception of bunker tanks containing fuel oil\*) shall not be capable, in the opinion of the Certificated Gas Chemist of releasing gas which will raise the concentration in any such space above the limits of Table I.

324. Satisfactory compliance with all the foregoing requirements shall be noted on the Gas Chemist's Certificate.

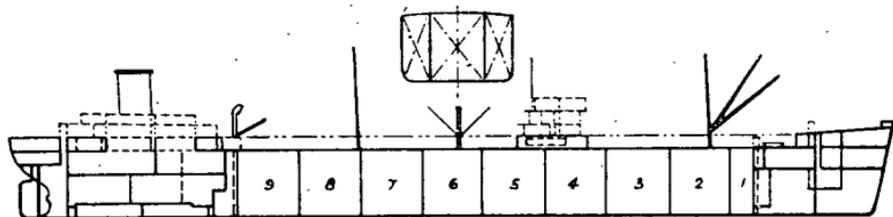
**330. Minimum Requirements Which Shall Prevail Prior to the Issuance of a Gas Chemist's Certificate Where a Safe Condition Is to Be Obtained by Both Cleaning and Inerting or Entirely by Inerting.**

331. A Certificated Gas Chemist shall approve the use of the inerting procedure. Except where water is the inerting medium he shall be present continuously and actually 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. (A substitute for the Certificated Gas Chemist shall not be permitted as provided under other conditions in U. S. Coast Guard regulations.)

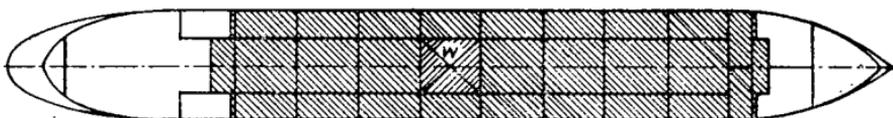
332. Only authorized persons and those actually necessary in connection with the repairs should be permitted on board the vessel from the time the inerting gas is taken aboard until the repairs and the safe disposal or securing of the inerting gas are completed.

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\*Note: If, however, the work involved is within the cargo compartment adjacent to fuel oil bunker boundaries, then the bunker tanks should be treated as deemed necessary by the Certificated Gas Chemist.



Paragraphs 320—Safe Condition Obtained Entirely by Cleaning in a Repair Yard.



Paragraphs 330—Safe Condition Obtained by Cleaning and Inerting in a Repair Yard.



Paragraphs 340—Safe Condition Obtained by Cleaning and Securing Not in a Repair Yard.



Paragraphs 350—Safe Condition Obtained by Cleaning, Inerting and Securing Not in a Repair Yard.

Key: ///-Clean; \\\-Inert; W-Work.

333. All cargo heater coils and cargo smothering and vent lines, except those in the inerted spaces, shall have been steamed and blown and the valves to the inerted spaces closed and secured. All cargo pumps and cargo lines shall have been flushed with hot water, blown with steam, or inerted.

334. 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.

335. Compartments or spaces in which internal repairs or alterations are to be undertaken shall be cleaned to comply with the requirements of paragraphs 320- and all other spaces (with the exception of bunker tanks containing fuel oil\*) shall be inerted in accordance with the requirements of Section 2, paragraph 224.

336. 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 335, and all other spaces (with the exception of bunker tanks containing fuel oil\*) shall be inerted, such inerting to be in accordance with the requirements of Section 2, paragraph 224.

337. Satisfactory compliance with all the foregoing requirements shall be noted on the Gas Chemist's Certificate.

**340. Minimum Requirements Which Shall Prevail Prior to the Issuance of a Gas Chemist's Certificate Where a Safe Condition Is to Be Obtained Entirely by Cleaning Certain Compartments and by Securing the Other Compartments.**

341. All cargo heater coils and cargo smothering and vent lines to the spaces involved shall have been steamed and blown and the valves to all other compartments closed and secured. All cargo pumps and cargo lines shall have been flushed with hot water or blown with steam and the valves closed and secured.

342. 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 paragraphs 320- and all other compartments shall be closed and secured.

343. Satisfactory compliance with all the foregoing requirements shall be noted on the Gas Chemist's Certificate.

**350. Minimum Requirements Which Shall Prevail Prior to the Issuance of a Gas Chemist's Certificate 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.**

351. All cargo heater coils and cargo smothering and vent lines to the spaces involved, except those in the inerted spaces, shall have been steamed and blown and the valves to all other compartments closed and secured. All cargo pumps and cargo lines shall have been flushed with hot water, blown with steam or inerted and the valves closed and secured.

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\*Note: 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 Certificated Gas Chemist.