NFPA No.

306

CONTROL OF GAS HAZARDS ON VESSELS TO BE REPAIRED 1975

NATIONAL FIRE PROTECTION ASSOCIATION
470 Atlantic Avenue, Boston, MA 02210

4M-12-75-FP
Printed in U.S.A.

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See Inside Back Cover for Official NFPA Definitions

Standard for the

Control of Gas Hazards on Vessels to Be Repaired

NFPA No. 306 — 1975

1975 Edition of No. 306

The 1975 edition of this standard includes substantial changes and a major reorganization of materials recommended by the Sectional Committee on Gas Hazards and the Committee on Marine Fire Protection. It was adopted by the Association at its 1975 Fall Conference, November 17–20, 1975, 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. A revised edition was developed by the NFPA Sectional Committee on Gas Hazards, approved by the Committee on Marine Fire Protection, and adopted in 1962, amended in 1963, 1969, 1971 and 1972. The 1975 revision includes extensive changes in material reorganization.

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Interpretation Procedure of the Sectional Committee on Gas Hazards

Those desiring an interpretation shall supply the Chairman with five identical copies of a statement in which shall appear specific reference to a single problem, paragraph, or section. Such a statement shall be on the business stationery of the inquirer and shall be duly signed.

When applications involve actual field situations they shall so state and all parties involved shall be named.

The Interpretations Committee will reserve the prerogative to refuse consideration of any application that refers specifically to proprietary items of equipment or devices. Generally inquiries should be confined to interpretation of the literal text or the intent thereof.

Requests for interpretations should be addressed to the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

Contents

Standard for the

Control of Gas Hazards on Vessels

NFPA 306 — 1975

Chapter 1 General

1-1 Scope. This standard applies to vessels carrying or burning combustible or flammable liquids, carrying or having carried flammable compressed gases, chemicals in bulk, or other products capable of creating a hazardous condition. It describes the conditions required before a space may be entered or 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, flammable or toxic liquids, vapors, gases, and chemicals as hereinafter described or which may not contain sufficient oxygen to permit safe entry.

1-2 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 gasfree in advance.[1]

1-3 Governmental Regulations. Nothing in this standard shall be construed as superseding existing requirements of any governmental or local authority.[2] 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 "Occupational Safety and Health Standards" of the United States Department of Labor which prescribe an inspection prior to making repairs in-

[1] In such cases, however, all necessary precautionary measures should be taken as soon as practicable to provide safe conditions satisfactory to the Marine Chemist.

[2] For particulars, the applicable regulations and standards should be consulted.

volving riveting, welding, burning or like fire producing operations, and prior to entering spaces where toxic hazards or oxygen deficiency may exist. Those standards 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.

1-4 Definitions. Unless expressly stated elsewhere, the following terms shall, for the purpose of this standard, have the meanings indicated below.

1-4.1 Chemical. 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.

1-4.2 Flammable and Combustible Liquids. As related to shipboard testing, flammable and combustible liquids mean a liquid having a flash point. The flash point of a liquid means the minimum temperature at which it gives off vapor in sufficient concentration to form an ignitible mixture with air near the surface of the liquid within the vessel as specified by appropriate test procedure and apparatus.

NOTE: Standard flash point test methods D-56-70 and D-93-72 are available from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

1-4.3 Flammable Compressed Gas. Means any flammable gas which has been compressed and/or liquefied for the purpose of transportation and has a Reid vapor pressure exceeding 40 psia.

1-4.4 Hollow Structures. Means rudders, rudder stocks, skegs, castings, masts and booms, rails, and other attachment to a vessel which enclosed a void space.

1-4.5 Marine Chemist. Means 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 hazards covered by this standard, can be undertaken with safety.

1-4.6 Marine Chemist's Certificate. Means a written statement issued by a Marine Chemist in form and manner prescribed by this standard. It states the conditions which the Marine Chemist found at the time of his inspection.

1-4.7 Repair Classifications.

1-4.7.1 Hot Work. Means 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.

1-4.7.2 Cold Work. Means any construction, alteration, repair or shipbreaking which does not involve heat, fire or spark producing operations.

1-4.7.3 Work Below Deck. Means work in or on enclosed spaces surrounded by shell, bulkheads, and overheads.

1-4.7.4 Work in the Open. Means work performed from open decks or in spaces covered by Section 5-2, from which the overhead has been completely removed.

1-4.8 Shipbreaking. Means the breaking down of a vessel's structure for the purpose of scrapping the vessel including the removal of gear, equipment, or any component part of a vessel.

1-4.9 Vessels include every description of watercraft used, or capable of being used, as a means of transportation on water.

1-4.10 Tanker Designations.

1-4.10.1 Tank Vessels. Means any vessel especially constructed or converted to carry liquid bulk cargo in tanks.

1-4.10.2 Tank Ship. Means any tank vessel propelled by power or sail.

1-4.10.3 Tank Barge. Means any tank vessel not equipped with means of self-propulsion.

1-5 Standard Safety Designations. The following standard safety designations shall be used where applicable in preparing Marine Chemist's Certificates, cargo tank labels, and other references.

1-5.1 Safe for Men. Means that in the compartment or space so designated:

(a) The oxygen content of the atmosphere is at least 18.0 percent by volume; and that,

(b) Toxic materials in the atmosphere are within permissible concentrations; and that,

(c) In the judgment of the Marine Chemist, the residues are not capable of producing toxic materials under existing atmospheric conditions while maintained as directed on the Marine Chemist's Certificate.

NOTE: As a guide to permissible concentration limits, refer to the current table of "Threshold Limit Values" of the American Conference of Governmental Industrial Hygienists, 1014 Broadway, Cincinnati, OH 44304.

1-5.2 Safe for Fire. Means that in the compartment so designated:

(a) The concentration of flammable materials in the atmosphere is below 10 percent of the lower flammable limit;[1] and that,

(b) In the judgment of the Marine Chemist, the residues are not capable of producing a higher concentration than permitted by 1-5.2(a) under existing atmospheric conditions in the presence of fire and while maintained as directed on the Marine Chemist's Certificates; and further, that,

(c) All adjacent spaces have either been cleaned sufficiently to prevent the spread of fire, are satisfactorily inerted, or, in the case of fuel tanks, have been treated as deemed necessary by the Marine Chemist.

1-5.3 Safe for Shipbreaking. Means that the compartment so designated:

(a) Shall meet the requirements of 1-5.1; and,

(b) In the judgment of the Marine Chemist, the residual combustible materials designated are not capable of producing fire beyond the extinguishing capabilities of the equipment on hand; and,

(c) All adjacent compartments or spaces shall meet the requirements of 1-5.2(c).

1-5.4 Inerted. Means that the following procedure has been completed in the compartment or space so designated. Either:

(a) Carbon dioxide[2] 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 atmos-

[1] The terms "lower flammable limit" and "lower explosive limit" are used synonymously.

[2] The improper introduction of an inerting gas can generate sufficient static electricity for ignition.

phere of the space at or below 10 percent or below 50 percent of the lower flammable limit, whichever is less, 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; or that,

(c) The space has been flooded with water, provided that any hot work is performed at least three feet below the water level, and further provided that the gas content of the atmosphere above the water does not exceed 10 percent of the lower flammable limit and such procedure is approved by a Marine Chemist.

1-5.4.1 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.

1-5.5 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.

NOTE: Liquefied cargoes shall be specifically treated.

Chapter 2 Minimum Requirements Precedent to the Issuance of a Marine Chemist's Certificate — Applicable in All Cases

2-1 The Marine Chemist Shall Personally Determine Condition. Before a Marine Chemist may 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.

2-2 Preparation of Certificates. 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 prepared in form and manner prescribed by the National Fire Protection Association. (See page 306-20.)

2-3 Certificate Shall State Qualification.

2-3.1 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.

2-3.2 The Certificate shall include the frequency and type of such additional tests, inspections, and other instructions as he considers required.

2-3.3 The Certificate shall state conditions under which he should be consulted or recalled.

2-3.4 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.

2-4 Certificate Issued at Work Site.

2-4.1 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.

Exception: The prescribed work may be performed at another location when approval for locally shifting the vessel is noted on the Certificate.

2-4.2 All Certificates shall be issued within 24 hours prior to the time the prescribed work is commenced.

Exception No. 1: Certificates may be issued in excess of 24 hours prior to commencement of shipbreaking operations.
Exception No. 2: Certificates may be issued in excess of 24 hours prior to commencement of the prescribed work, other than shipbreaking operations, if so noted by the Marine Chemist on his Certificate.

2-5 Responsibility for Obtaining Certificate.

2-5.1 It shall be the responsibility of the vessel repairer or shipbreaker to retain the services of the Marine Chemist, to secure copies of his Certificate, and to provide the Master of the vessel and the representatives of the vessel owner with copies of such Certificate.

2-5.2 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.

Chapter 3 Minimum Requirements for Vessels

3-1 Vessels Entering a Shipyard.

3-1.1 Tank Vessels.

3-1.1.1 Tank vessels may enter a repair yard when cleaned or cleaned and inerted in accordance with the provisions in 3-4.1 or 3-4.2 respectively. Repairs or alterations shall not be undertaken until a Marine Chemist's Certificate is obtained.

3-1.1.2 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.

3-1.1.3 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.

3-1.1.4 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, 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.

Exception: A Marine Chemist's Certificate shall be required before work is performed on hollow structures.

3-1.1.5 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 25 feet from the nearest cargo compartment which has not been cleaned or inerted to meet the appropriate designation requirements of Section 1-5; 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.

3-1.1.6 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 preparaed in accordance with the provisions of 3-4.3 and 3-4.4.

3-1.2 Requirements for Use of a Special Berthing Area for Cleaning, Gas Freeing or Inerting.

3-1.2.1 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.

3-1.2.2 The degassing, cleaning or inerting of vessels at such special berths shall be carried out in accordance with the requirements of 3-4.1 or 3-4.2 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 3-4.1 or 3-4.2 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.

3-1.3 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 3-1.1.1 have been complied with; provided, however, individual pressure tanks, inerted in accordance with 1-5.5 are considered in a safe condition for such work not directly involving these tanks or their pipelines.

3-1.4 Vessels Other Than Tank Vessels.

3-1.4.1 On any vessels which have carried flammable or combustible liquid in bulk as fuel or cargo, or cargoes which may produce hazardous atmospheres (including, but not limited to, those of decomposition or reaction with oxygen from the atmosphere), 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 compartment and pipelines, deemed necessary by the Marine Chemist, have been cleaned or inerted to meet the appropriate designation requirements of Section 1-5, except that the application of 1-5.4(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.

3-2 Vessels Outside a Shipyard.

3-2.1 Tank Vessels.

3-2.1.1 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 3-4.3 or unless the compartment or spaces involved have been cleaned and the adjacent compartments or spaces have been inerted in accordance with 3-4.4 and so certified by a Marine Chemist. Repairs or alterations shall not be undertaken until a Marine Chemist's Certificate is obtained.

3-2.2 Vessels carrying flammable compressed gas shall comply with 3-1.3.

3-2.3 Vessels other than tank vessels shall comply with 3-1.4.

3-3 Electric Welding Operations. For all electrical welding operations, grounded 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.

3-4 Minimum Requirements for Issuance of a Marine Chemist's Certificate.

3-4.1 Where a Safe Condition Is to Be Obtained Entirely by Cleaning.

3-4.1.1 All cargo heater coils shall have been steamed and blown. 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.

NOTE: 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 4-5.2.

3-4.1.2 Compartments concerned shall be so cleaned that the atmosphere in all cargo compartments and other spaces subject to gas accumulation (with the exception of bunker tanks containing fuel oil) is in accordance with 1-5.1 and/or 1-5.2 as applicable.

Exception: If the work involved is within or on the cargo compartment adjacent to fuel oil bunker boundaries, then the bunker tanks shall be treated as deemed necessary by the Marine Chemist.

3-4.1.3 The residue in all compartments concerned (with the exception of bunker tanks containing fuel oil) shall be such that, in the opinion of the Marine Chemist, the conditions of 1-5.1 and/or 1-5.2 as applicable will be met.

Exception: If the work involved is within or on the cargo compartment adjacent to fuel oil bunker boundaries, then the bunker tanks shall be treated as deemed necessary by the Marine Chemist.

3-4.1.4 Satisfactory compliance with all the foregoing requirements shall be noted on the Marine Chemist's Certificate.

3-4.2 Where a Safe Condition Is to Be Obtained by Both Cleaning and Inerting or Entirely by Inerting.

3-4.2.1 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.

NOTE: 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.

3-4.2.2 Only authorized persons and those actually necessary in connection with the repairs shall 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.

3-4.2.3 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.

Exception: 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 4-5.2.

3-4.2.4 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, shall be closed and secured.

3-4.2.5 All access openings to an inerted space shall be appropriately labeled with a warning sign "Not Safe for Men," which shall remain in place throughout the course of repairs.

3-4.2.6 Compartments or spaces in which internal repairs or alterations are to be undertaken shall be cleaned to comply with the requirements of 3-4.1 and all other spaces (with the exception of bunker tanks containing fuel oil) shall be inerted in accordance with the requirements of 1-5.4.

Exception: If the work involved is within or on the cargo compartment adjacent to fuel oil bunker boundaries, then the bunker tanks shall be treated as deemed necessary by the Marine Chemist.

3-4.2.7 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 3-4.2.6 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 1-5.4.

Exception: If the work involved is within or on the cargo compartment adjacent to fuel oil bunker boundaries, then the bunker tanks shall be treated as deemed necessary by the Marine Chemist.

3-4.2.8 Satisfactory compliance with all the foregoing requirements shall be noted on the Marine Chemist's Certificate.

3-4.3 Where a Safe Condition Is to Be Obtained Entirely by Cleaning Certain Compartments and by Securing the Other Compartments.

3-4.3.1 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.

Exception: 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 4-5.2.

3-4.3.2 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 3-3.1 and all other compartments shall be closed and secured.

3-4.3.3 Satisfactory compliance with all the foregoing requirements shall be noted on the Marine Chemist's Certificate.

3-4.4 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.

3-4.4.1 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.

Exception. 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 4-5.2.

3-4.4.2 Compartments or spaces in which internal repairs or alterations are to be undertaken shall be cleaned to comply with the requirements of 3-3.1 and all adjacent compartments, including those diagonally adjacent thereto, shall be inerted to comply with the applicable requirements of 1-5.4 and all other compartents shall be closed and secured.

3-4.4.3 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 3-4.4.2 and all adjacent compartments, including those diagonally adjacent thereto, shall be inerted to comply with the applicable requirements of 3-4.2 and all other spaces shall be closed and secured.

3-4.4.4 Satisfactory compliance with all the foregoing requirements shall be noted on the Marine Chemist's Certificate.

Chapter 4 Bulk Chemical Cargo Tanks

4-1 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 3-1 or 3-2.

4-2 Standard Definitions. The standard definitions set forth in Section 1-4 shall be used.

4-3 Standard Safety Designations. The standard safety designations set forth in Section 1-5 shall be used.

4-4 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 set forth in Chapter 2 of this standard.

4-5 Minimum Conditions.

4-5.1 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 Section 3-4 insofar as they are applicable with the addition of the requirements in this section.

4-5.2 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 shall be exercised in the selection of methods and materials used for cleaning or inerting to avoid noncompatibility with previous cargoes.

4-5.3 Compartments having carried chemicals in bulk and which are to be cleaned shall be so cleaned that the atmosphere in those compartments is in accordance with 1-5.1 and 1-5.2, as applicable.

4-5.4 The residues in the compartments concerned shall be such that, in the judgment of the Marine Chemist, the conditions of 1-5.1 and 1-5.2 as applicable will be met.