

NFPA® 306

Standard for the Control of Gas Hazards on Vessels

2014 Edition



NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
An International Codes and Standards Organization

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NFPA® 306

Standard for the Control of Gas Hazards on Vessels

2014 Edition

This edition of NFPA 306, *Standard for the Control of Gas Hazards on Vessels*, was prepared by the Technical Committee on Gas Hazards. It was issued by the Standards Council on May 28, 2013, with an effective date of June 17, 2013, and supersedes all previous editions.

This edition of NFPA 306 was approved as an American National Standard on June 17, 2013.

Origin and Development of NFPA 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, adopted in 1962, and amended in 1963, 1969, 1971, 1972, 1975, 1980, and 1984.

In 1988, a complete revision was prepared by the Committee. It added a new safety designation, a safe condition for vessels in lay-up, and a section on military unique vessels. Chapters 2, 3, and 4 were restructured to present the sequence for obtaining a Marine Chemist Certificate.

The 1993 edition contained amendments to the 1988 edition.

The 1997 edition, which marked the 75th year for these requirements, incorporated a new standard safety designation that reflected a common approach to an industry practice. That new designation was also supported by other changes to the document, including expanded inspection of vessel piping systems.

The 2001 edition incorporated a revised standard safety designation, and several changes that reflect safe, commonly used industry practices. Several new definitions were also included. For the first time in this document, the well-established relationship between the Marine Chemist and the competent person (as defined by U.S. Department of Labor, Occupational Safety and Health Administration regulations), and the frequency of retesting confined spaces, was provided.

The 2003 edition was completed on an expedited schedule to further revise requirements in the standard that must complement those shipyard safety requirements defined by OSHA. The Committee clarified the standard and the Marine Chemist role by further defining the atmospheric hazards associated with safe entry and hot work as the standard’s primary focus. The standard also clarified the intent for defining “permissible concentrations,” by stating that the most conservative value for the various exposure limits should always be used.

The 2009 edition included changes to several definitions within the standard. The term *vessel* was expanded to apply to special purpose floating structures such as offshore drilling, production, and/or storage vessels. Definitions for *contract employer*, *host employer*, and *multi-employer workplace* were added to the standard. The Committee amended the definition of *adjacent spaces* to include areas affected by hot work and also clarified requirements for testing and inspecting spaces adjacent to hot work operations. The Committee also made several revisions to the requirements for obtaining a Marine Chemist Certificate and maintaining the conditions on the Certificate.

For the 2014 edition, the Technical Committee on Gas Hazards has reorganized the requirements to reflect the actual work process that is involved when a marine vessel goes from normal operating status to the point where a Marine Chemist's Certificate is obtained and repair work can begin. Over the years, Marine Chemists have become recognized experts in fire prevention during vessel repairs, which has led to repair contractors calling upon them to provide services or consultation for areas and spaces on a vessel where the chemist is not necessarily required by either OSHA or U.S. Coast Guard regulations. Those consultations can include tests and inspections in accommodation areas, storage spaces, and auxiliary equipment rooms. New provisions have been added that address this evolution of the NFPA Certificated Marine Chemist's role in ship repair. In addition, the Technical Committee has established a maximum acceptable concentration of combustible or flammable gas of less than 10 percent of the lower explosive limit (LEL) in all spaces adjacent to hot work, and incorporated information from an OSHA compliance directive for cargo, passenger, and miscellaneous vessels explaining that a Marine Chemist's Certificate is necessary any time hot work is closer than 7.6 m (25 ft) to an adjacent tank that contains a liquid with a flashpoint at or below 65.6°C (150°F). The 2014 edition also provides new explanatory material in Annex A about how frequently a space must be checked by the shipyard's competent person after a certificate has been posted. This guidance stresses the importance of maintaining safe conditions within confined spaces and provides minimum re-inspection and testing criteria to achieve this objective.



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NOTE: Membership on a committee shall not in and of itself constitute an endorsement of the Association or any document developed by the committee on which the member serves.

Committee Scope: This Committee shall have primary responsibility for documents on the prevention of fire and explosion of flammable vapors in compartments or in spaces on board vessels and within shipyards and on the conditions that must exist in those compartments or spaces in order that workers can safely enter them and perform work.

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A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex F. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex F.

Chapter 1 Administration

1.1 Scope.

1.1.1 This standard applies to vessels that carry or burn as fuel, flammable or combustible liquids. It also applies to vessels that carry or have carried flammable compressed gases, flammable cryogenic liquids, chemicals in bulk, or other products capable of creating a hazardous condition.

1.1.2 This standard describes the conditions required before a space can be entered or work can be started, continued, or started and continued on any vessel under construction, alteration, or repair, or on any vessel awaiting shipbreaking.

1.1.3 This standard applies to cold work, application or removal of protective coatings, and work involving riveting, welding, burning, or similar fire-producing operations.

1.1.4 This standard applies to vessels while in the United States, its territories and possessions, both within and outside of yards for ship construction, ship alteration, ship repair, or shipbreaking.

1.1.5 This standard applies specifically to those spaces on vessels that are subject to concentrations of combustible, flammable, and toxic liquids, vapors, gases, and chemicals as herein described. This standard is also applicable to those

spaces on vessels that might not contain sufficient oxygen to permit safe entry.

1.1.5.1 When requested, the Marine Chemist shall apply this standard to other spaces to ensure and promote safe working conditions.

1.1.6 This standard applies to land-side confined spaces, whether stationary or mobile; underground and aboveground storage tanks; other hollow structures throughout a shipyard such as tank trucks, railroad tank cars, power plant fuel tanks, storage tanks, dip and laundry tanks, vaults, tunnels; or other spaces that could contain dangerous atmospheres located within the boundaries of a shipyard or ship repair facility.

1.1.7 This standard applies to Marine Chemists performing activities related to inspection and certification procedures described in this standard and consulting services connected therewith on board any vessel.

1.1.8* This standard does not apply to physical hazards of tanks and confined or enclosed spaces on a vessel or vessel sections, or in the shipyard. For the purposes of this standard, physical hazards do not include fire and explosion hazards.

1.2 Purpose. The purpose of this standard is to provide minimum requirements and conditions for use in determining that a space or area on a vessel, or in a shipyard or ship repair facility, is safe for entry or work.

1.3* Emergency Exception. Nothing in this standard shall be construed as prohibiting the Marine Chemist from allowing the immediate drydocking or emergency repair of a vessel whose safety is imperiled or that presents the potential of a serious release, discharge, or disbursement into the environment of combustible, flammable, or toxic liquids, vapors, gases, or solid chemicals (the vessel is sinking or is seriously damaged), making it impracticable to clean and to gas free in advance. This emergency exception shall be subject to the approval of any authority having jurisdiction.

1.4* Governmental Regulations. Attention of owners, repairers, and Marine Chemists is directed to the rules and regulations for tank vessels in 46 CFR 35, "Operations," and other rules and regulations for vessel inspection of the United States Coast Guard and the Occupational Safety and Health Administration standards (OSHA) of the United States Department of Labor, in 29 CFR 1915, which prescribe an inspection prior to making repairs involving hot work and prior to entering spaces where oxygen deficiency can exist. Those standards provide, under the conditions stated therein, for inspection by a Marine Chemist certificated by the National Fire Protection Association or, alternatively, for inspection by certain other persons.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 312, *Standard for Fire Protection of Vessels During Construction, Conversion, Repair, and Lay-Up*, 2011 edition.

"Rules for the Certification and Recertification of Marine Chemists," as amended 2013.

2.3 Other Publications.

2.3.1 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402.

Title 29, Code of Federal Regulations, Part 1915.7.

Title 29, Code of Federal Regulations, Part 1915.15.

Title 46, Code of Federal Regulations, Chapter I, Part 35, "Operations," Subpart 35.01.

2.3.2 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 55, *Compressed Gases and Cryogenic Fluids Code*, 2013 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.2 Shall. Indicates a mandatory requirement.

3.2.3 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the *Manual of Style for NFPA Technical Committee Documents*.

3.3 General Definitions.

3.3.1 Adjacent Spaces. Those spaces in all directions from subject space, including all points of contact, corners, diagonals, decks, tank tops, and bulkheads. Pipelines are not adjacent spaces and are not considered safe for hot work unless noted on the Marine Chemist's Certificate.

3.3.2 Certificate. See 3.3.14, Marine Chemist's Certificate.

3.3.3 Chemical. Any compound, mixture, or solution in the form of a solid, liquid, or gas that might be hazardous by virtue of its properties other than or in addition to flammability or by virtue of the properties of compounds that might be evolved from hot work or cold work.

3.3.4 Coiled Vessels. See 3.3.20.2.

3.3.5* Combustible Material. Material made of or surfaced with wood, compressed paper, plant fibers, plastics, liquids, or other material that will ignite and burn, whether flame-proofed or not, or whether plastered or unplastered.

3.3.6* Competent Person. A person who is designated in writing by their employer in accordance with 29 CFR 1915.7.

3.3.7 Contract Employer. An employer, such as a welder, burner, grinder, painter, or other subcontractor, who performs work under contract to the host employer or to another employer under contract to the host employer at the host employer's work site.

3.3.8 Facility. A shoreside location such as a shipyard, cleaning plant, naval base, dock, pier complex, and so forth, that is under the ownership or control of the same party and has the same continuous shoreline under their ownership or operation.

3.3.9 Flammable Compressed Gas. Any flammable gas that has been compressed, liquefied, or compressed and liquefied for the purpose of transportation and has a Reid vapor pressure exceeding 2.76×10^5 Pa (40 psia).

3.3.10 Hollow Structures. Rudders, rudder stocks, skegs, castings, masts and booms, rails, lapped plates, and other attachments to a vessel that enclose a void space.

3.3.11 Host Employer. An employer who is in charge of coordinating work or who hires other employers to perform work at a multi-employer workplace.

3.3.12 Liquids.

3.3.12.1* Combustible Liquid. Any liquid that has a closed-cup flash point at or above 37.8°C (100°F).

3.3.12.2 Cryogenic Liquid. See 3.5.3.

3.3.12.3* Flammable Liquid. A liquid that has a closed-cup flash point that is below 37.8°C (100°F) and a maximum vapor pressure of 2068 mm Hg (40 psia) at 37.8°C (100°F).

3.3.13* Marine Chemist. The holder of a valid Certificate issued by the National Fire Protection Association in accordance with the "Rules for the Certification and Recertification of Marine Chemists," establishing the person's qualifications to determine whether construction, alteration, repair, or ship-breaking of vessels can be undertaken with safety.

3.3.14 Marine Chemist's Certificate (Certificate). A document issued by a Marine Chemist, on a form authorized by the National Fire Protection Association, stating the conditions that the Marine Chemist found at the time of inspection. (See Annex C for an example.)

3.3.15 Multi-Employer Workplace. A workplace where there is a host employer and at least one contract employer.

3.3.16* Requester. A company or entity that requests the survey by the Marine Chemist and is listed at the top of the Marine Chemist Certificate in the space, *Survey Requested by*.

3.3.17* Secured. Closed in a manner to prevent opening or operation.

3.3.18 Shipbreaking. The breaking down of a vessel's structure for the purpose of scrapping the vessel.

3.3.19 Toxic. A property of any chemical that has the capacity to produce injury to workers, which is dependent on concentration, rate, and method and site of absorption.

3.3.20* Vessel. Every description of watercraft or other artificial contrivance used or capable of being used as a means of transportation on water including special purpose floating structures not primarily designed for or used as a means of transportation on water.



3.3.20.1 Barge. Any vessel not equipped with a means of self-propulsion.

3.3.20.2 Coiled Vessel. Tank vessels using a closed system or heating coils that use thermal oil as the heating medium.

3.3.20.3 Ship. Any vessel propelled by power or sail.

3.3.20.4 Tank Vessel. Any vessel especially constructed or converted to carry liquid bulk cargo in tanks.

3.3.21 Visual Inspection. The physical survey of the space or compartment and surroundings in order to identify potential atmospheric and fire hazards.

3.4 Repair Classifications.

3.4.1 Cold Work. Any construction, alteration, repair, or ship-breaking that does not involve heat, fire, or spark-producing operations.

3.4.2* Hot Work. Any activity involving any of the following: riveting, welding, burning, the use of powder-actuated tools or similar fire-producing operations; any operation that raises the temperature of the work piece equal to or greater than 204°C (400°F); or grinding, drilling, abrasive blasting, or similar operations in the presence of or against the accumulations of readily combustible materials or flammable or combustible liquids or vapors when the atmosphere exceeds 10 percent of the LEL.

3.5 Flammable Cryogenic Liquid Carriers.

3.5.1* Cargo Area. That part of the ship that contains the cargo containment system, cargo pump room, and compressor room and that includes the deck areas over both the full beam and the length of the ship located above the aforementioned.

3.5.2* Cargo Containment System. The arrangement for containment of cargo including, where applicable, a primary and secondary barrier, associated insulation, and any intervening spaces and adjacent structures if necessary for the support of these elements.

3.5.3 Cryogenic Fluid. A fluid with a boiling point lower than -130°F (-90°C) at an absolute pressure of 14.7 psi (101.3 kPa). [55, 2013]

3.5.4 Hold Space. The space enclosed by the ship's structure in which a cargo containment system is situated.

3.5.5 Interbarrier Space. That space between a primary and secondary barrier, whether or not completely or partially occupied by insulation or other material.

3.5.6 Primary Barrier. The inner element designed to contain the cargo when the cargo containment system includes two boundaries.

3.5.7 Secondary Barrier. The liquid-resisting outer element of a cargo containment system designed to afford temporary containment of any envisaged leakage of liquid cargo through the primary barrier and to prevent the lowering of the temperature of the ship's structure to an unsafe level.

Chapter 4 Vessels Required to Have Marine Chemist's Certificate

4.1 Tank Vessels. Tank vessels shall be permitted to be repaired in accordance with the provisions of Chapter 5. A Certificate to this effect shall be required. Repairs or alterations involving hot work shall not be undertaken unless specifically authorized by the Certificate.

Exception No. 1: Tank vessels shall be permitted to enter a repair yard — while afloat or in dry dock — for examination, provided that all bulk cargo compartments and cofferdams are kept closed.

Exception No. 2: Tank vessels shall be permitted to enter a repair yard — while afloat or in dry dock — for scraping, washing down, and painting, provided that all bulk cargo compartments and cofferdams are kept closed.

Exception No. 3: Tank vessels shall be permitted to enter a repair yard — while afloat or in dry dock — for cold work to be performed outside of the vessel on the propeller, tailshaft, or rudder, or for hot 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 No. 4: Tank vessels shall be permitted to enter a repair yard — while afloat or in dry dock — for work within boiler and machinery spaces and other locations provided that, where hot work is to be undertaken, a Certificate shall be required. This Certificate shall set forth each specific location for which hot work is approved. All bulk cargo compartments, cofferdams, and other areas where the flammable content of the atmosphere is above 10 percent of the LEL shall be kept closed and secured. The securing of the compartments, cofferdams, and other areas shall be noted on the Certificate.

4.2 Vessels Other Than Tank Vessels. On any vessels that have carried flammable or combustible liquid in bulk as fuel or cargo, or that have carried cargoes that can produce hazardous atmospheres (including, but not limited to, those caused by decomposition or reaction with oxygen from the atmosphere), no repairs involving hot work shall be made in or on the external boundaries (shell, tank top, or deck) of cargo tanks, fuel tanks, oil pipelines, heating coils or hollow structures, and machinery spaces, unless such compartments and pipelines, as deemed necessary by the Marine Chemist, have been inerted or cleaned to meet the appropriate designation requirements of 7.1.4, 7.1.6, or 7.1.8, and for spaces that will be entered, the requirements of 7.1.1. Repairs and alterations shall not be undertaken until a Certificate is obtained.

4.3 Military Unique Vessels (i.e., U.S. Navy, Coast Guard, Army).

4.3.1 Oilers and tank barges shall be treated as tank vessels in accordance with Section 4.1.

4.3.2 All ammunition shall be removed from any space requiring hot work. Adjacent spaces containing ammunition shall be treated in accordance with the Marine Chemist's requirements. Adjacent spaces containing flammable or combustible liquids shall be treated in accordance with the Marine Chemist's requirements and acknowledged on the Certificate.

4.3.3 Adjacent tanks used for radiation shielding on nuclear-powered vessels shall be treated in accordance with the Marine Chemist's requirements.

4.3.4 All tanks, confined spaces, and machinery compartments in which internal repairs or alterations are to be undertaken shall be cleaned to comply with the requirements of either 7.1.1 or 7.1.3. For repair or alteration involving hot work, these spaces shall meet the requirements of 7.1.4, 7.1.6, or 5.1.3, and adjacent compartments shall be cleaned to meet the requirements of 7.1.4, 7.1.6, or 5.1.3, or shall be permitted to be inerted to meet the requirements of 7.1.8. The adjacent spaces shall be permitted to be secured in accordance with the Marine Chemist's requirements and acknowledged on the Certificate.