

Guidelines for Confined Space Entry On Board Tank Ships in The Petroleum Industry

API RECOMMENDED PRACTICE 1141
FIRST EDITION, MARCH 1994



American Petroleum Institute
1220 L Street, Northwest
Washington, D.C. 20005



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Manufacturing, Distribution and Marketing Department

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FOREWORD

This recommended practice was prepared under the auspices of the API General Committee on Marine Operations. It is intended for use by API member companies and others to develop confined space entry procedures for work on board tank ships.

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Suggested revisions are invited and should be submitted to the director of the Manufacturing, Distribution and Marketing Department, American Petroleum Institute, 1220 L Street, N.W., Washington, D.C. 20005.

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Guidelines for Confined Space Entry On Board Tank Ships in the Petroleum Industry

SECTION 1—GENERAL

1.1 Scope

This recommended practice provides guidance for safely entering and working in confined spaces on board tank ships in the petroleum industry. The work procedures and recommendations described in this recommended practice are based on a consensus among marine operators of the essential elements needed in a confined space entry program to prevent accidents, injuries, and illnesses. In addition, marine operators recognize that with the evolution of ship design more numerous, and potentially less accessible, confined spaces will be found on board tank ships, particularly those with double hull and double bottom construction.

The concepts presented in this recommended practice are intended to aid the user in preparing detailed procedures for safely performing work in confined spaces. The types of confined spaces and their hazards will vary, but the fundamentals presented should be applicable, perhaps with modifications, to all confined spaces that may be encountered on board tank ships.

These guidelines are not applicable to the following situations:

- a. Entry into confined spaces under emergency situations.
- b. Hot work in confined spaces (that is, any work involving sources of ignition sufficiently high to cause the ignition of a flammable gas mixture).
- c. Tank ships that have been certified "Safe for Workers" by a marine chemist (see NFPA 306).

This recommended practice does not address the specific requirements of port authorities or federal, state, or local governments. In addition to these guidelines, users should refer to applicable port authority, federal, state, and local regulations pertinent to specific circumstances.

1.2 Conformance to API Environmental Mission and Guiding Principles

This recommended practice has been reviewed to determine if it conforms to API's Environmental Mission and Guiding Principles.¹ It has been determined that because this recommended practice directly addresses safety and environmental issues, it does conform to API's Environmental Mis-

sion and Guiding Principles. The following guiding principles have been determined to be especially relevant to this practice:

- To operate our plants and facilities, and to handle our raw materials and products in a manner that protects the environment, and the safety and health of our employees and the public.
- To make safety, health, and environmental considerations a priority in our planning, and our development of new products and processes.
- To advise promptly, appropriate officials, employees, customers and the public of information on significant industry related safety, health, and environmental hazards, and to recommend protective measures.

1.3 Definitions

The following terms are used in this recommended practice:

1.3.1 A *tank ship* is a tank vessel propelled by power or sail.

1.3.2 *Confined spaces* are enclosures with known or potential hazards that have a restricted means of entrance and exit. These enclosures are not normally occupied by people or well ventilated. Examples of confined spaces on board tank ships include cargo, ballast, and fuel tanks; cofferdams; duct keels; and spaces between decks or between cargo tanks and the outer hull (double hulls or double bottoms). Pumprooms have some of the characteristics of confined spaces although they are intended for human entry. Under these guidelines, pumprooms are treated separately from other confined spaces.

1.3.3 An electrical circuit or part of a circuit is *intrinsically safe* if any spark or thermal effect produced normally (that is, by breaking or closing the circuit) or accidentally (for example, by short circuit or earth fault) is incapable, under prescribed test conditions, of igniting a prescribed gas mixture. This definition is consistent with the *International Safety Guide for Oil Tankers & Terminals*.

1.3.4 Electrical equipment is defined and certified as *explosionproof* (flameproof) when it is enclosed in a case that is capable of withstanding an explosion within it of a hydrocarbon gas/air mixture or any other specified flammable gas mixture. It must also prevent the ignition of such a mixture outside the case either caused by spark or flame from the internal explosion or as a result of the temperature rise of the case following the internal explosion. The equipment must

¹ *Charter and Bylaws of the American Petroleum Institute*, American Petroleum Institute, Washington, D.C., April 3, 1991.

operate at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby. This definition is consistent with the *International Safety Guide for Oil Tankers & Terminals*.

1.3.5 *Lower explosive limit (LEL) or lower flammable limit (LFL)* is the concentration of a hydrocarbon gas in air below which there is insufficient hydrocarbon to support and propagate combustion. A *lean atmosphere* is an atmosphere where the hydrocarbon content is below the lower explosive limit. This definition is consistent with the *International Safety Guide for Oil Tankers & Terminals*.

1.3.6 *Upper explosive limit (UEL) or upper flammable limit (UFL)* is the concentration of a hydrocarbon gas in air above which there is insufficient air to support and propagate combustion. An *overrich atmosphere* is an atmosphere where the hydrocarbon content is above the upper explosive limit. This definition is consistent with the *International Safety Guide for Oil Tankers & Terminals*.

1.3.7 A *qualified person* refers to a trained and experienced licensed officer, knowledgeable about work in confined spaces and capable of supervising work in confined spaces. A qualified person is familiar with the following:

- a. The tasks to be performed.
- b. The potential hazards that may be encountered in confined spaces, including oxygen content, concentration of flammable materials in the atmosphere, and toxic materials.
- c. The safety and health requirements for confined space work.
- d. The entry permit program in place.
- e. The procedures for rescue operations.

1.3.8 A *standby* refers to a person who meets the following requirements:

- a. Familiar with the tasks to be performed.
- b. Capable of positively identifying all persons in the confined space at all times.
- c. Capable of and responsible for maintaining communication with the persons who have entered a confined space and with the officer of the watch.
- d. Capable of and responsible for initiating rescue operations by notifying the officer of the watch.
- e. Dedicated to operating as a standby without conflicting duties.

1.3.9 A confined space may be designated "*Safe for Workers*" if it meets the following conditions:

- a. The atmosphere's oxygen content is at least 19.5 percent and not greater than 22 percent by volume.
- b. The concentration of flammable materials in the atmosphere is less than 1 percent of the lower explosive limit (LEL).
- c. All toxic materials in the atmosphere associated with cargo, fuel, tank coatings, inerting media, or fumigants are

within the permissible concentrations at the time of the inspection.

d. The residues or materials associated with the work authorized by the permit will not produce hydrocarbon or toxic materials higher than the permissible levels under the existing atmospheric conditions.

If the conditions of Items a, b, c, and d do not all exist, then the confined space shall be designated "*Not Safe for Workers*." A confined space that is designated "*Not Safe for Workers*" should not be entered.

1.3.10 A *vapor* is a gaseous form of a substance that at room temperature and atmospheric pressure is in a solid or liquid state. A common example of vapor is gasoline. The process whereby a liquid changes to a gas is called evaporation; a solid-to-gas transformation (such as dry ice going from a white solid to colorless carbon dioxide gas) is called sublimation.

1.3.11 *Gas* is the physical state of matter where the substance in question will completely fill in a uniform manner a container of any size. The gas state is the normal condition (at room temperature and atmospheric pressure) of nitrogen, hydrogen, and oxygen.

1.3.12 *Toxicity* is the inherent capability of a substance to cause harm to a living organism.

1.3.13 *Threshold limit value (TLV)* is a term created by the American Conference of Governmental Industrial Hygienists (ACGIH). It refers to airborne concentrations of substances and represents conditions under which it is believed that nearly all workers may be repeatedly exposed to day after day without adverse health effects. Because of the wide variation in individual susceptibility, however, a small percentage of workers may experience discomfort from some substances at concentrations at or even below the threshold limit value; a smaller percentage of workers may be affected more seriously by the aggravation of a pre-existing condition or by the development of an occupational illness. TLVs are based on the best available information collected from industrial experience, experimentation, human and animal studies, and where possible, a combination of the three. TLVs, as issued by the American Conference of Governmental Industrial Hygienists, are recommended for use as convenient indicators of toxicity and should be used as guidelines for safe practice. Three categories of threshold limit values are specified as follows:

- a. The *threshold limit value time-weighted average (TLV-TWA)* is the time-weighted average concentration of a substance for a normal 8-hour workday and a 40-hour work week, to which nearly all workers may be repeatedly exposed to day after day without adverse health effects.
- b. The *threshold limit value short-term exposure limit (TLV-STEL)* is the concentration of a substance to which workers