THE REPUBLIC OF LIBERIA
LIBERIA MARITIME AUTHORITY

Office of
Deputy Commissioner
of Maritime Affairs

Marine Notice

SAF-003
Rev. 12/15

TO: **ALL OWNERS, OPERATORS, MASTERS AND OFFICERS OF MERCHANT SHIPS and MOBILE OFFSHORE UNITS, AGENTS AND RECOGNIZED ORGANIZATIONS**

SUBJECT: **Procedures for Entering Enclosed Spaces and Enclosed Space Entry and Rescue Drills**

References:
- **(a) Maritime Law 10.296(4)**
- **(b) SOLAS as amended by Resolutions MSC.338 (91), MSC.350 (92), MSC.380 (94)**
- **(c) MODU Codes as amended by Resolutions MSC 382(94), MSC 383(94), MSC 384(94)**
- **(d) ISM Code**
- **(e) IMSBC Code**
- **(f) IMDG Code**
- **(g) MLC, 2006, Standard A4.3**
- **(h) IMO Resolution A. 1050 (27)**
- **(i) MSC.1/Circ.1477**
- **(j) MSC.1/Circ.1485**

Supersedes: **Marine Notice SAF-003, dated 08/15**

PURPOSE:

This Notice establishes safety requirements and recommendations for entering enclosed spaces on board vessels, including cargo spaces, tanks, pump-rooms, fuel tanks, cofferdams, duct keels, ballast tanks and similar enclosed spaces. The objective is to encourage the adoption of safety procedures aimed at preventing deaths and injuries to personnel entering enclosed spaces on Liberian flagged vessels where there may be an oxygen-deficient, oxygen-enriched, flammable and/or toxic atmosphere.

Investigations of casualties have shown that accidents involving enclosed spaces on vessels are caused by an insufficient knowledge of, or disregard for, the need to take precautions rather than a lack of guidance.

APPLICABILITY:

The following requirements and practical recommendations apply to all types of vessels and provide guidance to vessel operators and seafarers. It should be noted that on vessels where entry into enclosed spaces may be infrequent, for example, on certain passenger ships or small

general cargo ships, the dangers may be less apparent, and accordingly there is a need for increased vigilance.

1.0 DEFINITIONS

1.1 **Enclosed space**: A space which has any of the following characteristics:

.1 limited openings for entry and exit;
.2 inadequate ventilation; and
.3 is not designed for continuous worker occupancy,

and includes, but is not limited to, cargo spaces, double bottoms, fuel tanks, ballast tanks, cargo pump-rooms, cargo compressor rooms, cofferdams, chain lockers, void spaces, duct keels, inter-barrier spaces, boilers, engine crankcases, engine scavenge air receivers, sewage tanks, and adjacent connected spaces. This list is not exhaustive and a list should be produced on a vessel-by-vessel basis to identify enclosed spaces.

1.2 **Adjacent connected space**: A normally unventilated space which is not used for cargo but which may share the same atmospheric characteristics with the enclosed space such as, but not limited to, a cargo space access way.

1.3 **Competent person**: A person with sufficient theoretical knowledge and practical experience to make an informed assessment of the likelihood of a dangerous atmosphere being present or subsequently arising in the space.

1.4 **Responsible person**: A Person authorized to permit entry into an enclosed space and having sufficient knowledge of the procedures to be established and complied with on board, in order to ensure that the space is safe for entry.

1.5 **Attendant**: A person who is suitably trained within the safety management system, maintains a watch over those entering the enclosed space, maintains communications with those inside the space and initiates the emergency procedures in the event of an incident occurring.

REQUIREMENTS:

2.0 Safety Management System for Entry into Enclosed Spaces

2.1 The company shall ensure that clear instructions and procedures for entering enclosed spaces are included among the key operations concerning the safety of personnel and the vessel, in accordance with paragraph 7 of the International Safety Management (ISM) Code, reference (d). The instructions and procedures should ensure that entries into enclosed spaces are carried out in a safe manner, taking into account the guidance provided in this Marine Notice.

2.2 The company shall ensure crew members with enclosed space entry or rescue responsibilities participate in an enclosed space entry and rescue drill on board the vessel at least once every two (2) months. Each enclosed space entry and rescue drill shall include:

- Checking and use of the personal protective equipment required for entry;
- Checking and use of communication equipment and procedures;
- Checking and use of instruments for measuring the atmosphere in enclosed spaces;
- Checking and use of rescue equipment, and
- Instructions in first aid and resuscitation techniques.

2.2.1 The drills shall be recorded in the official log book.

2.3 All crew members shall be given instructions in the risks associated with enclosed spaces including the evaluation, measurement, control and elimination, of the hazards (risk assessment) and onboard procedures for safe entry into such spaces taking into account the guidance provided in this Marine Notice.

2.3.1 The record of instruction shall be recorded in the ship's on-board training record.

2.4 An onboard means of recharging breathing apparatus cylinders used during drills shall be provided or a suitable number of spare cylinders shall be carried on board to replace those used during drills. These are in addition to those required under Regulation 10.10 of SOLAS chapter II-2.

2.5 When deciding the number of spare cylinders to be provided for on board drills, the company should consider the requirements in the Safety Management System for the number/frequency of drills where breathing apparatus cylinders may be used, and the nature of the vessels trading pattern with respect to shore based charging facilities.

2.6 Cylinders intended for drills should be prominently marked to indicate their intended use.

2.7 The Safety Management System shall take account that at least two fully charged spare cylinder for drills must be on board.

2.8 Internal audits by the company of the ship's safety management system should verify that the established procedures are complied with in practice and are consistent with the safety strategy adopted by the Company.

2.9 Masters and Officers are reminded that enclosed spaces shall be assumed to be incapable of supporting life and shall be well ventilated before testing and entry. 'Tanks and void spaces shall be adequately vented before testing and should take into account the contaminants in the tank, the lay-out and size of the tank and the rating and design of the ventilation system.'

3.0 Assessment of Risk

3.1 The company should ensure that a risk assessment is conducted to identify all enclosed spaces on board the vessel. This risk assessment should be dynamic and periodically validated.

3.2 In order to ensure safety, a competent person should always make a preliminary assessment of any potential hazards in the space to be entered. The assessment should take into account current and previous cargo carried, safety restrictions related to treated

ballast in the ballast water management plan, fumigation, inert gas, ventilation of the space, coating of the space and other relevant factors. The competent person's preliminary assessment should determine the potential for the presence of an oxygen-deficient, oxygen-enriched, flammable or toxic atmosphere. The competent person should bear in mind that the ventilation procedures for an adjacent connected space may be different from the procedures for the ventilation of the enclosed space itself.

3.2.1 The Competent Person's record of certification shall be recorded in the official log book.

3.3 The procedures to be followed for testing the atmosphere in the space and for entry should be decided on the basis of the preliminary assessment. These will depend on whether the preliminary assessment shows that:

.1 there is minimal risk to the health or life of personnel entering the space; or
.2 there is no immediate risk to health or life but a risk could arise during the course of work in the space; or
.3 a risk to health or life is identified.

3.4 Where the preliminary assessment indicates minimal risk to health or life or potential for a risk to arise during the course of work in the space, the precautions described in sections 4, 5, 6 and 7 should be followed, as appropriate.

3.5 Where the preliminary assessment identifies a risk to life or health, if entry is to be made, the additional precautions specified in section 8 should also be followed.

3.6 Throughout the assessment process, there should be an assumption that the space to be entered is considered to be hazardous until positively proved to be safe for entry.

4.0 Authorization of Entry

4.1 No person should open or enter an enclosed space unless authorized by the master or the nominated responsible person and unless the appropriate safety procedures laid down for the particular vessel have been followed.

4.2 Entry into enclosed spaces should be planned and the use of an entry permit system, which may include the use of a checklist, is recommended. An Enclosed Space Entry Permit should be issued by the master or the nominated responsible person, and completed by the personnel who enter the space prior to entry. An example of the Enclosed Space Entry Permit is provided in the annex.

5.0 General Precautions

5.1 Entry doors or hatches leading to enclosed spaces should at all times be secured against entry, when entry is not required.

5.2 A door or hatch cover which is opened to provide natural ventilation of an enclosed space may, wrongly, be taken to be an indication of a safe atmosphere and therefore, an attendant may be stationed at the entrance or the use of a mechanical barrier, such as a rope or chain positioned across the opening with an attached warning sign, could prevent such accidental entry.

5.3 The master or the responsible person should determine that it is safe to enter an enclosed space by ensuring that:

.1 potential hazards have been identified in the assessment and as far as possible isolated or made safe;
.2 the space has been thoroughly ventilated by natural or mechanical means to remove any toxic or flammable gases and to ensure an adequate level of oxygen throughout the space;
.3 the atmosphere of the space has been tested as appropriate with properly calibrated instruments to ascertain acceptable levels of oxygen and acceptable levels of flammable or toxic vapors;
.4 the space has been secured for entry and properly illuminated;
.5 a suitable system of communication between all parties for use during entry has been agreed and tested, including alternate means of attracting attention;
.6 an appropriate means of rescue has been evaluated and agreed taking into account the nature and construction of the enclosed space and the rescue and resuscitation equipment available;
.7 an attendant has been instructed to remain at the entrance to the space whilst it is occupied;
.8 rescue and resuscitation equipment has been positioned ready for use at the entrance to the space and rescue arrangements have been agreed;
.9 personnel are properly clothed and equipped for the entry and subsequent tasks; and a permit has been issued, authorizing entry; and
.10 vessel's crew should be made aware of such operations in order to avoid accidents resulting from unauthorized use of equipment, valves, stopping the ventilation or closing of ventilators.

The precautions in subparagraphs .7 and .8 may not apply to every situation described in this section. The person authorizing entry should determine whether an attendant and the positioning of rescue equipment at the entrance to the space are necessary.

6.0 Testing the Atmosphere

6.1 Every vessel to which Chapter I of SOLAS and Chapter I of the MODU Codes, references (b) and (c) apply shall carry an appropriate atmosphere testing instrument or instruments capable of measuring concentrations of oxygen, flammable gases or vapors, hydrogen sulphide and carbon monoxide prior to entering enclosed spaces. Guidance in selecting the testing instrument is provided in reference (i). Instruments carried under other requirements may satisfy this regulation. The testing instrument should be calibrated in accordance with the manufacturer's instructions. Suitable means shall be provided for the calibration of all such instruments.

6.2 Appropriate testing of the atmosphere of an enclosed space shall be carried out by persons trained in the use of the instrument. The manufacturers' instructions should be strictly followed. Testing of the space shall be carried out before any person enters the space and at regular intervals thereafter until all work is completed. Where appropriate, the testing of the space should be carried out at as many different levels as is necessary to obtain a representative sample of the atmosphere in the space. In some cases it may be difficult to test the atmosphere throughout the enclosed space without entering the space

(e.g. the bottom landing of a stairway) and this should be taken into account when assessing the risk to personnel entering the space. The use of flexible hoses or fixed sampling lines, which reach remote areas within the enclosed space, may allow for safe testing without having to enter the space.

6.2.1 The record of training in the use of the equipment for testing the atmosphere shall be retained in the ship's on-board training record.

6.3 For entry purposes, steady readings of all of the following should be obtained:

.1 21% oxygen by volume;

.2 not more than 1% of lower flammable limit (LFL), where the preliminary assessment has determined that there is potential for flammable gases or vapors; and

.3 not more than 50% of the occupational exposure limit (OEL)* of any toxic vapors and gases.

If these conditions cannot be met, additional ventilation should be applied to the space and re-testing should be conducted after a suitable interval.

* It should be noted that the term Occupational Exposure Limit (OEL) includes the Permissible Exposure Limit (PEL), Maximum Admissible Concentration (MAC) and Threshold Limit Value (TLV) or any other internationally recognized terms.

6.4 Any gas testing should be carried out with ventilation to the enclosed space stopped, and after conditions have stabilized, in order to obtain accurate readings.

6.5 Where the preliminary assessment has determined that there is potential for the presence of toxic gases and vapors, appropriate testing should be carried out, using fixed or portable gas or vapor detection equipment. The readings obtained by this equipment should be below the occupational exposure limits for the toxic gases or vapors given in accepted international standards, in accordance with paragraph 6.2. It should be noted that testing for flammability or oxygen content does not provide a suitable means of measuring for toxicity, nor vice versa.

6.6 It should be emphasized that the internal structure of the space, cargo, cargo residues and tank coatings may also present situations where oxygen-deficient areas may exist, and should always be suspected, even when an enclosed space has been satisfactorily tested as being suitable for entry. This is particularly the case for spaces where the path of the supply and outlet ventilation is obstructed by structural members or cargo.

7.0 Precautions during Entry

7.1 The atmosphere should be tested frequently whilst the space is occupied and persons should be instructed to leave the space should there be deterioration in the conditions.

7.2 Persons entering enclosed spaces should be provided with calibrated and tested portable multi-gas detectors that monitor the levels of oxygen, carbon monoxide and other gases as appropriate.

7.3 Ventilation should continue during the period that the space is occupied and during temporary breaks. Before re-entry after a break, the atmosphere should be re-tested. In the event of failure of the ventilation system, any persons in the space should leave immediately.

7.4 Particular care should be exhibited when working on pipelines and valves within the space. If conditions change during the work, increased frequency of testing of the atmosphere should be performed. Changing conditions that may occur include increasing ambient temperatures, the use of oxygen-fuel torches, mobile plant, work activities in the enclosed space that could evolve vapors, work breaks, or if the vessel is ballasted or trimmed during the work.

7.5 In the event of an emergency, under no circumstances should the attending crew member enter the space before help has arrived and the situation has been evaluated to ensure the safety of those entering the space to undertake rescue operations. Only crew members with enclosed space entry or rescue responsibilities should perform rescue operations in enclosed spaces.

8.0 Additional precautions for entry into a space where the atmosphere is known or suspected to be unsafe

8.1 Spaces that have not been tested should be considered unsafe for persons to enter. If the atmosphere in an enclosed space is suspected or known to be unsafe, the space should only be entered when no practical alternative exists. Entry should only be made for further testing, essential operation, safety of life or safety of a vessel. The number of persons entering the space should be the minimum compatible with the work to be performed.

8.2 Suitable breathing apparatus, e.g. of the air-line or self-contained type, should always be worn, and only personnel trained in its use should be allowed to enter the space. Air-purifying respirators should not be used as they do not provide a supply of clean air from a source independent of the atmosphere within the space.

8.3 Emergency Escape Breathing Devices (EEBDs) should not be used for entering oxygen deficient spaces, as these are used only for escaping from a compartment that has a hazardous atmosphere, although spare EEBDs may be available at location in the enclosed space for emergency escape, when necessary.

8.4 Persons entering enclosed spaces should be provided with calibrated and tested portable multi-gas detectors that monitor the levels of oxygen, carbon monoxide and other gases as appropriate.

8.5 Rescue harnesses should be worn and, unless impractical, lifelines should be used.

8.6 Appropriate protective clothing should be worn, particularly where there is any risk of toxic substances or chemicals coming into contact with the skin or eyes of those entering the space.

8.7 The advice in paragraph 7.5 concerning emergency rescue operations is particularly relevant in this context.

9.0 Hazards related to specific types of ships, cargo or operations

Dangerous goods in packaged form

9.1 The atmosphere of any space containing dangerous goods may put at risk the health or life of any person entering it. Dangers may include flammable, toxic or corrosive gases or vapors that displace oxygen, residues on packages and spilled material. The same hazards may be present in spaces adjacent to the cargo spaces. Information on the hazards of specific substances is contained in the International Maritime Dangerous Goods (IMDG) Code, the IMDG Code supplement which contains the Emergency Procedures for Ships Carrying Dangerous Goods (EMS guide) and Material Safety Data Sheets (MSDS)*. If there is evidence or suspicion that leakage of dangerous substances has occurred, the precautions specified in section 8 should be followed.

* Refer to the Recommendations for material safety data sheets (MSDS) for MARPOL Annex I oil cargo and oil fuel (resolution MSC.286 (86)).

9.2 Personnel required to deal with spillages or to remove defective or damaged packages should be appropriately trained and wear suitable breathing apparatus and appropriate protective clothing.

Liquid Bulk

9.3 The tanker industry has produced extensive advice to operators and crews of ships engaged in the bulk carriage of oil, chemicals and liquefied gases, in the form of specialist international safety guides. Information in the guides on enclosed space entry amplifies these recommendations and should be used as the basis for preparing entry plans.

9.4 Crew should be alerted to the danger which will arise if liquid cargo leaks from defective pumps or cargo piping systems into the pump-room bilges.

Solid Bulk

9.5 On ships carrying solid bulk cargoes, dangerous atmospheres may develop in cargo spaces and adjacent spaces. The dangers may include flammability, toxicity, oxygen depletion or self-heating, as identified in the shipper's declaration. For additional information, reference should be made to the International Maritime Solid Bulk Cargoes (IMSBC) Code.

Use of Nitrogen as an inert gas

9.6 Nitrogen is a colorless and odorless gas that, when used as an inert gas, causes oxygen deficiency in enclosed spaces and at exhaust openings on deck during purging of tanks and void spaces and use in cargo holds. It should be noted that one deep breath of 100% nitrogen gas will be fatal. Refer to MSC.1 Circ.1401, for guidelines on tank entry on tankers using nitrogen as an inerting medium.

Oxygen depleting cargoes and materials

9.7 A prominent risk with such cargoes is oxygen depletion due to the inherent form of the cargo, for example, self-heating, oxidation of metals and ores or decomposition of vegetable oils, fish oils, animal fats, grain and other organic materials or their residues. The materials listed below are known to be capable of causing oxygen depletion. However, the list is not exhaustive. Oxygen depletion may also be caused by other materials of vegetable or animal origin, by flammable or spontaneously combustible materials and by materials with a high metal content, including, but not limited to:

.1 grain, grain products and residues from grain processing (such as bran, crushed grain, crushed malt or meal), hops, malt husks and spent malt;
.2 oilseeds as well as products and residues from oilseeds (such as seed expellers, seed cake, oil cake and meal);
.3 copra;
.4 wood in such forms as packaged timber, round wood, logs, pulpwood, props (pit props and other propwood), woodchips, woodshavings, wood pellets and sawdust;
.5 jute, hemp, flax, sisal, kapok, cotton and other vegetable fibers (such as esparto grass/Spanish grass, hay, straw, bhusa), empty bags, cotton waste, animal fibers, animal and vegetable fabric, wool waste and rags;
.6 fish, fishmeal and fish scrap;
.7 guano;
.8 sulphidic ores and ore concentrates;
.9 charcoal, coal, lignite and coal products;
.10 direct reduced iron (DRI);
.11 dry ice;
.12 metal wastes and chips, iron swarf, steel and other turnings, borings, drillings, shavings, filings and cuttings; and
.13 scrap metal.

Fumigation

9.8 When a ship is fumigated, the detailed recommendations contained in the Recommendations on the safe use of pesticides in ships in MSC.1/Circ.1358, Recommendations on the safe use of pesticides in ships applicable to the fumigation of cargo holds in MSC.1/Circ.1264, as amended should be followed. Spaces adjacent to fumigated spaces should be treated as if fumigated.

9.9 Care should be taken to ensure that piping leading from cargo spaces or adjacent connected spaces through the ship's accommodation are properly sealed in accordance with Class requirements.

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ANNEX

EXAMPLE OF AN ENCLOSED SPACE ENTRY PERMIT

This permit relates to entry into any enclosed space and should be completed by the master or responsible officer and by the person entering the space, e.g. competent person and attendant.

General

Location/Name of enclosed space: _____

Reason for entry: _____

This permit is valid From _____ hrs. Date _____

To _____ hrs. Date _____

(See Note 1)

Section 1 - Pre-entry preparation
(To be checked by the master or nominated responsible person)

	Yes	No
• Has the space been thoroughly ventilated by mechanical means?	☐	☐
• Has the space been segregated by blanking off or isolating all connecting pipelines or valves and electrical power/equipment?	☐	☐
• Has the space been cleaned where necessary?	☐	☐
• Has the space been tested and found safe for entry? **(See Note 2)**	☐	☐

• Pre-entry atmosphere test readings:	By (Name)	Time
-Oxygen..... % vol (21%)		
-Hydrocarbon ..... % LFL (less than 1%)		
-Toxic gases.....ppm (less than 50% OEL of the specific gas)		

(See Note 3)

• Have arrangements been made for frequent atmosphere checks to be made while the space is occupied and after work breaks?	☐	☐
• Have arrangements been made for the space to be continuously ventilated throughout the period of occupation and during work breaks?	☐	☐
• Are access and illumination adequate?	☐	☐

	Yes	No
• Is rescue and resuscitation equipment available for immediate use by the entrance to the space?	☐	☐
• Has an attendant been designated to be in constant attendance at the entrance to the space?	☐	☐
• Has the officer of the watch (bridge, engine room, cargo control room) been advised of the planned entry?	☐	☐
• Has a system of communication between all parties been tested and emergency signals agreed?	☐	☐
• Are emergency and evacuation procedures established and understood by all personnel involved with the enclosed space entry?	☐	☐
• Is all equipment used in good working condition and inspected prior to entry?	☐	☐
• Are personnel properly clothed and equipped?	☐	☐

Section 2 - Pre-entry checks

(To be checked by the person entering the space)

	Yes	No
• I have received instructions or permission from the master or nominated responsible person to enter the enclosed space.	☐	☐
• Section 1 of this permit has been satisfactorily completed by the master or nominated responsible person.	☐	☐
• I have agreed and understand the communication procedures	☐	☐
• I have agreed upon a reporting interval of _____ minutes.	☐	☐
• Emergency and evacuation procedures have been agreed and are understood.	☐	☐
• I am aware that the space must be vacated immediately in the event of ventilation failure or if atmosphere tests show a change from agreed safe criteria.	☐	☐

Section 3 – Breathing apparatus and other equipment (To be checked jointly by the master or nominated responsible person and the person who is to enter the space)	Yes	No
• Those entering the space are familiar with the breathing apparatus to be used	☐	☐
• The breathing apparatus has been tested as follows:		
- gauge and capacity of air supply		
- low pressure audible alarm if fitted		
- face mask – under positive pressure and not leaking		
• The means of communication has been tested and emergency signals agreed?	☐	☐
• All personnel entering the space have been provided with rescue harnesses and, where practicable, lifelines.	☐	☐

Signed upon completion of sections 1, 2 and 3 by:

Master or nominated responsible person:		Date: ..... Time: .....
Attendant:		Date: ..... Time: .....
Person entering the space:		Date: ..... Time: .....

Section 4 - Personnel entry
(To be completed by the responsible person supervising entry)

Name of Person	Time in	Time Out

Section 5 - Completion of job
(To be completed by the responsible person supervising entry)

-	Job completed	Date:	Time: .....
-	Space secured against entry	Date:	Time: .....
-	The officer of the watch has been duly informed	Date:	Time: .....

Signed upon completion of sections 4 and 5 by: _____

Responsible person supervising entry

Date: _____ Time: _____

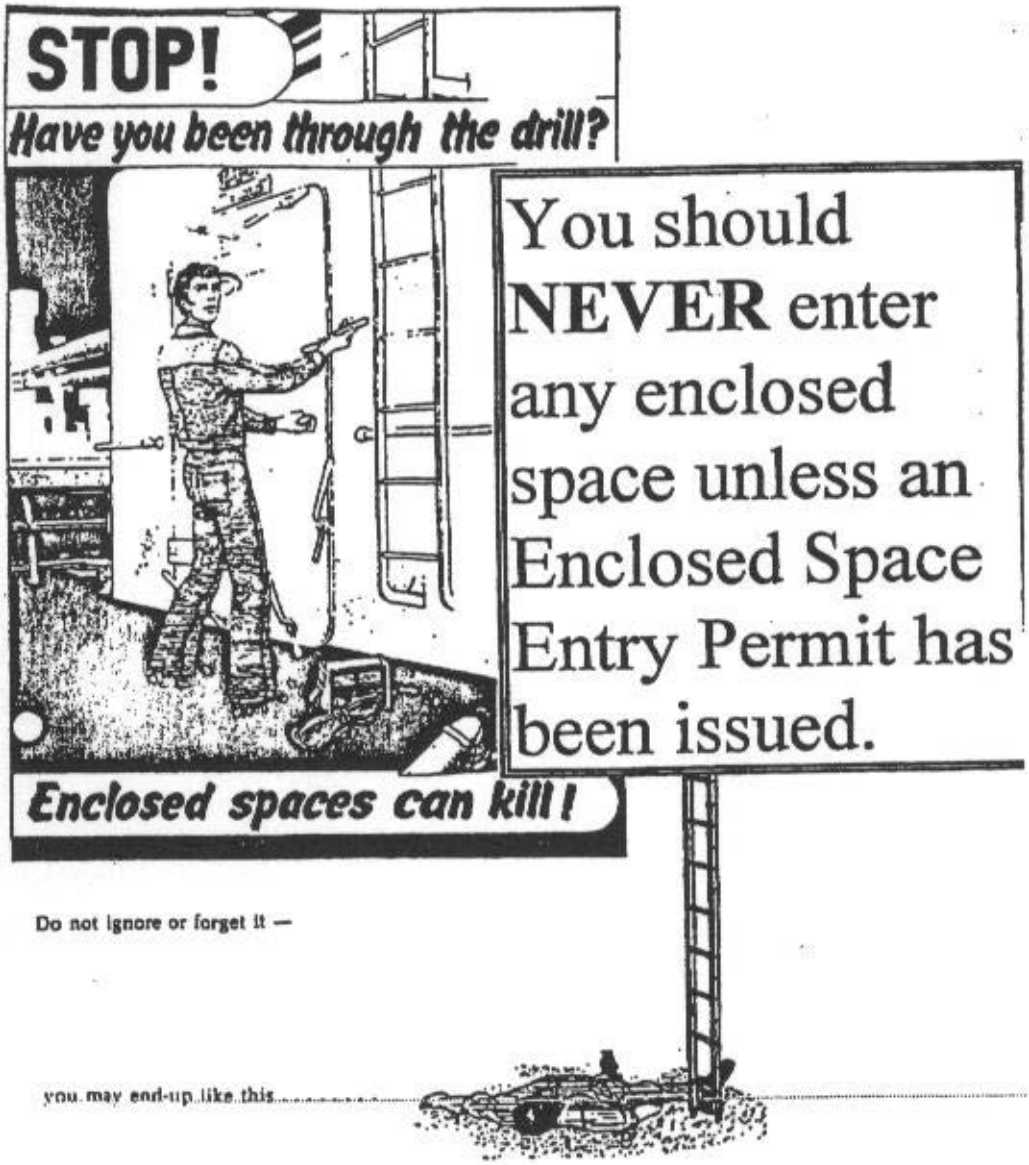
THIS PERMIT IS RENDERED INVALID SHOULD VENTILATION OF THE SPACE STOP OR IF ANY OF THE CONDITIONS NOTED IN THE CHECKLIST CHANGE.

Notes:

1. The permit should contain a clear indication as to its maximum period of validity.

2. In order to obtain a representative cross-section of the space's atmosphere, samples should be taken from several levels and through as many openings as possible. Ventilation should be stopped for about 10 minutes before the pre-entry atmosphere tests are taken.

3. Tests for specific toxic contaminants, such as benzene or hydrogen sulphide, should be undertaken depending on the nature of the previous contents of the space.


STOP!
Have you been through the drill?
You should NEVER enter any enclosed space unless an Enclosed Space Entry Permit has been issued.
Enclosed spaces can kill!
Do not ignore or forget it —
you may end-up like this.....