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Enclosed Spaces

Enclosed Spaces

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Deaths Still Happening

Few aspects of personal safety on ships have received more attention than the importance of following the correct procedures before entering an enclosed space. Unfortunately, fatalities and serious injuries continue to happen with relentless regularity - almost every one of which could have been prevented if the correct procedures had been followed.

Serious efforts have been made by many different sectors of the shipping industry to raise awareness of the dangers of entering enclosed spaces. Despite all these efforts, the death toll continues to mount.

This briefing aims to provide yet another reminder about the correct procedures which must be followed before entering an enclosed space to be sure of coming out alive.

The advice within the briefing has a straightforward aim, that of protecting personnel through the safe and proper implementation of entry procedures - from the correct identification of a confined or enclosed space through to atmospheric testing, safe rescue procedures and an appreciation of the hazards to be found within such dangerous spaces.

Safe working in enclosed spaces must be a top priority within a vessel's safety management system. But accidents, sometimes involving highly experienced personnel, continue to happen despite the introduction of modern safety management systems, procedures and techniques.

IMO Recommendations

Revised Recommendations for Entering Enclosed Spaces Aboard Ships (Resolution A.1050(27))

The International Maritime Organization's (IMO) Revised Recommendations for Entering Enclosed Spaces Aboard Ships (Resolution A.1050(27)) is included in the Appendix to this briefing. It contains advice on assessment of risk, testing of atmospheres and precautions during entry. It also covers hazards related to specific types of cargo, including oxygen-depleting cargoes and materials. The annex to Resolution A.1050 (27) also contains an example of an enclosed space entry permit and this can be found at the **IMO Knowledge Centre.**

Resolution MSC.350(92) Amendments to the International Convention for the Safety of Life at Sea, 1974, as Amended.

This regulation (see Appendix) makes it compulsory for crew members who may possibly become involved with enclosed space entry or rescue to participate in enclosed space entry and rescue drills at least once in every two months. It also mandates the content of such drills.

MSC.1/Circ.1485 SOLAS Regulation XI-1/7 on Atmosphere Testing Instruments for Enclosed Spaces.

Amendments to SOLAS regulation XI-1/7 on atmosphere testing instrument come into force on 1 July 2016. The regulation makes it mandatory for ships to carry at least one four-gas instrument capable of measuring concentrations of oxygen, flammable gases or vapours, hydrogen sulphide and carbon monoxide, prior to entry into enclosed spaces. Although the requirements are not due to come into force until 1 July 2016, the IMO is encouraging early adoption.

Making the Same Mistakes

The story behind the majority of incidents is all too familiar. One person enters an enclosed space without having taken the necessary precautions then collapses from either lack of oxygen or toxic fumes. The collapsed person is then seen by a second person who, without taking any precautions, attempts a rescue and he or she also collapses. It is not unknown for even a third or fourth person to be overcome in the same way in the belief that they can do better. Eventually, someone stops to think and follows the correct procedures. An emergency party, with the correct rescue equipment, is mustered and

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carries out a controlled rescue. Unfortunately, asphyxiation can be very rapid, and will often result in emergency crews recovering multiple fatalities.

It is vital to stress the fact that an unplanned rescue will most likely end in tragedy as personnel repeatedly rush into lethal atmospheres under the misconception that they will be able to save colleagues. According to the International Association of Classification Societies (IACS) over 50% of the workers who die in confined spaces are attempting to rescue other workers.

It is also vital to remember that personnel should never trust their senses to determine if the air in a confined space is safe. Many toxic gases and vapours cannot be seen or smelt, nor can personnel determine the level of oxygen present without properly testing the atmosphere.

What is most surprising is that enclosed space accidents appear to involve a wide range of people, including highly qualified and experienced seafarers as well as stevedores and even surveyors.

It is perhaps understandable, from a human point of view, to appreciate that one's first reaction on seeing a collapsed colleague is to rush to their assistance. Whilst the intention is good, it is virtual suicide - compounding an already tragic situation.

Almost all the people who die in enclosed spaces have received training and are well aware of the correct procedures. In the agony of the moment, they choose to disregard those procedures.

Letting your guard down just once can be fatal – vigilance saves lives and adherence to this advice will underpin any existing efforts to enter enclosed spaces safely.

Identifying an Enclosed Space

Identifying a space as enclosed and therefore potentially dangerous will often be sufficient to deter crew members from entering until proper preventative measures can be put in place.

International Maritime Organization (IMO) recommendations published in an annex to resolution A.1050(27) suggest enclosed spaces can be identified by asking the following questions.

- Is the space provided with limited openings for entry and exit?
- Is the space subject to poor natural ventilation?
- Is the space not designed for continuous occupancy?

If the answer to any of these questions is 'yes', the space should not be entered until an appropriate assessment of risk has been carried out.

Warning Signs

In addition to discussing enclosed spaces during familiarisation training, posting 'Enclosed Space' prohibition signs adjacent to access points may act as a timely reminder of the need to take suitable precautions before entering.

Rules and Regulations

In the UK, the Merchant Shipping Regulations state that procedures for ensuring safe entry to, and working in, dangerous spaces should be clearly laid down by the ship operators and that the master should ensure such procedures are observed on board ship.

The regulations further state that, except where necessary for entry, a ship should ensure entrances to unattended dangerous spaces are either kept closed or otherwise secured against entry.

Other flag administrations have similar rules and regulations. Whilst the ISM Code does not contain such explicit rules and regulations, they are certainly implied within a properly constituted safety management system. Indeed, there are few who would doubt such regulations represent good practice, irrespective of flag.

Stevedores

Controlling Stevedore Entry Into Enclosed Spaces

IMO Resolution A.1050(27), which provides comprehensive guidance on procedures for entering enclosed spaces on ships, defines 'enclosed spaces' as those with limited openings for entry and exit, unfavourable natural ventilation and not designed for continuous worker occupancy.

Clearly this includes many cargo spaces, so it is vital when loading and discharging that access by stevedores is carefully monitored and controlled in compliance with the ship's enclosed space entry procedures.

As with any enclosed space on a ship, the atmosphere in a cargo space may be deficient in oxygen, contain flammable gases or vapours, or contain toxic gases or vapours. Many types of cargo create specific hazards. For example, certain packaged dangerous goods may contain flammable, toxic or corrosive gases or vapours that displace oxygen. On ships carrying solid bulk cargoes, dangerous atmospheres may develop in cargo spaces and adjacent spaces. Cargo spaces may also be fumigated.

Oxygen depletion is a particular hazard from some cargo, caused by self-heating, oxidation of metals and ores, or decomposition of vegetable oils, animal fats, grain and other organic materials or their residues. Materials such as grain, some types of wood, fishmeal, and scrap metal are known to be capable of causing oxygen depletion. This list is not exhaustive; oxygen depletion may also be caused by other

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materials of vegetable or animal origin, by flammable or spontaneously combustible materials, and by materials with a high metal content.

Controlling Stevedore Access

It is therefore vital that the ship's safety management system includes proper procedures for entry into enclosed spaces, and that they are rigorously followed. More importantly, it is essential that these procedures control how stevedores gain access to cargo compartments.

In order to ensure safety, a competent person should always make a preliminary assessment of any potential hazards in the space to be entered; taking into account the cargo carried, or previously carried, the ventilation of the space and other relevant factors. The competent person's preliminary assessment should determine the potential for the presence of an oxygen-deficient, flammable or toxic atmosphere. The procedures to be followed for testing the atmosphere in the space and for the entry should be decided on the basis of the preliminary assessment.

No stevedore should open or enter a cargo space unless authorised by the master or responsible duty officer and unless the appropriate safety procedures laid down for the particular ship have been followed.

What Training is Needed?

Marine Accident Investigators' International Forum (MAIIF) statistics have identified the following as the most common contributory factors in enclosed space accidents:

- Lack of knowledge, training and understanding of the dangers of entering enclosed spaces;
- Personal Protective Equipment (PPE) or rescue equipment not being used, not available, of an inappropriate type, improperly used or in disrepair;
- Inadequate or non-existent signage;
- Inadequate or non-existent identification of enclosed spaces on board;
- Inadequacies in Safety Management Systems; and
- Poor management commitment and oversight.

Because many people tend to respond instinctively rather than to what they have been taught, theoretical training should be reinforced by frequent practical drills and exercises involving the whole crew and Resolution MSC.350(92) makes it compulsory for crew members with enclosed space or rescue responsibilities to participate in enclosed space entry and rescue drills at least once in every two months. These drills should include:

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

Practice does not only make perfect, it also makes the training and the knowledge permanent and instinctive.

Posters can also help people remember what they have been taught. North's posters are reproduced in this briefing and high resolution copies can be downloaded from the Club's website: **www.nepia.com**

Conclusion

Fatalities will only be prevented when ship owners and managers implement, and ensure compliance with, procedures on board that incorporate relevant national legislation, international recommendations and industry best practice.

All potentially dangerous spaces should be clearly identified to crew members and suitable warning signs posted adjacent to their access points.

Crew members should comply with their company procedures each and every time they enter an enclosed space for whatever reason.

Following a decision to enter an enclosed space, senior officers and safety officials should properly plan and prepare the entry ensuring that the correct equipment and suitably trained personnel are available. The master or responsible officer should always complete an appropriate risk assessment and use an 'Entry into Enclosed Spaces permit'.

Such permits may incorporate a suitable checklist card such as the one produced by North's Loss Prevention Department, which can be found in our publications section or via our **Industry News** pages.

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APPENDIX: IMO RECOMMENDATIONS

IMO RECOMMENDATIONS FOR ENTERING ENCLOSED SPACES ABOARD SHIPS - ANNEX TO RESOLUTION A.1050 (27) - ADOPTED 30 NOVEMBER 2011

1 INTRODUCTION

The atmosphere in any enclosed space may be oxygen-deficient or oxygen-enriched and/or contain flammable and/or toxic gases or vapours. Such unsafe atmospheres could also subsequently occur in a space previously found to be safe. Unsafe atmospheres may also be present in spaces adjacent to those spaces where a hazard is known to be present.

2 DEFINITIONS

2.1 Enclosed space means a space which has any of the following characteristics:

2.1.1 limited openings for entry and exit;

2.1.2 inadequate ventilation; and

2.1.3 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 ship-by-ship basis to identify enclosed spaces.

2.2 Adjacent connected space means 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.

2.3 Competent person means 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.

2.4 Responsible person means 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.

2.5 Attendant means 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.

3 SAFETY MANAGEMENT FOR ENTRY INTO ENCLOSED SPACES

3.1 The safety strategy to be adopted in order to prevent accidents on entry to enclosed spaces should be approached in a comprehensive manner by the company.

3.2 The company should ensure that the procedures for entering enclosed spaces are included among the key shipboard operations concerning the safety of the personnel and the ship, in accordance with paragraph 7 of the International Safety Management (ISM) Code.

3.3 The company should elaborate a procedural implementation scheme which provides for training in the use of atmospheric testing equipment in such spaces and a Schedule of regular on board drills for crews.

3.3.1 Competent and responsible persons should be trained in enclosed space hazard recognition, evaluation, measurement, control and elimination, using standards acceptable to the Administration.

3.3.2 Crew members should be trained, as appropriate, in enclosed space safety, including familiarization with on board procedures for recognizing, evaluating and controlling hazards associated with entry into enclosed spaces.

3.4 Internal audits by the company and external audits by the Administration 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 referred to in paragraph 3.1.

4 ASSESSMENT OF RISK

4.1 The company should ensure that a risk assessment is conducted to identify all enclosed spaces on board the ship. This risk assessment should be periodically revisited to ensure its continued validity.

4.2 In order to ensure safety, a competent person should always make a preliminary assessment of any potential hazards in the space to be entered, taking into account previous cargo carried, 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

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for an adjacent connected space may be different from the procedures for the ventilation of the enclosed space itself.

4.3 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:

4.3.1 There is minimal risk to the health or life of personnel entering the space; or

4.3.2 There is no immediate risk to health or life but a risk could arise during the course of work in the space; or

4.3.3 a risk to health or life is identified.

4.4 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 5, 6, 7 and 8 should be followed, as appropriate.

4.5 Where the preliminary assessment identifies a risk to life or health, if entry is to be made, the additional precautions specified in section 9 should also be followed.

4.6 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.

5 AUTHORIZATION OF ENTRY

5.1 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 ship have been followed.

5.2 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 appendix.

6 GENERAL PRECAUTIONS

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

6.2 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.

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

6.3.1 potential hazards have been identified in the assessment and as far as possible isolated or made safe;

6.3.2 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;

6.3.3 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 vapours;

6.3.4 the space has been secured for entry and properly illuminated;

6.3.5 a suitable system of communication between all parties for use during entry has been agreed and tested;

6.3.6 an attendant has been instructed to remain at the entrance to the space whilst it is occupied;

6.3.7 rescue and resuscitation equipment has been positioned ready for use at the entrance to the space and rescue arrangements have been agreed;

6.3.8 personnel are properly clothed and equipped for the entry and subsequent tasks; and

6.3.9 a permit has been issued, authorizing entry.

The precautions in subparagraphs .6 and .7 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.

6.4 Only trained personnel should be assigned the duties of entering, functioning as attendants or functioning as members of rescue teams. Ships' crews with rescue and first aid duties should be drilled periodically in rescue and first aid procedures. Training should include as a minimum:

6.4.1 identification of the hazards likely to be faced during entry into enclosed spaces;

6.4.2 recognition of the signs of adverse health effects caused by exposure to hazards during entry; and

6.4.3 knowledge of personal protective equipment required for entry.

6.5 All equipment used in connection with entry should be in good working condition and inspected prior to use.

7 TESTING THE ATMOSPHERE

7.1 Appropriate testing of the atmosphere of a space should be carried out with properly calibrated equipment by persons trained in the use of the equipment. The manufacturers' instructions should be strictly followed.

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Testing of the space should 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.

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

7.2.1 21% oxygen by volume by oxygen content meter;

Note: National requirements may determine the safe atmosphere range.

7.2.2 not more than 1% of lower flammable limit (LFL) on a suitably sensitive combustible gas indicator, where the preliminary assessment has determined that there is potential for flammable gases or vapours; and

7.2.3 not more than 50% of the occupational exposure limit (OEL)* of any toxic vapours 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.

7.3 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.

7.4 Where the preliminary assessment has determined that there is potential for the presence of toxic gases and vapours, appropriate testing should be carried out, using fixed or portable gas or vapour detection equipment. The readings obtained by this equipment should be below the occupational exposure limits for the toxic gases or vapours given in accepted national or international standards, in accordance with paragraph 7.2. It should be noted that testing for flammability or oxygen content does not provide a suitable means of measuring for toxicity, nor vice versa.

7.5 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.

8 PRECAUTIONS DURING ENTRY

8.1 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.

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

8.3 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.

8.4 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 vapours, work breaks, or if the ship is ballasted or trimmed during the work.

8.5 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 properly trained and equipped personnel should perform rescue operations in enclosed spaces.

9 ADDITIONAL PRECAUTIONS FOR ENTRY INTO A SPACE WHERE THE ATMOSPHERE IS KNOWN OR SUSPECTED TO BE UNSAFE

9.1 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 ship. The number of persons entering the space should be the minimum compatible with the work to be performed.

9.2 Suitable breathing apparatus, e.g. of the air-line or self-contained type, should always be worn, and only

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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.

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

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

9.5 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.

9.6 The advice in paragraph 8.5 concerning emergency rescue operations is particularly relevant in this context.

10 HAZARDS RELATED TO SPECIFIC TYPES OF SHIPS OR CARGO

10.1 **Dangerous goods in packaged form**

10.1.1 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 vapours 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 Emergency Procedures for Ships Carrying Dangerous Goods (EMS) and Material Safety Data Sheets (MSDS)*. If there is evidence or suspicion that leakage of dangerous substances has occurred, the precautions specified in section 9 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)).

10.1.2 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.

10.2 **Liquid bulk**

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.

10.3 **Solid bulk**

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.

10.4 **Use of Nitrogen as an inert gas***

Nitrogen is a colourless and odourless 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 the Guidelines on tank entry for tankers using nitrogen as an inerting medium MSC.1/Circ.1401).

10.5 **Oxygen-depleting cargoes and materials**

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:

10.5.1 grain, grain products and residues from grain processing (such as bran, crushed grain, crushed malt or meal), hops, malt husks and spent malt;

10.5.2 oilseeds as well as products and residues from oilseeds (such as seed expellers, seed cake, oil cake and meal);

10.5.3 copra;

10.5.4 wood in such forms as packaged timber, round wood, logs, pulpwood, props (pit props and other propwood), woodchips, woodshavings, wood pellets and sawdust;

10.5.5 jute, hemp, flax, sisal, kapok, cotton and other vegetable fibres (such as esparto grass/Spanish grass, hay, straw, bhusa), empty bags, cotton waste, animal fibres, animal and vegetable fabric, wool waste and rags;

10.5.6 fish, fishmeal and fishscrap;

10.5.7 guano;

10.5.8 sulphidic ores and ore concentrates;

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10.5.9 charcoal, coal, lignite and coal products;

10.5.10 direct reduced iron (DRI);

10.5.11 dry ice;

10.5.12 metal wastes and chips, iron swarf, steel and other turnings, borings, drillings, shavings, filings and cuttings; and

10.5.13 scrap metal.

10.6 **Fumigation**

When a ship is fumigated, the detailed recommendations contained in the Recommendations on the safe use of pesticides in ships (MSC.1/Circ.1358) should be followed. Spaces adjacent to fumigated spaces should be treated as if fumigated.

11 CONCLUSION

Failure to observe simple procedures can lead to persons being unexpectedly overcome when entering enclosed spaces. Observance of the principles and procedures outlined above will form a reliable basis for assessing risks in such spaces and for taking necessary precautions.

The reproduction of the text of IMO Assembly Resolution A.1050(27) has been done with the agreement of the IMO Publishing Service, London. The International Maritime Organization does not, however, accept any responsibility for the authenticity of this text and, in case of doubt, the original text of Assembly Resolution A.1050(27) published by IMO shall prevail.

IMO AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974, AS AMENDED – RESOLUTION MSC.350(92) ADOPTED 21 JUNE 2013

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO article VIII(b) of the International Convention for the Safety of Life at Sea (SOLAS), 1974 (hereinafter referred to as "the Convention"), concerning the amendment procedure applicable to the annex to the Convention, other than to the provisions of chapter I thereof,

HAVING CONSIDERED, at its ninety-second session, amendments to the Convention, proposed and circulated in accordance with article VIII(b)(i) thereof,

1. ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the Convention, the text of which is set out in the annex to the present resolution;

2. DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the said amendments shall be deemed to have been accepted on 1 July 2014, unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50 per cent of the gross tonnage of the world's merchant fleet, have notified their objections to the amendments;

3. INVITES SOLAS Contracting Governments to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2015 upon their acceptance in accordance with paragraph 2 above;

4. REQUESTS the Secretary-General, in conformity with article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Contracting Governments to the Convention;

5. ALSO REQUESTS the Secretary-General to transmit copies of this resolution and its annex to Members of the Organization which are not Contracting Governments to the Convention.

CHAPTER III - LIFE-SAVING APPLIANCES AND ARRANGEMENTS

Part B
Requirements for ships and life-saving appliances
Regulation 19 — Emergency training and drills

1 The existing text of paragraphs 2.2 and 2.3 is replaced with the following:

2.2 On a ship engaged on a voyage where passengers are scheduled to be on board for more than 24 h, musters of newly-embarked passengers shall take place prior to or immediately upon departure. Passengers shall be instructed in the use of the lifejackets and the action to take in an emergency.

2.3 Whenever new passengers embark, a passenger safety briefing shall be given immediately before departure, or immediately after departure. The briefing shall include the instructions required by regulations 8.2 and 8.4, and shall be made by means of an announcement, in one or more languages likely to be understood by the passengers. The announcement shall be made on the ship's public address system, or by other equivalent means likely to be heard at least by the passengers who have not yet heard it during the voyage. The briefing may be included in the muster required by paragraph 2.2. Information cards or posters or video programmes displayed on ships video displays may be used to supplement the

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briefing, but may not be used to replace the announcement."

2 After existing paragraph 3.2, a new paragraph 3.3 is inserted as follows:

3.3 Crew members with enclosed space entry or rescue responsibilities shall participate in an enclosed space entry and rescue drill to be held on board the ship at least once every two months."

3 Existing sections 3.3 and 3.4 are renumbered as 3.4 and 3.5, respectively. In the renumbered paragraph 3.4.2, the reference "paragraph 3.3.1.5" is replaced by the reference "paragraph 3.4.1.5"; and in the renumbered paragraph 3.4.3, the reference "paragraphs 3.3.4 and 3.3.5" is replaced by the reference "paragraphs 3.4.4 and 3.4.5"

4 After the renumbered section 3.5, the following new section is added:

3.6 Enclosed space entry and rescue drills

3.6.1 Enclosed space entry and rescue drills should be planned and conducted in a safe manner, taking into account, as appropriate, the guidance provided in the recommendations developed by the Organisation

3.6.2 Each enclosed space entry and rescue drill shall include:

.1 checking and use of personal protective equipment required for entry;

.2 checking and use of communication equipment and procedures;

.3 checking and use of instruments for measuring the atmosphere in enclosed spaces;

.4 checking and use of rescue equipment and procedures; and

.5 instructions in first aid and resuscitation techniques."

5 In paragraph 4.2, at the end of subparagraph .3, the word "and" is deleted; at the end of subparagraph .4, the period "." is replaced by the word "; and"; and after subparagraph .4, the following new subparagraph is added:

.5 risks associated with enclosed spaces and on board procedures for safe entry into such spaces which should take into account, as appropriate, the guidance provided in recommendations developed by the Organization.

6 In paragraph 5, after the words "fire drills," the words "enclosed space entry and rescue drills," are inserted.

CHAPTER V - SAFETY OF NAVIGATION

Regulation 19 - Carriage requirements for shipborne navigational systems and equipment

7 In subparagraph 1.2.1, the words "1.2.2 and 1.2.3" are replaced with the words "1.2.2, 1.2.3 and 1.2.4".

8 In subparagraph 1.2.2, the word "and" at the end of the subparagraph is deleted and in subparagraph 1.2.3, the full stop "." is replaced with the word "; and".

9 After the existing subparagraph 1.2.3, the following new subparagraph is added:

.4 be fitted with the system required in paragraph 2.2.3, as follows:

.1 passenger ships irrespective of size, not later than the first survey after 1 January 2016;

.2 cargo ships of 3,000 gross tonnage and upwards, not later than the first survey~ after 1 January 2016;

.3 cargo ships of 500 gross tonnage and upwards but less than 3,000 gross tonnage, not later than the first survey~ after 1 January 2017; and

.4 cargo ships of 150 gross tonnage and upwards but less than 500 gross tonnage, not later than the first survey* after 1 January 2018.

The bridge navigational watch alarm system shall be in operation whenever the ship is underway at sea.

The provisions of paragraph 2.2.4 shall also apply to ships

10 After the new subparagraph 1.2.4, the following new paragraph is added:

"1.3 Administrations may exempt ships from the application of the requirement of paragraph 1.2.4 when such ships will be taken permanently out of service within two years after the implementation date specified in subparagraphs 1.2.4.1 to 1.2.4.4."

Enclosed Spaces (cont.)

CHAPTER XI-1 - SPECIAL MEASURES TO ENHANCE MARITIME SAFETY

Regulation 1 – Authorization of recognized organizations

11 The existing text of regulation 1 is replaced with the following:

"The Administration shall authorize organizations, referred to in regulation I/6, including classification societies, in accordance with the provisions of the present Convention and with the Code for Recognized Organizations (RO Code), consisting of part 1 and part 2 (the provisions of which shall be treated as mandatory) and part 3 (the provisions of which shall be treated as recommendatory), as adopted by the Organization by resolution MSC.349(92), as may be amended by the Organization, provided that:

a) amendments to part 1 and part 2 of the RO Code are adopted, brought into force and take effect in accordance with the provisions of article VIII of the present Convention;

b) amendments to part 3 of the RO Code are adopted by the Maritime Safety Committee in accordance with its Rules of Procedure; and

c) any amendments adopted by the Maritime Safety Committee and the Marine Environment Protection Committee are identical and come into force or take effect at the same time, as appropriate.

The reproduction of the text of IMO Assembly Resolution MSC.350(92) has been done with the agreement of the IMO Publishing Service, London. The International Maritime Organization does not, however, accept any responsibility for the authenticity of this text and, in case of doubt, the original text of Assembly Resolution MSC.350(92) published by IMO shall prevail.

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Enclosed Spaces (cont.)

ANNEX 1: EXAMPLE OF AN ENCLOSED SPACE ENTRY PERMIT

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 person and by any persons 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:		
- oxygen .....% vol (21%)* By:		
- hydrocarbon .....% LFL (less than 1%)		
- toxic gases ..... ppm (less than 50% OEL of the specific gas) Time: (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?	.....	.....

* Note that national requirements may determine the safe atmosphere range.

Enclosed Spaces (cont.)

	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 each 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	"	"

Enclosed Spaces (cont.)

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 any 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)

Names .....

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.