

Enclosed Space Entry Workbook

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1. Enclosed Space Entry

Enclosed Space Entry

Every year many seafarers are injured or killed during work in enclosed spaces, therefore IMO has introduced new requirements in SOLAS Chapter III, regulation 19, which entered into force on 1 January, 2015. *“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.”*

Enclosed space accidents can happen in any ship. The location for these accidents are often cargo holds, oil tanks, engine rooms, ballast tanks and duct keels. But also locations like chain lockers and deck stores can be dangerous. The most common causes of death or injury are oxygen deficiency, carbon monoxide, hydrocarbons, hydrogen sulphide, and refrigerants.

The majority of the jobs in an enclosed space are carried out efficiently and safely without any danger for the personnel, but the small percentage of the jobs that ends in an accident very often have serious or fatal consequences.

What is an Enclosed space?

Enclosed space means a space which has any of the following characteristics.

- Limited openings for entry and exit
- Inadequate ventilation
- Is not designed for continuous worker occupancy

And includes, but not limited to, 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.

According to IMO, accidents on board ships are in most cases caused by an insufficient knowledge of, or disregard for, the need to take precautions rather than lack of guidance.

If this is to be changed there must be a focus on:

Training

Realistic and frequent awareness training and drills should be carried out.

According to SOLAS an enclosed space entry and rescue drill shall include;

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

Culture

Lack of safety culture is a root cause for accidents. Safety culture must be implemented on all levels. There should be developed an enclosed space management plan.

Procedures and permits to work in an enclosed space must be in place and used.

Other areas to focus on will be:

Equipment

All equipment must be easy to use and fit for purpose.

Design

Shipboard design and operation should minimise the need to go into enclosed spaces and escape possibilities should be in place.

Recurring accidents in enclosed spaces

Despite the fact that just about everyone seems to be aware of the hazard, accidents with fatality and serious injury continue to happen. The key to avoid such accidents is to ensure a safety culture, the safest possible equipment and operation, and to educate personnel from the top management through the entire crew onboard.

More than once those who try to rescue people working in the enclosed space have been killed or seriously injured due to lack of proper knowledge, training and equipment.

The most common factors in fatal accidents are:

- failure to recognise an enclosed space
- failure to recognise the hazards involved in enclosed space entry

- tendency to trust physical senses
- tendency to underestimate the danger
- complacent attitude
- attempt to rescue another crew member

Safety Management plan for enclosed space entry

There should be made a strategy to prevent accidents related to enclosed spaces. The company should ensure that procedures for enclosed space entry are made and used by all involved personnel.

The crew onboard should be trained in the use and importance of atmospheric testing equipment.

Responsible persons should be trained in risk assessment associated with entry into enclosed spaces.

The crew should have enclosed space awareness training at regular intervals.

Internal audits should verify that the safety management plan is followed onboard the vessel.

A safety management plan for enclosed spaces should at least contain the following:

- a training schedule which should include training and drills according to SOLAS requirements
- guidance on how to determine if a space may be hazardous
- procedures to be followed during all stages before and during work in an enclosed space
- guidance on standards and duties of personnel involved in work in an enclosed space
- guidance on safety equipment to be used in enclosed space entry
- emergency procedures including evacuation and rescue of personnel in an enclosed space

Risk assessment

All enclosed spaces onboard the vessel must be identified. Whenever work is to be carried out in any of these spaces there must be carried out a risk assessment. The risk assessment should include all potential hazards in the space to be entered, taking into account previous cargo, ventilation, oxygen deficiency or enrichment, flammable or toxic atmosphere, etc.

If the risk assessment indicates a potential risk to health or life, all possible precautions must be made to eliminating such risks.

When carrying out a risk assessment all hazards must be considered;

What is inside the enclosed space?

Atmosphere, structure, content or condition of the enclosed space.

What is affected inside the enclosed space by the work?

Can the work inside the enclosed space increase the risk of dangers? Can the work affect the atmosphere by the use of cleaning chemicals and flammable substances, etc.?

What is outside the enclosed space?

Are there any hazards or substances outside the enclosed space that could affect the persons inside the space? Are all pipelines etc. containing harmful substances isolated or sealed off? Are all automatic equipment and valves secured against inadvertent operation? Is there any nearby work to the enclosed space or the ventilation system that affect the safety of those working inside the enclosed space?

Before entry

No personnel must open or enter an enclosed space before it is authorized by the master or a responsible person assigned by the master. Such authorization should not be given unless all safety procedures have been followed.

Everyone should refuse to enter a space they consider unsafe, do not enter the space if in doubt, and only enter it if the correct procedures have been followed, even in an emergency.

During occupation

The atmosphere must be tested frequently, persons inside the enclosed space should carry multi-gas detectors that monitor oxygen and other dangerous gases that can be present. The ventilation must continue as long as the space is occupied and during breaks. After a break the atmosphere must be re-tested. If the ventilation stops during work all personnel must be evacuated.

If the atmosphere in the space is known or suspected to be unsafe it should only be entered when **no practical alternative exist**. A minimum number of workers should enter the space and they must be well trained in the use of the safety equipment needed.

Emergency

In case of an emergency or an accident inside the space, under no circumstances should personnel enter the space before help has arrived and the situation has been evaluated to ensure the safety of the rescue team. Only trained personnel should perform the rescue operation.

2. Exercises

Both exercises are marked with a score; try to answer all questions as comprehensive as possible. 75% score is required to pass the course.

Although it might not be you who usually plan and prepare enclosed space entry exercises, these two exercises will focus on all important aspects regarding enclosed space entry.

Exercise 1 (40 marks/score)

All questions must be answered to pass the exercise.

1. What is your position onboard?
2. What type of vessel are you onboard?
3. Have you done work inside an enclosed space? If so, which enclosed space?
4. Does your vessel have a safety management plan for enclosed space entry?
5. Which procedures and checklists do you have onboard your vessel regarding enclosed space entry?
6. If you shall enter a cargo or fuel tank, why is it essential to look at the material safety data sheet (MSDS) for the last substance in the tank before you start planning for a safe entry into the tank?
7. Many accidents in enclosed spaces are caused due to underestimation of the danger or hazards, is this a focus on onboard your vessel?
8. Describe the safety culture in your company.
9. How often are enclosed space entries and rescue drills executed onboard your vessel?
10. What is the procedure if you have personnel from shore working in any of the vessels enclosed spaces?
11. Tendency to trust physical senses, underestimate the danger and complacent attitude are all common factors in fatal accidents, describe how you think this factors can be avoided.

Exercise 2 (80 marks/score)

All questions must be answered to pass the exercise.

In this exercise you shall plan and prepare a realistic enclosed space entry exercise. It is important that the exercise is prepared and planned as a real enclosed space entry.

Choose **one** of the following enclosed spaces: Fuel tank, Ballast tank, Bilge water tank, Duct keel, or Cofferdam.

1. Before you plan the exercise you should have a main goal(s) for the exercise, what will be your main goal(s) for this exercise?
2. Which enclosed space did you choose?
3. What potential hazards or dangers and can you expect in the enclosed space you chose?
4. What can be the reason for these hazards or danger?
5. How can you ensure the safest possible atmosphere before entering the enclosed space?
6. Which measuring instruments would you use for testing the atmosphere in the space?
7. Which personal protective and safety equipment will be used in the exercise?
8. How would you ensure that all crew in the exercise understand the importance of the use of the protective and safety equipment?
9. Which checklists and procedures do you have to help you with in the preparation of the enclosed space exercise?
10. What communication equipment will be used during the exercise? What will be the routine for communication?
11. In the exercise you must set up a rescue team, who will be in the rescue team? How would you train the rescue team?
12. What type of rescue equipment is available onboard your vessel?

3. Document status

Issue no.	Date	Author
A	08.04.2015	Anders Brunvoll
A1	20.09.2016	AB
A2	14.02.2018	AB
A3	15.08.2018	AB
2.0	25.11.2020	IG

4. Changes in the document

Issue no.	Paragraph no.	Description
A1	1.3	Added: The candidate must complete all CBTs, read trough and complete all exercises in this workbook. Candidate must at least obtain 95% completion and a test score of 75% on all CBTs.
	1.5	Added: "and not be older than 12 months."
A2		Replaced module #285 with #387, #388, #389
A3	1.7	Updated text
	4	Updated evaluation form
2.0		New Ocean TG course template. Split procedure and workbook, changed version numbering