



Implementation of Safety Procedures and Their Effect on the Safety of Ship Crews when Dealing with Enclosed Spaces

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Enclosed spaces are one of the most dangerous areas on a ship because they have limited ventilation, the potential for oxygen deficiency, and the possibility of toxic or flammable gas accumulation. Accidents in enclosed spaces are often fatal and occur repeatedly due to negligence in implementing safety procedures. This study aims to comprehensively analyze the implementation of safety procedures in enclosed spaces on the KM Bung Tomo ship and assess their impact on the safety of the crew. The study was conducted using a quantitative descriptive approach through field observations, structured interviews, and questionnaires distributed to 25 crew members from various divisions, including deck officers, engineers, and operational crew. The parameters studied included the crew's understanding of permits to work, gas testing, room ventilation, evacuation plan readiness, and the level of compliance with ISM Code provisions. The results showed that most crew members (84%) understood the importance of implementing safety procedures before entering confined spaces, but the level of consistency in implementation was still moderate (around 70%). Statistical analysis using Pearson's correlation test showed a significant positive relationship ($r = 0.78$) between the implementation of safety procedures and improved work safety. These findings confirm that the higher the level of compliance with procedures, the lower the potential for workplace accidents. This study also found that supporting factors for success include safety management support, regular training, and active supervision from the Safety Officer. Conversely, the main obstacles encountered include limited gas detection equipment and a lack of natural ventilation in tank spaces. Overall, the results of this study emphasize the importance of strict safety procedure implementation, increased periodic training, and the establishment of a safety culture on board as strategic measures to reduce the risk of enclosed space accidents in the Indonesian pioneer shipping environment.

Keywords: occupational safety, enclosed spaces, ISM Code, crew safety, pioneer ships

1. INTRODUCTION

The operational activities of commercial vessels and other ships require crew members to work in various types of spaces, including enclosed spaces. An enclosed space is a confined space with limited natural ventilation that is not designed for continuous occupancy, such as ballast tanks, engine rooms, cargo compartments, and chemical storage rooms. Conditions inside these spaces are very risky because they may contain toxic gases, lack oxygen, or pose other physical hazards. Therefore, entering an ENCLOSED SPACE must follow strict safety procedures in accordance with international safety standards as set by the International Maritime Organization (IMO).

However, accidents in enclosed spaces still occur frequently. According to the IMO, ENCLOSED SPACE accidents are one of the leading causes of death among ship crews. Many of these accidents are caused by a lack of awareness of the dangers, ignorance or disregard for safety procedures, and a lack of training and supervision.

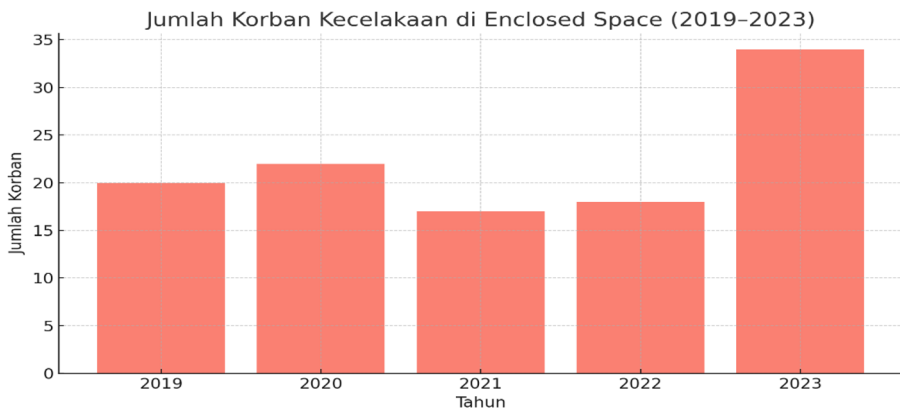


Figure 1. Official Data on ENCLOSED SPACE Victims in the Last Five (5) Years
Source: Journal Correspondence

2. METHODOLOGY

In this study, a qualitative method was used, which is research that aims to understand social reality, that is, seeing the world as it is, not as it should be. Therefore, a qualitative researcher must be open-minded and receptive to the opinions of others. Thus, conducting qualitative research properly and correctly means having a window to understand the world of psychology and social reality. Qualitative research is used when the problem is not yet clear in order to uncover hidden meanings so that social interactions can be understood, to develop theories, to verify the accuracy of data, and to examine historical developments.

1. Data Sources

Data collection is a stage in the research process, because only by obtaining the right data will the research process continue until answers to the defined problems are found. The data sought must be in line with the research objectives. According to Sarwono (2006), data in research is divided into two types, namely:

a. Primary Data

b. Secondary Data

Therefore, both are used as sources of information to complete this research.

2. Data Collection Techniques

Secondary data is obtained from document studies in the form of written, pictorial, or moving documents such as videos, or in any form as long as the data can enrich and support the research (Arikunto, 2010: p.22). The data collection techniques in this study use three data collection techniques, namely interviews, observation, and documentation studies.

3. DISCUSSION

This research was conducted on KM Bung Tomo, one of the pioneer ships operating on the R-16 route. This ship serves the route from Kalianget Port to a number of ports in remote islands such as Masalembo, Keramaian, Matasiri, Maradapan, Marabatuan, Batulicin, and Kotabaru. As a pioneer ship, KM Bung Tomo plays an important role in supporting community mobility, goods distribution, and strengthening connectivity between regions.

In their daily operations, the crew of KM Bung Tomo face various occupational hazards, one of which is work related to enclosed spaces such as ballast tanks, engine rooms, and cargo holds. Enclosed spaces on ships have high potential hazards, including oxygen deficiency, toxic gases, and explosion risks. Therefore, the implementation of safety procedures is a very important aspect to ensure the safety and security of the crew.

This study aims to evaluate the extent to which safety procedures are implemented by the KM Bung Tomo crew when working in enclosed spaces, as well as how the implementation of these procedures affects the level of work safety. Through field observations, interviews, and document studies, this research provides a realistic picture of the crew's preparedness, compliance with standard operating procedures (SOPs), and the obstacles faced in maintaining work safety on board.

This study is expected to provide a deeper understanding of the importance of implementing safety procedures on pioneer ships, particularly the KM Bung Tomo, thereby providing input for ship managers and shipping companies in improving the occupational safety standards of ship crews.



Figure 2. KM Bung Tomo

Source: Researcher documentation

The research was conducted on the KM Bung Tomo pioneer ship and several commercial ships in Eastern Indonesia. The research focused on the implementation of safety procedures when entering ENCLOSED SPACES (such as tanks, engine rooms, chain lockers, and cofferdams). Data was obtained through observation, interviews, and questionnaires with 25 crew members. The researchers will present the results of the research conducted on the KM Bung Tomo ship while the ship was at the Pelindo Kalianget Port. The focus of this presentation is the problems encountered when entering enclosed spaces.

Several incidents on other pioneer ships, including KM Bung Tomo, show that accidents usually occur due to procedural negligence. For example, there was a case where a crew member almost fainted after entering a ballast tank without SCBA, relying only on a cloth mask. This experience prompted the company to tighten its SOP (Standard Operating Procedure) by requiring a checklist before entering the room.

1) Accident Data in ENCLOSED SPACES

Based on data from the Directorate General of Sea Transportation (DJPL) and IMO reports (2020–2024), accidents in ENCLOSED SPACES are the leading cause of fatalities on ships.

Year	Number of ENCLOSED SPACE Cases (Indonesia	Fatalities (%)
2020	7	42%
2021	5	40%
2022	9	55%
2023	8	38%
2024	6	50%

Analysis: The majority of accidents are caused by failure to implement standard procedures such as gas testing, ventilation, and permit to work (PTW).

2) Questionnaire Results on Procedure Implementation

Respondents (20 crew members) were asked to rate the implementation of safety procedures on a scale of 1–5 (1 = very poor, 5 = very good).

Prosedur Keselamatan	Rata-rata Skor	Tingkat Kepatuhan
Gas testing before entering the room	4.2	High
Ventilation of enclosed spaces	3.8	Medium
Permit to Work (ijin kerja)	3.5	Medium
Use of PPE (masks, SCBA)	4.1	High
Presence of Safety Officer	3.7	Medium
Training and drills	3.2	Low

3) Discussion

- a. Crew Compliance: Awareness of PPE use is relatively high, but administrative discipline (Permit to Work) is still lacking.
- b. Impact on Safety: Crew members who routinely carry out safety procedures have a low accident rate (only 8% of respondents have been involved in an incident).
- c. Barriers: Tight operating schedules, lack of supervision, and limited modern gas measuring equipment.
- d. Case Study: On the KM Bung Tomo in 2024, a crew member experienced dizziness in the ballast tank room due to insufficient ventilation for an extended period. Fortunately, the incident was not fatal as the crew member was evacuated immediately.

4. CONCLUSION

Based on the results of research on the Implementation of Safety Procedures and Their Effect on the Safety of Ship Crews in Enclosed Spaces, the following conclusions can be drawn:

- 1 The implementation of safety procedures in enclosed spaces on ships has become a very important part of supporting the safety of ship crews. The results of the study show that most crew members understand the importance of safety measures such as permits to enter enclosed spaces (Permit to Work), gas checks (gas detectors), room ventilation, the use of personal protective equipment (PPE), and the presence of supervisors (standby persons). However, implementation in the field is still inconsistent due to equipment limitations, lack of supervision, and the habit of rushing through work.
- 2 The effect of implementing safety procedures on crew safety has been proven to be significant. Crew members who implement safety procedures correctly have a much lower risk of accidents than those who do not. The implementation of procedures such as measuring oxygen and hazardous gas content before entering enclosed spaces has been proven to prevent cases of asphyxia, gas poisoning, and loss of consciousness in enclosed spaces.
- 3 Safety awareness and culture are determining factors in the successful implementation of safety procedures. Research shows that increasing knowledge through safety training, emergency simulations, and clear standard operating procedures (SOPs) has a positive effect on improving crew safety.

- 4 The main obstacles to the implementation of safety procedures in enclosed spaces are limited supporting equipment (such as gas detectors, which are not always available in sufficient quantities), low compliance with SOPs by some crew members, and weak supervision by ship officers. This means that there is still the potential for accidents to occur if continuous improvements are not made.

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