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Improving the Safety Management System to Reduce the Risk of Workplace Accidents on the MT. Stargaze Ship

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Abstract

This study aims to analyze the factors that hinder safety management and the efforts needed to improve the safety management system in order to reduce the risk of occupational accidents on board MT Stargaze. This research used a qualitative method with observation, interviews, and documentation techniques. The study was conducted over 12 months, starting on 23 July 2024 when the researcher departed from Singapore and ending on 23 July 2025 in Indonesia. Observations focus on the use of Personal Protective Equipment (PPE), the implementation of safety meetings, safety drills, work supervision, filing practices, and the maintenance of safety equipment. Secondary data were obtained from PPE inventory records, safety meeting notes, drill lists, the deck logbook, inspection reports, and maintenance records for safety equipment during the research period. The findings show that safety management on board has been implemented, but inconsistencies remain in PPE usage, limited understanding among some crew members regarding safety procedures, and document filing that is not yet fully orderly. These findings are supported by interviews and documentation, which indicate the continuing need for guidance, stronger supervision, and disciplined work practices. The necessary improvement efforts include routine coaching, stricter officer supervision, better reporting discipline, and ensuring that safety equipment is always ready for use so that the safety management system can operate more effectively

Keywords: Safety Management, Occupational Accidents, Personal Protective Equipment

INTRODUCTION

The International Safety Management Code (ISM Code) is a form of standardization in occupational safety, health and environmental management systems (Mudiyanto, 2018). This regulation has the same standing as the Occupational Health and Safety Assessment Series (OHSAS) and the International Organization for

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Standardization (ISO) (Hz & Rosalina, 2025). Unlike most voluntary management systems, the implementation of the ISM Code is binding, mandated by international regulations and law. Domestically, Indonesia implements a similar policy through the Occupational Safety and Health Management System (SMK3), a mandatory standardization whose legal framework is explicitly stipulated in Government Regulation Number 50 of 2012.

The International Safety Management Code (ISM Code) is a safety management system that provides guidance for shipping companies in developing and implementing various safety procedures. The implementation of these procedures aims to ensure that all conditions, operations, and task commitments on board are aligned with applicable standards. Through this governance, occupational safety and the protection of all crew members on board can be planned, organized, and strictly monitored to comply with regulations and internal provisions established by the company (Fauzan et al., 2025).

The Safety Management System (SMS) is developed and implemented directly by all crew members responsible for fleet operations and the prevention of marine pollution from ships. Within this framework, a thorough understanding of the differentiation of responsibilities and authorities of each personnel involved is crucial, including clear communication channels connecting shore-based and shipboard personnel. This safety management system is purposefully designed and applied to every detail of operational tasks to achieve two primary goals: ensuring shipping safety and preserving the maritime ecosystem.

As an illustrative case, a fatal incident occurred in East Kalimantan involving three workers on the MT Nur Hasanah ship. The victims were found dead in the ship's hold, allegedly due to exposure to toxic gas. The incident began when five workers intended to disembark to retrieve samples of the oil cargo. Three personnel entered the hold area, while two others stood guard on the upper deck. Upon entering the enclosed space contaminated with hydrogen sulfide gas, the workers were allegedly not equipped with adequate Personal Protective Equipment (PPE). As a result, the three victims immediately inhaled the hazardous gas, losing consciousness and dying (Widodo & Setiawan, 2022);(Husna et al., 2019).

To minimize the impact of such incidents, preventive measures are required through the implementation of a comprehensive occupational safety system. These occupational safety efforts are essentially designed to reduce the frequency of accidents and operational errors (human error) influenced by the characteristics of the task and work environment. Through the implementation of proper occupational safety, the introduction of adequate Personal Protective Equipment (PPE), and the enforcement of the Safety Management System (SMS), the potential for workplace accidents can be significantly reduced. To realize the standardization of applicable SMS on board ships

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through work procedures based on control sheets (checklists) with the criteria of the International Safety Management Code (ISM Code).

METHODOLOGY

This study uses a qualitative approach with descriptive methods to systematically describe the implementation of a safety management system in supporting the smooth loading and unloading activities on board a ship. The study was conducted on board the MT. Stargaze, a Type II Oil/Chemical Tanker operating on international voyages. The researcher acted as a deck cadet who carried out sea practice so that he could make direct observations of the ship's operational activities. The data sources used consisted of primary and secondary data. Primary data were obtained through interviews with the Chief Officer and Third Officer and the results of observations during the ship's operational activities, while secondary data were obtained from inventory documents, equipment maintenance and care data, and other documents related to the safety management system.

Data collection was conducted through observation, interviews, and documentation to obtain comprehensive information regarding the implementation of the safety management system on board ships. The data obtained were then analyzed using qualitative data analysis techniques, including data reduction, data presentation, and conclusion drawing. The data reduction stage was carried out by selecting, grouping, transcribing, and organizing data according to the research focus. Next, the data were presented in the form of descriptive descriptions supported by charts, documentation, and observation results to facilitate interpretation. The final stage was carried out by drawing conclusions based on the analysis results to obtain a complete picture of the implementation of the safety management system in supporting the smooth loading and unloading process on board ships.

Results and discussion

Data Presentation

1. Observation Results

Based on observations, the safety management system on the MT. Stargaze appears to be operationally implemented, but practical inconsistencies were still identified in some tasks. The observations focused on three main activities: cargo loading on the main deck, fire drills, and abandon ship drills.

During cargo loading activities, researchers observed that crew members working in the manifold and main deck areas, particularly under the supervision of the Chief Officer and deckhands, were not always wearing complete PPE, particularly goggles, during the work. Furthermore, at the beginning of the work, there was still a tendency for

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toolbox meetings to not be followed with full discipline by all personnel involved. This indicates that work procedures are in place, but their implementation still needs to be strengthened to ensure that each work stage truly adheres to established safety regulations.

During the fire drill and abandon ship drill activities, observations showed that safety drills had been carried out, but crew compliance with the sequence of procedures was still not entirely consistent. The Third Officer as the drill implementing officer had provided direction, but on several occasions crew members were still found to be late to the assembly point, not ready to put on safety equipment quickly, or not adapting to the drill instructions in an orderly manner. The form of warning given was verbal and directly at the drill location, accompanied by repeated instructions for the crew to repeat the inappropriate actions. This finding is also supported by the existence of Fire Drill Report documents, Abandon Ship Drill Reports, steering gear failure documentation, and drill oil spills during cargo operations which indicate that safety activities were indeed carried out and recorded, but still require improvement in aspects of discipline, preparedness, and orderly implementation of procedures.

Table 1. Observation Results on the MT. Stargaze Ship

Observation Activities	Observed Personnel	Specific Findings	SOP / Procedures Not Complied With	Warning and Corrective Action	Documentary Evidence
*Cargo loading*on the main deck	*Chief Officer*, helmsman, AB/OS in the manifold area	When work is underway, the use of gloves and goggles is not always complete, and toolbox meetings are not attended by all personnel in a disciplined manner.	SOP for loading and unloading work, PPE inspection before work, and initial work briefing	Given a verbal warning, required to complete PPE, then re-checked before work continues	Attachment of MT. Stargaze Work SOP and documentation of drill oil spill during cargo operation
Fire drill	*Third Officer*and ship crews involved in	There are still crew members who are not	Emergency preparedness SOP and	The officer gave re-instructions, directed	Fire Drill Report Attachment

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Observation Activities	Observed Personnel	Specific Findings	SOP / Procedures Not Complied With	Warning and Corrective Action	Documentary Evidence
	the exercise	responsive when heading to the assembly point and are not ready to follow the training sequence quickly.	muster procedures	each person's position, and reprimanded the crew who were late.	
Abandon ship drill	*Third Officer*, watch crew, and other ship's crew	There are still delays in wearing safety equipment and irregularities when following training commands.	Emergency evacuation SOP and abandon ship procedures	Direct warnings, repetition of instructions, and recording of findings in training reports are carried out.	Attachment of Abandon Ship Drill Report and Abandon Ship Drill documentation

2. Interview

Based on the results of interviews with the Chief Officer, the implementation of safety management on the MT Stargaze vessel was deemed to have been implemented in operational activities, but in practice there were still discrepancies found in certain jobs, especially during cargo loading on the main deck. In this job, the Chief Officer explained that all crew members involved should have attended a toolbox meeting before work began, used complete Personal Protective Equipment (PPE), and ensured the work area was safe before the load connection was carried out. However, from observations during the sea practice period, there were still conditions where the use of gloves, goggles, and safety helmets was not fully disciplined, so that safe work procedures were not implemented consistently. This condition indicates that SOPs are in place, but their implementation still needs to be strengthened at the initial supervision stage of the job.

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*Chief Officer*also stated that the obstacles that arose were not limited to cargo loading, but also to safety activities such as fire drills and abandon ship drills. During the drills, crew members were still found to be late to assembly points, not responding promptly to commands, or not adapting quickly to the sequence of emergency procedures. The warnings given were direct and verbal, accompanied by repeated instructions for the crew to correct any inappropriate actions. The results of the corrections were then recorded in the drill report and used as material for internal evaluation. These findings indicate that violations were not always serious, but tended to be recurring in aspects of discipline, preparedness, and compliance with safety procedures.

The results of the interview with the Third Officer showed that the implementation of occupational safety on the MT Stargaze vessel was already implemented in daily activities, especially during the supervision of work on deck and the implementation of safety training. During the fire drill and abandon ship drill activities, the Third Officer explained that the crew should immediately respond to alarms, go to their respective positions according to the muster list, and wear safety equipment according to the provisions. However, on several occasions, crew members were still found to be not fully orderly in following the training sequence, either because they were late in moving or because they were not disciplined in wearing complete safety equipment. This indicates that emergency procedures are generally understood, but their implementation still needs to be practiced repeatedly to become a habit.

Furthermore, the Third Officer stated that safety documentation such as fire drill reports, abandon ship drill reports, steering gear failure documentation, and drill oil spills during cargo operations are evidence that safety activities are indeed carried out on board the ship. However, in terms of archiving and reporting, there is still a need to improve the accuracy of recording so that data is easily traced and used as evaluation material. In practice, officers are given direct warnings when a crew member does not follow the procedure correctly, then instructions are repeated or work position corrections are carried out until the procedure is understood. The results of this interview confirmed that the main obstacle is not the lack of safety activities, but rather the consistency of crew discipline and the orderly implementation of SOPs in every training and risky work.

3. Documentation Data

Based on the results of the examined documentation, researchers reviewed documents that were indeed relevant to safety activities on board the MT Stargaze, namely PPE inventory data, safety equipment maintenance and care records, Fire Drill Reports, Abandon Ship Drill Reports, MT. Stargaze Work SOPs, MT. Stargaze Steering gear failure documentation, and oil spill drill documentation during cargo operations.

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These documents show that safety activities on board are not only carried out in practice, but are also recorded as part of safety control and evaluation materials. From the content of the documents, it is seen that safety equipment is available as ship inventory, emergency drills are carried out, and equipment maintenance is carried out periodically to maintain operational readiness.

Table 2. Safety Management Documentation at MT. Stargaze

No	Document Type	Document Contents / Functions	Relevant Findings
1	PPE inventory data	Demonstrates the availability of personal protective equipment on board.	*PPE*listed as safety equipment that must always be available
2	Maintenance and care records	Shows the safety equipment maintenance schedule and condition.	Safety equipment is checked to ensure it is always ready for use.
3	*MT. Stargaze Work SOP*	To serve as a guideline for safe work procedures on ships	Be a reference in risky work activities on deck
4	*Fire Drill Report*	Evidence of fire emergency drills	Demonstrate safety drills are implemented and recorded
5	*Abandon Ship Drill Report*	Evidence of abandon ship practice	Demonstrate crew readiness in case of emergency
6	Steering gear failure documentation	Evidence of training/handling of steering disorders	Indicates that there is readiness testing under emergency technical conditions.
7	Documentation of drill oil spill during cargo operation	Evidence of oil spill response training	Demonstrate preparedness for pollution prevention during cargo operations

However, documentation also shows that the existence of documentation does not automatically guarantee the full implementation of safety discipline in the field. Inventory and maintenance records indicate the presence of safety equipment, but observations and interviews confirm that inconsistencies remain in the use of PPE, the orderliness of reporting, and the neatness of filing. Thus, the documentation data confirms that the safety system is in place, but it still requires stricter supervision, ongoing coaching, and more disciplined follow-up on any findings to ensure that occupational safety is truly effective.

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Data analysis

The analysis results show that the implementation of safety management on the MT. Stargaze has been implemented in operational activities, but its implementation is not yet fully uniform across the three observed jobs. During cargo loading on the main deck, safe work procedures are available through the ship's SOP, but there was still disorder in the initial stages of the work, especially in the use of complete PPE and compliance with toolbox meetings. During fire drill and abandon ship drill activities, safety training has been carried out and recorded in the ship's documents, but the readiness of the crew when following commands and the sequence of procedures still needs to be strengthened so that the training is not only administrative.

When linked to the principles of the ISM Code, this condition indicates that the ship already has a documented safety system, emergency training, supervision, and maintenance of safety equipment, but its effectiveness still depends heavily on the discipline of the crew when carrying out procedures in the field. Thus, the main problem is not the lack of procedures, but rather the consistency of their implementation. This aligns with the findings in the research results section that the safety system on board the ship is in place, but still requires strengthening in terms of understanding, consistency of implementation, and operational control.

Table 3. Analysis of Safety Management Implementation

Aspects Analyzed	Analysis Results	Information
*Cargo loading*on the main deck	Safe work procedures are in place, but the use of PPE and toolbox meetings are not always disciplined.	Shows that safety implementation is not yet uniform
Fire drill	The drills have been carried out and recorded, but the crew's response still needs to be improved	Demonstrates the need for more stringent training practices
Abandon ship drill	Evacuation drills are underway, but personnel preparedness still needs to be strengthened.	Demonstrates the need for repeated practice and rigorous evaluation.
Safety documents	*SOUP*, training reports, and operational documentation are available	Demonstrates that the safety system has been established administratively
Officer supervision	Supervision already exists, but does not fully guarantee field compliance	Becoming a point that needs to be strengthened

Obstacles also arise from aspects of supervision and the implementation of work systems that are not yet fully optimized. Supervision by ship officers is carried out, but it is not always able to ensure that all safety procedures are consistently implemented. On the other hand, the orderliness of documentation, reporting, and the readiness of safety

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equipment also require attention because they directly influence the effectiveness of safety management implementation. Thus, it can be concluded that the main obstacles to safety management on ships stem from a combination of human resources, supervision, and the lack of disciplined procedure implementation.

Table 4. Analysis of Factors Causing Obstacles to Safety Management

Causative factor	Analysis Results	Impact on Safety Management
Lack of understanding of the crew	There are still crew members who do not fully understand safety procedures	The application of the rules is not uniform
Work discipline	Use of PPE and adherence to procedures has not always been consistent	The risk of work accidents increases
*Safety meeting*and drill	Activities already exist, but participation and seriousness need to be increased.	The ship's crew's preparedness is not yet optimal
Officer supervision	Supervision is carried out, but it is not yet fully effective.	Implementation of procedures can still be neglected
Documentation and reporting	Safety records need to be more orderly	Evaluation and follow-up are less than optimal
Safety equipment readiness	Equipment is available, but requires constant monitoring and maintenance.	Reduces the effectiveness of protection during emergencies

Triangulation results also demonstrated a congruence between the obstacles encountered in the field and the available supporting data. The lack of consistency in PPE use, reporting compliance, and crew discipline was reflected in interviews and direct observations by researchers while on board. Meanwhile, safety documents and maintenance data indicated that procedures were in place, but their effectiveness depended heavily on crew implementation. Therefore, data triangulation confirmed that the primary obstacle was not the absence of a system, but rather its implementation, which was not yet fully disciplined and consistently controlled.

Table 5. Data Triangulation Analysis

Data source	Key Findings	Conformity of Findings
Observation	*PPE*, safety meetings and drills have been carried out	In line with interviews and documentation

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Interview	There are still barriers to understanding, discipline, and supervision.	In line with observations and documents
Documentation	Equipment, inventory, and safety records are available	Confirming that the system is in place
Overall Triangulation	The safety system is running, but not yet optimal	Become the basis for research problem analysis

This increased understanding must be supported by strengthened oversight and evaluation of the implementation of the safety management system. Ship officers must conduct ongoing oversight to ensure that all crew members comply with applicable safety procedures. Furthermore, compliance with reporting, archiving of safety documents, and maintenance of safety equipment must be continuously improved so that all safety data can be used for evaluation and improvement. With these efforts, it is hoped that the safety management system on board ships will operate more effectively, thereby minimizing the risk of work-related accidents.

Table 6. Analysis of Safety Management Improvement Efforts

Problems Found	Improvement Efforts	Objective
Lack of crew understanding of safety procedures	Conducting socialization, training, and safety meetings regularly	Increase safety knowledge and awareness
Discipline in using PPE is not yet consistent	Increase supervision and familiarization of PPE use	Prevent work accidents
Participation in drills and safety activities needs to be increased	Carrying out drills regularly and involving all crew members	Improving emergency preparedness
Supervision of the implementation of procedures is not optimal	Strengthening the role of officers in occupational safety supervision	Ensure procedures are carried out consistently
Safety documentation and reporting are not yet optimal	Organize a safety document reporting and archiving system	Facilitate evaluation and follow-up
Safety equipment maintenance needs to be carried out continuously.	Perform inspections and maintenance as scheduled	Ensure equipment is always in ready-to-use condition

Based on the analysis of safety management implementation, factors causing obstacles, data triangulation, and improvement efforts, it is clear that the safety

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management system on the MT. Stargaze has been implemented in daily operations. However, several obstacles remain that affect its effectiveness, particularly in terms of crew understanding, discipline in implementing safety procedures, supervision, and orderly documentation.

Through increased safety training, strengthened supervision, ongoing safety meetings and drills, and improvements to the reporting and maintenance systems for safety equipment, it is hoped that the implementation of safety management on board ships will be more optimal. The results of this data analysis will then form the basis for a discussion of the problem formulation regarding factors that hinder safety management and efforts that can be made to improve safety management to reduce the risk of work accidents on board ships.

DISCUSSION

Factors that Result in Obstructions to Safety Management on Board Ships

Based on the data presented, the main obstacles to safety management on the MT. Stargaze were evident in three of the most relevant activities: cargo loading on the main deck, fire drills, and abandon ship drills. During cargo loading, researchers found that crew members on duty in the manifold and main deck areas did not always wear complete PPE, particularly gloves and goggles, and there was still disorganization at the toolbox meeting before work began. During emergency drills, particularly fire drills and abandon ship drills, delays in arriving at the muster station and a lack of responsiveness to officers' commands were still observed. These findings indicate that work procedures and training are in place, but their implementation is not yet consistent in the field. This condition is in line with the principles of the ISM Code, which requires companies and vessels to have documented safety procedures, regular training, implementation supervision, and ongoing coaching to ensure effective safety implementation.

When compared to the interview results, the Chief Officer and Third Officer both emphasized that the biggest obstacle was not the absence of a system, but rather the human factor, namely a lack of discipline, a lack of awareness, and the crew's uneven understanding of safety procedures. These results are also consistent with previous research showing that weak commitment, a lack of understanding, and irregular safety meetings and drills are the main causes of obstacles to the implementation of SMK on ships. The impact on the MT Stargaze was an increased potential for non-conformity during work, decreased preparedness for emergencies, and reduced effectiveness of work risk control. Corrective actions that emerged from these findings were repeated work briefings, verbal warnings when violations were found, recording findings in training reports, and strengthening direct supervision by the watch officer.

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Table 8. Factors Inhibiting Safety Management

Field Findings	Compliance with ISM Code / SMS	Reason	Impact	Corrective Action
When loading cargo, gloves and goggles are not always worn in full, and toolbox meetings are not followed with full discipline.	Not fully compliant with safe work procedures, risk control and personnel readiness obligations	Lack of discipline habits and initial supervision of work	The risk of hand, eye and work errors in the manifold area increases.	Verbal warning, mandatory PPE, and re-inspection before work continues
During the fire drill, there were still delays in getting to the muster station and a lack of responsiveness in following commands.	Not fully in line with the principles of emergency preparedness and routine training	Understanding of emergency procedures is not yet widespread	Emergency response is slow	Re-instruction, repetition of exercises, and individual evaluation
In abandon ship drill, the sequence of exercises is not always followed in an orderly manner.	Not fully compliant with emergency evacuation procedures	Lack of habituation and consistency of practice	Evacuation readiness decreases	Direct correction by officers and recording of drill results

Efforts to Improve Safety Management on Board Ships

Efforts to improve safety management on the MT Stargaze need to be directed at strengthening crew development, officer supervision, and ensuring orderly safety documentation. For cargo loading, the most important step is ensuring all crew members understand the work sequence through a toolbox meeting before the operation begins, checking for complete PPE, and enforcing discipline in the use of safety equipment during the work. For fire drills and abandon ship drills, exercises need to be made more realistic and repetitive so that crew members become accustomed to responding to alarms,

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moving quickly to their respective positions, and carrying out procedures according to the muster list. This aligns with the ISM Code, which emphasizes routine training, incident reporting, safety equipment maintenance, and ongoing evaluation of the ship's safety system.

Based on previous research, efforts such as familiarizing crew members with the use of PPE, increasing crew understanding, conducting regular safety meetings, and conducting more stringent supervision have proven relevant for improving safety practices. Therefore, on the MT. Stargaze, the most realistic approach is to build safe work habits through repeated coaching, direct supervision, recording non-conformities, and consistent corrective follow-up. The expected impact is not simply a general "risk reduction," but also technically results in more stable procedural compliance, faster training responses, and more orderly safety documentation. Therefore, safety management should be understood as an ongoing control process, not an administrative activity that ends with a drill or report.

Table 9. Efforts to Improve Safety Management

Improvement Efforts	Relation to ISM Code / SMS	Expected results
*Toolbox meeting*mandatory before cargo loading	Supports safe work procedures and communication between personnel	The entire crew understands the duties and risks of work
Pre-work PPE check	In accordance with the principles of crew protection and injury prevention	The use of PPE has become more disciplined
*Drill*made more organized and evaluated	In accordance with emergency drills and preparedness provisions	The crew's response became faster
Immediate warning and recording of non-conformities	In line with the principles of reporting and follow-up	Non-recurring violations without correction
Active supervision of the duty officer	Supporting operational control of ships	Procedural compliance increased
Safety report archiving	In accordance with the principles of continuous documentation and evaluation	Easily traceable data for improvement

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CONCLUSION

Based on the research results, it can be concluded that the obstacles in implementing safety management on board the MT. Stargaze are primarily caused by human resource factors, namely the crew's lack of understanding and discipline in implementing work safety procedures. This condition is evident in the inconsistent use of Personal Protective Equipment (PPE), the implementation of safety meetings and drills that have not fully formed a safety culture, and safety supervision, documentation, and reporting that still need to be improved. Thus, the main problem lies not in the availability of a safety management system, but in its implementation that has not been running optimally. Therefore, improving safety management needs to be done through safety socialization, conducting regular safety meetings and drills, increasing supervision of compliance with PPE use and work procedures, and regular maintenance of safety equipment to ensure it is always ready for use. Consistent implementation of these steps is expected to increase the effectiveness of safety management and minimize the risk of work accidents on board.

Based on the research results, it is recommended that all crew members improve their understanding and compliance with work safety procedures and use Personal Protective Equipment (PPE) diligently in all risky activities. Ship officers need to strengthen supervision of the implementation of safety procedures, hold regular safety meetings and drills, and ensure proper safety documentation and reporting. Furthermore, safety equipment must be routinely inspected and maintained to ensure its readiness, while the company is expected to provide support through coaching, evaluation, and the provision of adequate safety facilities to create an effective and sustainable work safety culture on board.

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