

The RightShip Safety Insights series shares key lessons from maritime incidents and RightShip Inspections to highlight identified gaps and provide practices and guidance to help improve standards and reduce risk — supporting our goal of achieving a Zero Harm maritime industry.

This paper covers the critical role of effective Lock Out Tag Out (LOTO) application in enhancing safety and reducing risks in shipping operations.

Introduction

In the dynamic and high-risk environment of maritime operations, ensuring safety of personnel and operational integrity is paramount. One of the most effective yet often underutilised safety protocols is Lock Out Tag Out (LOTO)—a system designed to prevent accidental energisation of machinery or equipment during maintenance or high-risk activities.

As stated in Section 4.8 of the RightShip Inspection Ship Questionnaire (RISQ), LOTO is a key focus area during vessel inspections, reflecting its importance in mitigating risks and ensuring compliance with international safety standards.

Why LOTO Matters

LOTO procedures are essential for:

- Preventing injuries and fatalities during equipment maintenance or high-risk activities.
- Reducing downtime and operational disruptions due to incidents.
- Improving crew confidence and safety culture onboard.
- Ensuring compliance with regulatory requirements and industry standards.

Shipboard tasks that may require application of LOTO

Mechanical Systems

- Maintenance on propulsion systems (e.g., main engines, gearboxes)
- Servicing auxiliary machinery (e.g., pumps, compressors, boilers)
- Repairing steering gear systems
- Working on HVAC systems
- Maintenance of elevators
- Maintenance of hydraulic systems (e.g., cranes, hatch covers, winches)

Electrical Systems

- Servicing electrical panels or switchboards
 - Repairing lighting circuits or power outlets
 - Working on emergency generator systems
 - Maintenance of battery banks or UPS systems
 - Servicing fire detection or alarm systems
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Fuel and Fluid Systems

- Cleaning or repairing fuel oil purifiers
 - Maintenance on fuel transfer pumps
 - Servicing bilge or ballast systems
 - Working on freshwater or sewage treatment systems
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Safety and Emergency Systems

- Testing or repairing fire suppression systems
 - Servicing lifeboat launching mechanisms
 - Maintenance on watertight doors or bulkhead closures
 - Repairing emergency shutdown systems
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General Shipboard Operations

- Routine inspections involving isolation of machinery
- Calibration of sensors or instrumentation requiring system shutdown
- Hot work (welding, cutting) near energised equipment
- Cleaning or painting in machinery spaces with active equipment
- Work near radar scanners, high power communication antennas or ship's whistle
- Underwater work such as propeller polishing

RightShip Inspections and LOTO

The RightShip Inspection Ship Questionnaire (RISQ) framework emphasises the need for:

- Implementation of a LOTO system
- Validation of LOTO system application
- Verification of isolation before work begins
- Crew training and familiarity with LOTO protocols
- Proper documentation and tagging systems

During inspections, RightShip inspectors are required to evaluate:

- Presence and accessibility of LOTO procedures
- Crew understanding and implementation of LOTO
- Condition and availability of LOTO equipment
- Records confirming that LOTO has been applied during onboard tasks that are expected to involve the isolation of machinery or equipment

Data from 3,610 RightShip Inspections (involving 3021 different vessels) between January and August 2025 reveals:

- 758 findings recorded related to RISQ Question 4.8.
- Of these 758 findings, 567 (75%) included LOTO shortcomings.
- Of the inspections which had findings that included LOTO related shortcomings:
 - 18% were deemed UNACCEPTABLE
 - 26% gained 3 months validity
 - 18% gained 6 months validity
 - 17% gained 9 months validity
 - Only 21% gained the full 12 months validity
- Common issues were:
 - LOTO procedures included within SMS but no LOTO equipment onboard.
 - LOTO equipment onboard but not being used.
 - Simple signs being used but no locks being applied.
 - Crew unaware of how LOTO system should be applied.
 - Incomplete isolation procedures and no isolation records.
- Vessels with repeat LOTO related findings were twice as likely to receive reduced inspection validity (6 months or less).

In summary: Vessels that demonstrate robust LOTO practices are more likely to gain favourable inspection outcomes with longer validity periods, reducing the frequency and cost of re-inspections.

Incident Case Study

Background

A vessel was anchored, awaiting clearance to berth. During this downtime, the Chief Engineer authorized maintenance on Ballast Pump Motor #1, which had been showing signs of wear.

The Incident

The 3rd Engineer was assigned to inspect and clean Ballast Pump Motor #1. As part of the work preparation, a simple “Do Not Use” notice had been hung on the ballast pump starter panel in the Control Room but the pump had not been electrically isolated on the switch panel or locally. Considering it safe, the engineer began working on the motor’s electrical connections.

Due to A/C airflow in the Control Room, the “Do Not Use” notice was dislodged from the starter panel and unaware of the maintenance work, another crew member activated the ballast system to adjust the vessel’s trim. The motor started unexpectedly, causing the 3rd Engineer to suffer fatal electrocution and blunt trauma from the rotating equipment.

Investigation Findings

- While proper LOTO equipment was available onboard, it was unused
 - No formal training had been provided to crew on LOTO
 - The SMS referenced LOTO but lacked implementation procedures
 - Internal audits failed to check LOTO compliance
 - Signage and communication to warn others of ongoing maintenance was inadequate
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Root Causes

- Failure to isolate and LOTO the ballast pump
 - Lack of crew awareness and training
 - Poor communication between departments
 - Inadequate enforcement of SMS procedures
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Lessons Learned

1. LOTO procedures must be actively enforced, not just documented.
2. Training is essential. Crew must understand how and when to use LOTO.
3. Audits should verify actual usage, not just the presence of equipment.
4. Clear communication protocols are vital during maintenance operations.
5. Designated responsibility for LOTO implementation improves accountability.

Recommendations for Vessel Operators

To strengthen LOTO compliance and associated vessel inspection outcomes:

1. Ensure that LOTO procedures are clearly stated within the Safety Management System.
2. Ensure that LOTO system is integrated into all work permits.
3. Review and update LOTO procedures regularly to align with recognised LOTO practices.
4. Provide personnel with practical and specific training in the application of company LOTO procedures and equipment.
5. Ensure proper tags/labels, isolation tools/locks and any isolation logbooks are readily available and well maintained.
6. Consider the appointment of an onboard LOTO Champion who is the onboard LOTO Subject Matter Expert (SME) and is responsible for supporting the effective implementation of LOTO onboard each vessel.
7. Monitor and audit LOTO implementation as part of Safety Management System effectiveness verification.
8. Use internal and external inspection feedback to drive continuous improvement.
9. Provide personal LOTO padlocks to appropriate onboard personnel and any members of the shore management team who perform ship visits.
10. Positively recognise/acknowledge when LOTO best practices are observed.
11. Ensure that Task Risk Assessments, PMS Work Orders or maintenance procedures clearly state any LOTO requirements for tasks.

IMPORTANT - Having LOCKOUT STATIONS with a comprehensive assortment of LOTO equipment (such as below) is NOT the same as having an effective LOTO system!



An effective LOTO system involves the correct use of LOTO equipment to prevent the accidental energisation of machinery or equipment during maintenance/inspection.



Going Further – Evolution of LOTO into LOTOTO

As part of a vessel operator's continual improvement journey, an evolution from LOTO to LOTOTO (Lock Out Tag Out Try Out) represents a significant advancement in safety protocols.

While traditional LOTO procedures focus on isolating energy sources and tagging equipment to prevent accidental startup, LOTOTO introduces an essential verification step—"Try Out"—to ensure that the isolation is effective and the equipment is truly de-energised. This added layer of safety helps eliminate assumptions and human error, which are common contributors to workplace incidents.

For vessel operators, adopting LOTOTO as part of continual improvement efforts enhances operational safety, aligns with best practices in risk management, and demonstrates a proactive commitment to protecting personnel and assets. Integrating LOTOTO into existing procedures not only strengthens compliance with international safety standards but also fosters a culture of accountability and vigilance in hazardous environments.

Conclusion

LOTO (or LOTOTO) is more than a checklist item—it's a cornerstone of safe and efficient vessel operations. By prioritising LOTO (or LOTOTO) compliance, vessel operators not only protect their crew but also reduce risk exposure, enhance inspection outcomes, and contribute to a safer maritime industry.