

BANSIGHT

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CRANE INCIDENTS

CRANES PLAY A VITAL ROLE IN SHIPBOARD OPERATIONS, FACILITATING THE EFFICIENT LOADING AND UNLOADING OF CARGO, AND SUPPORTING VARIOUS MARITIME ACTIVITIES.

They are essential for lifting heavy loads, and their inspection, maintenance, and certification are crucial for ensuring the safety of personnel and the protection of valuable cargo.

The Minton, Treharne & Davies Group

OUR PARTNER FOR THIS ISSUE

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INSPECTION AND MAINTENANCE

EVERY CRANE ON BOARD A SHIP SHOULD HAVE A MANUAL FROM THE MANUFACTURER THAT PROVIDES RECOMMENDATIONS ON HOW TO OPERATE THE CRANES AND GUIDANCE ON INSPECTIONS.

The manual should also be used to create a planned maintenance regime that includes the manufacturer’s recommendations. This planned maintenance regime should be incorporated into the ship’s Safety Management System procedures. All required maintenance, inspections, and testing of each crane should be carried out at appropriate intervals. These intervals may be determined by factors such as:

Discharge of abrasive cargo (additional greasing of unsealed bearings may be required)

Crane running hours, or regular time intervals, such as monthly checks. Recognise the significance of conducting maintenance based on running hours, as it proves invaluable in predicting potential failures by comparing actual usage with the expected lifespan of specific components. As a result, take preventive measures promptly to avoid downtime and mitigate the risks of failures.

Wire rope lubrication is essential and serves two purposes: internal and external lubrication, as well as corrosion protection. It is crucial to avoid using grease for this purpose. Wire strands experience movement against each other when the wire is tensioned or passes over sheaves. Therefore, using wire rope lubricant ensures penetration into the core of the wire, whereas grease tends to sit on the surface, potentially getting washed off or contaminated with cargo dust, leading to the formation of a thick layer on the wire’s surface.

It’s important to note that during a visual inspection of wire ropes, only the visible parts of the outer wires can be assessed. These outer wires constitute around 40% of the total cross-section of the wire rope, and even then, only about half of their length is visible. Consequently, a visual inspection can only cover approximately 20% of the wire rope. Unfortunately, it is common for the visible 20% to appear undamaged, while hidden wire breaks may be present in the remaining unseen portion of the rope. Wire ropes with internal wire breaks and no external signs of damage pose a high level of danger.



Crew changing wire

Crane hydraulic systems rely on high-quality hydraulic oil for smooth and efficient operation. Shipowners should establish a proactive oil analysis program to monitor oil condition and detect potential issues, such as contamination or degradation. Regular oil sampling and testing, along with appropriate filtration and oil changes, will help to keep the crane’s hydraulic system in optimal condition. Regular inspection and cleaning of the oil cooler is also essential, especially when the cranes are operated in high ambient air temperatures. If the ship frequently loads and unloads dusty, or corrosive cargoes, the cleaning may be required more often. Neglecting to clean the oil cooler could cause the crane to cut out once it reaches the high temperature limit, leading to potential performance issues if the cranes repeatedly stop functioning. Timely attention to hydraulic oil leaks is crucial. Aside from being a safety hazard, failure to address these leaks may result in stevedores refusing to use the cranes altogether. Therefore, it is imperative to address oil cooler maintenance and hydraulic leaks promptly.

Crane safety devices, such as load indicators and limit switches, are critical for preventing accidents and ensuring safe operations. Verify the functionality of these safety devices by conducting inspection and testing before discharging or loading. Shipowners should establish procedures to address any malfunctioning safety devices promptly.

A competent member of the crew should test safety devices related to load handling for gantry cranes, along with testing trolley slowdown and stop limits, as well as gantry movement alarms (both visual and auditory), emergency stops, and obstruction stops before using the crane.

Luffing and slewing usually have a key-operated by-pass switch for the lower limit of the jib, specifically utilised when stowing the jib. It is important to ensure that the key is never left in the crane, and precautions should be taken to prevent accidental operation of the switch. Stevedores' requests to make override keys available (which may be the standard practice in some ports) should be resisted. The jib should only be operated below its lower limits when it is being stowed. Operating the jib below its lower limit while there is a load on the hook can result in the jib or the luffing wire coming off its drum, potentially causing failure.



To prevent accidents and equipment failure, operators must maintain the structural integrity of cranes. Regular visual inspections and structural assessments should be conducted to identify signs of corrosion, fatigue, or other structural weaknesses. Any identified issues should be promptly addressed through appropriate repairs or replacement. Inspections should also cover all sheaves, bearings, and other moving parts to determine if there is any wear or deformation.

Additionally, when operating gantry cranes, visually inspect the supply cable for correct spooling and check for physical damage to the outer sheath. Also, visually inspect the trolley cable mat. Check the correct tension of the electrical cables and verify the operation of their safety devices. If any parts are found to be defective, remove them and replace them with new spare parts. Also, apply the appropriate grease to these moving parts following the correct procedure. Conduct thorough inspections of the foundation structures and mountings to identify any defects or damages. Note that many crane manufacturers forbid "hot work" on any structural components of cranes due to the possible damage to internal corrosion resistant coatings.

CERTIFICATION

THERE SHOULD BE A TEST CERTIFICATE AVAILABLE ON BOARD FOR ALL WIRE ROPES, INCLUDING THOSE IN USE AND THOSE THAT ARE SPARES.

These certificates must be kept together with the Register of Lifting Appliances and should include information such as the date of manufacture, material strength, rope construction, and the breaking load test results. The Register of Lifting Appliances is a requirement under the International Labour Organisation (ILO) Convention. The measures aim to guarantee that ships possess lifting appliances by a qualified individual and are periodically assessed by a competent person. A comprehensive annual examination, along with retesting and thorough examination is required every five years. If any lengthening, alteration, or repair, such as welding, occurs on the lifting equipment or its components, it must undergo proper retesting and re-examination before being utilised for hoisting or lowering, and a new certificate should be obtained.

During inspections, the entire length of the crane wire ropes undergoes scrutiny for broken or corroded wires and terminal fittings and if the total number of visible broken wires exceeds 10% of the total number of wires in any length of eight (8) diameters. The Register of Lifting Appliances and loose gear items should adhere to a format specified by the competent authority, aligning with the recommended model provided by the ILO. Accessibility of these records and associated certificates is imperative for any person authorised by the authority. Retention of the register and certificates for gear currently on the ship is mandatory for a minimum of five years from the date of the last entry.



It is important to note that relying solely on regulatory inspections conducted by external inspectors, as recorded in the Register of Lifting Appliances, can lead to a false sense of confidence. Instead, regular planned maintenance should be carried out on the crane and its associated equipment, as emphasised earlier in this guidance.

SAFE WORKING LOADS

DETERMINING THE SAFE WORKING LOADS (SWL) OF CRANES IS CRUCIAL TO PREVENT OVERLOADING AND ASSOCIATED RISKS.

Shipowners should ensure that crane manufacturers provide accurate SWL information, considering factors such as the crane's configuration, outreach, and environmental conditions. The SWL should be prominently displayed on the crane, and operators should be trained to understand and adhere to these limits. The hook SWL is defined as the safe maximum weight that can be lifted with the load suspended directly from the hook in the standard configuration.



In certain rigging variations, such as bulk cargo handling with a grab, it is common practice to decrease the Safe Working Load (SWL). This adjustment is necessary due to the dynamic load exerted on the crane structure when the grab scoops dig into the cargo. The act of hoisting the grab can result in significant additional loads on the lifting gear, depending on factors such as cargo density and frictional resistance. Predicting these additional loads beforehand proves to be a challenging task. To proactively address this, crane manufacturers typically reduce the crane's SWL by approximately 20% when it is used in grab mode.

Consequently, if the crane is designed for both hook and grab operations, it is likely to have two distinct SWL ratings: one for hook operation and another for grab operation. Both SWL ratings should be clearly indicated on the crane jib, with the grab SWL accounting for the weight of the grab itself.



THE GENERAL USE OF CRANES

All crane operators, whether they belong to the ship's crew or the stevedores, must receive proper training and become familiar with the specific crane's operating instructions.

Individuals operating cranes should hold valid certificates that verify their formal training and authorise them to operate the specific crane. Strict adherence to the provided operating instructions is essential when operating the crane, including compliance with the environmental lifting limitations and SWL.

Before cargo operations commence, there are several checks that should be carried out. The crane's controls and safety devices should be checked to ensure that they are functioning properly. This includes the crane limits being set in accordance with the manufacturer's recommended settings. Also, if there are various speed modes on the crane, they should only be used as intended by the makers to prevent failures or incidents. The crane should be visually inspected to ensure that all components are in good condition and properly lubricated, including the sheaves, wire ropes and swivels. The electrical components are also to be checked to ensure that they are dry, as well as all machinery and machinery housing. The weather and sea conditions should also be checked before the crane is operated, including checking the wind speed and direction, wave height, and any other weather conditions that may affect the crane's operation.



ONCE THE PRE-OPERATION CHECKS HAVE BEEN CONDUCTED, THE FOLLOWING SHOULD BE CONSIDERED, THE LIST BELOW IS NOT CONSIDERED EXHAUSTIVE:

- Conduct a meeting with the stevedores to discuss the discharge plan and verify the grab's working condition, fault indicators, means of communication with the ship, and the presence of a signaller/banksman
- Ensure sufficient lighting in the cargo spaces
- Report any equipment faults to the terminal representative immediately
- Report any damages to the ship's structure, regardless of their impact on seaworthiness, and raise a stevedore damage report
- The duty officer and other crew members on watch should monitor all crane handling and document any concerns immediately
- During cargo operations, ensure that all limit switches remain functional and refrain from overriding them. Override or bypass of a limit control is only allowed under exceptional circumstances and must be conducted under the direct supervision of senior ship's personnel. Avoid any such actions during regular cargo operations.

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WHERE CRANES ARE BEING USED FOR THE DISCHARGE OF BULK CARGOES THE FOLLOWING SHOULD ALSO BE CONSIDERED:

- Ensure the grab works evenly across the entire hold area to prevent steep banks and cargo collapse
- Under normal circumstances, the grab is to be kept straight and parallel to the ship's side
- Prevent pendulum swinging of the grab or buckets into the wings to avoid contact with the ship's side shell frames
- Do not swing the grab at an angle to the hold's extremities to avoid striking the hopper tank and causing indentations or holing
- With certain cargoes, hydraulic grabs may need to be slightly lifted when closing to avoid overloading the closing system
- Avoid landing the grab buckets on the hopper side where steel is visible
- Exercise caution when landing the grab close to the fore and aft direction of the bulkheads as there may be stool plates or ladders underneath
- Operate the grab from the highest point of the cargo with a clear line of sight or with the assistance of a signaller/banksman
- Lower the grab bucket onto the tank top carefully and evenly
- Do not enter the space beneath the grab bucket
- Wait until the grab bucket is landed before entering the area for stevedores/scrappers
- Avoid dropping the grab bucket onto the tank top at high speed, as it can cause punctures.



Grab discharging bulk cargo

Note that when alongside and cargo operations are suspended due to heavy weather, or during a significant gap in cargo operations, e.g. overnight, or at a weekend, or when awaiting labour, it is strongly recommended to stow cranes in accordance with the manufacturers recommendations, rather than being left extended for a long period of time when the crane is not in use.

After completing cargo operations without notable incident, it is advisable to conduct a comprehensive inspection of the cranes and their equipment too. It is important to maintain a record of this inspection, including any identified damages or defects, along with relevant evidence.



TANDEM AND SIMULTANEOUS LIFTING

TANDEM LIFTS ARE LIFTS CARRIED OUT BY TWO CRANES WORKING TOGETHER TO LIFT THE SAME PIECE OF CARGO.

They are commonly seen on larger, heavier or awkwardly cargoes, such as [windmill turbine blades](#). The cargo operation must be supported by a thorough risk assessment and method statement, which should include drawings of the cargo arrangement. There must be a clear briefing and agreement covering the signals and communication between the crane operators, the lifting foreman and other stakeholders.

Closely monitor the stability of the ship throughout the entire operation, especially when using the ship's own cranes that turn simultaneously, as this action can significantly increase the ship's heeling and become a particular concern.



Cranes conducting tandem lift of windmill blades

Simultaneous lifting with cranes is a technique utilised to achieve higher loading and discharging rates during operations. However, it is essential to implement enhanced safety measures when employing two cranes simultaneously. These safety procedures should be integrated into the ship's Safety Management System (SMS) and undergo a risk assessment before commencing any operations. While the following list is not exhaustive, it covers considerations to ensure safe simultaneous crane operations. These considerations apply not only when two cranes are used but also when a crane operates from a barge alongside the ship's crane.

- Ensure proper positioning and alignment of the cranes to avoid potential collisions between the crane booms or other structures. Maintain adequate separation between the cranes for safe operations
- Ensure the cranes have sufficient lifting capacity to handle the weight of the cargo
- Coordinate with precision between the crane operators to prevent swinging or sudden movements that could endanger the cargo or personnel
- Employ skilled and experienced crane operators for safe and efficient simultaneous lifting operations. They should be familiar with the specific procedures and safety protocols for using multiple cranes
- Communication is essential to avoid collisions, swinging loads, or other incidents
- Assign personnel to each crane operation to minimise confusion or misunderstandings.

USE OF CRANES TANKERS

IN ADDITION TO LOADING STORES AND EQUIPMENT, CRANES ON TANKERS ARE COMMONLY USED TO HANDLE CARGO HOSES AND TRANSFER PERSONNEL TO/FROM SMALL CRAFTS.

Masters can access information on the operation, certification and safety requirements for the use of cranes on tankers through the Oil Companies International Marine Forum (OCIMF) publications. Specifically refer to the SIRE 2.0 Question Library Part 1 – Chapter 1 to 7, published in January 2022.

Operating cranes on tankers involves adhering to special requirements due to potential hazards in environments that may not be gas-free. Take extra care to prevent the creation of sources of heat and sparks.



Parted crane wire

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EVIDENCE NEEDED IN THE EVENT OF AN INCIDENT

It is important to remember that a crane that undergoes regular and thorough maintenance is less prone to failures during its normal operation. If a defect does arise, maintaining comprehensive records of all inspections, maintenance activities, and any repairs performed will help demonstrate the diligent measures that were taken to ensure the crane was in a proper working condition.

In the unfortunate event of an incident, it is recommended that as much relevant information and evidence to support a case is retained. This evidence may include the following:

- Evidence of thorough briefings, 'toolbox' talks, and operational instructions provided to stevedores operating cranes
- Evidence confirming cranes were thoroughly checked before and after use for any visible/noticeable damage
- A statement of facts from the master, chief officer, or deck officer/crew on duty
- Photographs of the damaged equipment
- Photographic or video evidence of the crane operator mishandling the crane during cargo operations
- Retention of any failed wires, preferably in their "failed shape" stored in a dry location
- Maintenance records of the crane (bearings, sheaves, wires, etc.)
- Relevant sections of the Planned Maintenance Schedule
- Crane alarm logs, if available
- Load tests and certificates
- Records of replacement parts taken within the last 6 months
- Records of any prior warnings (verbal or written) given to stevedores if they are mishandling the crane
- Copies of stevedore training and certification to operate cranes
- Details of the cargo loaded/discharged with relevant loads/weights
- Oil samples.

In the case of an incident, it may be necessary to appoint an independent crane expert to determine the source of the failure. This involved assessing whether the failure occurred due to mishandling of the crane, insufficient maintenance or any wear and tear fatigue/ latent failure of the material. Additional forensic investigation, including a metallurgist analysis, may be required to establish whether poor maintenance provoked the damage to the crane.

It should be noted that Safety of Life at Sea (SOLAS) 74, as amended Chapter II/I Regulation 3-13, is applicable to Lifting Appliances and Equipment aboard ships. Recent amendments to SOLAS introduce mandatory requirements for on board lifting appliances and anchor handling winches. These requirements specify guidelines for designing, constructing, installing, operating, and maintaining lifting gear on ships. The regulations apply to both new and existing ships, requiring all lifting appliances and anchor handling winches to undergo testing, examination, inspection, and operation in accordance with these guidelines. The aim is to improve safety and ensure the effective functioning of lifting gear on board ships.

If you require any further guidance on this topic, please contact the [loss prevention department](#).



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