



# Maritime New Zealand Guidelines

## SAFETY BULLETIN ISSUE 11 – 2007

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### CARGO VESSEL CRANE WIRES - EXAMINATION AND RENEWAL

This safety bulletin is for:

- All New Zealand shipping companies
- All New Zealand shipping agents
- All New Zealand port companies and stevedoring companies
- All New Zealand harbourmasters
- All Foreign flagged vessels visiting New Zealand ports
- IACS Classification Societies based in NZ.

### Purpose

The purpose of this safety bulletin is to highlight crane wire mechanisms of failure and recommend that both renewal and examination regimes onboard vessels need to be improved in order to better prevent accidents.

Within the last 7 years in New Zealand 18 accidents have been reported involving the failure of ships' crane wire ropes.

This alarming statistic is highlighted by the most recent of these accidents. In November 2006 at Mount Maunganui a cargo crane wire rope parted onboard a general cargo vessel while unloading. This resulted in the loaded cargo grab falling into the hold of the vessel.

### Wire rope safe working life

The wire ropes used in cranes are expendable components. They should be renewed when examination shows that the strength of the wire has been reduced to unsafe levels or after the selected working lifespan has passed.

The working lifespan of a wire rope depends on the crane type, the materials, design and construction of the wire rope, how it is used to lift cargo and the environment it works in. It can either be required by international conventions, as with lifeboat davit wire falls, or selected by the owner based on the manufacturer's recommendations, how often the crane is used, how often and how hard the crane wire is stressed and the abrasive/corrosive environment the wire is exposed to.

Crane wire safe working lifespans are directly affected by changing cargoes, crane utilisation and maintenance levels applied to the wire rope. The interaction of these factors, and the cost implications of renewal, create a tendency towards examination regimes but without setting fixed periods for when the wire should be replaced.

Choosing to rely solely on examination regimes is a significant safety decision. This should be made in the context of the known mechanisms of failure for wire ropes and the predetermined discard criteria that need to be applied to prevent those failures.

## Wire rope mechanisms of failure

The methods and interval of wire rope examinations are critical in order to maintain safety when using cranes. Examinations must be undertaken with a working technical knowledge of the crane, knowledge of the wire rope construction and the typical modes of failure for that wire rope.

The care, maintenance and method of installation for the wire rope are also very important to the integrity, durability and working lifespan of the complex wire strand structure which makes up a wire rope.

It is strongly recommended that all companies operating cargo cranes obtain a copy of the International Standard *ISO 4309: 2004 - Cranes - Wire ropes - Care, maintenance, installation, examination and discard*. This standard contains detailed criteria for examination frequency, internationally agreed discard criteria (with useful pictures) and clear recommendations on the care and maintenance of wire ropes.

### Wire core damage

Wire rope construction involves an outer layer of wire strands and core material that is not visible. The core of a wire can suffer heavy corrosion or fatigue breakages which can lead to wire rope failure.

**These wire rope core defects are not detectable by surface visual examinations.**

### Wire corrosion and abrasion

A vessel's cargo can often be corrosive in nature and may also contaminate the wire rope with particles. This is additional to the salt corrosion and contamination from the marine environment. Cargo contamination greatly increases the abrasion acting upon the wire and the moving parts of the crane. The regular greasing of the wire rope is essential to minimise the wear of the wire but also to assist in reducing the contamination and corrosion.

**This interaction between a corrosive and abrasive environment highlights the importance of wire rope examinations and the application of clear and pre-determined discard criteria.**

### Wire reductions and material fatigue

When the surface of a wire is worn it reduces the cross sectional area of those strands, which increases the chance of fatigue failure and strand breakages. Also, wire rope that is exposed to low bending ratios (sheave diameter/rope diameter) or high loading may result in high stresses and fatigue initiated breakages. **The load history, wear levels and number of breakages in a wire are important to record accurately and act upon when discard criteria are passed.**

## Conclusion and recommendations

- It is the vessel owner's responsibility under International Safety Management (ISM) to maintain adequate maintenance procedures for cargo cranes and their wire ropes. These should include procedures for crane wire care, maintenance, installation and examination, including clear discard criteria.
- It is recommended that both external and internal inspections of the crane wire rope are undertaken to the standard of ISO 4309: 2004 and that the discard criteria proposed in this standard are adopted.
- It is recommended that recording of the examinations of crane wire ropes involves the use of the reporting format as proposed in annex B of ISO 4309: 2004.
- It is recommended that the owner of the ship makes a clear statement within the ship's safety management system of a maximum operational lifespan for all the crane wires based upon the crane type, wire construction, typical cargo types, crane utilisation levels and the crane and wire manufacturers' recommendations.

### Further information

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