

# Marine Safety Flash

## A16-11 (11<sup>th</sup> March 2016)



## Mechanical Failure of 10t Stinger During Routine Lift

### Incident Overview

A platform support vessel (PSV) had come alongside of a construction support vessel (CSV) and after appropriate job planning and risk assessments had been undertaken commenced loading of first stores using the CSV's main deck crane.

A 12' refrigerated container, weighing approximately 7t, was connected to the crane's safe working limit (SWL) 10t whip-line via a working load limit (WLL) 10t wire rope sling.

Whilst commencing to take the load of the container the crane's sling failed at the ferrule/ sleeve end nearest to the master link.

All personnel were clear of the load and no one was at risk of injury during the lifting operation.



### Key Findings

The Flemish Eye of the 10t wire rope sling came undone, the loose wire strands slipped through the ferrule/ sleeve and the sling dropped to the deck of the PSV.

The sling was quarantined pending a full investigation and inspection by a specialist 3<sup>rd</sup> party rigging and lifting gear contractor to determine the cause of failure. The failed sling was subsequently inspected by the vendor and sent for metallurgical analysis to determine if any materials defects were present in the sling's components.

A formal investigation was undertaken and the following root causes of failure were identified:

- **Inadequate manufacturing procedure, including instruction and Quality Control (QC):**
  - Manufacture of the Flemish eye within the sleeve (ferrule) resulted in wire tails that were estimated to be between 20-40 mm in length, which did not conform with the vendor's manufacturing work instruction,
  - The vendor's work instruction did not provide sufficient guidance to ensure that the wire tails were of equal length after splicing, and
  - Manufacturing and load testing did not involve 2<sup>nd</sup> party QC.

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- **Inadequate training and maintenance of training records:**
  - The vendor identified that its operator had not followed its manufacturing work instruction correctly and missed a critical step, which allowed the tails of the Flemish Eye to be too short and unevenly distributed within the ferrule (see image), and
  - The vendor's training matrix did not accurately record all up-to-date training provided to the operator.
- **Inadequate load test:**
  - The load test appeared to have been conducted to an appropriate standard and passed an inadequately manufactured wire rope sling. This was an unexpected outcome for an accredited load test.

### Recommendations

Following completion of the investigation, the following corrective actions were either undertaken or planned to be undertaken:

1	The manufacturer (vendor) of the wire rope sling was issued with a non-conformance report (NCR), which required them to undertake an investigation to identify causes of the failure and advise corrective actions to prevent a recurrence.
2	An escalated authority to purchase future rigging equipment from the vendor was put in place, pending implementation of their corrective actions.
3	Remaining wire rope slings manufactured by the same manufacturer were quarantined on each Project vessel, pending replacement with independently manufactured, load tested and certified wire ropes. As an interim measure, confidence testing was performed on remaining vendor's slings to 110% of the <i>expected</i> load weight ( <b>not</b> SWL) until affected wire ropes had been replaced.
4	Company's regional procurement departments were requested to engage with suppliers of similar lifting equipment to discuss the information contained within this Safety Flash and request that their suppliers review and demonstrate adequate procedures are documented and implemented to ensure similar instances of non-conformity do not occur.
5	Company Internal Safety Flash was issued globally for information sharing and learning experience.
6	Company inspected the vendor's manufacturing facility. Specifically the QC and competency assurance processes were verified, as well as certification of load testing equipment.

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7	Vendor was requested to revise applicable work instructions to provide clearer instruction to operators when forming a Flemish eye to ensure that spliced wire tails were of equivalent length prior to swaging. This change was made to improve the consistency of future wire ropes manufactured by the vendor.
8	Vendor was requested to incorporate adequate 2 <sup>nd</sup> party QC at critical steps during the manufacture and proof testing of Flemish eye wire rope slings. Work instructions to be updated to reflect the critical steps when the verification checks are to be made, e.g. after splicing, swaging and during witnessing of load tests.
9	Vendor was requested to update its Training Matrix to ensure that it adequately reflects all training records relating to the manufacture and testing of wire rope slings
10	The Company shall review the vendor's corrective actions and verify that they have been implemented adequately to prevent a recurring equipment failure
11	<p>Vendor was requested to video record the manufacture and load testing of a test 10t wire rope sling to provide assurance of the load test. In particular, the vendor was requested to record the:</p> <ul style="list-style-type: none"><li>• re-manufacture of a <i>test</i> 10t wire rope sling as close as possible to the specifications of the failed 10t stinger, having regard to how the Flemish eye was formed at the time, and</li><li>• proof testing of the re-manufactured <i>test</i> wire rope sling to the accredited load testing procedure to verify whether it passes or fails its accredited load test</li></ul>