Mines Safety Bulletin No. 155

Subject: Inspecting synthetic fibre round slings

Date: 21 September 2018

Background

Round slings made of synthetic fibres are a type of lifting gear in common use at mining operations. They may be used for lifting suspended loads, either alone or in combination with other lifting gear.

Round slings have the advantage that they minimise the potential for damage to the item being lifted because they support the load with a soft, flexible contact surface. They are also lighter, easier to handle and store than some other types of slings of equivalent-rated capacity. However, they have the disadvantage that they are more vulnerable to physical damage, sunlight (ultraviolet), chemicals and excessive heat than some other types of lifting gear.

In a round sling, the load bearing core consists of a bundle of synthetic yarns beneath a protective cover that cannot be removed for inspection without destroying the sling. As the cover cannot be removed, inspections are conducted by observing and feeling the condition of the core through the cover. During inspection, a lump in the core may be felt as a result of a permissible termination in the yarn (i.e. an explainable lump) or as the result of a "bunching up" of the yarns due to failure of the core (i.e. a defect), or as the result of contamination (also a defect).

It is widely accepted in Australian industry that the manufacture (including testing), care and use (including periodic inspection) of synthetic fibre round slings should comply with Australian Standard AS4497:2018 Round slings – Synthetic fibre.

Summary of hazard

All round slings (or other lifting equipment) that may be used in the load path of a suspended load must have a high level of integrity and reliability to control the risk of losing control of the suspended load. Integrity should be checked through inspection prior to each use.

The safety factor for synthetic fibre round slings depends on the yarn material used for the core. For the most common material – polyester – round slings that comply with AS4497:2018 have a minimum breaking load of seven times their working load limit (WLL) and are individually proof loaded to two times their WLL. However, physical damage, heat damage, prolonged exposure to ultraviolet light and the adverse effects of chemicals will reduce their integrity. Therefore, persons who use round slings and persons who perform periodic inspection of round slings must be sufficiently competent to detect and evaluate any defects or weaknesses that may affect the performance.

During inspection of round slings, some confusion has occurred concerning the nature of lumps in the core. Clause 4.17.4 of AS4497:2018 states that slings should be withdrawn from service immediately if unexplained lumps are observed under the cover. However, AS4497:2018 provides no further guidance about how to determine which lumps indicate that a round sling may be defective or damaged and how to distinguish them from lumps that are of no concern.

Terminations in the yarn of the core (as permitted by AS4497:2018) may sometimes be felt through the cover as a small lump. Hard, pea-sized lumps felt through the cover are most likely to be foreign matter. If the core is failing or separating, this can result in bunching up of the core under the cover which may also be felt through the cover as a lump. When a failed core bunches up it usually packs up tightly producing a large hard thickening over a significant length. A lump produced by a (permissible) knotted joint or termination, a lump produced by contamination with foreign matter and a lump produced by a damaged core will all feel different.

Inspectors have observed that users and inspection personnel on mine sites do not always have the knowledge or experience to understand the difference between explainable lumps in the core and signs of damage or contamination under the cover. Such gaps in competence may result in either unnecessary discarding of round slings or damaged slings being passed as fit for continued service (with hidden defects). If the latter occurs then there may be an increased risk of failure under load.

Examples of permissible yarn terminations

Contributory factors

In round slings, the multiple wraps of the yarn are what achieves the strength of the sling. To facilitate manufacture, some manufacturers use adhesive tape and/or knots to terminate the ends of the yarn strands (at start and finish) and these may be felt through the cover sleeve. These terminations do not contribute to the load capacity of the sling.

An overlap in the protective cover sleeve is sometimes referred to as a "joint". This also is not load bearing.

Australian Standard AS4497:2018 does not:

- specify how the ends of the yarn in a round sling should be terminated (e.g. knotted. taped or otherwise)
- specify what types of knots are permissible whenever a knotted joint is used to join the yarn, or when knots are used as part of a termination of the yarn
- define the qualitative differences between lumps in the core that are explainable and those that are not (when feeling through the cover).

Personnel who are deemed competent to use and/or periodically inspect round slings need to have sufficient knowledge, training and experience to recognise lumps that indicate a defect and make sound decisions about the discarding or retention of slings.

MSIR Regulations 6.5 to 6.13 require designers, manufacturers, importers and suppliers of plant (including round slings) within Western Australia to provide information for the purpose of testing or inspection of the slings supplied, including information relating to the required knowledge necessary for persons undertaking inspection.

Under MSIR Regulation 4.13, the responsible person at a mine has the primary duty to ensure that personnel are adequately instructed, trained and assessed as competent. There appears to be a reliance on High Risk Work Licences as proof of competence for operational or periodic inspection of round slings. These, however, are only a minimum competency standard and may not cover detailed inspection of all types of lifting gear used at a particular mine. Based on the results of individual needs-based training assessments, additional training or information may be required regarding particular lifting equipment such as round slings.

Actions required

It is recommended that the responsible person(s) at a mine:

- Ensure that round slings are manufactured, tested, cared for, stored, used and periodically inspected in accordance with AS4497:2018 (as a minimum), or an alternative standard that achieves at least an equivalent level of safety.
- Ensure periodic inspection intervals are selected based on risk assessment but should not be greater than three months.
- Ensure that periodic inspections are completed by competent persons who are able to detect and evaluate all defects and weaknesses that may affect the performance of the round sling. AS4497:2018 provides some guidance on the discard criteria for round slings. If additional information is required, consult the manufacturer or supplier.
- Ensure that all round slings have a valid, individual, proof load test certificate.
- Ensure all proof load test certificates are traceable to the individual sling (e.g. via tag numbers or serial numbers).
- Ensure that the application of lifting techniques, including the use of round slings, is always undertaken by persons who hold an appropriate High Risk Work Licence and have been assessed as competent for each task undertaken.
- Ensure that round slings are selected such that the fibre material of their core is resistant to the chemicals they may potentially be exposed to during use.
- Ensure that for every lift, the lifting gear is fit for purpose.
- When a new round sling is aquired, the user should familiarise themselves with the feel of the sling to educate themselves on any normal lumps that may be a result of the manufacturing process. If any questions arise, the user should consult the manufacturer or supplier.

Further information

- Australian Standard AS4497:2018 Round slings – Synthetic fibre

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