

# SAFETY BULLETIN

DATE: NOVEMBER 2019

## Hoist rope unravels over head sheave

This safety bulletin provides safety advice for the NSW mining industry relating to small gemstone mine person-riding hoists (winding systems).

### Issue

A person-riding gemstone hoist winch rope was found with the inner strand of the rope protruding from the rope lay in two places. This condition reduced the strength of the rope. This may have caused it to break and injure people, on or under the conveyance.

*Figure 1 Hoist rope with inner strand protruding*



## Circumstances

The 33-metre wire rope was installed on a man-riding hoist that was registered to carry one person at a small gemstone mine shaft.

The 8-millimetre diameter non-rotating wire rope lay in a 12-millimetre diameter head pulley groove.

*Figures 2, 3 and 4: Arrangement of the hoist showing the conveyance, head sheave and winch drum.*



## Investigation

In two places, the inner strand protruded from the outer rope layer as shown in figure 1. In other areas, some wires were found to be proud of the rope profile, as shown in figure 5 below.

The rope lay length, which is the period of one strand from where it comes around the rope to the next in-line position was measured. The lay length was found to increase along the rope, affecting the non-rotating properties of the rope.

*Figure 5 Proud wires corresponding to shortened lay length*

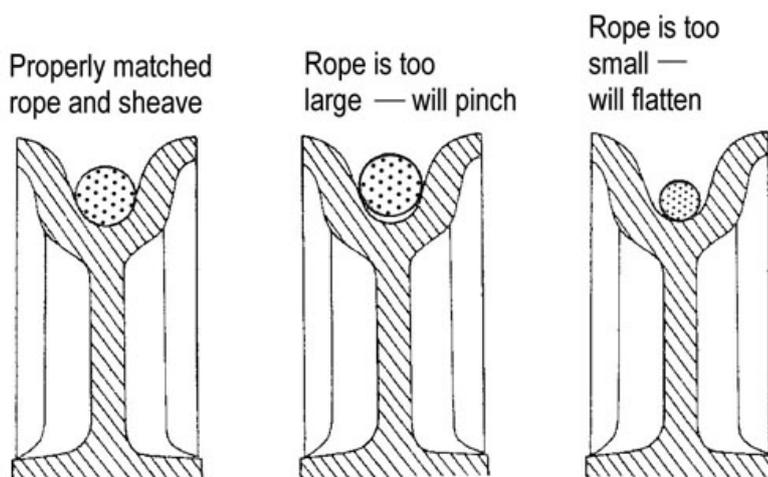


When the rope was unloaded, the built-up torque in the rope resulted in two rope distortions occurring where the inner strand protruded from the rope.

### Sheave compatibility factors

The rope condition is believed to be affected by compatibility factors associated with the head sheave groove dimensions.

Figure 7 Head sheave groove diagrams showing matched, tight and too large rope groove conditions.



### Rope strength loss

The rope breaking force of the damaged rope was found to have lost 10% of its strength where the wire was proud of the rope and up to 50% loss of strength where the inner strand had protruded.

## Recommendations

Mine operators should:

- carry out a visual inspection of hoist ropes to look for evidence of protruding wires or strands. If protruding strands are found, the rope must be replaced.
- measure both the head pulley groove diameter and rope diameter. Ensure that power to the hoist is isolated, all energy has been dissipated and safe access for working at heights is in place before taking measurements.
- consult the hoist designer to determine if the rope in service is compatible with the head sheave design.

- adhere to Australian Standard AS 3785.7 *Underground mining equipment – Sheaves* which gives guidance that the head sheave groove diameter should be 7.5% to 12% greater than the nominal rope diameter for which the sheave is designed.
- ensure that the sheave diameter should be equal to or larger than the diameter of the drive drum.

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