

HAZARD ALERT

Information

CRANE GEARBOX SHAFT FAILURE: LIEBHERR 200 HC TOWER CRANES

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OBJECTIVE

To ensure that owners, employers and suppliers of Liebherr 200 HC tower cranes (or cranes with similar hoist drum brake assemblies), are aware of and comply with their responsibilities. These include closely inspecting, maintaining and monitoring gearbox and hoist tolerances to provide and maintain plant and equipment in a safe condition.

BACKGROUND

In August 2008, a workbox containing approximately two tonnes of building materials was being lowered on a Liebherr 200 HC tower crane on an Adelaide construction site. During this procedure, the hoist drum went into free fall and the workbox fell approximately 25 metres to the ground. The crane was manufactured in 1982.

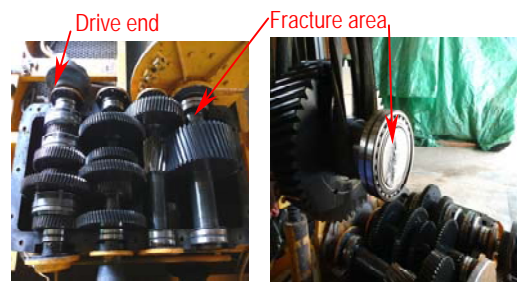
Similar incidents occurred in other states in the preceding 12 months. All HC type Liebherr tower cranes are fitted with a similar gearbox to the one involved in the Adelaide incident.

Preliminary investigations of the hoist drive assembly exposed a broken output shaft (shaft 4), that is directly connected to the hoist drum. The hoist brake on this type of crane is located on reduction shaft 2.

When shaft failure occurs with this design of hoist gearbox, the hoist brake will be ineffective, allowing the crane's load to free fall.

Further investigation indicated that metal fatigue appears to have occurred, possibly due to a misalignment of the output shaft with the hoist drum. Further alignment

checks and a metallurgist's assessment are being undertaken to verify this.



Shaft 1 2 3 4

STATUTORY REQUIREMENTS

Under sections 19 (1), and 24 (A) of the *Occupational Health, Safety and Welfare Act 1986*, employers and owners are required to provide and maintain plant in a safe condition. Section 24 also requires designers, manufacturers and suppliers of plant to ensure it is designed and constructed so as to be safe.

Division 3.2 of the *Occupational Health, Safety and Welfare Regulations 1995* clarifies duty holders' responsibilities for ensuring the design and manufacture of safe plant, and the provision of plant in a safe condition.

RISK CONTROL MEASURES

Failures of this type cannot be predicted by observing the gearbox in operation.

It is essential to have a scheduled strip down, inspection and non-destructive testing programme for the gearbox shafts and bearings that meets the manufacturer's specifications.

Immediate steps that need to be carried out are:

1. Check the alignment of the output shaft with the hoist drum shaft, to the manufacturer's specifications. This must include bearing alignment and condition, and fastener integrity.
2. If the alignment is out of tolerance, immediately remove the gearbox, strip down all shafts and bearings, and carry out non-destructive testing for cracks, unless otherwise justified by a professional engineer.
3. Maintain this procedure as part of the documented major inspection programme.

Note:

It is critical for the gearbox output shaft to be correctly aligned with the hoist drum. Failure to inspect and test to ensure this is likely to lead to a catastrophic failure of the output shaft.

Designers, manufacturers, suppliers and owners are required to ensure a risk assessment is conducted on all aspects of the plant. Steps must be taken to eliminate, or, if that is not possible, minimise risks arising from the plant.

Employers and owners of plant are required to have a planned and documented periodic inspection, maintenance and testing process. This process must be to the manufacturer's specifications.

If required, additional testing or inspection may be determined by a Competent Person.

FURTHER INFORMATION

SafeWork SA

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Country Offices

Berri, Mount Gambier, Port Lincoln, Port Pirie and Whyalla

Help and Early Intervention Centre

Library and Bookshop
100 Waymouth Street, Adelaide

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