Industry Alert

Risk of cracks in perforated chassis rails

Waka Kotahi NZ Transport Agency are issuing this industry alert to warn heavy vehicle specialist certifiers and heavy vehicle service providers about the risk of cracks forming in perforated chassis rails.

Perforated chassis rails are used by a number of vehicle manufacturers, but two reported failures in logging trucks have prompted us to issue this industry alert.

Perforations can be used to lighten the chassis rail, or mount components or equipment (such as fuel or air tanks, batteries, storage boxes).

Key points for service providers

Heavy vehicle service providers should make sure:

- chassis rails are inspected at every opportunity, especially near load anchor points like log bolsters or container twist locks, and mounting points for other heavy equipment like hi-abs or cranes
- any repairs are completed according to the manufacturer's instructions, where available
- any modifications meet the applicable certification requirements.

Key points for certifiers

- **Make sure the HVEL certification (LT400) for a log bolster attachment confirms the chassis rating remains valid,** or a new chassis rating and HVEC certification (LT400) must be issued.
- **Consider all conditions of loading** in your assessment, including unusual conditions such as side loading from the towing connection or a 'piggybacked' trailer.
- **Follow good design practice** by assessing critical areas, for example avoiding points of high stress concentrations (refer to Appendix B of AS3990-1993 for more information).

The reported incidents

Two instances of cracked chassis rails in logging trucks have been reported to Waka Kotahi. In both cases, a crack developed between the rear suspension hanger and the log bolster attachment (Figure 1).

Figure 1: Cracked chassis rail

Waka Kotahi and a heavy vehicle specialist certifier investigated and found the crack started in a large perforation in the central chassis rail web, where changes in geometry and stiffness produced an 'alleyway of flexibility'. The crack then extended to the top and bottom flanges, causing the rail to fail.

One of the vehicles a certifier examined in more detail had only travelled 390,000km.

Where and why the cracks formed

The failure was located in an area where the chassis rail would normally be under low to medium stress. Analysing a similar vehicle and log bolster installation found the stresses around the central holes were low in all the load cases usually considered.

However, very high stress readings were produced when we applied a side load at the rear of the chassis. This simulates the cornering loads imposed by a 'piggybacked' trailer, and from the towing connection pulling the trailer around corners.

The high bending stress combined with the chassis flexing through the 'alleyway of flexibility' has started the cracks, and ultimately led to the chassis failing.

The line of failure

The cracks began in a large central hole. Due to tension when the trailer was loaded with logs, the crack travelled downwards through the perforations and into the bottom flange. This is shown by the *Line of failure* in Figure 2.

The crack weakened the chassis considerably so when a trailer was carried, the top of the chassis was loaded in tension. Then the crack extended rapidly upwards until it broke across the top flange. This bent the chassis down until the rear of the truck was dragging along the road.

Repair practices

We're not currently providing detailed repair instructions or drawings with this alert. Any repairs must be carried out according to instructions from the vehicle manufacturer and/or a heavy vehicle specialist certifier.

It's important to note that lateral reinforcement must be provided in these designs.

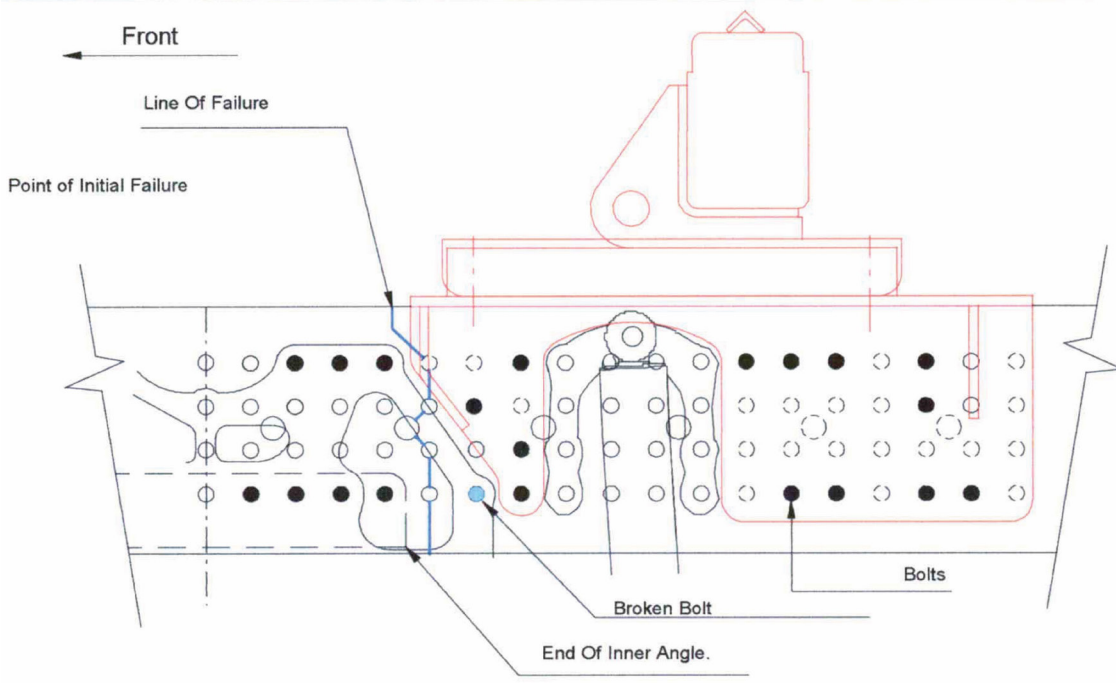

Figure 2: Schematic of crack location