



Submitted June 2024

SAFETY NOTE AFTER THE THEMATIC INVESTIGATION OF SEVERAL INCIDENTS IN WHICH SEMI-TRAILERS DETACHED FROM THE TRACKING VEHICLE DURING TRANSPORT

Road 2024/SN1

The Norwegian Safety Investigation Authority (NSIA) is a public investigation body. The purpose of the NSIA's investigations is to elucidate matters deemed to be important to the prevention of accidents and serious incidents. It is not the NSIA's task to apportion blame or liability under criminal or civil law. The NSIA has prepared this document with the aim of improving road safety. This is a summary in which the NSIA describes safety findings and learning points from the investigation, without releasing a full investigation report.

About the thematic investigation

Every year, several incidents occur in which heavy goods vehicles lose their semi-trailer during transport, and historically there have been serious accidents. In April 2021, the NSIA initiated a thematic investigation into this type of incident. The purpose has been to identify how and why they occur, as well as contributory technical and operational factors. The purpose of the investigation has also been to identify learning points and safety improvement opportunities.

Based on initial findings in the investigation, the NSIA issued a notification of safety-critical issues (NSIA no 2022/01) to the Norwegian Public Roads Administration (NPRA) on 21 January 2022 (see appendix). The further investigation has not generated findings that warrant additional safety recommendations beyond this notification. The NSIA has therefore chosen to issue a safety memo.

Sources of information and investigations

During the period from September 2019 to January 2022, the NSIA was notified of several incidents in which a semi-trailer had detached from the tractor unit during transport. Among other things, the thematic investigation has included obtaining information and conducting technical investigations of fifth wheel couplings from the tractor units (see Figure 1) involved in four incidents that occurred during the period (see Table 1). The first incident occurred in Lunner and the last took place in the Ræling tunnel at Lillestrøm. The NSIA has also conducted technical investigations of fifth wheel couplings from several other incidents reported during the same period.

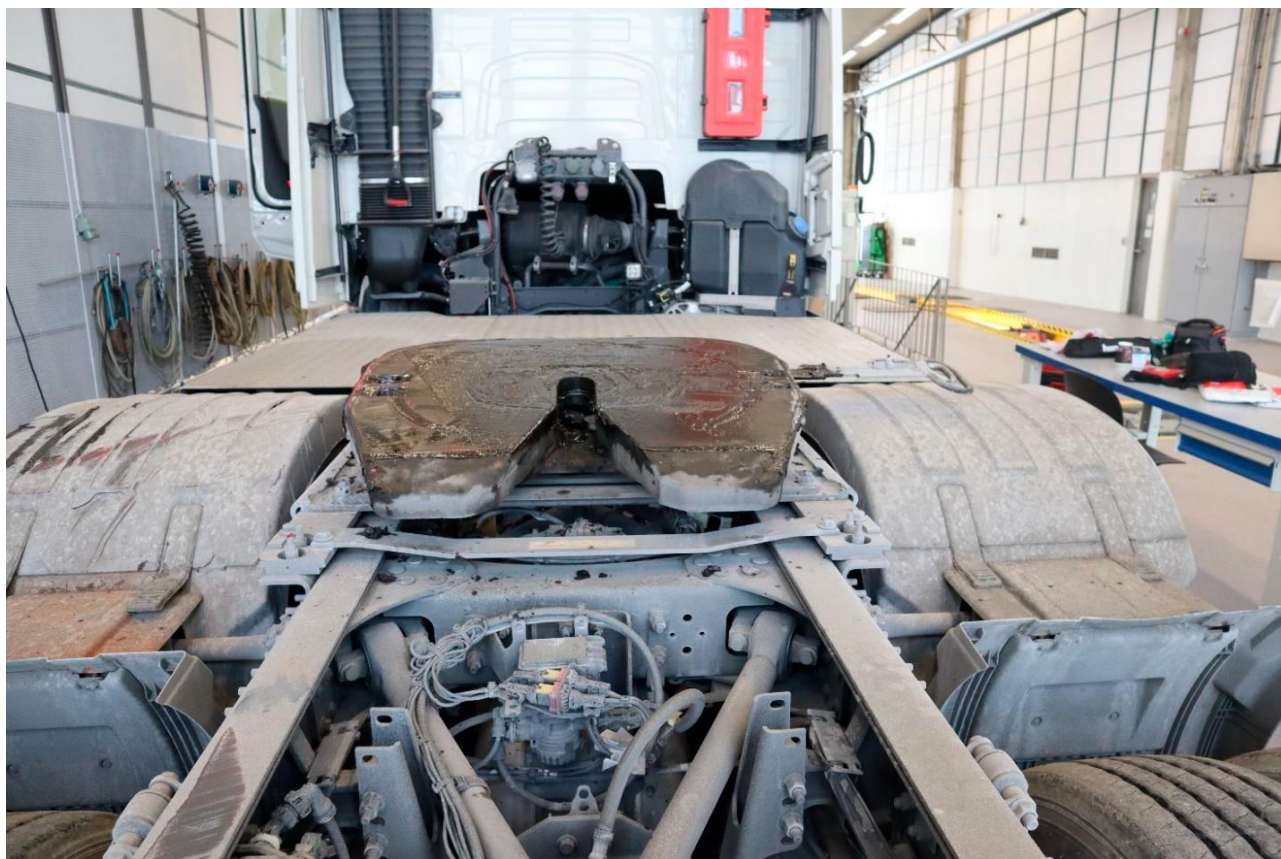


Figure 1: A fifth wheel is a device for connecting a tractor unit to a semi-trailer. The semi-trailer rests on the fifth wheel and is locked to the fifth wheel with a king pin. Photo: NSIA

Table 1: Overview of investigated incidents.

Date	Place	Incident
11 September 2019	Lunner	A semi-trailer detached from the tractor unit during transport on the E16 road in Lunner. No personal injuries.
10 February 2021	Gratangen	A semi-trailer detached from the tractor unit during transport on the E6 road in Gratangen. No personal injuries. See Figure 2.
1 March 2021	Odda	A semi-trailer detached from the tractor unit during transport on a construction site in Odda. No personal injuries.
3 January 2022	Rælingen	A semi-trailer detached from the tractor unit during transport on the RV 159 road in the Ræling tunnel. No personal injuries. See Figure 3.



Figure 2: Gratangen – the semi-trailer on its side in the ditch. Photo: NPRA



Figure 3: Rælingen – tractor unit and semi-trailer seen from the front. Photo: The police

In addition to extensive technical investigations, the NSIA has obtained police documents from reported incidents, collected information and documentation from fifth wheel manufacturers, as well as conducted interviews with HGV drivers, transport companies and heavy vehicle driving schools, and held meetings with the NPRA.

The NSIA's findings and assessments

The thematic investigation has shown the following:

- Fifth wheels of the type Fontaine 3000 that the NSIA has investigated appear to be susceptible to technical damage in the locking mechanism (see Figure 4 and Figure 5), which probably occurs in connection with the coupling of the vehicle combination throughout its lifecycle, in that the locking mechanism not being set in fully open position when coupling the vehicle combination. The nature of the damage means that it does not necessarily have an immediate effect but may develop and worsen over time. The damage will eventually prevent the fifth wheel from being locked in the safe position.



Figure 4: Crack formation and dent on the fifth wheel top plate, to the right of the locking mechanism. Photo: NSIA



Figure 5: Lock jaw, damaged example on the left, new on the right. Photo: NSIA

- If the manufacturer's user manual for maintenance, coupling and safety control had been followed by all users, such damage would probably not have occurred or would have been

detected at an earlier stage. The NSIA points out that there are differences in how fifth wheels from different manufacturers are prepared for coupling and inspection.

- Many users test the coupling between tractor unit and semi-trailer by conducting a 'pull test'. The NSIA, in cooperation with the NPRA, has conducted a practical test with a vehicle combination, which showed that a fifth wheel that was not locked in the safe position still passed the 'pull test'. The NSIA therefore considers that the 'pull test' as a method is not sufficient as a safety check on its own and that the check must also involve a physical inspection to ensure that the release handle is securely locked (cf. Fontaine 3000 user manual, see Figure 6 and Figure 7).



Figure 6: Front page of Fontaine user manual. Source: Fontaine

Standard Handle

The fifth wheel is only correctly locked when the inside notch in the handle is hidden under the fifth wheel and the safety clip can be fitted in the hole (see Figure 5).



Figure 5 - Locking of a fifth wheel with a Standard handle

Interlock Handle

The fifth wheel is only correctly locked when the inside notch in the handle is hidden under the fifth wheel and the handle plunger is correctly positioned in the locking slot under the fifth wheel (see Figure 6).

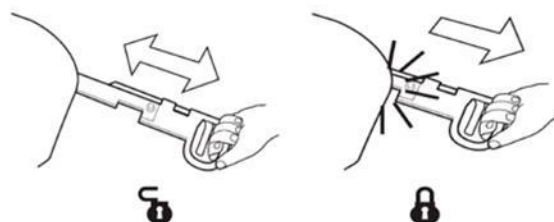


Figure 6 - Locking of a fifth wheel with an Interlock handle

Figure 7: Two different locking handles on Fontaine fifth wheel couplings. Source: Fontaine

Planned measures

The NPRA has stated that they have initiated several measures as a result of the NSIA's notification of safety critical issues of 21 January 2022. The NPRA is working on changes to the guidelines for annual periodic vehicle inspections, and information will be shared with several NPRA departments involved in inspection and training relating to tractor units with semi-trailers. The NPRA has also been in contact with the manufacturer and the Norwegian importer of Fontaine.

Safety learning

Based on an overall assessment and measures implemented by the NPRA, the NSIA will not issue any safety recommendations as a result of this investigation. However, the NSIA wishes to communicate safety findings and learning points through this final safety note.

In connection with this thematic investigation, the NSIA wishes to highlight the following learning points for users, organisations and authorities concerning secure coupling between tractor units and semi-trailers:

- Fifth wheels of the type Fontaine 3000 may be susceptible to technical damage that occurs in connection with the locking mechanism not being set in fully open position when coupling the vehicle combination.
- The damage may develop over time and eventually affect the locking mechanism and its ability to be securely connected over time.
- The damage can be detected visually through relatively simple procedures – when you know what to look for – before it develops and causes minor or major incidents and accidents.
- The damage is preventable if all users follow the manufacturer's user manual for maintenance, connection, and safety checks.
- A 'pull test' with a tractor unit only demonstrates whether the vehicle combination is connected, but not whether the fifth wheel coupling is securely locked.
- The safety check must always include a physical inspection to ensure that the release handle is securely locked.

Norwegian Safety Investigation Authority
Lillestrøm, June 2024

Appendix A Notification of safety-critical condition NSIA no. 2022/01 in connection with a thematic investigation of incidents where a semi-trailer has detached from a tractor during transport

Sent to Norwegian Public Roads Administration on 21 January 2022.

In April 2021, the Norwegian Safety Investigation Authority (NSIA) initiated a thematic investigation of incidents in which semi-trailers have become detached from a truck during transport. The thematic investigation includes four incidents, of which the last incident occurred in the Ræling tunnel at Lillestrøm on 3 January 2022.

The NSIA has so far carried out technical examinations of three different fifth wheel connections from three different incidents where semi-trailers have lost their trailer during transport. The technical examinations were carried out in NSIA's own premises, with assistance from the importer of fifth wheels; BPW Hofstad Ltd. The purpose of the technical examinations has been to find possible technical and operational causal factors for semi-trailers falling off a tractor during transport.

The technical examinations have identified a common type of damage that is of such a nature that NSIA sees a need to inform the Norwegian Public Roads Administration as the control authority about the situation. Thus, before the NSIA's investigation is completed, the Norwegian Public Roads Administration can implement the necessary measures pending the final results of the investigation.

In this connection, we refer to regulations of 30 June 2006 no. 793 on public investigation of traffic accidents and on notification of such etc. § 11. Information to the relevant public body:

The investigating authority shall continuously keep the relevant public body informed of serious conditions that are revealed during the investigation, and its own preliminary assessments of these, to the extent that this is considered critical for road traffic safety.

All the fifth wheels that the NSIA has examined have had a type of damage that affects the locking mechanism, and its possibility for a secure connection. This type of damage also gives the possibility of a "false" locking, that is, it can give the driver the impression that the trailer is securely connected. The locking handle moves in, but not completely in the locked position.

The damage is of such a nature that it initially does not necessarily damage the locking mechanism itself, but the damage develops over time during normal transport. This gives the locking mechanism itself an increasing degree of damage, which may eventually fail completely if the locking handle has not reached the locked position.

Furthermore, it is a common feature that this damage can be detected visually by relatively simple routines before it develops into serious incidents and accidents. The

NSIA believes that this type of damage can be detected both by drivers, car owners, workshops and by periodic vehicle inspection (MOT) when you know what to look for.

The NSIA's recommendations to the Norwegian Public Roads Administration as a control authority are as follows:

- Routines should be established to ensure that the marked area on the upper side of the fifth wheel (see appendix) is regularly cleaned and visually inspected.
- If wear mark, dent, damage or crack formation are discovered in the marked area, a ban on use should be imposed until any damage to the underside can be verified.
- The sidewalls for the locking wedge should always be visually inspected during periodic vehicle inspections (MOT).
- Information should be given to workshops and car owners/operators about this type of damage. The driver can detect damage even with simple aids before this leads to incidents and accidents.

The damage and its detection capability are shown in the appendix.

The NSIA has so far only received notifications for and examined Fontaine brand fifth wheels, but due to design similarity among the different manufacturers, there is reason to assume that the type of damage in question can also be detected for other brands.

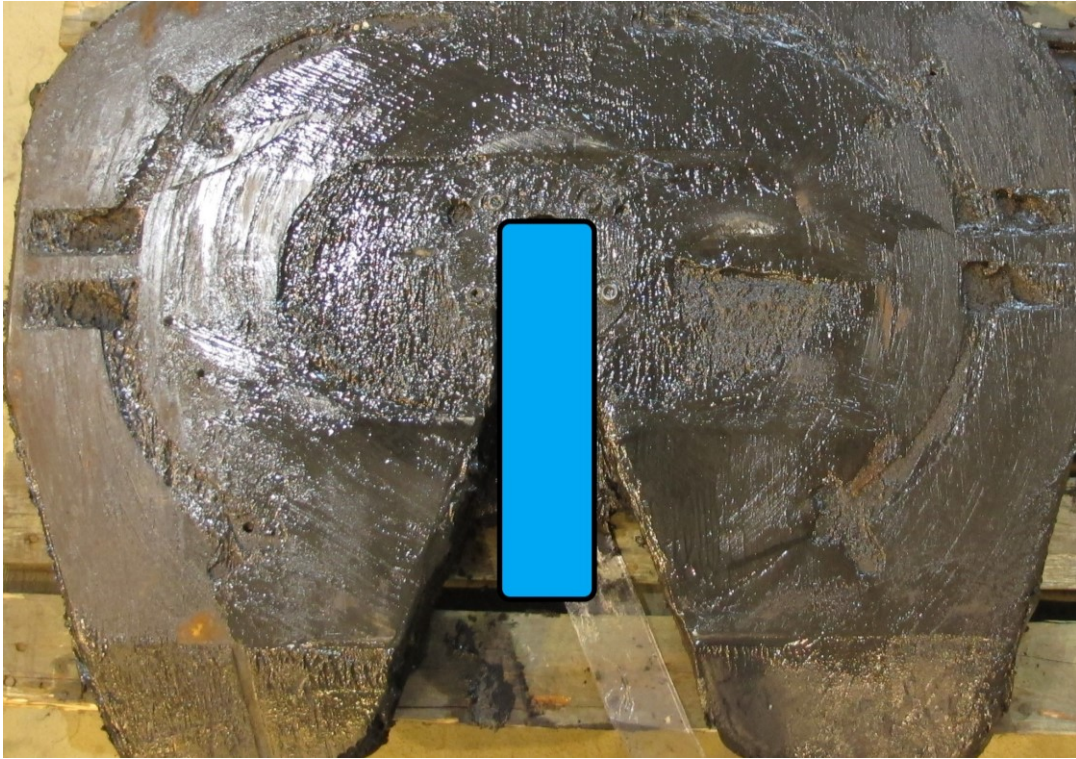
An extension of the sidewalls for the locking wedge is an injury that will develop on its own and should mandate a replacement of the fifth wheel. In the NSIA's assessment, this may help to reduce the number of incidents where semi-trailers fall off during transport.

Relevant operational and technical conditions will be followed up further by the NSIA in the thematic investigation.

Technical examinations of fifth wheel connections 13 January 2021

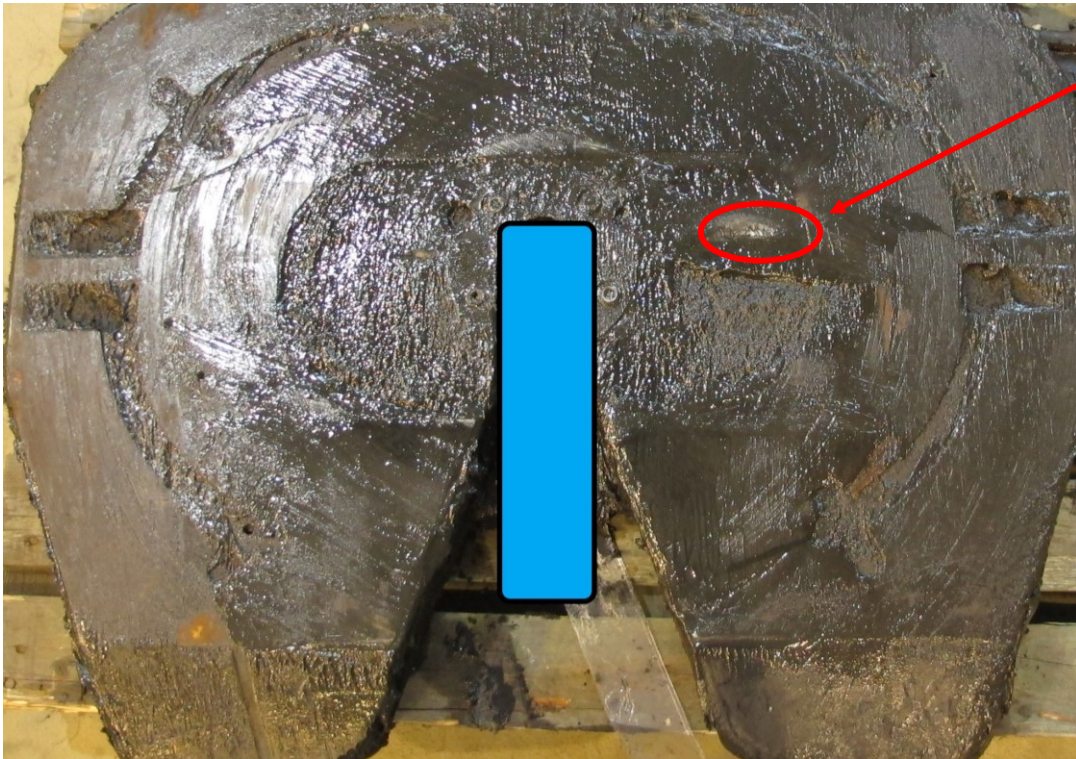
- The NSIA has carried out a technical examinations of three fifth wheels after reported incidents, these are from a total of six reported cases.
- The examinations were carried out in the NSIA's own premises, with assistance from the Norwegian importer of fifth wheels; BPW Hofstad AS.
- Purpose: to find possible technical and operational causal factors for semi-trailers falling off a tractor during transport.
- The technical examinations have so far identified a common type of damage to the fifth wheel, which can cause the mechanical lock to not fully engage.
- The NSIA has so far only received notifications for and examined Fontaine brand fifth wheels, but due to design similarity among the different manufacturers, there is reason to assume that the type of damage in question can also be detected for other brands.

The Raelingen tunnel 3 January 2022



- Volvo FH, 2020 mod, approx. 260,000 km
- Trailer falls off after approx. 2 km drive
- Visible damage to the fifth wheel/locking mechanism:
 - Bent and twisted release handle.
 - Wear under handle.
- The image contains a visible critical damage, this is identified on the next page.

The Raelingen tunnel 3 January 2022



- The damage is barely visible on the top of the disc, but this is usually hidden by the grease on the fifth wheel.
- This is due to a critical but almost invisible damage to the underside.
- The sidewalls for the locking wedge are bent out (extended). This allows the King pin to move inside the fifth wheel lock.
- This means that the damage will continue to develop under load, during normal transport.
- The damage will eventually destroy the fifth wheel lock and could give a “false” lock, in that the driver believing that the train is securely connected without being so.

The Raelingen tunnel 3 January 2022



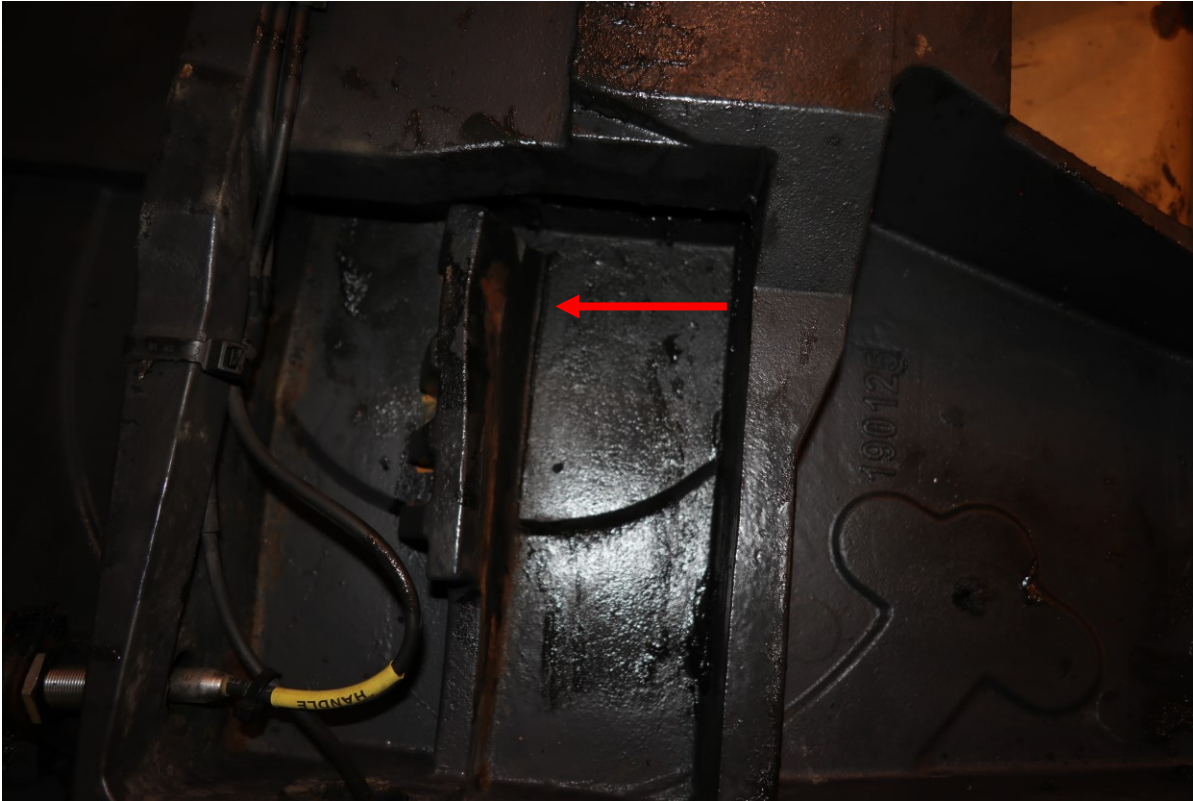
- Cleaned fifth wheel, now the damage is more visible.
- Clear crack formation in the submerged area in the middle of the fifth wheel, this area is normally filled with fifth wheel grease.

The Raelingen tunnel 3 January 2022

- Visible crack formation.

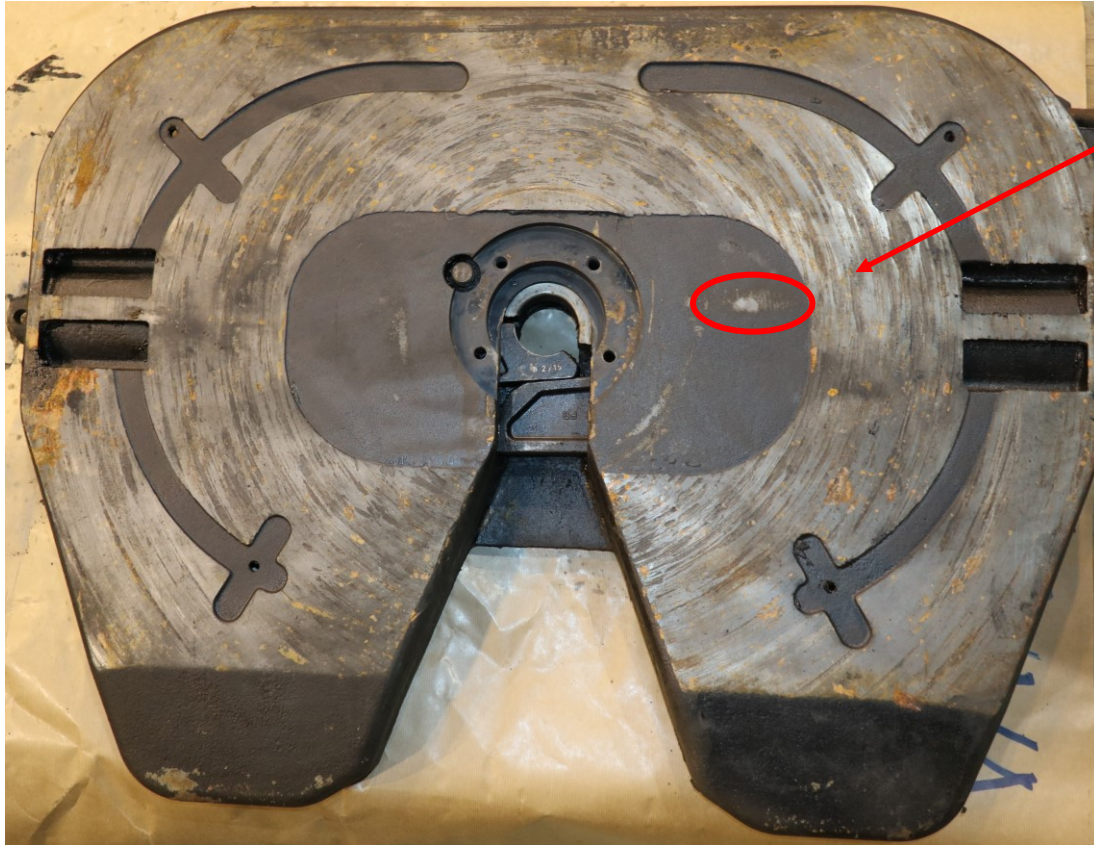


The Raelingen tunnel 3 January 2022



- The sidewalls for the locking wedge are clearly bent/extended.
- The investigation has so far shown that it is not possible to get the fifth wheel to securely lock. The locking handle enters, but not in the secured position.
- If the driver does not carry out a thorough check, it may look as if it has been locked.

Odda, construction area, 1 March 2021



- Mercedes Actros, ca. 400,000 km
- Lost trailer (dump trailer) inside a construction site.
- Cleaned fifth wheel has a little visible wear/dent in the marked area.
- This wear/dent looks insignificant but indicates a critical damage to the locking wedge slide.

Odda, construction area, 1 March 2021

- Upon closer inspection, it appears that the fifth wheel has a smaller dent from the underside.

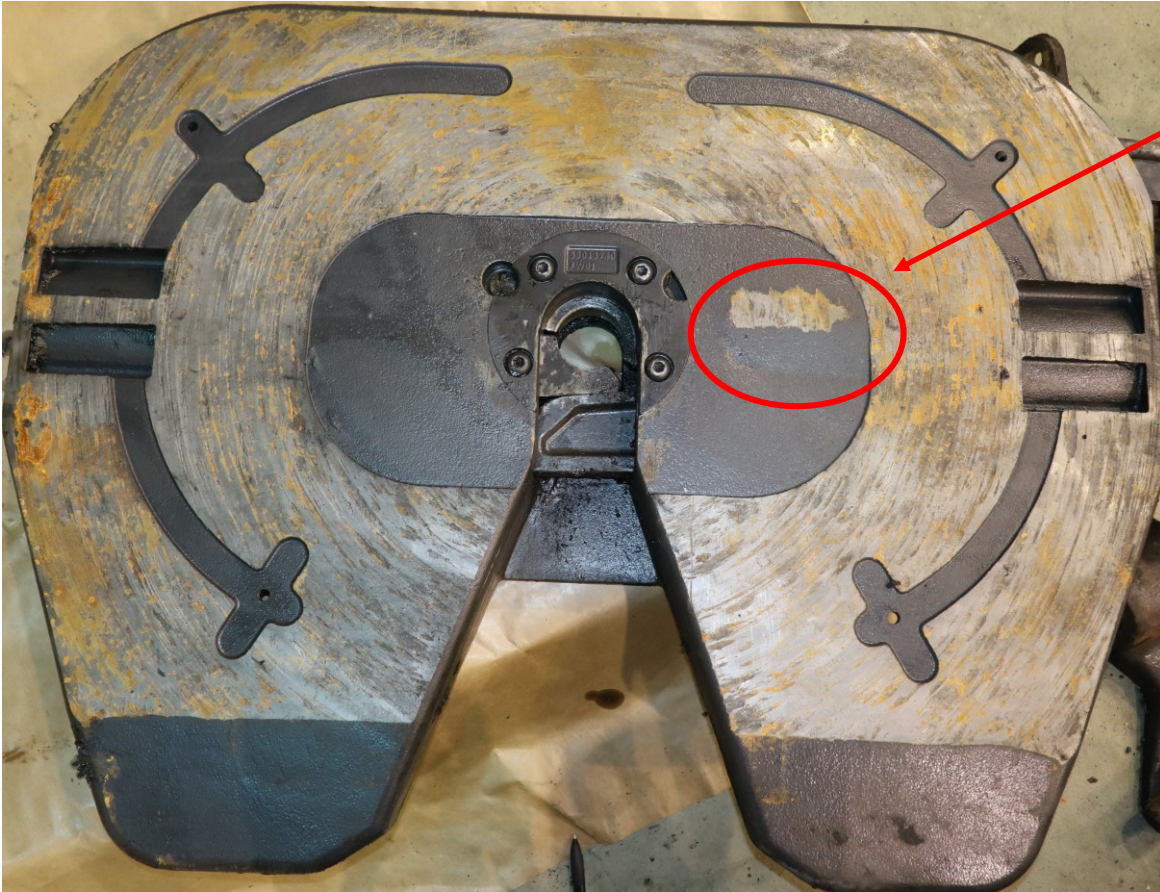


Odda, construction area, 1 March 2021



- The sidewalls for the locking wedge have been extended, by the red arrow.
- This extension allows the King pin to travel inside the fifth wheel lock.
- This damage will develop over time.

Gratangen 10 February 2021, bulk transport



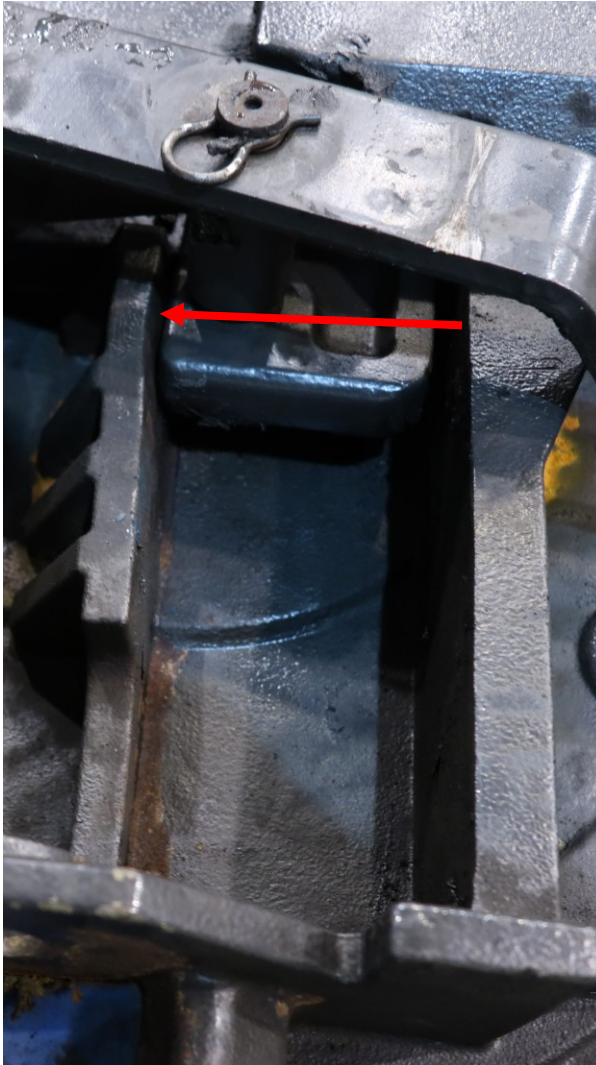
- Volvo FH, ca. 260,000 km, Swedish registered.
- E10 in Gratangen, overturns in the ditch.
- 25 tons of formic acid in reservoir.
- Cleaned fifth wheel has a slightly more visible wear/dent in the submerged area, which is normally filled with fifth wheel grease.
- This wear/dent looks insignificant, but indicates a critical damage to the locking wedge slide.

Gratangen 10 February 2021, bulk transport

- The fifth wheel has a visible larger damaged area, also normally hidden by fifth wheel grease.



Gratangen 10 February 2021, tank transport



- The sidewalls for the locking wedge are clearly extended by the red arrow.
- After examination at an approved workshop, the fifth wheel was rejected and replaced.