

SUMMARY IN ENGLISH

A freight train from Hallsberg to Borlänge derailed at 02:22 hrs on 12 October 2017 when approaching Ludvika station.

The train consisted of a Rd2 locomotive pulling a V5 diesel locomotive in transport and 36 freight wagons. At a speed of 70 km/h, passing a level crossing and entering the first switch to the station, the Rd2 locomotive bounced heavily on the track. Shortly after, the functions for automatic lowering the pantograph and the emergency brake were activated.

The Rd2 locomotive separated from the rest of the train but remained on track and stopped about 450 metres further on. The V5 locomotive in transport and the next 12 wagons derailed. The last 24 wagons remained on the track.

No personal injury occurred. However, the derailed railway vehicles and the railway infrastructure were extensively damaged.

The SHK considers it very likely that the derailment was caused by the V5 locomotive's dynamics in combination with the track errors on site.

The factor that is most clearly considered to have affected the dynamics is that the locomotive was three-axled with short wheelbase. Another factor is considered to be that the locomotive's shock absorbers had been angled. Other factors that have been found to have had a minor, but not insignificant, effect on the locomotive's dynamics, were that the springs and shock absorbers did not meet the applicable requirements and that the wheels were newly turned.

One contributing factor to the derailment was that the risk that the new angle of the shock absorbers on the three-axled locomotive in combination with track errors could contribute to an increased risk of flange climbing and derailment was not noticed in the simulations, test runs and risk analyses that were carried out in connection with the reconstruction.

Another contributing factor was that the risk that track errors in combination with the dynamics of certain types of vehicles could lead to derailment had not been recognized within the framework of the Swedish Transport Administration's maintenance system.

One contributing factor to the fact that the springs and shock absorbers did not meet current requirements was that there were no maintenance intervals for these.

When it comes to the rescue operation, the investigation shows that some problems arose in the dialogue between SOS Alarm and the Swedish Transport Administration when disconnection of traction current was requested, which delayed this measure. The site also needed to be electrically isolated and earthed because there were catenary lines torn down, but due to lack of short circuit devices, this took one and a half hour. This must be considered as a serious limitation. According to SHK the fire and rescue services must be able to perform this action much faster.

SAFETY RECOMMENDATIONS

Green Cargo is recommended to:

- Test the coil springs on type V5 locomotive at eg. periodic maintenance to ensure proper functionality. *(RJ 2019:02 R1)*
- Evaluate whether the V5 locomotive, after modification with angled shock absorbers, receives sufficient vertical damping capability, in relation to the original design and the locomotive's suspension. *(RJ 2019:02 R2)*
- Review what conditions and values that are used in simulations and test runs in the event of changes to vehicles to ensure that also less favourable conditions are tested. *(RJ 2019:02 R3)*

The Swedish Transport Administration is recommended to:

- Evaluate whether the current regulations and applied routines for track errors, inspection notes and action times, based on current regulations for moving dynamics of railway vehicles, takes care of the identified risks resulting from the combination of the moving dynamics of three-axle locomotives with short wheelbase and the type of track errors on the site. *(RJ 2019:02 R4)*
- Review how the routines for disconnecting traction current function in different situations. *(RJ 2019:02 R5)*

The Swedish Transport Agency is recommended to:

- Review the extent to which the approval process ensures that the applicant has ensured that the effect of the change has also been tested under less favourable conditions. *(RJ 2019:02 R6)*

SOS Alarm Sverige AB is recommended, in dialogue with the Swedish Transport Administration, to:

- Improve the support for SOS operators to handle a request from rescue services to stop railway traffic and to disconnect traction current. *(RJ 2019:02 R7)*

The Fire and rescue service Dala Mitt is recommended, in cooperation with the Swedish Transport Administration, to:

- Take actions to strengthen the ability to quickly isolate and earth catenary lines in railway areas within their area of operation. *(RJ 2019:02 R8)*

The Swedish Civil Contingencies Agency is recommended, in consultation with representatives from mainly the Swedish Transport Administration and fire and rescue services, to:

- Survey local conditions to quickly isolate and earth catenary lines in railway areas at rescue operations in Sweden. *(RJ 2019:02 R9)*
- Based on the survey, if necessary, produce guidance to municipal rescue services and the Swedish Transport Administration when developing local solutions for isolation and earthing catenary lines in railway areas. *(RJ 2019:02 R10)*