

SUMMARY IN ENGLISH

On Monday, August 19 at 17:33, passenger train 8923 arrived at Karlstad C (Karlstad central station) from Kristinehamn. The train had permission to approach the platform on track 1A which meant that the track section would be free from other vehicles and that the switches would be locked in the correct position in the interlocking system.

At the same time a train route was prepared in the interlocking system in the other direction for train 18922 from track 20. The switch should only have changed position after train 8923 had passed into track 1A.

Switch 417a unlocked and changed position to track 20 in front of train 8923. The driver of train 8923 noticed that the switch had changed position, applied brakes and managed to stop before the switch and train 18922 occupying track 20. The distance between the trains became approx. 140 meters. Under some other conditions, the trains could have collided.

Work had been carried out in the signal system as part of a major project for two tracks across the Pråm Canal, just east of Karlstad C.

When the project began, in 2014, the Swedish Transport Administration had planned a computer based interlocking to control the new track area. In 2016, Swedish Transport Administration instead decided to expand the old relay interlocking. However, the requirements remained unchanged with modern design conditions and adjustments for a future computer based interlocking.

The changes in the signal system were planned and reviewed in 2016–2017. A procurement process then delayed the implementation until 2019.

During the traffic shutdown 12–18 August 2019, a large part of the changes were made, followed by a commissioning inspection to check that the signalling system was functioning before allowing operation and traffic.

A dependence from a track circuit was not included in the interlock of a switch. When train 8923 was only on that track circuit, the switch could unlock and be redirected in front of the train. The track circuit had no purpose in the relay interlocking, but was designed for modern requirements and needs in the future computer based interlocking.

The error was not detected and passed all processes and controls in the safety management system including project planning, risk analyses, staff authentication, assessor assessment, safety review, approvals by the Swedish Transport Administration and the final commissioning inspection. All with the common purpose of ensuring a traffic-safe signal system and traffic.

Causes

The direct cause of the incident was that track circuit 132 was not engaged in the interlock of switch 417a. When there was a prepared train route for train 18922 from track 20 in combination with train 8923 under its train path to track 1A being shorter than the individual track circuit 132, the switch was unlocked and redirected to track 20 in front of train 8923.

The underlying causes were that the lack of interlocking was designed into the signal processing and was subsequently not identified during the safety review.

Another underlying cause was that the commissioning inspection of the train route from signal 159 to 133 was not performed with only one track circuit at a time.

One possible contributing cause was the lack of relay kits for signals in interlocking system 65. With availability of relay kits, it would have been possible to project and position additional signals.

At system level, one contributing factor was that the safety management system and risk analyses did not take into account the combined risks in signal technology, design rules, knowledge and operation.

SAFETY RECOMMENDATIONS

The Swedish Transport Administration is recommended to:

- review whether the basis for risk analyses for change in signal systems needs to be expanded with regard to (see section 3.4):
 - Special conditions and changes regarding signal technology and design rules,
 - Deficiencies and experience from previous signal design, security review and commissioning. *(RJ 2020:03 R1)*
- review how safety management system provides support for individual deficiencies identified during planning or safety reviews also to be analysed from a broader risk perspective (see section 3.3).
(RJ 2020:03 R2)
- review how training and information for projectors, safety examiners and commissioning inspectors can be improved based on past experience and changes in technology and regulations (see section 3.5). *(RJ 2020:03 R3)*