

EXTENDED SUMMARY IN ENGLISH

A near collision occurred at the station Strömtorp on November 4th, at 14:05 hrs between passenger trains no. 634 and 8919. 634 consisted of an X2-class trainset with a length surpassing 150 metres and 8919 was a Regina-class trainset with two carriages, only some 50 metres in length.

Strömtorp is a three-track station on the single track "Värmlandsbanan" line, and the trains involved were scheduled to cross there, using tracks 3 and 4 while track 2 was being occupied by a freight train awaiting its departure time. Strömtorp has no platforms, so passenger trains (as 634 and 8919) do not stop there unless a crossing is due and/or a train comes up to a signal showing a "Danger" aspect.

Strömtorp has an interlocking plant built with relays for all safety-related functions. The control system allows local or remote control (CTC) and the station is normally managed from the traffic control centre in Hallsberg.

The route for incoming train 634 was set to track 4, and for train 8919 to track 3. The station interlocking plant allows simultaneous incoming trains, so both routes were locked, both home signals showing a "clear" aspect. The orders for the routes, for the subsequent departures of the both trains, were stored in the interlocking plant control system; these routes would be set and locked, as the routes for the respective incoming (arriving) train were unlocked and dissolved. The unlocking process is automatically started as the train rear end clears a designated point in the train route.

Train 634 arrived a few minutes before 8919, and was slowly approaching the starting signal on track 4 (signal 36), which was showing a "Stop" aspect, as 8919 passed the home signal (21) in the other direction. As 8919 approached the paired switch 23a/b that connects tracks 3 and 4, the train route for 8919 was prematurely unlocked. For track and signal layout, please refer to Fig. 3 or 4.

As the route unlocked, under the train, as it were, the paired switches 23a/b were changed by the stored route order for the departure route for 634. Train 8919 was thus led over to track 4, travelling heads-on with 634, creeping up to its starting signal.

Train 8919 was travelling at a reduced speed of about 40 km/h, as its driver had adjusted the speed to avoid having to come to a full stop at the starting signal on track 3 (31), which showed a "Stop" aspect. As the drivers became aware of the situation, they immediately applied full brake and the trains came to a standstill with a distance of some 70 meters between them.

The situation occurred because of a faulty design in the unlocking circuits for the train route between signals 21 > 31. The conditions required for unlocking that route include (only) the track circuit of switch 1 to become free and the track circuit S32 (SIIIA) to be occupied (the sequence of events must be correct to initiate the unlocking of the route). If a train is short enough (i.e shorter than the track section controlled by track circuit S32, which is 120 m), this situation can occur before the train occupies and trips the track circuit of the paired switches 23a/b (which would preclude changing switch position). This is contrary to the prevailing principles ruling the unlocking of a protected train route. It would be expected, that a train should completely pass all points in the route, before unlocking of the points can occur. As

the route was unlocked, the stored route orders that were held back by that existing route were executed. In this case that included the changing of position of switches 23a/b.

The interlocking plant was rebuilt in 1997 to allow simultaneous train arrival, which was not allowed in the older traffic regulations and not possible in the original design of the interlocking plant. The design error is assumed to have been introduced at that point and it was not discovered during the third-party check that was carried out prior to the actual rebuild, and not in the function check carried out after the rebuild.

Since the dangerous situation linked to the design flaw can only manifest itself in a particular traffic situation, and requires one of the trains involved to be shorter than the section of track controlled by track circuit S32, it seems it has gone undetected for several years. However, with great probability the design flaw *could* have been detected in a function check aimed at the unlocking process of the route 21 > 31 in Strömtorp. The purpose of the rebuild in 1997, was to speed up crossings at the station, by allowing simultaneous arrivals, and to alter the train route unlocking prerequisites, so as to achieve route unlocking as early as possible while still maintaining full safety. Checking the correct functionality of system parts that have been altered is fundamental, but checks can be carried out in different ways. For the case at hand, neither instructions nor notes have been saved, which could have shown what tests were actually performed.

Safety Recommendations

Because of the extensive investigations and the corrective measures taken very shortly after the incident by the infrastructure manager, Trafikverket, and considering the very specific technical nature of the problem, SHK has chosen not to issue any safety recommendations.

