

## **EXTENDED SUMMARY IN ENGLISH**

On the night between 14 and 15 January 2013, two electric multiple units (EMUs) entered into an uncontrolled movement on the Saltsjöbanan commuter railway. The vehicles left the depot at Neglinge and proceeded towards the end station of the line, Saltsjöbaden, under full tractive power. At Saltsjöbaden, which is a cul-de-sac station, the vehicles travelled over track 1 at some 80 km/h and went through the end barrier and collided with an apartment building 30 metres beyond the end of the track. Rescue workers extracted one seriously injured woman from the wreckage but no other casualties occurred. The leading car was damaged beyond repair and the building sustained severe, but repairable damage.

Earlier, the last scheduled train had arrived at the depot at Neglinge and its EMU was coupled to the one from the second-last train, which was already standing at track 3 at Neglinge. At this point, the traffic controller for Saltsjöbanan went off duty and, according to plan, left the traffic control center unmanned for the duration of the time when there were no train services. All switches were released for local operation and the entire system was given over to a track possession, in the charge of an overseer. This was normal procedure, introduced to allow various types of system maintenance during the night.

During the time until the first train of the next day was due, cleaning and light maintenance were planned to be carried out on the EMUs. A shunter and a cleaner (the woman later found in the wreckage in Saltsjöbaden) were working in the depot. It had been snowing during the day, and the temperature was a few degrees below freezing point. The shunter decided that the vehicles couldn't be left with the brakes applied, as there was a risk of the blocks freezing to the wheels during the standstill. In order to avoid such trouble, a special piece of equipment is installed on all parking tracks at Neglinge. Using a 24 V AC feed through a cable from outside and a special procedure in the driver's cab, the brakes can be released without having to activate the driver's controls. However, this equipment was not in working order at track 3 and had actually been nonfunctional for several weeks. That being the fact, the shunter decided to use an unauthorized procedure to keep the brakes released. For that purpose he proceeded to activate the driver's controls in the cab facing Saltsjöbaden, engaged the driver's safety device ("dead man's switch") using a loose brake block and closed the doors, to enable brake release. The doors were then released for individual control, to prevent engagement of tractive power. At some point during the procedure, the train control lever was placed in the "Full power" position. The shunter then assisted the cleaner with some of the tasks that needed to be carried out.

When the cleaner was almost finished, the shunter left the vehicles and went to the workshop office to print out and complete some maintenance forms. The driver's cab was left as arranged, with the controller key in the lock. When he returned some 30 minutes later, the vehicle combination of two EMUs had disappeared.

The cleaner cannot remember any details of that night, but has been able to give a statement as to how the normal cleaning procedure is conducted. The crucial part is the fact that cleaning of the car floors involve sweeping sand and grit out through the passenger doors. Since dirt in the door guides can prevent proper door function, a final move is normally to close the doors using a central command from a cab where the door system is activated, to check the proper function of the doors.

It has been shown, through practical tests, that with the driver's controls arranged as they were, engagement of tractive power depends only on a central impuls to close the passenger doors. SHK

is convinced that this is what actually happened in this case. The driver's controls were arranged to release the brakes. Later, the cleaner closed the doors using a central command button, to ensure the proper function of the doors. When the impulse was given, the tractive power was engaged. The control lever, being left in the "full power" position, enabled the power control system gradually to apply full power to the traction motors. Since the cleaner had no knowledge of the function or use of the driving controls and, indeed, probably had no idea at all of what was happening, she couldn't find a way to stop the vehicles and eventually took cover in a passenger seat close to the driver's cab. The duration of the movement from Neglinge to Saltsjöbaden was less than 2 minutes, during which the EMUs gradually gained speed.

The points at Neglinge had been left in the position they had had after the route was set for the arrival of the last train to track 3. The runaway vehicles were thus led back out onto the line towards Saltsjöbaden.

The EMUs on the Saltsjöbanan line consist of one motor car and one cab car. The weight of one EMU is about 45 metric tonnes, the runaway vehicle combination had a weight of about 90 metric tonnes, accordingly.

Direct cause of accident:

Controls in the driver's cab had been arranged to release the brakes and keep them released without further human intervention. The manner in which the arrangement was carried out, made the engagement of tractive power depend only on a central impulse to close the passenger doors.

Contributing factors:

a) the shunter was under the impression that his method of effecting release of the brakes was not insecure and that it was an efficient measure to take when the proper equipment was out of service. Supervising functions in the safety management system of the railway undertaking had not been able to identify neither where unauthorized procedures were employed in the practical work, nor the risks accompanying such procedures.

b) one switch in the route that the runaway used leaving Neglinge, was intended to be used as trap points to protect the line towards Saltsjöbaden from irregular movements in the shunting yard at Neglinge. This switch was not changed to the protective position, however, as the operator had concluded that there was no rule that clearly stated which position the switch should be in when not used. The switch was left in the position for the route of the last incoming train, to facilitate the departure of the first train the next morning, i.e. to minimize risk of snow/ice blocking the switch in the "wrong" position. It was found during the investigation, that the railway undertaking and the infrastructure manager had different views on the handling of switches serving as trap points, but the infrastructure manager had not noted this discrepancy.

## **Recommendations**

In the light of the actions taken in response to the accident, by the railway undertaking and the infrastructure manager, and the ongoing development work within the Swedish Transport Agency regarding licensing and auditing, SHK has decided not to issue explicit recommendations. It is assumed, however, that findings recorded in this report are taken into account in the ongoing development work mentioned above.