R2021-02 CONCLUSIONS

The conclusions include the causes of the accident or incident. A cause means the various factors behind the incident and the direct and indirect circumstances affecting it.

1. As a whole, the softer narrow track support structure in the section of track as well as the wooden sleepers that are lighter than concrete sleepers created a structure that was more vulnerable to the stresses of train traffic and the forces of nature. A closer investigation into the condition of the support layer of the track section was not carried out before starting the sleeper replacement project, and it was not required by the Railway Engineering Guidelines. The quality of the railway work was inspected in accordance with the instructions before the track was handed over for use in traffic both visually during a walking inspection and by using the instruments on the tamper.

   Conclusion: *The stability of the track was weakened further when work on replacing the sleepers and supporting the track was carried out on the section of track, in connection with which the surface and support structure of the track had to be handled and loosened.*

2. There were non-functioning rail joints in the section of the track, which was partly caused by shortening the rails used. Due to drilling errors during the renovation of the track, some rail joints did not work as intended. When the contractor for the maintenance area changed, non-functioning rail joints were discovered in the section of the track. According to the Railway Engineering Guidelines (RATO), the non-functioning rail joints should have been addressed.

   Conclusion: *The correct implementation and maintenance of rail joints is especially important, because in sections of track with an outdated and crumbling support layer, the weakened support layer does not provide enough support for the rail.*

3. There are several sections of track in use in Finland that are based on an outdated support layer, where the durability of the support layer does not meet the current safety requirements. Despite the challenges, however, the service condition of even such sections of track is maintained with normal maintenance measures.

   Conclusion: *Maintenance measures of sections of track based on an outdated support layer cannot completely remove the heightened risk to railway safety caused by non-functioning rail joints and a support layer that has been left softer and narrower.*

4. The railway work project continued during June despite the exceptionally hot weather. During the work, the temperature of the rails was measured, but the temperatures were not recorded. The instructions did not require recording the rail temperatures during railway work. The supervisors, who mainly monitored the railway work remotely, did not have a document-based opportunity to assess the effect of the development of rail temperatures during railway work on safety risks in rail traffic.

   Conclusion: *The risk of constant hot weather was not recognised partly due to incomplete instructions. In order to work, remote management requires careful instruction, documentation, reporting and monitoring of the work.*

5. The management and work processes in the railway maintenance work were divided between three organisations based on specifications in accordance with the agreements. With regard to the work on replacing the sleepers, a management model characteristic of an expert organisation, based on independent operation, decision-making and supervision, was emphasised in the management of all three organisations. In their current form, the Railway Engineering Guidelines do not describe the activities between the three organisations and their decision-making responsibilities in connection with a potential interruption of railway work.

   Conclusion: *The work process that was divided between three organisations and the incomplete instructions did not provide guidance for stopping the work on replacing the sleepers during exceptional weather conditions. A management model typical of expert organisations made it possible for the work on replacing the sleepers and the activities of the site personnel to continue despite the elevated risk factors.*

6. The self-monitoring emphasised by the customer organisation applied to all three organisations central to railway work. Implementing the monitoring through reports and spot checks as well as implementing the supervisory duties on site as remote work allowed the site personnel to work very independently based on their own job practices and processes. The deficiencies in the obligations of the Railway Engineering Guidelines made it possible to neglect recording and saving the rail temperatures in exceptional conditions.

   Conclusion: *A management model typical of an expert organisation as well as incomplete instructions on work processes may cause situations, in which the decision-makers are not aware of information essential for interrupting work during exceptional conditions.*

7. The track buckle that occurred on 18 June during railway work was processed as a deviation related to normal operations, and it did not cause any changes in the implementation of the railway work project. The railway work was not interrupted even though forecasts on the hot weather continuing were known.

   Conclusion: *Track buckles were handled as a normal phenomenon during railway work, instead of them being identified as risk factors that affected the operations.*

8. A freight train was derailed due to the track buckles that formed under the train. The formation of track buckles was affected by the failure of the old and narrow surface structure weakened by the railway work during the long period of hot weather.

   Conclusion: *Due to global warming, long periods of hot weather will become more common, and the risk of track buckles grows especially on the sections of track that are in the poorest condition.*

9. During the summer of 2021, a total of four track buckles formed on the section of track during a short period of time. Several similarities with the accident that occurred can be found in observations made during previous investigations by the Safety Investigation Authority, Finland: The accident involved a freight train. Work on replacing the sleepers and tamping the track had been carried out on the section of track where the accident occurred, and the stability of the track had weakened. The section of track had wooden sleepers, the track was supported by a gravel support layer, and the amount of chippings spread was insufficient. The load on the tracks in hot weather conditions during or after the railway work caused track buckles.

Conclusion: *The formation of track buckles and the accident that occurred can be considered a systemic accident. This means that the practices and ways of thinking that have been established in the field over a long period of time normalise and permit the occurrence of specific kinds of accidents.*