Translation of an excerpt of the investigation report

“Train derailment Bietigheim-Bissingen on 24/09/2020”

Status as of 11/11/2024, version 1.1.

Note:

In accordance with Article 3 of Implementing Regulation (EU) 2020/572, points 1, 5 and 6 of Annex I of an investigation report shall be written in a second official European language. This translation should be available no later than three months after the delivery of the report.

The following English translation is a corresponding excerpt of the investigation report. The German language version is authoritative.

Excerpt translation:

1 Summary

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1.1 Brief description of the event

On 24/09/2020 at around 6:40 pm the freight train GC 68327, which was carrying salt, derailed on the journey from Heilbronn to Kastl (Upper Bavaria) when leaving track 8 of Bietigheim-Bissingen station. Prior to this, the eighth carriage of the train lost load on one side several times during the journey.

1.2 Consequences

There were no injuries or fatalities. After the derailment, the eighth wagon of the train was dragged along for a few metres and then toppled over. All axles of the ninth wagon also derailed.

Material damage was caused to vehicles, the track infrastructure as well as the control and safety system amounting to around EUR 328,000.

1.3 Causes

During the investigation of the event, the following actions, failures, incidents or circumstances were identified as safety-critical factors. These are differentiated into causal or contributing and systemic factors according to Implementing Regulation (EU) 2020/572.

A system with designations in square brackets is used to provide better clarity about the factors and aspects of emergency management.

A detailed assessment of the event with classification as safety-critical factors is provided in the sections below.

Action/failure/circumstance/incident	Causal factor	Contributing factor	Systemic factor
Securing cams not inserted	Ineffective securing of hatches after maintenance [F1]		
Ineffective securing of hatches not identified	Quality of the technical wagon inspection [F2]		
Progressive loss of load	Spontaneous opening of the unloading hatches [F3]		
Derailment	Critical change in the resulting force [F4]		

Table 1: Summary of influencing factors

1.4 Safety recommendations

No safety recommendation has been provided.

5 Conclusions

The following section contains a summary of the identified causal, contributing and systemic factors. In addition, two further subsections are provided containing information about measures already taken, and additional comments.

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5.1 Summary and conclusion

One causal factor for the derailment was securing cams not being inserted correctly on one side after time spent in the workshop, which meant that the unloading hatches were not secured [F1]. The ineffective securing of hatches was not identified during the technical wagon inspection that must be carried out before the departure of the train [F2]. As a result, the unloading hatches spontaneously opened on one side and the load was progressively lost during the train journey [F3]. The critical change in the resulting force, including due to the conditions at the derailment point, resulted in the tilting and derailment of the wagon [F4].

In relation to the causal factor "Ineffective securing of hatches after maintenance" [F1]:

The locking levers on the right side of the wagon were not secured by the securing cams to prevent unwanted movement in the opening direction. Due to the forces from the adjacent load and the momentum during the journey, in particular when travelling around left-hand bends, the unloading hatches were able to push away the locking hooks and open unintentionally.

Based on the evidence available, it must be assumed that the failure to correctly insert the securing devices for the hatch locking on the right side of the wagon had already occurred after the maintenance work. The locking levers on the affected side of the wagon were only manually, i.e. without locking assistance, brought into a state that was indeed sufficient to temporarily prevent the opening of the unloading hatches, but did not ensure that they were permanently secured. The report from DB Systemtechnik GmbH conceded that an intermediate state of this kind may have been present.

In relation to the causal factor "Quality of the technical wagon inspection" [F2]:

The rules for the technical wagon inspection are stipulated in the relevant internal company regulations. Checking the locking and securing devices was explicitly part of this examination before the journey involving the accident. Evidently this examination was not carried out with the necessary care. The discrepancies relating to the times stated for the performance of the technical wagon inspection before the departure of the train in Heilbronn also point towards this. Depending on the model, it may no longer have been possible to manipulate the securing devices after loading without the load being discharged immediately. Conversely, it must be assumed that the locking device was already not secured at the time of the technical wagon inspection for train GC 68327 and this was not identified.

The lack of effective securing of the hatches was therefore also already present during the required technical wagon inspection before the transfer of the vehicle from the Kornwestheim workshop to Heilbronn and the corresponding shunting movements, and this was not identified.

In relation to the causal factor "Spontaneous opening of the unloading hatches" [F3]:

Due to the effective forces resulting from the movement during travel, particularly on the left-hand bend, and due to the adjacent load, the tappets that were not fully applied were ultimately pushed away to the extent that the unloading hatches opened spontaneously and the load escaped several times during the train journey. Due to the progressive loss of load on the entire right side of the wagon, the wagon's centre of gravity shifted to the left side. After the Besigheim stop at the latest, the wagon appeared to have reached a critical situation, which resulted in a strong probability of tilting or derailment as the train travelled onward.

In relation to the causal factor"Critical change in the resulting force" [F4]:

The slow negotiation of the left-hand bend on a superelevation in the area of the derailment point in Bietigheim-Bissingen station resulted in a further shift in the centre of gravity of the wagon with the load on one side. The altering forces when negotiating the superelevation slowly, whilst also dealing with an impaired track situation in Bietigheim-Bissingen station, were enough to generate sufficient tilting moment and compromise safe steering on the track by taking the load off individual wheels. Ultimately the wagon derailed and toppled over.

5.2 Measures taken since the event

After the event, DB Cargo AG defined the inspection requirements more precisely for employees involved in the technical wagon inspection in relation to the locking devices for unloading hatches in regulation 936.

5.3 Additional observations

During the accident investigation, an issue was identified that could have affected the safety level of the railway system and therefore was considered in more detail. It was not possible to identify one single event-relevant factor for the event.

At several points before and in the area of the derailment, build-ups of sand were found on the wooden sleepers. In the area of the derailment point there were noticeable problems on the left of the right rail. Several wooden sleepers were exposed here roughly to the base of the sleeper on the ballast. At the derailment point itself, the sleepers were sunken and covered with gravel as shown in the Figure below.

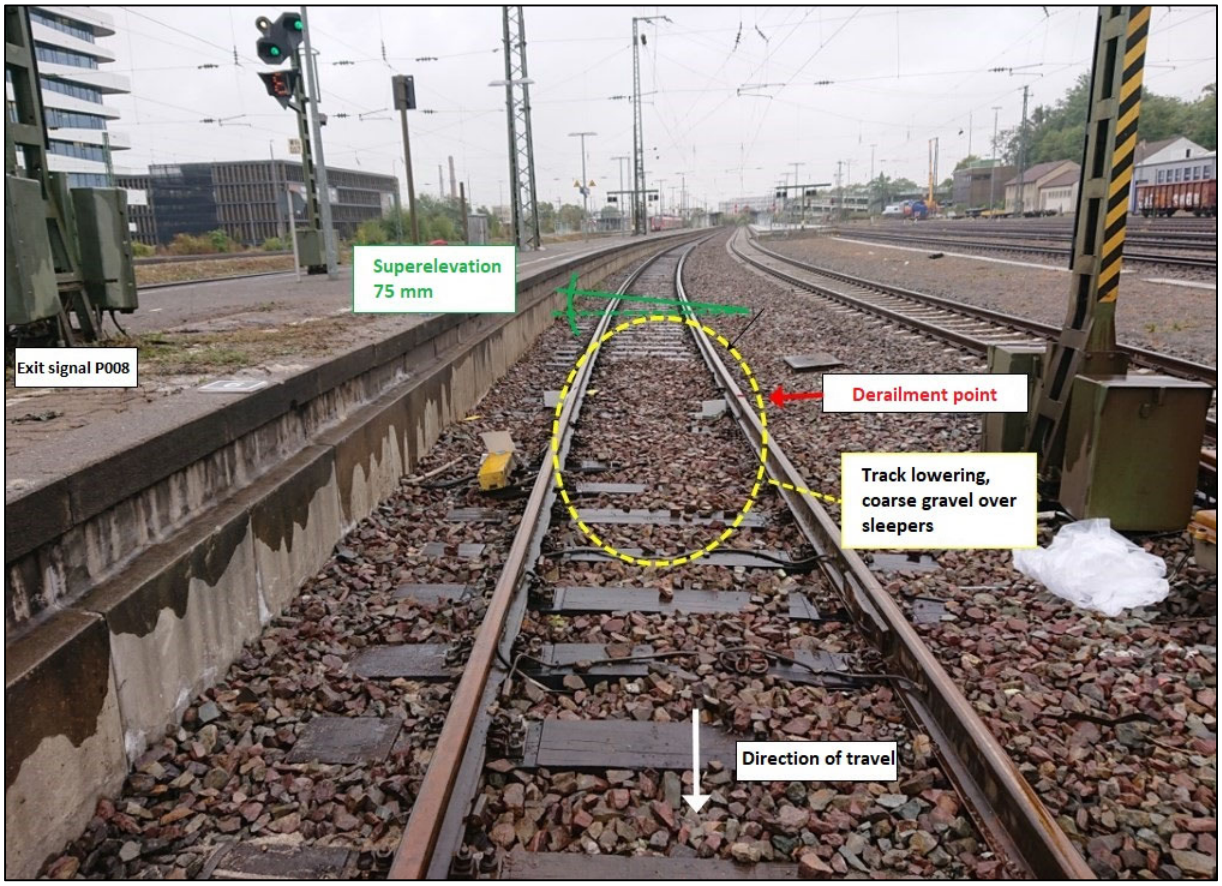

Figure 1: Gravel covering at the lowering of the track

Taken together, the issues identified indicated a muddy area in the substructure in the area of the derailment point. The very coarse gravel present in this area also indicated that maintenance work had already been carried out to stabilise the track.

Further investigations into the cause of the muddy area showed that the pipes for the deep drainage were blocked with very fine grain material, meaning that there was no longer sufficient water drainage via the drainpipes.

The figure below shows the view into a deep drainage pipe blocked with very fine grain material near to the derailment point.

Figure 2: Blocked deep drainage pipe

According to the railway infrastructure company, the drainpipes should be inspected once per year according to guideline 836. The substructure and the drainage were the responsibility of constructive engineering. The evidence of inspection of the drainage at Bietigheim-Bissingen station was requested for inspection.

The obvious results allow the following assessment to be made:

- No inspection record could be presented for 2018. It must be assumed that the inspection was not carried out.
- For the inspection in 2019, it was noted on the inspection report dated 30/10/2019 that shafts could not be found, shafts S 28 and S 29 were covered with gravel and the remaining shafts in the embankment were overgrown. Similarly, it can therefore be assumed that the drainpipes and their shafts were also not fully inspected in 2019.

Due to the silting up of the drainage systems, these systems were not able to drain away the accumulating water to the intended extent. Due to the failure to inspect the deep drainage, this issue was neither identified nor rectified. This resulted in muddy points in the track area, which reduced the load-bearing capacity of the substructure.

The failure to carry out inspections contravenes the specifications of Regulation (EU) 2018/762 Annex II points 5.2.1 and 5.2.2, according to which the organisation must ensure that the assets are used for the purpose intended throughout their life cycle while maintaining their safe operational state and the expected level of performance. Non-compliance with operating requirements must be detected as soon as possible.

According to Regulation (EU) 2018/762 Annex II point 6.1.2, the organisation shall regularly monitor, at all levels within the organisation, the performance of safety-related tasks and intervene if these tasks are not being properly performed. Evidently there was no monitoring of whether and to what extent the stipulated inspections of the drainage systems were actually carried out. It also seems to be worth asking why identifying that shafts were covered or overgrown in 2019 did not result in the lack of access to the shafts first being remedied so that the maintenance work could be carried out.

In July 2023, DB Netz AG arranged for the deep drainage pipes to be rinsed and for the drainpipes to be inspected with a camera.

6 Safety recommendations

The derailment was due to the inadequate quality of the work carried out at various points in the procedural organisation of the railway undertaking and ECM. In this individual case, no safety recommendation was issued in accordance with Section 6 EUV [German railway accident investigation regulation] and Article 26(2) of Directive (EU) 2016/798.