Translation of an excerpt of the investigation report

“Train collision at Ebenhausen-Schäftlarn station on 14/02/2022”

Status as of 27/11/2025, version 1.0.

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

The first section contains a brief description of the event, as well as information on the consequences, primary causes and safety recommendations provided in the individual case.

1.1 Brief description of the event

On 14/02/2022 at around 4:35 pm, when departing from Ebenhausen-Schäftlarn station the passenger train S 6785, which was travelling from Wolfratshausen to Aying, collided with passenger train S 6776, which was stationary at km 17.76.

1.2 Consequences

One person was killed. Ten people were severely injured and 47 people suffered less serious injuries. Considerable property damage amounting to around EUR 3.3 million was caused to the vehicles and the infrastructure.

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 2020/572. Identified shortcomings in the emergency management are also addressed.

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.

What happened: Date/time, and action/failure/circumstance/incident	Causal factor	Contributing factor	Systemic factor
14/02/2022, around 4:34 pm Without authorisation, the train driver of passenger train S 6785 failed to observe exit signal 1P1, which was showing stop, in Ebenhausen-Schäftlarn station and approached and then passed this exit signal.	Failure to observe the signal aspect [F1]		
14/02/2022, around 4:34 pm After passing the signal without authorisation, the driver of passenger train S 6785 failed to carry out the mandatory communication with the responsible signaller.		Lack of communication with the signaller [F2]	Safety consciousness of the employees [S2]
14/02/2022, around 4:35 pm The driver of passenger train S 6785 cancelled the automatic train stop of the PZB (intermittent train control system) and continued his journey into the track section that was already occupied by the oncoming passenger train.	Continuation of journey after passing the main signal without authorisation [F3]		Technical design of the PZB vehicle equipment [S3]

Table 1: Summary of influencing factors

1.4 Safety recommendations

The Federal Authority for Railway Accident Investigation published an initial interim report on 22/06/2022. This report issued the following safety recommendations in accordance with Section 6 EUV [German railway accident investigation regulation] and Article 26 of Directive (EU) 2016/798. These are maintained.

The following recommendation was made:

- that in the safety management system of the railways, processes be developed or improved that allow for effective examination of the effectiveness of compliance with the rules after the occurrence of a PZB automatic train stop. Appropriate measures must be deduced from these findings to raise awareness among employees in rail operations (Federal Authority for Railway Accident Investigation safety recommendation no. 03/2022).
- the vehicle technology must be expanded so that the driver must be given an appropriate period after the occurrence of a PZB automatic train stop to think (awareness of the situation) and act (processing of guideline 408.2651) (Federal Authority for Railway Accident Investigation safety recommendation no. 04/2022).

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

5.1 Summary and conclusion

Due to the nature of the event and the findings gained, it was possible to identify that the control and safety technology, the physical structure of the track infrastructure and the actions of the signaller were not relevant influencing factors for the event. It was possible to deduce the factors listed below from the investigations. In relation to these individual factors, the Federal Authority for Railway Accident Investigation believes there are opportunities to improve rail safety and has already issued safety recommendations 03/2022 and 04/2022 to this effect in the interim report dated 22/06/2022.

In relation to the causal factor “Failure to observe the signal position” [F1]:

The reconstruction of the event showed that at 4:34 pm, the driver of passenger train S 6785 approached and then passed exit signal 1P1, contrary to the fact that at this time this signal was displaying the signal aspect Hp 0 “Stop”. No other influencing factors, such as external conditions or a technical fault, were identified. It is therefore almost certain that this was a mistake by the driver. Mistakes of this kind were already well known before the event. In order to reduce the consequences of this kind of mistake, state of the art was and is to use appropriate technical systems for control, in this case in the form of the PZB train protection system. This system was working properly and brought the passenger train to a stop automatically shortly after exit signal 1P1, still within the intended protection area. If the operational rules on what to do next had been followed, the mistake would still have been revealed in good time.

There was therefore a risk control measure, which worked as intended in relation to the ignored signal position. As a result, no independent safety recommendation is issued in relation to causal factor [F1].

In relation to the contributing factor "Lack of communication with the signaller" [F2]:

In accordance with the rules to be followed by the driver, in particular in guideline 408.2651, following a PZB automatic train stop it was mandatory to communicate with the responsible signaller. The driver did not follow this fundamentally important rule in the case of the two PZB automatic train stops, which occurred shortly before the event, and in each case continued the journey without consultation. However, if the driver had followed the rule, it must be seen as at least probable that the actual situation would have been identified in the subsequent conversation with the signaller. Failure to communicate with the signaller, particularly after PZB automatic train stops, is a problem that has also repeatedly occurred in the past.

In relation to this issue, the Federal Railway Investigation Authority issued safety recommendation no 02/2015 in 2015:

> *"To examine the upgrading of the train control systems on the train with the protective aim of "establishing contact after PZB automatic train stops before travelling onwards", and to develop the systems further depending on the result of this examination".*

The Federal Authority for Railway Accident Investigation is not aware of any direct technical measures that had been implemented between the issuing of this safety recommendation in 2015 and the event. One of the reasons that industry associations used to justify this was the fact that in the longer-term it was planned that the PZB would be replaced with another train control system, in which mistakes of this kind could not occur in this way and continuing onward without further ado would not be possible. Organisational measures that were easy to implement, such as training, were therefore implemented as an alternative. However, the occurrence of another event showed that this was not sufficient. As a result, the Federal Authority for Railway Accident Investigation has already issued another safety recommendation no. 04/2022 in an interim report on this event in 2022:

> *"It is recommended that the vehicle technology be expanded so that the driver must be given an appropriate period after the occurrence of a PZB automatic train stop to think (awareness of the situation) and act (processing of guideline 408.2651)."*

This remains relevant in relation to factor [F2] and is maintained. In addition, reference is also made to safety recommendation 02/2015, which has almost the same content. It must be assumed that the PZB train protection system will still be used for some time to come. The

Federal Authority for Railway Accident Investigation therefore believes that a technical adjustment of the vehicle technology would be appropriate if possible.

In relation to the systemic factor "Safety consciousness of the employees" [S2]:

As already explained for factor [F2], in order for operations to be carried out safely after a PZB automatic train stop, it is mandatory for the employees to have an overview of the situation and to act accordingly in line with the stipulated rules. In order to achieve this, it is indispensable to implement the requirement as per Delegated Regulation (EU) 2018/762 relating to a safety culture and safety consciousness for all employees and organisations involved in railway operation. The Regulation stipulates the following in recital (7):

> *"The way safety is perceived, valued and prioritised in an organisation reflects the real commitment to safety at all levels in the organisation. Therefore, it is also important for railway undertakings and infrastructure managers to identify the actions and behaviours that can shape a positive safety culture and to promote through their safety management system this culture of mutual trust, confidence and learning in which staff are encouraged to contribute to the development of safety by reporting dangerous occurrences and providing safety-related information."*[1]

The event, and similar events that happened before and after, repeatedly show that employees misinterpreting the actual operational situation results in things being done or omitted that are perceived to speed up operations, but in some cases fundamentally contradict the systemic safety culture. It is the duty of the organisations to identify this and to take suitable measures to prevent it happening in the future. At this point, communication with one another must be highlighted above everything else. In actual fact, a culture must be established in which it is natural even to report one's own mistakes to other people. This requires continuous scrutiny and adjustment of the internal guidelines. The measures taken by the railway undertaking after the event show that this has been implemented in principle by DB Regio AG. Other railway undertakings have also made corresponding adjustments in the meantime. Communication also includes the relevant employees of the infrastructure manager and other organisations involved in railway operation. In relation to this issue, and particularly in relation to PZB automatic train stops, the Federal Railway Investigation

[1] Source: Delegated Regulation (EU) 2018/762 of the Commission of 8 March 2018

Authority had already issued safety recommendation no. 01/2015 in 2015 with the following content:

> *"The awareness and skills of the traction unit staff in dealing with PZB automatic train stops of any kind must be continuously strengthened through targeted training measures."*

Due to the further development of the corresponding procedures and due to the new requirements introduced in the meantime by Delegated Regulation (EU) 2018/762 issued in 2018, it is necessary to extend this to everyone involved. As a result, the Federal Authority for Railway Accident Investigation issued the extended safety recommendation no. 03/2022 in the interim report on this event in 2022. This is aimed explicitly at all railway undertakings involved and is maintained.

In relation to the causal factor "Continuation of journey after passing the main signal without authorisation" [F3]:

The investigations showed that, after passing exit signal 1P1 without authorisation, the driver of passenger train S 6785 continued onwards, without having received command 2 from the signaller, which was required according to guideline 408.2531 paragraph 2. This must ultimately be seen as a trigger for the event, because as a result of this all previously effective protective mechanisms were bypassed and the full impact of the original mistake from factor [F1] was felt. In all probability, this conduct was due to a lack of awareness of the situation on the driver's part. He probably did not realise that he had passed a stop signal, and instead incorrectly assumed that the situation was comparable to the PZB automatic train stop that had already occurred when approaching Ebenhausen-Schäftlarn station.

This misinterpretation would have been harmless if he had followed the rules already described in factors [F2] and [S2]. All other protective mechanisms had already been effective and were an established standard. As a result, no independent safety recommendation is issued in relation to causal factor [F3]. However, at this point reference is again made to the safety recommendations relating to factors [F2] and [S2].

In relation to the systemic factor "technical design of the PZB vehicle equipment" [S3]:

It was identified that various PZB vehicle systems used several technical designs for the display of PZB automatic train stops. These have already been explained in section 4.2.1; in relation

to this see also Table 9. In principle it can be determined that the displays reflected state of the art technology at the respective stage of development of the railway vehicles, and could be correctly interpreted if operated properly.

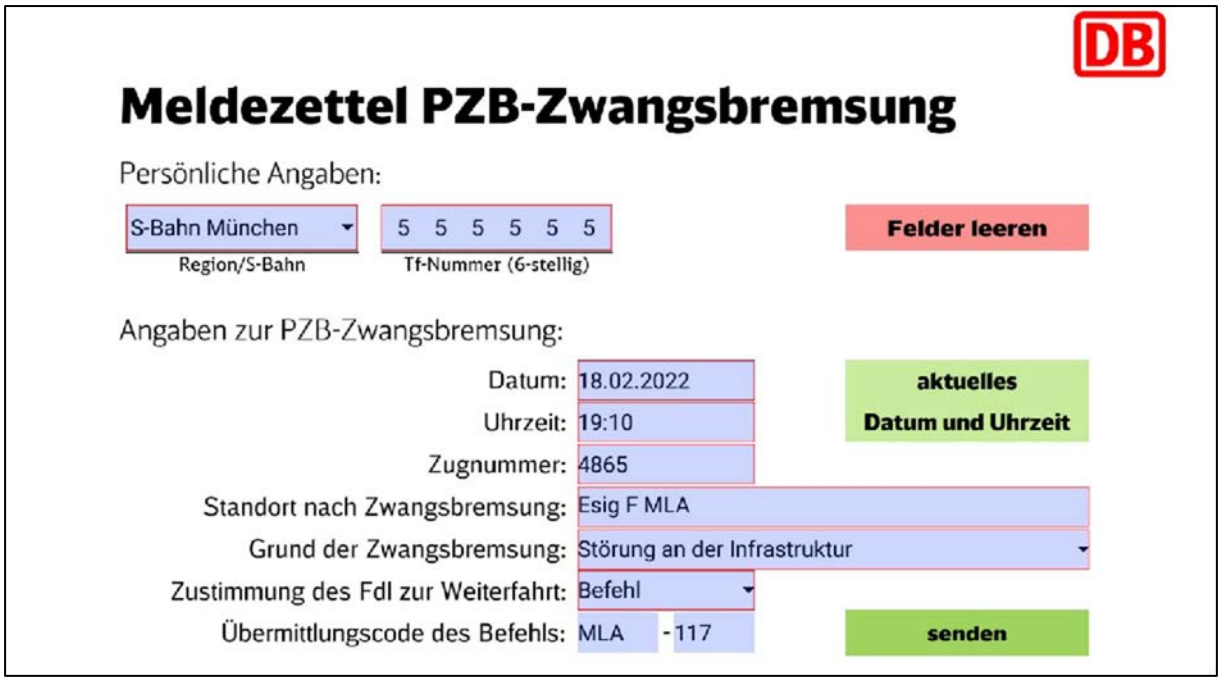
Consideration should be given to the amount of information that is constructive. By using modern display systems, usually in the form of displays, it is possible to only ever show the information that is actually needed. Based on current state of the art technology, it is therefore definitely possible to provide several pieces of information to the operator without resulting in information overload.

The operators always need to have appropriate training in order to deal with the information properly. At this point, reference is made to the statements concerning factor [S2]. Safety recommendation 04/2022 issued in relation to this factor must explicitly also be applied to the technical design of the PZB vehicle equipment.

5.2 Measures taken since the event

On the day after the event, DB Regio AG published an internal safety report (DB Regio Z02/2022) concerning the “Crossing situation on single-track sections” with reference to the need for the driver to contact the signaller after a PZB automatic train stop and stipulating measures to avoid accidents for the driver.

On 18/02/2022, DB Regio AG issued an internal instruction for drivers (W-R-023/2022) that was valid from 21/02/2022. The instruction included additional measures after a PZB automatic train stop. In addition to the operational rules of the operational regulations, PZB automatic train stops could only be cancelled while still at a standstill and a “PZB automatic train stop report form”, as shown in Figure 01, had to be completed and sent electronically at the next stop, or at the latest after the end of the train movement. This had to state the reason for the automatic train stop and the type of approval for onward travel from the signaller.



Meldezettel PZB-Zwangsbremsung

Persönliche Angaben:

S-Bahn München — Region/S-Bahn

5 5 5 5 5 5 — Tf-Nummer (6-stellig)

Felder leeren

Angaben zur PZB-Zwangsbremsung:

Datum:	18.02.2022
Uhrzeit:	19:10
Zugnummer:	4865
Standort nach Zwangsbremsung:	Esig F MLA
Grund der Zwangsbremsung:	Störung an der Infrastruktur
Zustimmung des Fdl zur Weiterfahrt:	Befehl
Übermittlungscode des Befehls:	MLA - 117

aktuelles Datum und Uhrzeit

senden

Figure 01: PZB automatic train stop report form[2]

In the meantime, similar procedures have been introduced at most railway undertakings.

The driver of train S 6785 no longer worked as a driver for DB Regio AG after the event.

In 2023, the Federal Railway Authority made the issue of PZB skills one of the focal points for monitoring of the railway undertakings and infrastructure managers. Details of this were presented in specialist notification 09 / 2022 dated 23/06/2022 relating to railway operations.

In addition, on 01/09/2022 the Federal Railway Authority set up the sub-working group “Optimisation of PZB according to safety recommendation” within the Train protection, train control and signalling working group. The Federal Railway Authority issued specialist notification 07/2025 in relation to the results of the sub-working group on 19/02/2025. This initially provides for the implementation of non-technical measures, the effectiveness of which will be monitored. If these non-technical measures are not sufficiently effective, additional technical measures will be considered. Safety recommendations 03/2022 and 04/2022, which are directed at the safety authorities, are still being dealt with.

5.3 Additional observations

The investigations conducted did not provide any contribution on this point.

[2] Source: DB Regio AG, instruction W-R-023/2022

6 Safety recommendations

In the interim report of 22/06/2022, the Federal Authority for Railway Accident Investigation issued safety recommendations 03/2022 and 04/2022 in accordance with Section 6 EUV and Art. 26(2) of Directive (EU) 2016/798. These recommendations can be found in the table below:

No	Addressee and safety recommendation	Relates to company
03/2022	National safety authority: It is recommended that, in the safety management system of the railways, processes be developed or improved that allow for effective examination of the effectiveness of compliance with the rules after the occurrence of a PZB automatic train stop. Appropriate measures must be deduced from these findings to raise awareness among employees in rail operations.	Railway undertakings
04/2022	National safety authority: It is recommended that the vehicle technology be expanded so that the driver must be given an appropriate period after the occurrence of a PZB automatic train stop to think (awareness of the situation) and act (processing of guideline 408.2651).	Railway undertakings