Česká Republika
Czech Republic

Drážní Inspekce
The Rail Safety Inspection Office

Investigation Report of Railway Accident

Collision of passenger train No 5307 with a shunting freight train
between
Hlinsko v Čechách and Ždírec nad Doubravou stations

Monday, 10 November 2008

Ref. No: 6-3715/2008/DI

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SUMMARY

Grade:	serious accident
Date and time:	10 November 2008, 12:57 (11:57 GMT)
Occurrence type:	trains collision (collision of passenger train with shunting freight train)
Description:	A long freight train performing shunting operation in Ždírec nad Doubravou station overlapped station boundary and partially got beyond the station entry signal. Passenger train No 5307 approaching the station collided with the shunting freight train at open line near the station. Trains were not derailed.
Type of train:	freight train performing shunting operation regional passenger train
Location:	open line between Hlinsko v Čechách and Ždírec nad Doubravou stations
Consequences:	no fatality 4 passengers seriously injured 7 passengers slightly injured total cost CZK 2 785 101.00
Direct cause:	operations (driver error) operations (station personnel error)
Underlying cause:	human factor
Root cause:	none
Recommendations:	addressed to Drážní úřad (national safety authority), manufacturer and railway undertakings operating class 914 (and similar) railcars: 1) It is recommended that the design of the glass partition between the low-floor section and the sitting area of the railcars should be modified to ensure that the partition is as capable of withstanding a crash as the windows and of other parts of the vehicle's interior.

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1. SUMMARY

Category of incident:	serious accident
Date and time:	10 November 2008, 12:57 (11:57 GMT)
Description of incident:	collision of passenger train No 5307 with shunting freight train
Railway line, location:	national railway line, rail track section between Hlinsko v Čechách and Ždírec nad Doubravou stations, km 27.716
Participants involved:	Railway Infrastructure Administration [Správa železniční dopravní cesty, s.o.], the owner and railway infrastructure manager; ČD Cargo, a.s., the operator of the shunting freight train; Czech Railways, the operator of the passenger train No 5307 .
Consequences:	4 persons seriously injured (passengers in train No 5307); 7 persons with minor injuries (6 passengers and chief operating officer on passenger train No 5307); total cost CZK 2 785 101.00.
Direct causes:	- the shunting freight train travelling outside the railway station boundary without the shunting operation being organised as shunting between operating points on the railway line, specifically beyond the "S" signalling device marking the railway station boundary on the rail track;
•	- incorrect organisation of railway transport, specifically conducting a shunting operation beyond a signal without obtaining line consent for the adjacent Hlinsko v Čechách – Ždírec nad Doubravou section and failing to stop the incorrect shunting operation.
Underlying cause:	- ignoring the signal of the "S" signalling device marking the railway station boundary beyond which it is prohibited to conduct shunting operations in the station (human factor); - failing to observe the rules of rail track operations under the technological procedures set by the railway operator (human factor).
Safety system cause:	none found
Recommendations:	to the Rail Authority [Drážní úřad], the manufacturer and operators of driving vehicles Class 914 and vehicles of similar construction: It is recommended that the design of the glazed partitions between the low-floor section and the passenger compartment be modified to ensure that the

resistance of these partitions in the event of a collision between vehicles is not lower than the resistance of other glazed partitions, constructions and fittings in passenger compartments and the drivers' cabs.

2. INFORMATION RELATING TO THE INCIDENT

2.1 Incident

2.1.1 Date, exact time and location of the incident

The incident occurred on 10 November 2008, at 12:57, on the national railway line operated by the railway infrastructure manager Správa železniční dopravní cesty, s.o. (Railway Infrastructure Administration), on rail track 507A Havlíčkův Brod – Pardubice – Rosice nad Labem, on the Hlinsko v Čechách – Ždírec nad Doubravou section, at km 27.716.

2.1.2 Description of the incident and location of the accident, including activities of the integrated rescue system and the rescue services

Travelling from Hlinsko v Čechách station to Ždírec nad Doubravou station, passenger train No 5307 of the transport operator České dráhy, a.s. (Czech Railways) collided with the shunting freight train of the transport operator ČD Cargo, a.s., which was standing in front of the "S" entry signalling device of Ždírec nad Doubravou station. The location of the accident is situated on the right-turning curve of a single, non-electrified rail track, 82 metres before the railway crossing at km 27.634, which is easily accessible for rescue services and equipment.

The following units of the integrated rescue system operated at the location of the incident: Medical Rescue Service Vysočina – Havlíčkův Brod work station, Air Medical Service, Fire-fighting Rescue Service of the Railway Infrastructure Administration, Kolin and Czech Republic Police Forces, Havlíčkův Brod Regional Directorate, Criminal Police and Investigation Unit.

On inspection of the incident location it was found that:

- With the fronts rammed together on impact, the railway vehicles remained standing at km 27.713, i.e. 28 metres before the "S" entry signalling device of Ždírec nad Doubravou station. The signpost is situated 86 metres beyond the entry signalling device and is painted in a prominent colour. There was no damage to the rail track and the points due to this incident. The No 9 set of points, which is manually operated, was unlocked with the switch locks in the down position. The front wheels of the first wagon of the shunting freight train stood 20 cm from the end of the point blades of this set of points. The No 8 set of points was reset for rail track No 2.

- Passenger train No 5307 of the transport operator Czech Railways consisted of engine vehicle No 814.030-3 and driving vehicle No 914.030-2. The train had 2 vehicles, length 28 metres, 4 axles, weight 46 tons. The required brake percentage was 67%, the actual brake percentage was 89%.

- The shunting freight train of the transport operator ČD Cargo, a.s., which was driven/towed by engine No 742.334-6, had 17 wagons, 68 axles, length 342

metres, weight 1 003 tons.

- The "S" entry signalling device indicated the signal "Stop", the safety warning system on the railway crossing at km 27.634 was operating and giving a warning to road users.

- The station blocks on the control and signalling devices of the safety system of Ždírec nad Doubravou station were in the basic position, the safety locks on both devices were undisturbed and correct in number. The readings on the counters conformed with the readings recorded in the traffic control documentation at the time of the last change of the traffic control personnel. Reserve keys for the sets of points and the control device were deposited in the cabinet in the traffic control room and their seals were undisturbed. On the rail track block system control panel the red indicator light was on, signalling line consent to the neighbouring Hlinsko v Čechách station; the indicator light signalling a clear line was off.

2.1.3 Decision to commence an investigation into the causes and circumstances, the composition of the team of experts and the method of investigating the causes and circumstances

The Rail Safety Inspection Office started investigating this incident after finding that it was a serious accident which may provide valuable information for improving railway lines and rail transport safety. An investigation into the causes was conducted by the Brno Regional Inspection Office of the Rail Safety Inspection Office, independently of the investigation undertaken by the railway infrastructure manager and operator and the rail transport operator and the investigation conducted by other agencies, using their own documentation and information obtained on request from the railway operator, the rail transport operator and the Czech Republic Police. The European Railway Agency was informed of the commencement of the investigation via the appropriate method and channels. To confirm important findings, the Rail Safety Inspection Office conducted a verification test and commissioned an analysis of braking operations of passenger train No 5307, in cooperation with the operator and transport operator and with representatives of the Czech Republic Police.

2.2 Circumstances of the incident

2.2.1 Employees of the railway infrastructure manager and the transport operator who were involved, persons in a contractual relationship and other participants and witnesses

Employees of the railway infrastructure manager, the railway infrastructure manager's operator and the rail transport operator who were involved:

- the engine driver of the shunting freight train, an employee of the rail transport operator ČD Cargo, a.s.;
- the train dispatcher in Ždírec nad Doubravou station, an employee of the railway infrastructure manager's operator Czech Railways;

- the shunting manager, an employee of the rail transport operator ČD Cargo, a.s.;
- the shunter, an employee of the rail transport operator ČD Cargo, a.s.;
- the engine driver of passenger train No 5307, an employee of the railway operator Czech Railways;
- the train dispatcher in Hlinsko v Čechách station, an employee of the railway infrastructure manager's operator Czech Railways;
- supervisor of the St. II set of points in Ždírec nad Doubravou station, an employee of the railway infrastructure manager's operator Czech Railways.

Witnesses:

- passengers on passenger train No 5307.

2.2.2 The trains and their composition, including registration numbers of the individual railway vehicles

- Passenger train No 5307 of the transport operator Czech Railways: the train's base station is Pardubice–Rosice nad Labem station, the terminal station is Havlíčkův Brod station. The train consisted of engine vehicle No 814.030-3 and driving vehicle No 914.030-2. The train had 2 vehicles, length 28 metres, 4 axles, weight 46 tons. The required brake percentage was 67%, the actual brake percentage was 89%.

  Engine vehicle No 814.030-3, owner Czech Railways, operator Rail Vehicles Depot [Depo kolejových vozidel] Česká Třebová; Rail Vehicle Roadworthiness Certificate [Průkaz způsobilosti drážního vozidla] Reg. No PZ 9310/07-V.22 issued 2 November 2007 by the Rail Authority in Prague.

  Driving vehicle No 914.030-2, owner Czech Railways, operator Rail Vehicles Depot Česká Třebová; Rail Vehicle Roadworthiness Certificate Reg. No PZ 11305/07-V.23 issued 2 November 2007 by the Rail Authority in Prague.

- Shunting freight train: rail transport operator ČD Cargo, a.s., driven by engine No 742.334-6, 17 wagons, 68 axles, length 342 metres, weight 1 003 tons.

  Shunting freight train engine No 742.334-6, owner ČD Cargo, a.s., operator SOKV Ostrava; Rail Vehicle Roadworthiness Certificate Reg. No PZ 7953/98-V.20 issued 10 February 1998 by the Rail Authority in Prague.

2.2.3 Description of the parts of the railway infrastructure and of the safety system (i.e. specifically the condition of rails, points, signalling equipment and devices and the train safety system)

The incident occurred on a national railway line. Ždírec nad Doubravou station is an intermediate station on the Havlíčkův Brod - Pardubice/Rosice nad Labem line. The station is equipped with an electromechanical rail safety system with light signals. The adjacent intermediate sections are not divided into sub-sections and all are equipped with a rail safety system – a relay semi-automatic block system for operation in both directions.

The location where the incident occurred is situated on the intermediate Ždírec nad Doubravou – Hlinsko v Čechách section, at km 27.716. The "S" signalling device of Ždírec nad Doubravou station is situated at km 27.685. The railway crossing, which is situated at km 27.6334, is fitted with PZS 3 SNI light-signalling crossing safety equipment. The station signpost is situated at km 27.599 and the No 9 set of points is situated at km 27.367.

2.2.4 Use of the means of communication

Portable Motorola CP 040 two-way radios were used in relation to the incident in question. These radios, working in the local network, were used by the engine driver of the shunting freight train, the train dispatcher in Ždírec nad Doubravou station, the shunting manager, the shunter and the supervisor of the St. II set of points.

2.2.5 Work carried out on the incident location and in the vicinity

No construction or maintenance works were being carried out at the incident location at the time in question.

2.2.6 Activation of the railway incident plan and the sequence of events

The railway incident plan was activated immediately following the incident by the chief operating officer on passenger train No 5307, who reported the incident to the train dispatcher station in Ždírec nad Doubravou station by calling number 155 using a mobile phone. The train dispatcher then activated the remaining units of the integrated rescue system and reported the incident in accordance with the incident reporting schedule. The Rail Safety Inspection Office was notified of the incident by the person authorised by the railway line and rail transport operators to investigate the causes of the incident.

2.2.7 Activation of the integrated rescue system, the police, the medical rescue services and the sequence of events

The integrated rescue system was activated by the chief operating officer on passenger train No 5307 and subsequently by the train dispatcher at the reporting station in Ždírec nad Doubravou station. All units of the integrated rescue system, specifically the Medical Rescue Service Vysočina – Havlíčkův Brod work station, Air Medical Service, Fire-fighting Rescue Service of the Railway Infrastructure Administration, Kolin and Czech Republic Police Forces, Havlíčkův Brod Regional Directorate, Criminal Police and Investigation Unit, then arrived at the incident location.

2.3 Fatalities, injuries and property damage

2.3.1 Passengers and third parties, employees of the railway infrastructure manager and the transport operator, including persons in a contractual relationship

Six passengers on passenger train No 5307 suffered minor injuries, four passengers suffered serious injuries and one employee of the rail transport operator Czech Railways suffered a minor injury in the incident.

According to the medical expert assessment, the injuries were described as fractures, lacerations, haematoma, swelling, one case of sprain of the cervical spine, and one case of stomach bleeding.

2.3.2 Transported items, luggage and other property

Passengers on passenger train No 5307 reported to the Czech Republic Police damage to transported items, luggage and other property totalling CZK 1 320.00.

2.3.3 Railway vehicles, parts of the rail track and the environment

The incident resulted in the following damage:

- damage to engine vehicle No 814.030-3, owner Czech Railways, amounting to CZK 2 000 000.00;
- damage to driving vehicle No 914.030-2, owner Czech Railways, amounting to CZK 750 000.00;
- damage to engine No 742.334-6 of the shunting freight train, owner ČD Cargo, a.s., amounting to CZK 35 101.00.

The total damage resulting from the incident amounted to CZK 2 785 101.00.

2.4 External circumstances

2.4.1 Weather conditions and geographical data

Overcast, + 8^0 C, snow cover about 15 cm, visibility not reduced.

With the fronts rammed together on impact, the railway vehicles remained standing at km 27.713, that is 28 metres before the "S" entry signalling device. Before this signalling device the line runs in a right-turning curve (dia. 282 m) and on a horizontal level. The "S" entry signalling device was visible from passenger train No 5307 in the direction of travel from km 27.919. The rail track is situated on an embankment which is 1.5 m high on both sides. The "S" signalling device of the Ždírec nad Doubravou station is situated at km 27.685. The railway crossing, which is situated at km 27.6334, is fitted with PZS 3 SNI light-signalling crossing safety

equipment. The station signpost is situated at km 27.599 and the No 9 set of points is situated at km 27.367.

The following measurements were taken:

- distance between the end of point blades of No 9 set of points and the "S" signalling device – 318 metres;
- distance between the "S" signalling device and the fronts of the railway vehicles rammed together during the incident – 28 metres;
- distance between the signpost and the "S" signalling device – 86 metres;
- distance at which the "S" signalling device becomes visible from passenger train No 5307 in the direction of travel – 234 metres.

3. RECORD OF STATEMENTS SUBMITTED

3.1 Record of statements submitted (subject to protection of personal identity)

3.1.1 Passengers and third parties, employees of the railway infrastructure manager and the transport operator, including persons in a contractual relationship

Employees of the infrastructure manager's operator and both transport operators made statements concerning the circumstances of the incident. These statements are contained in the following documents which constitute a part of the file:

- *Official record of statement provided in accordance with Para. 158, Clause 5 of the Criminal Code, ref. No RHB-1631-3/TČ-2008-70*, taken at the Czech Republic Police Force, Havlíčkův Brod District Directorate – engine driver of the shunting freight train;
- *Official record of statement provided in accordance with Para. 158, Clause 5 of the Criminal Code, ref. No RHB-1631-3/TČ-2008-70*, taken at the Czech Republic Police Force, Havlíčkův Brod District Directorate – train dispatcher in Ždírec nad Doubravou station;
- *Official record of statement provided in accordance with Para. 158, Clause 5 of the Criminal Code, ref. No RHB-1631-3/TČ-2008-70*, taken at the Czech Republic Police Force, Havlíčkův Brod District Directorate – shunting manager;
- *Official record of statement provided in accordance with Para. 158, Clause 5 of the Criminal Code, ref. No RHB-1631-3/TČ-2008-70*, taken at the Czech

Republic Police Force, Havlíčkův Brod District Directorate – shunter;

- *Official record of statement provided in accordance with Para. 158, Clause 5 of the Criminal Code, ref. No RHB-1631-3/TČ-2008-70*, taken at the Czech Republic Police Force, Havlíčkův Brod District Directorate – engine driver of passenger train No 5307;

- *Official record of statement provided in accordance with Para. 158, Clause 5 of the Criminal Code, ref. No RHB-1631-3/TČ-2008-70*, taken at the Czech Republic Police Force, Havlíčkův Brod District Directorate – supervisor of the set of points in Ždírec nad Doubravou station;

- *Official record of statement provided in accordance with Para. 158, Clause 5 of the Criminal Code, ref. No RHB-1631-3/TČ-2008-70*, taken at the Czech Republic Police Force, Havlíčkův Brod District Directorate – train dispatcher in Hlinsko v Čechách station;

- *Official record of statement provided in accordance with Para. 158, Clause 5 of the Criminal Code, ref. No RHB-1631-3/TČ-2008-70*, taken at the Czech Republic Police Force, Havlíčkův Brod District Directorate – chief operating officer on passenger train No 5307;

- *Record of employee statement concerning the A1 incident of 10.11.2008 between Hlinsko v Čechách and Ždírec nad Doubravou stations*, taken at the Czech Railways, Section 18 – RIBŽD [Regional Rail Transport Safety Inspectorate], Česká Třebová work station – engine driver of the shunting freight train;

- *Record of employee statement concerning the A1 incident of 10.11.2008 between Hlinsko v Čechách and Ždírec nad Doubravou stations*, taken at the Czech Railways, Section 18 – RIBŽD, Česká Třebová work station – train dispatcher in Ždírec nad Doubravou station;

- *Record of employee statement concerning the A1 incident of 10.11.2008 between Hlinsko v Čechách and Ždírec nad Doubravou stations*, taken at the Czech Railways, Section 18 – RIBŽD, Česká Třebová work station – shunting manager;

- *Record of employee statement concerning the A1 incident of 10.11.2008 between Hlinsko v Čechách and Ždírec nad Doubravou stations*, taken at the Czech Railways, Section 18 – RIBŽD, Česká Třebová work station – shunter;

- *Record of employee statement concerning the A1 incident of 10.11.2008 between Hlinsko v Čechách and Ždírec nad Doubravou stations*, taken at the Czech Railways, Section 18 – RIBŽD, Česká Třebová work station – engine driver of passenger train No 5307;

- *Record of employee statement concerning the A1 incident of 10.11.2008 between Hlinsko v Čechách and Ždírec nad Doubravou stations*, taken at the

Czech Railways, Section 18 – RIBŽD, Česká Třebová work station – train dispatcher in Hlinsko v Čechách station;

- *Record of employee statement concerning the A1 incident of 10.11.2008 between Hlinsko v Čechách and Ždírec nad Doubravou stations*, taken at the Czech Railways, Section 18 – RIBŽD, Česká Třebová work station – supervisor of the set of points in Ždírec nad Doubravou station;

- Registered letter of 17.12.2008 making changes to the statement concerning circumstances of the incident – train dispatcher in Ždírec nad Doubravou station.

3.1.2 Other persons

Passengers on passenger train No 5307 also made statements concerning the incident. Their statements are part of the file. There were no other persons present at the incident location or in the near vicinity.

3.2 Safety assurance system

3.2.1 General organisation and method of issuing and executing instructions

In Ždírec nad Doubravou Railway there are train dispatchers and two points supervisors working on a continuous shift basis. The train dispatcher work station is in the traffic office, the points supervisors work at St. I and St. II set of points work stations. The train dispatcher also acts as shift leader for the whole railway station, manages and organises railway traffic within the station and on the adjacent intermediate rail track sections, operates the safety equipment, manages and checks the work of all employees involved in operating transport and shunting, and keeps an electronic rail traffic log book.

3.2.2 Requirements regarding employees of the railway infrastructure manager and the transport operator and their enforcement

All the employees involved comply with the statutory professional qualifications requirements as well as the requirements specified in the regulations of the rail transport operator ČD Cargo, a.s. and the railway manager and operator Czech Railways

3.2.3 Internal safety inspection procedure and results thereof

Following investigation it was found that:

- The work of the employees of the railway infrastructure manager's operator Czech Railways in Ždírec nad Doubravou station was checked regularly and the records of these checks do not contain any findings related to this incident. The last check before the incident was carried out on 6 November 2008.

- The work of the engine drivers, employees of the rail transport operator ČD Cargo, a.s., in Ždírec nad Doubravou station was checked regularly and the records of these checks do not contain any findings related to this incident. The last check before the incident was carried out on 25 October 2008.

- In the *Record of Faults in Safety Equipment* there is no fault recorded at the time of the incident. The safety locks were found to be undisturbed and correct in number. The safety equipment has a valid *Technical Equipment Compliance Licence*, ref. No PZ 6466/96-E.45, issued by the Rail Authority and valid until 2011. An inspection of the safety equipment which was conducted by the commission from the Jihlava Railway Infrastructure Administration on 14 November 2008 resulted in a "no defect" conclusion. From the above information it appears clear that the technical condition of the safety equipment was not the cause of the incident.

- Engine vehicle No 742.334-6:
  - last technical check carried out on 14 August 2008;
  - last periodical check carried out on 25 September 2008;
  - the inspection conducted by the commission after the incident on 13 November 2008 resulted in the conclusion that the technical condition of the safety equipment was not the cause of the incident.

- Engine vehicle No 814.030-3:
  - last technical check carried out on 7 July 2008;
  - last periodical check carried out on 18 September 2008;
  - the inspection conducted by the commission after the incident on 12 November 2008 resulted in the conclusion that the technical condition of the safety equipment was not the cause of the incident.

- Driving vehicle No 914.030-2:
  - last technical check carried out on 7 July 2008;
  - last periodical check carried out on 18 September 2008;
  - the inspection conducted by the commission after the incident on 12 November 2008 resulted in the conclusion that the technical condition of the safety equipment was not the cause of the incident.

3.2.4 Interfaces between the various participants and the parts of the railway infrastructure

The interfaces are laid down by:

- Act 266/1994 Coll., *Railways*, as amended (hereinafter referred to as Act 266/1994 Coll.);

- Notice No 173/1995 Coll., *Railway Transport Regulations*, as amended (hereinafter referred to as Notice No 173/1995 Coll.);

- Notice No 376/2006 Coll., *Safety System for Operating Railways and Railway Transport and Procedures in the Event of Railway Accidents*, as amended (hereinafter referred to as Notice No 376/2006 Coll.);

- Notice No 101/1995 Coll., *Rules for Medical and Professional Qualifications of Persons Operating Railways and Railway Transport*, as amended (hereinafter referred to as Notice No 101/1995 Coll.);

- Notice No 177/1995 Coll., *Building and Technological Regulations for Railways*, as amended (hereinafter referred to as Notice No 177/1995 Coll.);

- Contract No 122D/3/2008, *Rail Transport Operation on the Rail track/Railway Siding to Stora Enso Timber Ždírec s.r.o.*;

- Contract concerning junction of rail tracks for the railway siding to Stora Enso Timber Ždírec s.r.o., ref. No 3320/2008-11/BNO, valid from 1 July 2008.

The railway infrastructure manager was the Railway Transport Administration [Správa železniční dopravní cesty, s.o.], the operator of passenger train No 5307 was Czech Railways, the shunting operator was ČD Cargo, a.s. Czech Railways was also the operator for the railway infrastructure manager, for whom, under contract, it provides services in organising and managing railway transport.

3.3 Legal and other regulations

3.3.1 Relevant community and national legal regulations

The following national legal regulations are relevant to the causes and circumstances of railway accidents:

- Act 266/1994 Coll.;

- Notice No 173/1995 Coll.;

- Notice No 376/2006 Coll.;

- Notice No 101/1995 Coll.;

- Notice No 177/1995 Coll.

3.3.2 Other regulations, e.g. operating rules, work rules, maintenance guidelines, current technical standards and other internal regulations

The following regulations are relevant to the causes and circumstances of railway accidents:

- Regulations of the railway infrastructure manager, the Railway Transport Administration, (ČD) D1 – Regulations for using signals in organising and

operating rail transport;

- Regulations of the railway infrastructure manager, the Railway Transport Administration, (ČD) D2 – Regulations for using signals in organising and operating rail transport;

- Regulations of Czech Railways, the railway infrastructure manager's operator (ČD) OK2 – Training and Testing Regulations of Czech Railways;

- Station Rules for Ždírec nad Doubravou station, ref. No 2492/2006, valid from 15 January 2007;

- Regulations of Czech Railways, the railway infrastructure manager's operator: Additional Provisions to the Regulations of the Railway Transport Administration (ČD) Z1 and (ČD) Z2 for operating safety system in Ždírec nad Doubravou station, ref. No 91/2006-11/9, valid from 19 May 2006;

- Operating Rules for rail track/railway siding to Stora Enso Timber Ždírec s.r.o., ref. No 2911/2007-011/BNO, valid from 1 June 2007.

3.4 Operation of railway vehicles and technical equipment

3.4.1 Management, signalling and safety systems, including automatic data recording equipment

In this section the following information concerning the causes and circumstances of the incident is of relevance:

- Ždírec nad Doubravou station is equipped with Category 2 safety equipment in accordance with TNŽ 34 2620 [railway standard] – an electromechanical safety system with light signals, manually operated points and secured switch locks. The adjacent intermediate railway line sections are not divided into sub-sections and all are equipped with Category 2 safety equipment – a relay semi-automatic block system for operation in both directions. These safety systems are not fitted with recording equipment.

- Trains' travelling operations in the intermediate Hlinsko v Čechách – Ždírec nad Doubravou section are conducted without using safety equipment. The basis for organising the trains' travelling operations is the receipt of line consent, which is essential for dispatching a train onto the rail track. A PC with an APM DK electronic traffic log, which is installed in the rail traffic office, is used for keeping the computerised traffic log book, for automatic train scheduling using a train traffic diagram and for summarising the operation in the station. This traffic log is equipped with recording equipment.

- Shunting operations in Ždírec nad Doubravou station are conducted without using safety equipment. The organisation of shunting operations is the responsibility of the shunting manager, subject to instructions from the train

dispatcher. Shunting signals are transmitted by portable Motorola CP 040 two-way radios which are used by all employees involved in shunting operations. Communications not recorded by any recording equipment.

3.4.2 Parts of the railway infrastructure

The freight train was shunted from railway siding No 3 of Stora Enso Timber Ždírec s.r.o. across the station's running head in the direction of Hlinsko v Čechách station, via No 7 and No 9 sets of points, past the signpost and the "S" entry signalling device. Passenger train No 5307 was approaching Ždírec nad Doubravou station, travelling past the "Pre-S" indicator with the sign "Caution" and towards the "S" entry signalling device with the sign "Stop". The shunting operation was using rail track No 2; No 8 and No 9 sets of points were unlocked.

3.4.3 Means of communication

All communication during the shunting operation between the engine driver, shunting manager, shunter and train dispatcher was made using portable Motorola CP 040 two-way radios.

3.4.4 Railway vehicles, including automatic data recording equipment

Engine vehicle No 742.334-6 driving the shunting freight train was fitted with a Metra speedometer with a mechanical recorder. The speed measuring strip was actually extracted at 15:14 while the clock on the speedometer was 20 minutes behind the real time. The activity of the engine vehicle prior to the collision consisted of several slow movements over short distances interspersed with short periods in a stationary position. These were mostly short periods of about one minute, with a travelling speed of about 5 km/hour and the distance travelled in the order of tens of meters. These small values approach the limit of the technical capacity of the mechanical data recorder and therefore the precision of the measured data must be considered to be quite low.

After comparing the data on the speed measuring strips with the topographical data, it appears that:

- between 12:48 and 12:52 the shunting freight train was travelling at a speed of 15 km/hour along the rail track for 250 m across the station's running head towards the signpost;

- between 12:52 and 12:53 the shunting freight train came to stop and was standing by the signpost;

- between 12:53 and 12:55 the shunting freight train continued at a speed of 10 km/hour travelling from the signpost over the railway crossing at km 27.634 and then past the "S" entry signalling device;

- between 12:55 and 12:56 the shunting freight train was slowing down while travelling towards the rail track;

- between 12:56 and 12:57 the shunting freight train came to stop and was standing on the rail track;

- at 12:57 the impact of passenger train No 5307 moved the shunting freight train 3–5 m towards Ždírec nad Doubravou station;

- between 12:57 and 15:14 the shunting freight train remained standing at km 27.713;

- at 15:14 the speed measuring strip was extracted from the engine vehicle.

Engine vehicle No 814.030-3 driving passenger train No 5307 was fitted with an electronic Tramex Re speedometer with a clock set by the DCF 77 normal time receiver. The actual time of the collision was therefore determined using the data obtained from the electronic speedometer of engine vehicle No 814.030-3.

According to the data from the electronic speedometer, it appears that the base station of passenger train No 5307 was Pardubice central station which is also where a braking test was carried out at 11:30 with the results showing that required brake percentage was 67% and the actual brake percentage was 89%. The train left Hlinsko v Čechách station at 12:46; i.e. 4 minutes late. Vítanov and Stružinec stations, where the train stops only on request, were passed at a reduced speed as there was no signal for passengers getting off or on the train at these stations. The train was then approaching Ždírec nad Doubravou station at a speed of 69 km/hour. As the train passed the "Pre-S" indicator with the sign "Caution", the engine driver placed the control lever in the "Coasting" position, thereby reducing the train's speed to 67 km/hour. Automatic accelerated braking was also introduced at this speed. The collision occurred at 12:57 at a speed 35–29 km/hour when the speedometer registered a sharp reduction of speed. Given the cause and circumstances of the incident, it was considered irrelevant to calculate the exact speed using data from the electronic speedometer. It was noted that after the incident the train travelled 3–5 m, pushing the shunting freight train the same distance towards Ždírec nad Doubravou station. The maximum allowable speed of passenger train No 5307, which is 70 km/hour, was not exceeded at any time during the trains' operation; the train safety system was operating and was controlled by the engine driver.

3.5 Operating system documentation

3.5.1 Measures adopted by employees of the railway infrastructure manager and the transport operator in relation to transport management, signalling and safety

Ždírec nad Doubravou station is not equipped with automated recording equipment. Records of rail traffic management are kept in the electronic rail log book, which has a recording function. The records in this log book show that train Lv 82344 came to a halt on rail track 2 at 12:28, passenger train No 5304 stopped on rail track 3 at 12:46 and passenger train No 5307 was expected to depart from Hlinsko v Čechách station at 12:46.

3.5.2 Exchange of verbal reports relating to the incident, including recording equipment documentation

Verbal communication between the engine driver of passenger train No 5307, the chief operating officer on this train, the engine driver of the shunting freight train, the shunting manager, the shunter and the supervisor of the St. II set of points started immediately after the incident, with the above persons exchanging information regarding the cause and consequences of the incident and instructions to ensure further safety. These communications were not recorded by any recording equipment. Units of the integrated rescue system were activated by the chief operating officer on passenger train No 5307 and the train dispatcher in Ždírec nad Doubravou station by telephone.

3.5.3 Measures adopted to protect and secure the incident location

Immediately after the incident the rail track between Ždírec nad Doubravou and Hlinsko v Čechách stations was closed and, in cooperation with the Czech Republic Police Force, the person authorised by the railway infrastructure manager and the rail transport operators to investigate the causes and circumstances of the incident then prevented movement of all participating rail vehicles, secured the incident site, obtained data concerning the rail traffic management from the electronic log books in Ždírec nad Doubravou and Hlinsko v Čechách stations and traffic documentation from both engine vehicles involved, recorded the position of all rail vehicles involved and extracted the speed measuring strip from the engine driving the shunting freight train. Data in the electronic speedometer in engine vehicle No 814.030-3 were downloaded on 11 November 2008. The Czech Republic Police Force also made photographic documentation and questioned all employees involved in the incident. The incident location was then inspected by the Czech Republic Police Force and the Rail Safety Inspection Office. Rail traffic on the closed rail track was then resumed on 10 November 2008 at 19:30 hours.

3.6 Operating system documentation

3.6.1 Working hours of employees of the rail infrastructure manager and the transport operator who were involved in the incident

The working hours of the employees involved was in conformance with the statutory working hours set by the legal regulations and had no effect on the incident:

- The engine driver of the shunting freight train started his work shift at 06:00 on 10 November 2008; before the work shift he had been off work for 48 hours.

- The train dispatcher in Ždírec nad Doubravou station started his work shift at 07:00 on 10 November 2008; before the work shift he had been off work for 36 hours.

- The shunting manager started his work shift at 06:00 on 10 November 2008; before the work shift he had been off work for 48 hours.

- The shunter started his work shift at 06:00 on 10 November 2008; before the work shift he had been taking his annual holiday.

- The engine driver of passenger train No 5307 started his work shift at 09:51 on 10 November 2008; before the work shift he had been off work for 48 hours.

- The supervisor of the St. II set of points in Ždírec nad Doubravou station started his work shift at 07:10 on 10 November 2008; before the work shift he had been off work for 25 hours.

- The train dispatcher in Hlinsko v Čechách Railway started his work shift at 05:41 on 10 November 2008; before the work shift he had been off work for 48 hours.

3.6.2 State of health and personal situations that had an impact on the incident, including physical or mental stress

All the employees involved complied with the medical fitness requirements set out in Notice No 101/1995 Coll.

- At the time of the incident the engine driver of the shunting freight train was medically fit to perform a driver's job in accordance with Para. 1, Clause a) of Notice No 101/1995 Coll. and was not under any physical or mental stress. Immediately after the incident he was subjected to a drug and alcohol test with a negative result.

- At the time of the incident the train dispatcher in Ždírec nad Doubravou station was medically fit to perform a train dispatcher's job in accordance with Para. 2, Clause a) of Notice No 101/1995 Coll. and was not under any physical or mental stress. Immediately after the incident he was subjected to a drug and alcohol test with a negative result.

- At the time of the incident the shunting manager was medically fit to perform a shunting manager's job in accordance with Para. 2, Clause a) of Notice No 101/1995 Coll. and was not under any physical or mental stress. Immediately after the incident he was subjected to a drug and alcohol test with a negative result.

- At the time of the incident the shunter was medically fit to perform a shunter's job in accordance with Para. 2, Clause a) of Notice No 101/1995 Coll. and was not under any physical or mental stress. Immediately after the incident he was subjected to a drug and alcohol test with a negative result.

- At the time of the incident the engine driver of passenger train No 5307 was medically fit to perform a driver's job in accordance with Para. 1, Clause a) of Notice No 101/1995 Coll. and was not under any physical or mental stress. Immediately after the incident he was subjected to a drug and alcohol test with a negative result.

- At the time of the incident the supervisor of the St. II set of points in Ždírec nad Doubravou station was medically fit to perform a dispatcher's job in accordance with Para. 2, Clause a) of Notice No 101/1995 Coll. and was not under any physical or mental stress. Immediately after the incident he was subjected to a drug and alcohol test with a negative result.

- At the time of the incident the train dispatcher in Hlinsko v Čechách station was medically fit to perform a train dispatcher's job in accordance with Para. 2, Clause a) of Notice No 101/1995 Coll. and was not under any physical or mental stress. Immediately after the incident he was subjected to a drug and alcohol test with a negative result.

3.6.3 Arrangements of the equipment in the control station or the vehicle that had an impact on its use

The arrangement and equipment of the train dispatcher's work station and of the work stations of the engine drivers of the shunting freight train and passenger train No 5307 had no effect on the incident.

3.7 Previous incidents of a similar nature

The Railway Inspection Office has not dealt with any previous incidents of a similar nature.

4. ANALYSIS AND CONCLUSIONS

4.1 Final description of the incident

4.1.1 Final description of the incident based on the facts established in Section 3 above

On 10 November 2008, shortly after midday, following a verbal communication, the train dispatcher in Ždírec nad Doubravou station gave the shunting manager consent to start a shunting operation from railway siding No 3 of Stora Enso Timber Ždírec s.r.o. to rail track No 2 in Ždírec nad Doubravou station. The shunting operation, which was to move 17 wagons of a total length of 342 m, was approved to proceed across the station's running head in the direction of Hlinsko v Čechách station within the shunting area under control of the supervisor of the St. II set of points. The shunting manager informed all the employees involved of the shunting procedure, i.e. the engine driver, the shunter and the supervisor of the St. II set of points. After the arrival of train Lv 82344 on rail track No 2, where the train stopped at 12:28, the train dispatcher informed the supervisor of the set of points of the intended shunting operation, put the safety system of the railway crossing at km 27.634 into operation and gave consent to start the shunting operation.

At approximately 12:40, after the supervisor of the St. II set of points had given the "Consent for shunting operation" signal, the shunting manager used the portable radio to instruct the engine driver to take the shunting freight train from the railway siding. However, contrary to the previous agreement with the train dispatcher, they first shunted one wagon to railway siding No 2, then returned to railway siding No 3 and only then started the shunting operation from the railway siding across the station's running head in the direction of Hlinsko v Čechách station. The shunting freight train was towed. To move the shunting freight train to the rail track No 2 it was necessary to release the No 9 set of points. However, due to the length of the shunting train, this was not done and when the engine driving the shunting train came to a stop beside the signpost at 12:55 the No 9 set of points was still engaged. As the railway crossing at km 27.634, which is situated between the signpost and the "S" entry signalling device, was still open, and the engine driver was instructed by radio to continue the shunting operation, he then used the radio to request that the railway crossing be closed. After a short time the railway crossing was closed, and immediately thereafter the train dispatcher announced by radio that the railway crossing was closed and the engine driver continued the shunting operation. As he was still receiving instructions by radio to continue the shunting operation together with the information that the No 9 set of points had still not been released, the engine driver continued driving past the "S" entry signalling device to the rail track and, on receiving the "Stop" signal given by radio, at 12:56 he stopped 31 m past the "S" entry signalling device where he awaited further instructions for shunting. In a short while he received the instruction, released the brakes of the shunted train section and was about to move in the direction of the railway station.

Initially the shunting manager was directing the shunting operation, but shortly after the train left railway siding No 3 and started the shunting operation across the station's running head he instructed the shunter by radio to take over giving the shunting signals and went to see the train dispatcher in the station traffic office to discuss further procedures. From that time until the time of the collision, the driver was receiving shunting signals from the shunter. At first the shunter was on the wagon in the middle of the shunting train but at the No 9 set of points he jumped off the wagon and continued to give further shunting signals only from this place.

In the meantime the train dispatcher in Ždírec nad Doubravou station attended to the arrival of passenger train No 5304 which was to cross with passenger train No 5307 in the station. Passenger train No 5304 came to a stop on rail track No 3 at 12:46. At 12:45 the train dispatcher used the rail traffic safety system to give the line consent signal for the Hlinsko v Čechách – Ždírec nad Doubravou section to the train dispatcher in Hlinsko v Čechách station thereby giving approval for the departure of passenger train No 5307 from that station. This train then left Hlinsko v Čechách station at 12:46, that is, 4 minutes late. When approaching Ždírec nad Doubravou station the engine driver observed that the "Pre-S" indicator displayed the "Caution" sign. He therefore placed the control lever in the "Coasting" position and was preparing to stop before the "S" entry signalling device. As he came out of the right-turning curve, he saw the engine with the wagons standing on the rail track, so he activated the accelerated brake and left his work station. The collision occurred at 12:57 at a speed of 35–29 km/hour.

The impact pushed the shunting train, which by now had its brakes released, some 3 m so that the front of the engine stopped at km 27.713, i.e. 28 metres before the "S" entry signalling device.

4.2 Analysis

4.2.1 Assessment of the facts established in Section 3 above and conclusions concerning the cause of the incident and the activities of the rescue services

On 10 November 2008, between 12:00 and 12:30, the shunting manager of the rail transport operator ČD Cargo, a.s. discussed the shunting operation with the train dispatcher in Ždírec nad Doubravou station. He informed the train dispatcher that it was necessary to shunt 17 wagons of a total length of 342 m from railway siding No 3 of Stora Enso Timber s.r.o. to rail track No 2 in Ždírec nad Doubravou station. The train dispatcher consented to this shunting operation provided that the operation would not start until after the arrival of the engine-driven train Lv 82344 which was expected at 12:30. Using the portable radio, the shunting manager informed all employees involved of the shunting procedure and went to the railway siding area.

Due to discrepancies between the statements of the train dispatcher and the shunting manager, it is not possible to determine precisely the time that the train dispatcher set for the completion of the shunting operation. However, according to his statement and his subsequent actions, it appears that he gave permission for the shunting operation to go past the signpost and that he knew that this operation had to be completed by 12:45 at the latest because immediately after that time it would be necessary to attend to the arrival of passenger train No 5307. Later the train dispatcher withdrew his statement concerning his permission for the shunting operation to go past the signpost but, after assessing the investigation's findings, this withdrawal seems self-serving.

The engine-driven train Lv 82344 stopped on rail track No 2 at 12:28 and then the engine was shunted to the manipulation rail track No 4 where four wagons were attached to it and the engine returned with the four wagons to rail track No 2. There it remained stationary, waiting for the 17 wagons from the railway siding of Stora Enso Timber s.r.o. to be attached to it. In the meantime the train dispatcher informed the supervisor of the St.II. set of points of the intended shunting operation, closed the railway crossing at km 27.634, which is situated between the signpost and the "S" entry signalling device and gave consent to start the shunting operation. Because the train dispatcher closed the railway crossing before the start of the shunting operation, it is obvious that he expected the shunting operation to go past the signpost.

After returning to the railway siding area, the shunting manager decided to change the previously announced shunting procedure. Obtaining the shunting consent from the supervisor of the St. II set of points, the engine first shunted one wagon to rail track No 2, then returned to railway siding No 3 where the shunting freight train was attached and only then did the shunting operation begin from the railway siding across the station's running head in the direction of Hlinsko v Čechách station. This

resulted in the shunting operation taking a substantially longer time than expected.

As the shunting freight train started moving, the shunting manager instructed the shunter by radio to take over giving the shunting signals to the engine driver and went to see the train dispatcher in the station traffic office to discuss further procedures. The shunter, who was at this time on the step of the wagon in the middle of the shunting train, then started giving shunting signals to the engine driver. To move the shunting freight train to rail track No 2 it was required to unlock the No 9 set of points. In order to see the points, the shunter jumped off the wagon and continued to give further shunting signals only from this place.

In the meantime the train dispatcher made preparations for the arrival of passenger train No 5304 on rail track No 3 and then, without checking whether the shunting operation had been completed, opened the railway crossing at km 27.634. However, the train dispatcher did not then inform any of the employees involved in the shunting operation that he had cancelled the warning signal on the railway crossing.

Passenger train No 5304 came to a stop at 12:46 and remained waiting at the station because it was to cross with passenger train No 5307, which at this time was departing from Hlinsko v Čechách station. One of the preconditions for the train's departure was the train dispatcher in Ždírec nad Doubravou station using the rail traffic safety system to give the line consent signal for the Hlinsko v Čechách – Ždírec nad Doubravou section. The time when he gave the line consent cannot be determined precisely due to discrepancies between the statements of the train dispatchers in Ždírec nad Doubravou and Hlinsko v Čechách stations. According to one statement, the train dispatcher in Ždírec nad Doubravou station gave the line consent at 12:45. According to the statement of the train dispatcher in Hlinsko v Čechách station, the line consent still remained in force after the arrival of train No 5305. Either way, the fact remains that during the shunting operation beyond the signpost the train dispatcher in Ždírec nad Doubravou station did not have line consent for the adjacent railway line section for either the whole or part of the period of the shunting operation.

At 12:55 the engine driving the shunting freight train stopped beside the signpost because the engine driver observed that the railway crossing had not been closed. As he continued receiving instructions by radio to continue the shunting operation, he then reported, using his portable radio, that he was standing beside the signpost and asked the train dispatcher to close the railway crossing. After a short while he observed that the railway crossing was closed and a moment later the train dispatcher advised by radio that the railway crossing was closed. At this point the engine driver set the shunting freight train in motion and continued driving past the signpost to the "S" entry signalling device. However, the railway crossing had not been closed by the train dispatcher but by passenger train No 5307 which was already approaching Ždírec nad Doubravou station. The train dispatcher did not respond either to this circumstance nor to the obvious fact that the engine driver intended to continue the shunting operation past the signpost and he did not contact the engine driver or take any further measures.

The engine driver continued the shunting operation and, as he was still receiving instructions by radio to continue the shunting operation together with the information

that the No 9 set of points had still not been released, he continued driving past the "S" entry signalling device to the rail track and, on receiving the "Stop" signal by radio, at 12:56 he stopped 31 m from the "S" entry signalling device. In this shunting operation he was therefore travelling outside the railway station boundary even though the shunting operation had not been organised as a shunting between the operating control points on the railway line and the engine driver was not specifically qualified to drive the engine outside the boundaries of the railway siding area and the railway station. He did not report to anyone the fact that he had left the railway station area and was already driving on the rail track. Shortly afterwards he received the instruction to continue the shunting operation, released the brakes of the shunted train section and was about to move in the direction of the railway station.

Passenger train No 5307 left Hlinsko v Čechách station at 12:46, that is, 4 minutes late. When approaching Ždírec nad Doubravou station the engine driver observed that the "Pre-S" indicator was showing the "Caution" sign. He therefore placed the control lever in the "Coasting" position and was preparing to stop before the "S" entry signalling device in Ždírec nad Doubravou station. As he came out of the forest, in the right-turning curve he saw the engine with the wagons standing on the rail track, and so, travelling at 67 km/hour, he activated the accelerated brake and, realising that a collision was unavoidable, left his work station.

Passenger train No 5307 was a motorised unit consisting of engine vehicle No 814.030-3 and driving vehicle No 914.030-2 with the engine vehicle in front. The total weight of the unit was 46 tonnes, the required brake percentage was 67%, and the actual brake percentage was 89%. The unit was braking using the automatic accelerated brake in the accelerated braking regime. The collision with the engine of the shunting freight train occurred at 12:57 at a speed of 35–29 km/hour. Calculation of the exact speed using data from the electronic speedometer was considered irrelevant, given the cause and circumstances of the incident. The impact pushed the shunting train, which by now had its brakes released, some 3 m so that the front of the engine came to a halt at km 27.713, i.e. 28 metres before the "S" entry signalling device. The trains were not derailed.

The record from the speedometer in engine vehicle No 814.030-3 of passenger train No 5307 confirmed that using accelerated braking caused the axles to block, which in turn resulted in a reduction of braking efficiency and an extension of the train's braking distance. This was also confirmed in the verification test conducted on 24 November 2008 with the same type of engine vehicle and under good adhering conditions. The results of this test also indicated that if, in the process of accelerated braking of passenger train No 5307, the shunting freight train had not been standing on the rail track, the passenger train would have been able to stop before the "S" entry signalling device displaying the "Stop" signal. Neither the mathematical analysis nor the reconstruction of the braking process was able to establish with certainty whether or not, under the adhering conditions that existed at the time of the accident, the train would have been able to stop before the "S" entry signalling device.

The impact caused both the glazed partitions between the low-floor section and the passenger compartment in driving vehicle No 914.030-2 to break. Other glazed areas, structures and fittings in the passenger compartments and driver cabins in

both vehicles resisted the impact without breaking into dangerous elements and creating a risk to the safety of persons in the vehicles.

4.3 Conclusions

4.3.1 Immediate causes of the incident, including contributing factors and factors relating to the actions of persons involved or to the condition of railway vehicles or technical equipment

The immediate causes of the incident were:

- The shunting freight train travelling outside the railway station boundary without the shunting operation being organised as shunting between operating points on the railway line, specifically beyond the "S" signalling device marking the railway station boundary on the rail track.

  This constitutes a breach of Para. 16, Clause 11 of Notice No 173/1995 Coll. which stipulates: *"Activities during shunting operations shall be governed by technological procedures specified by the railway operator."* Technological procedures for shunting between the operating control points on the railway line are laid down in the Regulations of the railway infrastructure manager (ČD) D2 which specify:

  - in Article 749: *"A shunting operation beyond the signpost may be conducted no further than the level of the entry signalling device of the railway station."*;

  - in Article 807: *"A shunting operation beyond the entry signalling device (further than the level of the entry signalling device of the railway station) must be conducted as a shunting operation between the control points on the railway line.";*

  - in Article 831: *"The engine driver of a shunting train not travelling outside the railway station boundary must be instructed by a directive given in writing which must specify when and where the shunting operation must terminate, the direction of the shunting operation and other circumstances relating to the particular shunting operation."*.

- Incorrect organisation of railway transport, specifically conducting a shunting operation beyond the signpost without obtaining line consent for the adjacent Hlinsko v Čechách – Ždírec nad Doubravou section and failing to stop the disrupting shunting operation.

  This constitutes a breach of Para. 16, Clause 11 of Notice No 173/1995 Coll. which stipulates: *"Activities during shunting operations, particularly during shunting operations beyond the signpost, shall be governed by technological procedures specified by the railway operator."* Technological procedures for shunting between the operating control points on the railway line are laid

down in the Regulations of the railway infrastructure manager (ČD) D2 which specify:

- in Article 750: *"The train dispatcher may approve a shunting operation beyond the signpost provided that [...] for rail tracks controlled by the line consent system he has obtained line consent."*;

- in Article 719: *"[...] When expecting a train, the train dispatcher must ensure that the rail track is clear and that a disrupting shunting operation, i.e. a shunting operation prohibited due to an approaching train, is discontinued. In the local Basic Rail Traffic Documentation it must be specified how many minutes before the arrival of particular types of train the shunting operation must be stopped."* (According to the Basic Rail Traffic Documentation of Ždírec nad Doubravou station a disrupting shunting operation must be stopped not later than 5 minutes before the expected arrival of any type of train.);

- in Article 720: *"A shunting operation must not take place during the period specified in the previous Article (Article 719) in the area between the outside set of points and the signpost."*.

4.3.2 Underlying causes relating to qualifications, procedures and maintenance

The immediate causes of the incident were:

- Ignoring the sign of the "S" signalling device marking the railway station boundary beyond which it is prohibited to conduct shunting operations in the station (human factor).

  This constitutes a breach of Para. 35, Clause 1 f) of Notice No 173/1995 Coll. which stipulates: *"To drive a rail vehicle, it must be ensured that the person driving observes the railway line and the railway signs from the front rail vehicle and takes appropriate actions according to the circumstances established."*

- Failing to observe the rules of rail track operations in accordance with the technological procedures set by the railway operator (human factor).

  This constitutes a breach of Para. 22, Clause *1 a) of Act 266/1994 Coll. which stipulates: "The railway operator is required to operate a railway line in accordance with the needs for safe and uninterrupted railway traffic and in accordance with the rules for operating the railway line and the official permit."*

4.3.3 Causes resulting from the regulatory framework and use of the safety system

No causes resulting from the regulatory framework were established.

4.4 Additional findings

4.4.1 Shortcomings and omissions established during the investigation into the causes and circumstances, which are, however, not significant in terms of conclusions as to the causes

The following shortcomings not affecting the causes of the incident were found:

- The previously announced shunting procedure, which was also approved by the train dispatcher, was changed but the train dispatcher was not informed about it. This resulted in the shunting operation taking a substantially longer time than expected.

  This constitutes a breach of Para. 16, Clause 11 of Notice No 173/1995 Coll. which stipulates: *"Activities during shunting operations, particularly during shunting operations beyond the signpost, shall be governed by technological procedures specified by the railway operator."* Technological procedures for shunting between the control points are laid down in the Regulations of the railway infrastructure manager (ČD) D2 which specify in Article 646: *"The employee directing the shunting operation is required [...] to carry out the prescribed tasks according to the time schedule determined by the station's Rail Traffic Office or according to the instructions of the train dispatcher."*

- The fact that from the time of instructing the shunter to take over giving signals for the shunting procedure, the shunting manager was unable to monitor the shunting operation sufficiently closely by radio.

  This constitutes a breach of Para. 16, Clause 11 of Notice No 173/1995 Coll. which stipulates: *"Activities during shunting operations, particularly during shunting operations beyond the signpost, shall be governed by technological procedures specified by the railway operator."* Technological procedures for shunting between the control points are laid down in the Regulations of the railway infrastructure manager (ČD) D2 which specify in Article 646: *"The employee directing the shunting operation is required [...] to give instruction for the shunting train to stop without delay if he finds that the circumstances are such as to represent a safety risk during the shunting operation."*

- By driving outside the railway station boundary marked by the S" signalling device, the engine driver overstepped his professional qualifications because he was not familiar with the conditions on the rail track in Hlinsko v Čechách – Ždírec nad Doubravou section which he had entered.

  This constitutes a breach of Para. 35, Clause 1 a) of Notice No 173/1995 Coll. which stipulates: *"To drive a rail vehicle, it must be ensured that the person driving the rail vehicle has been familiarised with the conditions on the rail tracks and at the control points where he is to drive the rail vehicle."*

- The damage to the two-vehicle motorised unit consisting of the Class 814 engine vehicle and the Class 914 driving vehicle indicates that the resistance

of the glazed partitions between the low-floor section and the passenger compartment in the Class 914 railway vehicle in the event of a head-on collision is lower than the resistance of other glazed partitions, constructions and fittings in the passenger compartments and driver's cabins in both vehicles of the motorised unit. Breaking of these glazed partitions during an accident increases the risk of injury to persons in the adjoining passenger compartments.

5. MEASURES ADOPTED

5.1 List of measures adopted or implemented as a consequence of the incident

The following measures were adopted as a consequence of this incident:

- The rail transport operator ČD Cargo, a.s. has issued Measures for Prevention of Accidents PŘ ČD Cargo, a.s., ref. No 399/2009 ŘTOD-013/22, with the following instructions:

  1. "The certificate of qualification of the engine driver of the shunting train was suspended and before resuming his work as an engine driver he shall be required to take a special qualification examination and to undergo a special medical examination, part of which will be a psychological examination."

  2. "The manager of the Brno Operating Unit shall issue an Instruction Sheet concerning the incident for his Operating Unit and shall demonstrably familiarise all the employees of the Operating Unit with the contents of this Instruction Sheet."

  3. "All operating employees of ČD Cargo, a.s. shall be informed of the incident investigation results and familiarised with the Instruction Sheet during the training organised by the DVI [Transport Education Institute].

  4. In March and April the traction inspectors shall each conduct at least two inspections of compliance with shunting regulations, concentrating particularly on the organisation of shunting operations beyond the station signpost and communication between the employees directing shunting operations, the engine driver and the train dispatcher."

- Czech Railways, the railway operator organising and managing rail transport for the railway infrastructure manager, adopted the following measures:

  - The certificate of qualification of the train dispatcher in Ždírec nad Doubravou station was suspended until reconfirmation of his professional qualifications and other disciplinary actions were taken.

  - Instruction Sheet Concerning the Incident, Group A No 2/2009, ref.

No 12/2009/018-RI 3 was issued.

6. SAFETY RECOMMENDATIONS

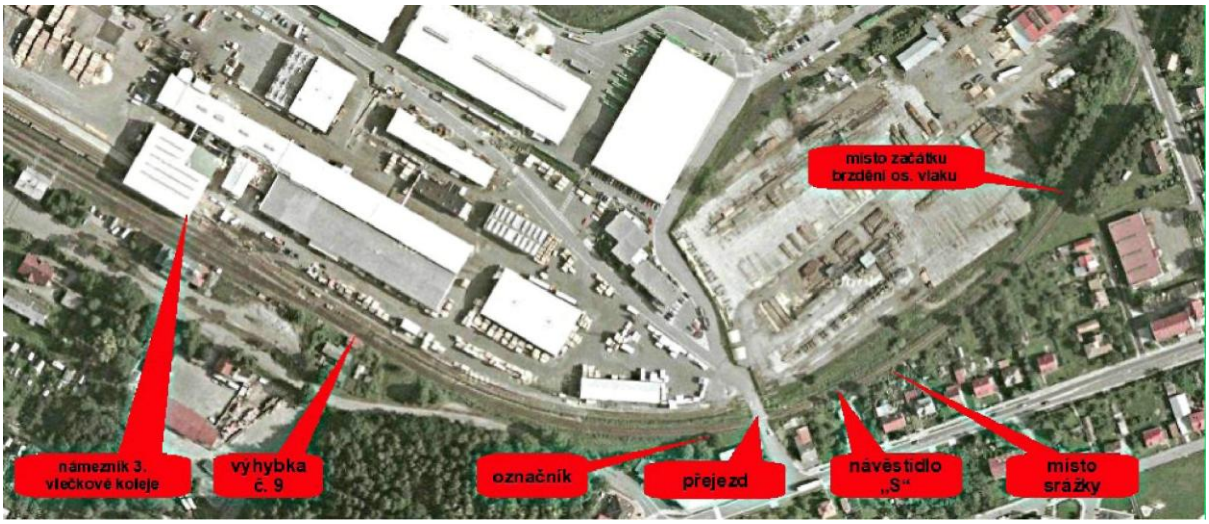
On the basis of the results of the investigation into the railway accident – the collision of passenger train No 5307 with a shunting freight train on the Hlinsko v Čechách – Ždírec nad Doubravou section on 10 November 2008 – the Railway Safety Inspection Office makes the following recommendation to the Rail Authority and the manufacturer and operators of Class 914 driving vehicles and vehicles of similar construction: To modify the design of the glazed partitions between the low-floor section and the passenger compartment to ensure that the resistance of these partitions in the event of a collision between vehicles is not lower than the resistance of other glazed partitions, constructions and fittings in the passenger compartments and the driver's cabins.

Brno, 2 July 2009

Jiří Chládek (in his own hand)
Chief Inspector
Brno Regional Inspection Office

Ing. Michal Miklenda (in his own hand)
Director
Brno Regional Inspection Office

7. APPENDICES

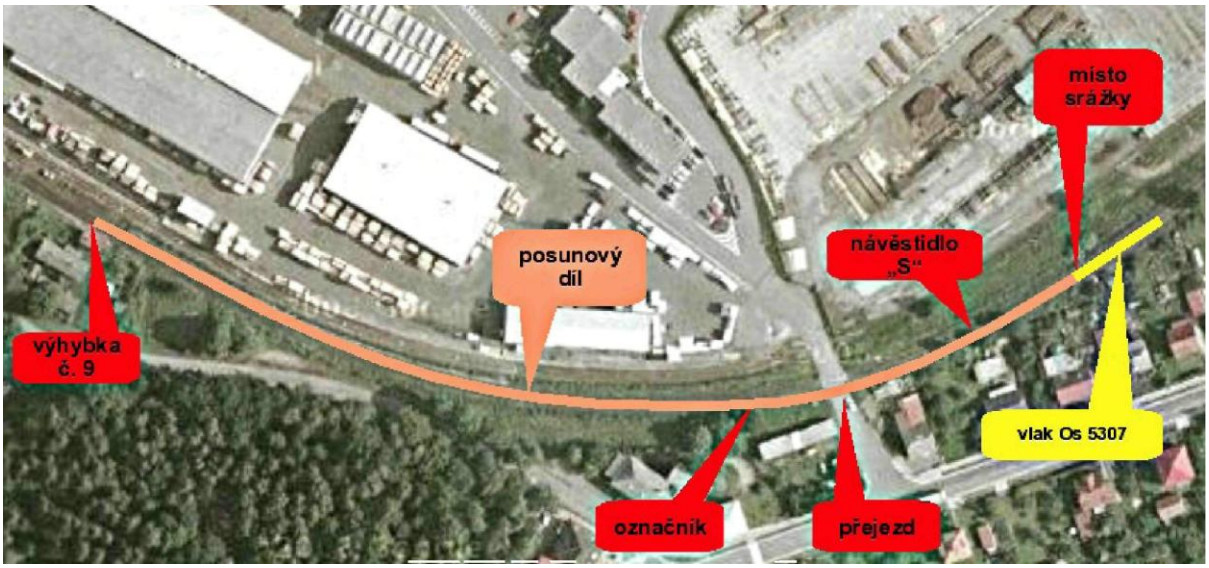


Appendix 1: Local conditions at the incident location

Legend (text in the bubbles):

Point where passenger train started braking

Buffer No 3 on rail track siding	No 9 set of points	Signpost	Railway crossing	"S" signalling device	Place of collision

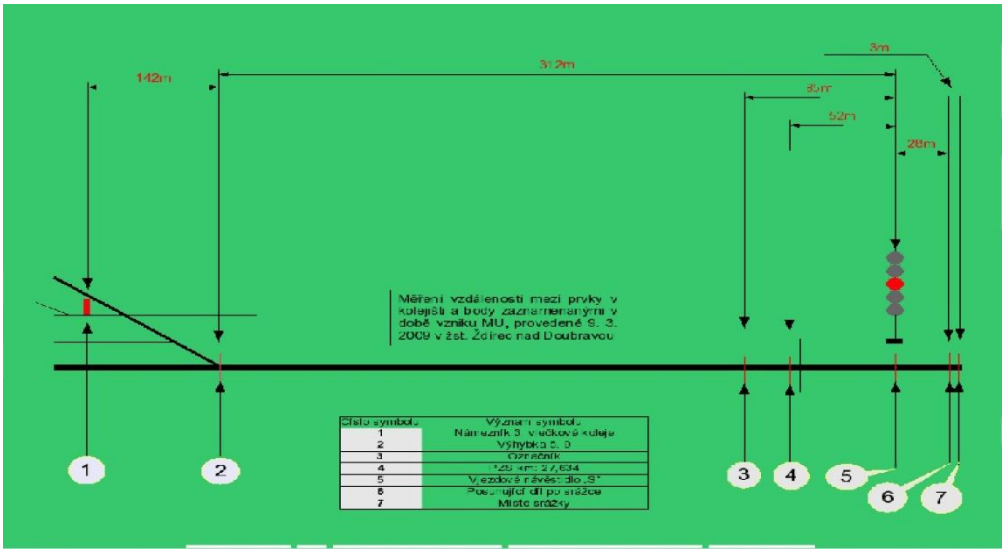


Appendix 2: Situation following the accident

Legend (text in the bubbles):

No 9 set of points	Shunting freight train	"S" signalling device	Place of collision

Signpost	Railway crossing	Passenger train No 5307



Appendix 3: Distances between the critical objects

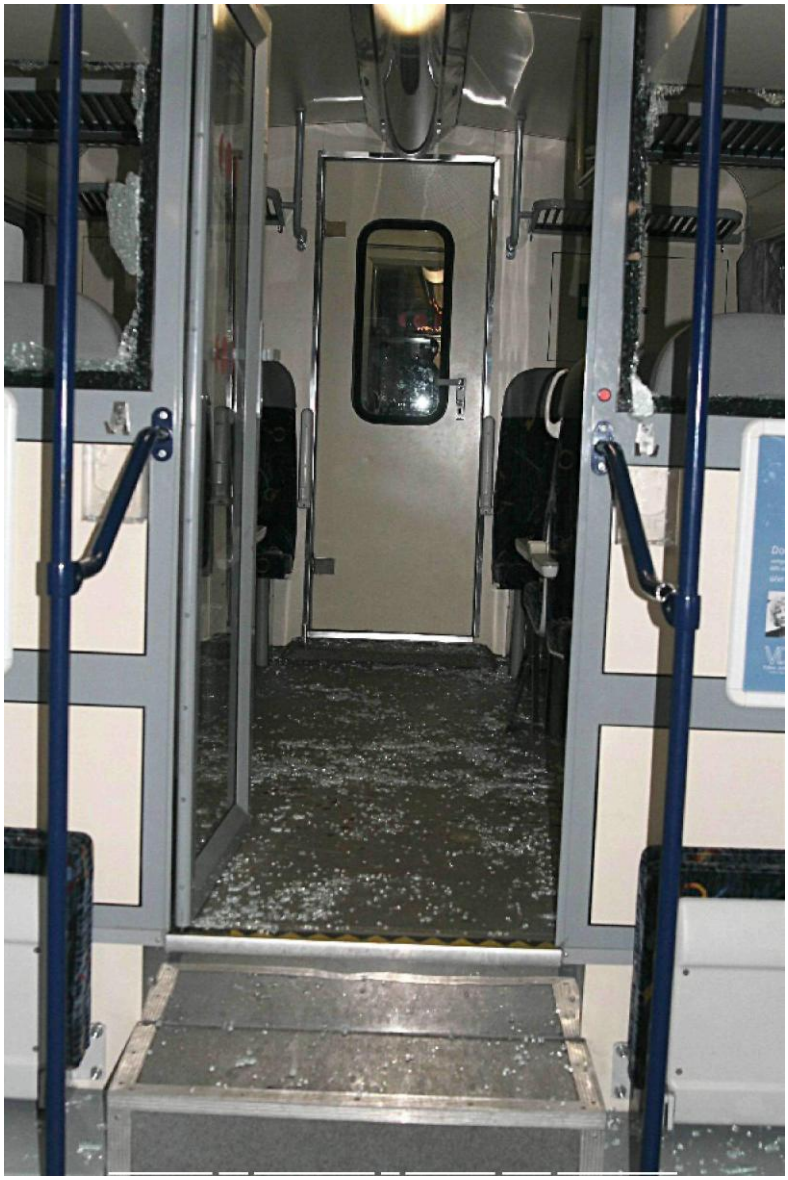
Legend (text in the diagram): Distances between objects on the rail track and the points recorded at the time of the incident and measured on 9.2.2009 in Ždírec nad Doubravou station

No / symbol	Symbol meaning
1 2	Buffer No 3 on the rail track siding No 9 set of points
3	Signpost
4	Signalling device of the railway crossing at km 27.634
5	"S" signalling device
6 7	Shunting train after the collision Place of collision

Appendix 4: Vehicles involved in the collision

Appendix 5: Position of the shunting freight train in relation to the "S" entry signalling device

Appendix 6: Broken glazed partition



Appendix 7: Fragments in the passenger compartment