MINISTRY FOR
INNOVATION AND TECHNOLOGY

TRANSPORTATION SAFETY BUREAU

ANNUAL REPORT 2017

Transportation Safety Bureau

Hungary

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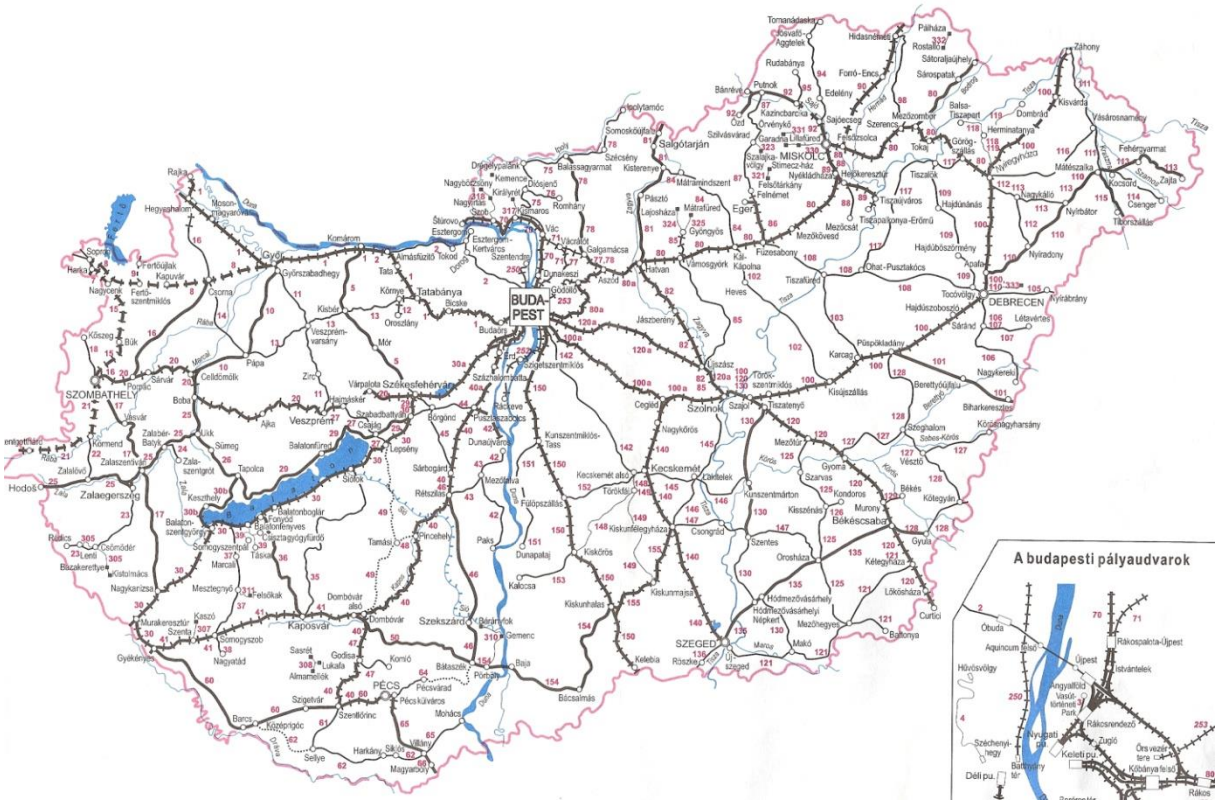
RAILWAY NETWORK IN HUNGARY



Basic data of the infrastructure:

National lines:	7690 km
	IM: MÁV (94%), GySEV (6%)
	Trans-European network: 2830 km (37%)
Regional lines:	480 km (100% narrow gauge)
Suburban lines:	210 km
Local network:	in Budapest, Debrecen, Miskolc, Szeged
Level crossings:	6041 (48% active, 52% passive)

SUMMARY

Hungary fully implemented all essential requirements concerning accident investigation of the Railway Safety Directive 2004/49/EC in its national law.

Transportation Safety Bureau was established on 1st January 2006 as the legal successor of Civil Aviation Safety Bureau (founded in 2002). TSB operates in a multimodal form. Its main duty is the independent safety investigation of aviation, railway and marine accidents and incidents. Within the organisational framework of TSB, the Railway Department began to operate on 1st March 2006.

Pursuant to Government Decree 230/2016. (VII. 29.) on the assignment of a transport safety body and the termination of Transportation Safety Bureau with legal succession, the independent organisational status (as a central authority) of Transportation Safety Bureau was terminated with an effect of 1 September 2016, and TSB was integrated in Ministry of National Development as a division. As part of this integration, the functions supporting the operation of the organisation (finance, communication, law, IT, HR) were wound up, and their responsibilities were transferred to the Ministry and other entities and units of public administration. As a result of such reorganisation, the Railway Department of TSB, which used to work with a clear professional profile dedicated to railway, became Railway and Dispatcher Department.

The year 2017 was the first full year of our operation in the new form of organisation.

In 2017, there was no occurrence (serious accident) on the railways which the Railway Department of TSB was, pursuant to the regulations, obliged to investigate.

TSB decided at its own discretion to conduct independent safety investigation into 31 occurrences. This is 10% more than in the previous year.

During year 2017, TSB published 35 final reports closing 40 investigations, including 16 safety recommendations. 2 of these recommendations have been implemented, implementation of 12 recommendations is in progress, 2 of them was left unanswered.

At its own discretion, TSB included in the scope of the safety investigation some occurrences of signals passed at danger (SPADs), taking into consideration hazards and high frequency of these cases with an otherwise fortunate outcome. Based on previous positive experiences, TSB monitored with particular consideration the occurrences related to level crossings (LC accidents) and to persons injured by railway vehicles, initiating safety investigations in cases that appeared to be instructive. In 2017, we laid great emphasis on revealing the root causes of the occurrences, especially in the aspects of human and organisational factors.

In 2017, we also set out the lessons learnt in the area of safety culture if we found it necessary and possible.

Abbreviations	
IC	Investigating Committee
LC	Level crossing
MÁV Co.	Hungarian State Railways Plc.
NIB	National Investigation Body
NSA	National Safety Authority (the National Safety Authority of Hungary)
RSD	Railway Safety Directive (2004/49/EC directive)
TSB	Transportation Safety Bureau

1. INTRODUCTION

The Transportation Safety Bureau of Hungary (TSB) as a multimodal organisation for the investigation of accidents was established on 1st January 2006.

The Annual Report 2016 of TSB - in accordance with Article 23 (3) of the Railway Safety Directive 2004/49/EC - gives an account on the following:

- the implementation of 2004/49/EC Railway Safety Directive into the Hungarian law,
- the relations of TSB with other concerned organisations,
- the philosophy and process of the independent safety investigation at TSB,
- the overview of the past 12 months from transport safety point of view,
- the experiences of the independent safety investigations carried out by TSB,
- the safety recommendations issued by TSB and the provisions made in relation to the recommendations, and
- the participation of TSB in the work of the European Railway Agency.

Legal basis - The implementation of the Safety Directive in the Hungarian law

Hungary implemented all essential requirements concerning accident investigation of Railway Safety Directive 2004/49/EC in Act CLXXXIV of 2005 on the safety investigation of aviation, rail and marine accidents and incidents. Based on the Directive, Transportation Safety Bureau was established on 1st January 2006 and – as a multimodal organisation - is responsible for the independent safety investigation of aviation, railway and marine accidents and incidents.

The detailed regulations of the safety investigation are included in the decrees of Act CLXXXIV of 2005 which were separately issued for the three modes of transport by the Minister of transport. The decree on the regulation of the safety investigation of serious railway accidents, railway accidents and incidents (7/2006 GKM) was issued on 27th February 2006.

Powers of TSB have been extended: previously, the scope of TSB activity had not included investigations of accidents and incidents occurred on local railways. Serious accidents are not frequent on these railways (underground railway, cogwheel railway, funicular, tram – Budapest, Miskolc, Debrecen, Szeged, – cableways, ski-lifts), nevertheless, related hazards are high, considering the high number of passengers transported daily. Extension of the investigation scope by including these railway systems was justified by this hazard, completion of the safety investigations additionally generated being possible by an allocation of minor extra resources.

Act CLXXXIV of 2005 on the safety investigation of aviation, rail and marine accidents and incidents was also amended parallel to this, the amendment concerning TSB activity by introducing the institution of accident investigation of the operator in the railway sector as well. Positive experiences of the accident investigation system of the operator, well established in the aviation sector, can be effectively applied to enhance safety in the railway sector also. Therefore, according to the new regulation for occurrences not included in the serious accidents category required to be investigated by the National Investigation Body (NIB), in case NIB takes decision on not conducting a safety investigation of the occurrence, the safety unit of the railway undertaking will be requested to conduct the investigation of the operator and inform NIB on the results in a report.

This regulation does not aim the duplication the safety system, it does not concern investigations required by the safety management system (SMS). Its objective is to ensure that reports, being issued anyway by the accident services of railway undertakings, would be forwarded to NIB, furthermore, authorizes NIB to request additions, when necessary, to these reports – by this, the regulation helps NIB in collecting data on safety issues. Involving organisations already actors of the SMS in the activity of NIB does not require extra resources (HR, etc.) on either side, nevertheless, it broadens significantly the information base of NIB activity and, by this, the enhancement possibilities of railway safety.

These rules were implemented into the decree on the regulation of the safety investigation of serious railway accidents, railway accidents and incidents (7/2006 GKM) issued on 27th February 2006, the new number of this decree: 24/2012 NFM issued on 8th May 2012.

Within the organisational framework of TSB, the Railway Department began to operate on 1st March 2006 pursuant to the regulations.

The national Act guarantees the complete independence of TSB from all other actors of the concerned transport sector. The Act defines the objective of the independent safety investigation as follows:

'The objective of the independent safety investigation is to reveal the causes and circumstances of serious railway accidents, accidents and incidents and to initiate the necessary technical measures and make recommendations in order to prevent similar cases in the future.' It also states that 'it is not the purpose of the investigation carried out by TSB to apportion blame or legal liability'.

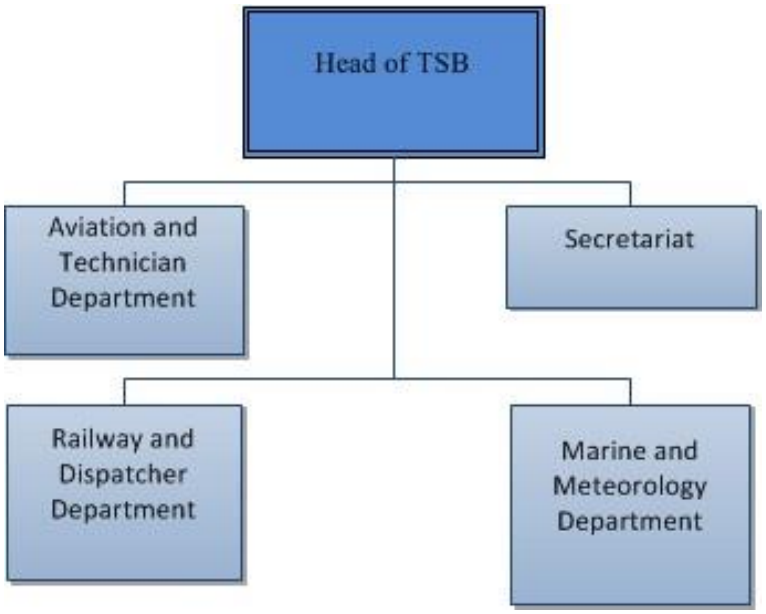
The Act contains the rights and responsibilities of the investigators defined in the Safety Directive.

According to the national regulations:

- All aviation, railway and marine occurrences shall be reported to TSB.
- The members of the Investigating Committee of TSB are authorized to be present at the site of any occurrence and to conduct the safety investigation parallel with the police investigation (if there is one).
- Based on the results of the investigation, TSB is entitled to issue safety recommendations and recommend immediate preventive actions before the completion of the investigation, if necessary. The implementation of safety recommendations is not obligatory, however, the addresses must report to TSB once a year whether they have accepted or rejected them. (The addresses must forthwith respond to the recommended immediate preventive actions.)
- The anonymity of the relevant parties is guaranteed. TSB shall make public the final reports on the results of the investigation. However, the final report shall not contain data based on which the relevant parties can be identified. The final report shall not be used in criminal procedures.

1.1 Organisation of TSB Hungary

The organisation and relations of the NIB is shown in organograph.

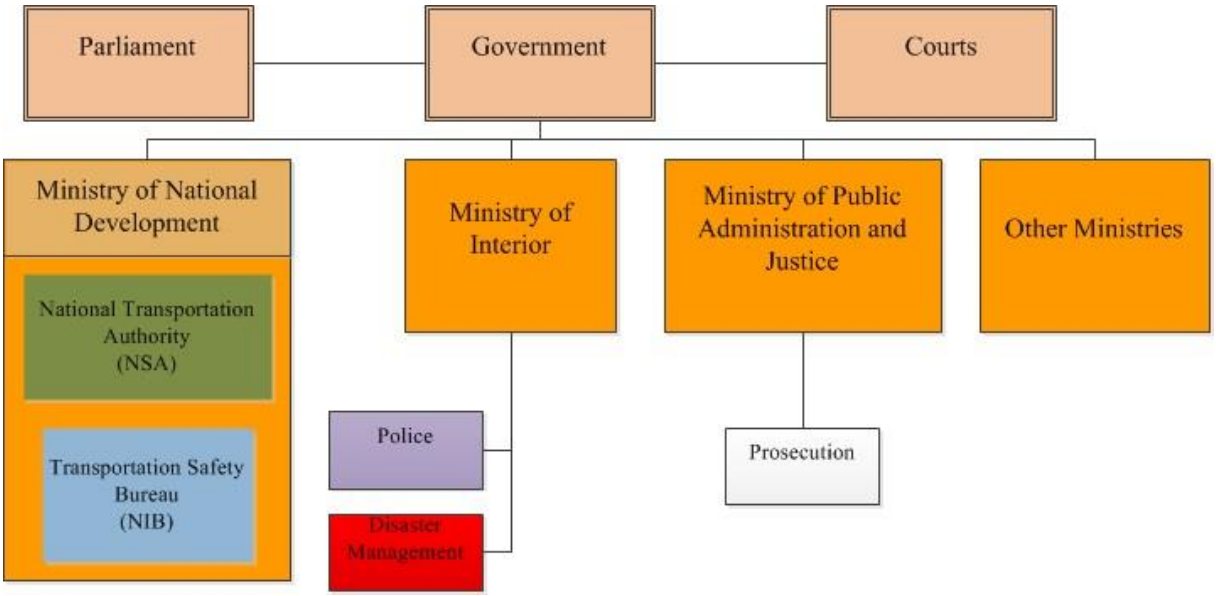


The organisation of the TSB

- TSB regards prevention as the main objective of its activity. TSB endeavours to share the findings, the results and the experiences of the safety investigations with a wide circle of organisations in the profession as well as with the civil sector.
- TSB was established on 1st January 2006. The Aviation Department and the 24/7 Duty Services operated from the beginning of 2006 and the other departments and units grew gradually during the year. The Railway and the Marine Department began to work officially on 1st March 2006.
- The total number of permanent staff at the end of August was 54, which decreased to 40 until 31th December. The Railway Department consists of 8 investigators and the Head of Department.

1.2 Organisational flow of TSB Hungary

The following chart shows the system of relations of the NIB:



System of relations

- Within Ministry of National Development, NSA is ranked Deputy State Secretariat, and TSB is a Division. Accordingly, NSA is positioned at a higher level, the addressee of the safety recommendations is different within the same entity, and supervision is common at the ministerial level.
- The Ministry of National Development is the national regulator.
- Based on the outcome of the investigations, TSB may issue safety recommendations to the National Safety Authority (NSA). The implementation of safety recommendations is not mandatory; the addressees however are obliged to compile an annual report on their response (acceptation, implementation, or refusal).
- TSB is part of the Ministry of National Development. The Head of TSB works under direct supervision of the Deputy State Secretary. According to the national law, the Minister shall not instruct TSB in matters concerning the independent investigations, but, according to the organizational rules, the Minister has the power to do so.
- TSB reports to the government annually on the activities of TSB, the lessons learned from the independent investigations, the processes and trends concerning transportation safety.
- The general rules regarding the operation of the railways are currently defined by the state-owned MÁV Co., the largest infrastructure manager in Hungary. The National Safety Authority only assents to the amendments to the rules.
- TSB is authorized to get access to all data relevant to the occurrence in question (including data stored on data recorders).

- The Investigating Committee of TSB may conduct its site investigation simultaneously with the police investigation.
- TSB and the police may help each other's work with exchange of factual data and results of expert analyses. The IC may withhold information obtained in the course of the investigation from other authorities in occurrences when the owner of the information would have had the right to do so.
- TSB, the police and the disaster management mutually inform each other about the received occurrence reports.

Following the changes in 2016, the structures and the system of relations are going to change again in the middle of 2018.

2. INVESTIGATION PROCESS

2.1 Independent basis of the investigation

Pursuant to national law, TSB is independent of all persons and organisations whose interests are contrary to the duties of the investigating organisation, in particular:

- authorities granting permission to put vehicles into service,
- authorities granting permission and controlling the operation and the maintenance of the vehicles,
- authorities issuing driving licences,
- the organisation operating the transport infrastructure,
- transport companies,
- railway undertakings
- the organisation determining railway tariffs,
- the organisation distributing routes,
- the safety authority and
- all regulators in the field of railways.

Under the national law, the civil servants of TSB shall not be the owners, senior officials or employees of the above mentioned organisations.

The Director-General and the Investigating Committee of TSB shall not be instructed in their scope of duties concerning the safety investigation.

Functional independence of TSB remained intact during its operation within the Ministry.

2.2 Accident investigation philosophy of TSB Hungary

Under the Hungarian regulations, TSB shall investigate serious railway accidents.

The definition of 'serious accident' under the national regulations - in accordance with the Railway Safety Directive 2004/49/EC – is as follows:

'*Any train collision or derailment of trains, resulting in the death of at least one person or serious injuries to five or more persons or extensive damage to rolling stock, the infrastructure or the environment of at least HUF 500 million and any other similar accident with an obvious impact on railway safety regulation or the management of safety*'.

Apart from serious accidents, the national regulations permit TSB to investigate other occurrences – at its own discretion – that may have an impact on the safety of rail transport as well as on the regulations and management of railway safety.

TSB availed itself of the opportunity provided by the regulations to decide which occurrences – apart from serious accidents – are to be investigated. TSB based its decisions regarding which occurrences require investigation on the following fundamental principles:

- **occurrences resulting in serious injuries to persons, extensive material damage and/or hindering railway transport significantly,**
- **the latent danger of the occurrence can be considered significant – irrespective of its actual consequences,**
- **accidents or incidents recurring at the same site or in the same manner**

should be investigated.

When deciding which occurrences to investigate - besides the ones with serious consequences - it helps a great deal that the Railway Department regularly requests information from railway undertakings and relevant authorities on occurrences which are not investigated in details. The collection and evaluation of these data provides the possibility to be able to discover recurrence and certain tendencies in the accidents. These observations can create basis for further investigations.

In order to increase efficiency in decision making, it is necessary to gain as much information as possible. The institution of accident investigation of the operator has been introduced in the railway sector as well. Positive experiences of the accident investigation system of the operator, well established in the aviation sector, can be effectively applied to enhance safety in the railway sector also. Therefore, according to the new regulation for occurrences not included in the serious accidents category required to be investigated by NIB, in case NIB takes decision on not conducting a safety investigation of the occurrence, the safety unit of the railway undertaking will be requested to conduct the investigation of the operator and inform NIB on the results in a report.

2.3 The investigation process of TSB

The Duty Services of TSB (dispatchers) receive the reports of the occurrences 24 hours a day.

The members of the Investigating Committee (IC) are appointed by the Head of TSB or by his deputy on duty. The IC consists of one field investigator technician and at least one accident investigator. In case of more serious or complicated occurrences, one of the heads of department on duty TSB may be present on the site.

If an occurrence is not obliged to be investigated under the law, the head of the concerned department advises the Head of TSB to decide whether or not to conduct an investigation.

The Investigating Committee carries out the site survey (parallel with other authorities) and decides on the direction of the investigation, the required technical and technological examinations as well as selecting the organisations and/or experts to be initiated in the investigation if necessary.

Other processes are the same as those specified in the ERA guide relating to technical investigations: collecting of data, investigative interviews, analysis etc.

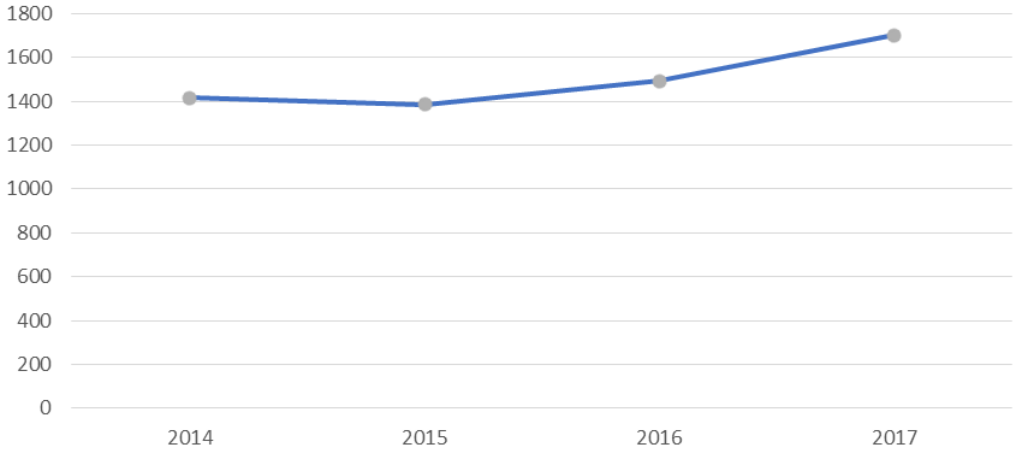
The draft reports on the occurrences are discussed by a board made up of the heads of departments of TSB.

The relevant parties of the investigation may make reflections on the draft report within 60 days from the date of receipt which is to be evaluated when compiling the final report. After this 60-day-period, TSB convenes a meeting for a final discussion with the participation of the representatives of the persons and organisations concerned. The purpose of the final discussions is that all concerned parties can hear the comments sent in reflection to the draft report as well as the viewpoint of TSB regarding the comments before the completion and publication of the final report. According to Hungarian law, the investigators may decide whether or not to include the parties' comments in the final report, the comments of an NIB of a Member State have to be included. Subsequently, the final report is made public.

All the three major departments of TSB have a separate 'Investigators' Manual' which lays down the methodological and technical requirements based on which the investigations shall be conducted by the investigators of TSB, taking the special characteristics of the given mode of transport into account.

3. OVERVIEW OF THE YEAR 2017

3.1 Notifications



Numbers of notifications

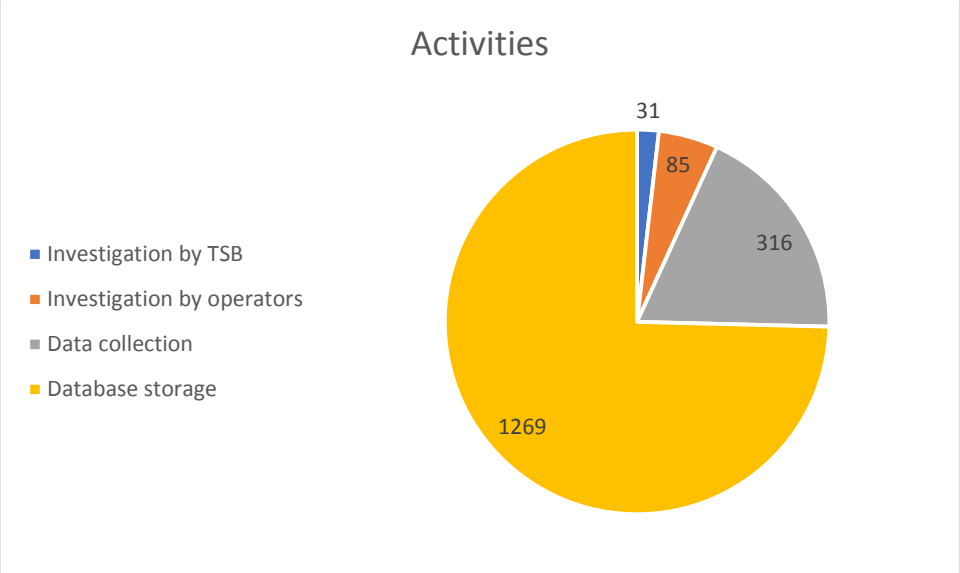
Our duty service received 1701 notifications in total in 2017, which is a significant, 15% increase compared to the previous year.

Analysis of the distribution of notifications from the aspect of network category shows that the number of notifications has increased for each network category except for the underground, as follows:

- national network: by 11% (practically, the value returned to the level of 2015 after a decrease in 2016);
- local networks: the extent of increase in the number of notifications was similar;
- suburban networks: the number of notifications increased by 84%, however.

The above numbers show that willingness to report is excellent, practically all occurrences are really reported to us.

3.1 Investigations



Activities following notifications

In 2017, we decided to perform an immediate *site survey* (based on data in the notifications) on 47 occasions; such surveys were usually performed by a team of three members. 34 of the 47 site surveys affected locations in the national railway network, which shows that the consequences of the accidents and incidents in such networks are more serious, and that the investigation into such accidents/incidents is more likely to require detailed data collection at the scene.

Detailed data collection was performed on 316 occasions in total. A purpose of detailed data collection was to find out whether the occurrence may offer such lessons to learn which justify the performing of a full investigation by us. In these cases, we asked the railway companies for information and data, and decided on the investigation on the basis of such inputs. Another form of detailed data collection is when we ask the competent authorities for information relating to whether a case where a person by a vehicle was a suicide or an accident caused by rolling stock in motion. This is needed because, pursuant to the relevant EU regulation, classification must be made on the basis of a decision of the authorities.

In 2017, we commenced a *full safety investigation* in 31 cases. With regard to the nature of the given occurrence, an investigating committee of 2 to 5 members is appointed to perform the investigation. When staffing an investigating committee, we ensure that investigators with relevant professional knowledge and experience be available in each committee for a successful investigation. Such areas of expertise are, for instance: traffic control, mechanics, infrastructure or human and organisational factors. The investigating committee is chaired by a member appointed by the Head of TSB, and such chair is responsible for successful and timely completion of the investigation. Compared to the headcount, it can be seen that an investigator had to chair 4.3 investigating committees on average in 2017, due to changes to the headcount during the year. This number significantly exceeds the quantity of 2 investigations/year specified by the European Union Agency for Railways in its activity assessment report on the operation of Railway Department TSB in 2012.

In 2017, TSB invited operators to investigate 85 occurrences. In the railway sector, since 2012 – similarly to aviation – TSB has the opportunity to request information from operators on the causes of railway occurrences which need no investigation by TSB but may offer a lesson to learn in connection

with general safety on rail transport. Today, the conditions of investigation by the operator are given: in order to meet the personal requirement of the performing of investigation by operators, accident investigation training sessions are running since 2013. Over 200 people involved in the investigation of occurrences completed the courses.

This value is 29 more than that of 2016. Taking this value into account together with the decrease of the number of cases of collection of detailed data by 34, we find that our organisation is moving in the direction of investigation by the operators. An advantage of this practice is that we gain more detailed information from the reports made of the investigations performed by the operators, and we are also informed on the preventive safety recommendations of the railway companies.

3.3 Safety Investigations started by TSB in 2017

Date 2017	Description of the occurrence	Classification
02 01	The train № 616 crashed into the train № 2846 from behind between Ceglédbercel-Cserő and Cegléd stations. Two people had severe injuries and five were injured slightly.	Railway accident
10 01	Two wagons of a freight train departing from Debrecen station derailed.	Railway accident
18 01	A train approaching Esztergom station derailed on a switch.	Railway accident
26 01	At Csengele station, the train № 702 passed the exit signal at danger, and stopped ca. 350 metres from the train № 7037 arriving from the opposite direction.	Railway incident
05 02	A train collided with an automobile at an unprotected level crossing between Kiskunfélegyháza and Lakitelek station. One occupant of the automobile died.	Railway accident
14 02	The leading wagon of a freight train departing from Székesfehérvár station derailed with 3 axles. No one was injured.	Railway accident
03 03	A train running from Újszász station in the direction of Tápiógyörgye ran on correctly on the left track but opposite the correct direction, without prior notification.	Railway incident
28 03	A tram derailed on a switch at Városháza terminal Budapest.	Railway accident
28 03	The crane of a work train hit the entry signal at Dunaújváros station.	Railway accident
27 05	Two locomotives and six wagons of a freight train approaching Ács station derailed.	Railway accident
08 06	A light engine approaching Ferencváros station derailed on the switch № 58.	Railway accident
17 06	A tram derailed at Közvágóhíd station, Budapest.	Railway accident
04 07	A tram derailed at Új köztemető terminal.	Railway accident
06 07	The locomotive of a passenger train departing from Balatonkenese station caught fire.	Railway accident
27 07	At Tata station, the freight train № 43489 passed the exit signal at danger; the train № 4810 arriving from the opposite direction stopped at the entry signal.	Railway incident

Date 2017	Description of the occurrence	Classification
03 08	The train № 560 approaching Abony station with subsidiary signal stopped in front of the switch set for it inappropriately.	Railway incident
16 08	A train derailed on the temporary switch in Haller street, Budapest.	Railway accident
21 08	A freight train approaching Hegyeshalom station failed to stop at the assigned spot, and burst a switch open.	Railway incident
21 08	At Bükkösd station, a freight train passed the exit signal at danger, and stopped after bursting a switch open.	Railway incident
25 08	The train № 7504 started from Békéscsaba station with the exit signal at danger, burst a switch open, thus entering the route of an approaching freight train.	Railway incident
05 09	At Délegyháza station, the freight train № 45296-1 passed the exit signal at danger; the approaching passenger train stopped at the entry signal.	Railway incident
13 09	Six tank wagons of a freight train approaching Vép station derailed, two wagons tipped to the side, and a significant quantity of the oil cargo spilt.	Railway accident
19 10	The train derailed at Hűvösvölgy terminal, Budapest.	Railway accident
20 10	A train collided with a coach between Enese and Kóny; two people were injured slightly.	Railway accident
26 10	A train collided with a light truck between Lakitelek and Kecskemét stations. The driver of the road vehicle was injured slightly.	Railway accident
29 10	A tram derailed at Új köztemető terminal. No one was injured.	Railway accident
29 10	Two trains were running towards each other between Cece and Vajta stations; there was no collision.	Railway incident
30 11	A tram derailed at Közvágóhíd station, Budapest.	Railway accident
05 12	A passenger jumped out of the train at Balatonszárszó station, and died while being carried to the hospital.	Railway accident
14 12	Three wagons of a freight train approaching Kelebia station derailed	Railway accident
29 12	One wagon of a freight train approaching Ferencváros station derailed.	Railway accident

4. INVESTIGATIONS COMPLETED IN 2017 WITH THE ISSUED RECOMMENDATIONS

In 2017, 35 final reports were compiled and published on the website of TSB, closing 40 investigations**. Further 6 draft reports were compiled and sent** to the relevant parties for reflections. The above investigations were closed and the final reports were published at the beginning of 2017 considering the 60 days provided by law for the relevant parties to reflect on the draft report.

The final reports issued in 2017 analysed occurrences of the following types:

- Derailment 16 occurrences
- Accident at LC 6 occurrences
- SPAD 4 occurrences
- Collision of trains 4 occurrences
- Collision to obstruct 3 occurrence
- Fire in rolling stock 3 occurrence
- Other 4 occurrences

Investigations completed in 2017 by the amount of damages:

In 2017, the damages related to an occurrence exceeded EURO 150,000 in 5 cases, and EURO 2 million in one case.

Number of investigations lasting longer than one year over 2014-2017

Year	at the end of 2014	at the end of 2015	at the end of 2016	at the end of 2017
Amount	12(8)	9 (5)	13 (8)	8(6)

Numbers in brackets show the amount of reports which sent to relevant parties

5. INVESTIGATIONS CLOSED IN 2017.

2015-0639-5 and 2016-0176-5

Overview of the occurrences

29 June 2015

On 29 June 2015, on the open railway line between Komárom-Rendező and Nagyigmánd-Bábolna stations, the engine driver of the freight train with Reg. № 91869 realised that the cargo of the second open wagon had caught fire with strong smoke. In order to make fire extinguishing easier, the engine driver drove the train as far as Nagyigmánd-Bábolna station and performed extraordinary stop there, at 09:01 o'clock, to provide the firefighters easy access. The fire spread over to the third wagon as well. The firefighters finished extinguishing the fire at about 10:30 am.

No one was injured during the occurrence.

12 February 2016

The traffic manager at Kisbér station stopped (by manual signal) the freight train with Reg. № 91861 (which was moving through the station according to timetable) because the cargo of the second open wagon of the train was in flames. The train did not fully enter the station: it stopped on the main track in such position that it blocked the track in the direction of Nagyigmánd-Bábolna station.

The units of the Disaster Management service extinguished the fire, so it did not spread to adjacent wagons or nearby buildings or vegetation.

The investigation found in both cases that the hot oil drops and soot from the exhaust pipe of the Diesel engines of the trains had lit the plastic net used to cover the wagons in order to prevent cargo spills, from which the fire spread over to the cargo of the wagon (which was picked up as non-flammable substance).

The IC proposes that safety recommendations be issued relating to the use of combustible cargo fasteners and the technical revision of outdated Diesel engines in order to prevent similar fires in the future.

Factual statements directly connected to the occurrence of the incident

The cargo loaded as not dangerous goods in open wagons was covered with plastic nets which had a lower flashpoint than the temperature of the fume and soot leaving the exhaust pipe of the engine, and so the net could catch fire which then spread over to the cargo.

The cargo accepted as waste iron contained large quantities of combustible material.

Factual statements indirectly connected to the occurrence of the incident

The railway instruction in effect contain no restrictions for those wagons with "Flammable" label which may be placed in a train after a Diesel-powered engine, although these old, outdated internal combustion engines often emit hot solid and gaseous substances.

Other risk factors

The IC makes no such statement.

4. SAFETY RECOMMENDATIONS

TSB issue the following safety recommendations proposed by the Investigating Committee at the closing of the investigation.

BA2015-0639-5-01 *The Investigating Committee of TSB found during its investigation that Diesel-powered, outdated engines of the Series 628 emit such hot solid and gaseous substances through the exhaust system during normal operation which can light flammable substances situated nearby.*

> **TSB recommends Railway Authority Division, Ministry of National Development to review the technical state of the Diesel-powered, non-modernised engines of the Series 628 in service in Hungary, with special regard to the risk of fire implied by the hot solid particle content of the exhaust leaving the exhaust system, and take action as necessary.**

The position of the IC is that, by acceptance and expected implementation of the safety recommendation, the risk of fire could be reduced in the case of freight trains towed by outdated Diesel-powered engines.

BA2015-0639-5-02 *The Investigating Committee of TSB found that the material used to prevent cargo spill in the case of bulk goods has a lower flashpoint than the temperature of the soot particles and oil drops emitted by Diesel-powered engines.*

> **TSB recommends National Directorate General for Disaster Management to review the conditions of use of cargo fasteners used in railway transport from the aspect of fire protection and propose a recommendation as necessary for a solution by legislation or other regulation.**

The position of the IC is that, by acceptance and expected implementation of the safety recommendation, the use of flammable materials used for fastening rail cargo could be avoided in the area of railway transport.

2015-0655-5

Overview of the occurrence

The train with Reg. № 5433 approaching (with a subsidiary signal) Track I of Miskolc-Gömöri station had an extraordinary stop in front of Switch № 29 because it was set to guide the train to Track II which was occupied. The clamp lock in the switch failed to work, so it could not be locked out. After the situation was clarified, the train reversed and moved to the unoccupied Track III through another route. The investigation also revealed that the switch had been burst open during the previous shunting movement, and that was the cause of its erroneous operation. No accident or personal injury occurred, owing to the engine driver's quick assessment of the situation and immediate stopping of the train.

Factual statements directly connected to the occurrence of the incident

While setting the route for shunting, the outer traffic manager № 2 set the Switch № 29 erroneously, in such manner that there was an engine over it, so it was burst open during the shunting movement, but this fact was not noticed before the arrival of the passenger train.

The employer assigned to set the switch did not perform a trial setting of the switch burst open when setting the route for the approaching train,

- the personnel could not lock the route out due to malfunction of the switch, but they failed to conclude from this situation that the switch might have been burst open before,
- before approving the issuing the subsidiary signal, the traffic manager in charge failed to ensure that each step of the setting of the route had been done properly,
- the train entered the station with a subsidiary signal, in the direction of the switch burst open.

Factual statements indirectly connected to the occurrence of the incident

The IC makes no such statement.

Other risk factors

Proper functioning of the safety installation with a design of almost 100 years can only be achieved by strict control, so the possibility of human error or omission is fairly high. Dangerous situations caused by human error cannot always be prevented – certain functions of the installation are only suitable for mitigating the consequences.

2015-0752-5 and 2015-0968-5

Overview of the occurrences

At 00:02 o'clock on 27 July 2015, between the stations Záhony and Mándok, the 6th and 10th loaded wagon of the train with Reg. № 68151 derailed with one bogie. The rail track was damaged in a length of ca. 90 m during the occurrence. After the derailed wagons were lifted back on the track, the wagon with Reg. № 33 87 785 3633-8 derailed again while being towed back to Záhony station.

At 22:20 o'clock on 15 September 2015, between the stations Mándok and Záhony, the loaded wagon with Reg. № 33 55 797 0024-6 of the train with Reg. № 68158 derailed with one bogie. Neither the undercarriage nor the container body of the wagon was damaged in the occurrence.

The rail tack was damaged in the occurrence. Passengers of the passenger trains were carried by replacement buses until the track was restored.

During investigations of the occurrences, the IC found that, in several cases, the instrumental track measurements performed at the location of the occurrences a few days before the first occurrence showed error values which were close to the limit where operation must be suspended.

The investigation of the occurrences by the IC concluded that several factors contributed to the occurrences:

- the railway track was so worn-out at the time of the occurrence that the values measured during track measurement were close to the limit where operation must be suspended,
- The cant values measured in the curved track section exceeded the specified limit at certain points,
- the bogies of the derailed vehicles involved in the occurrence of 27 July 2015 were different type than those of the other vehicles in the train, and were more sensitive to the state of the rail track,
- it was found with the vehicle involved in the occurrence of 15 September 2015 that the wheel load differences (measured after the derailment) slightly exceeded the permitted limits.

Factual statements directly connected to the occurrence of the incident

On the basis of data available, the IC concluded that the occurrence had several contributing factors:

- the railway track was so worn-out at the time of the occurrence that the values measured during track measurement were close to the limit where operation must be suspended,
- at certain points, the cant values measured in the curved track section exceeded the limit of cant specified for curves,
- the bogies of the derailed vehicles involved in the derailment of 27 July 2015 were different type than those of the other vehicles in the train, and were more sensitive to the state of the rail track,
- the wheel load differences (measured after the derailment) of the vehicle involved in the occurrence of 15 September 2015 slightly exceeded the permitted limits.

Factual statements indirectly connected to the occurrence of the incident

The general state of the track impaired despite continuous track supervision, and the actions (introduction of restricted speed running, track re-alignment with small machines) taken to maintain safe state of the infrastructure proved insufficient.

Other risk factors

The IC makes no such statement.

Actions taken after the occurrence

During the repair works at the scene of the first derailment of 27 July 2015, 130 sleepers were replaced in the damaged track, and 4 at the scene of the second derailment. Manual track-realignment was also done crushed stone was added during the remedial works.

Employers of the infrastructure manager replaced 150 damaged sleepers during the repairs following the derailment of 15 September 2015.

Following the remedial works, track re-alignment was performed with large machines in the curve between sections 877+00 and 894+58 in late September 2015. The cant value measured earlier was aligned to the C2 value indicated in the relevant specifications.

Since the occurrences, the laboratory train with reg. № FMK-004 has performed measurement in the affected section on one occasion, in November 2015. Such measurement brought no value reaching or exceeding the C3/D limit.

Both the charts made by the laboratory train and made available to the IC and the on-site measurements performed by the IC in July 2016 showed that the earlier cant values of 140-170 mm in the curved section had been modified to 80-100 mm values.

The restricted speed running (40/30 km/h) introduced earlier in the curved section remained invariably in effect after the track-realignment performed using large machines.

The position of the IC is that similar occurrences could be prevented by observing the instructions relating to the supervision of the tracks, and by providing the conditions (personnel, technical, financial) of maintaining serviceable state of the tracks.

With regard to the actions taken after the occurrence (track realignment with large machines), the IC proposes no safety recommendation.

2015-0845-5

Overview of the occurrence

On 16 August 2015, at 08:37, failing to observe the permit indicated in the written instruction received, the train with Reg. № 33512, which was late, departed in the direction of Nógrádkövesd station, and (in Section № 260) collided with the train with Reg. № 33517 which was coming from the opposite direction.

Both engine drivers realised the situation ca. 200 metres before the collision, so they started emergency braking and left their respective driver's cab. The speeds of the two railcars were 23 km/h and 28 km/h, respectively, at the time of the collision.

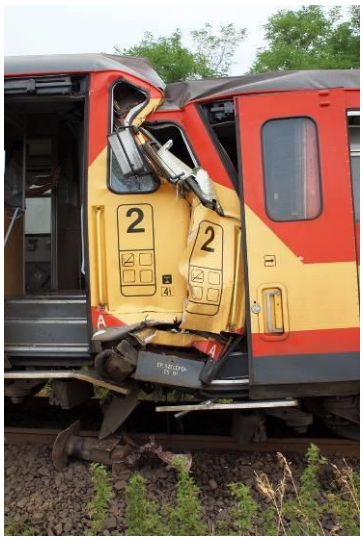
The two motor cars and a wagon were damaged badly as a consequence of the collision. 27 people were injured altogether; five of them suffered severe injuries.

The IC attributes the occurrence to human factors on the part of the crew of the train with Reg. № 33512 and the traffic manager of Galgamácsa station.

However, the IC found during the investigation that the traffic management technology applied for the track № 78, set up for secondary network traffic management, is not used properly, and it encourages the crew to work routinely.

MÁV Zrt. modified the traffic management technology after the occurrence, so the IC proposes no safety recommendation to the issue.

The IC has formulated a safety recommendation relating to the requirements for the form and contents of safety critical communication.



Factual statements directly connected to the occurrence of the incident

- The traffic manager of Galgamácsa station did not read out the contents of the written instruction when delivering it, and delivered it at different times to the engine driver and the ticket inspector in charge.

- The engine driver and the ticket inspector in charge of the train with Reg. № 33512 acknowledged and signed the written instruction without hearing its contents from the traffic manager, and both of them failed to read it.
- Accordingly, they left Acsa-Erdőkürt station in their train while another train was coming from the opposite direction on the single track line.
- Prior to departing from Acsa-Erdőkürt station, the ticket inspector in charge of the train with Reg. № 33512 did not inform the traffic manager of Nógrádkövesd on the expected departure time of the train, so there was no chance of detecting the train crew's mistake.

Factual statements indirectly connected to the occurrence of the incident

- The railway line has no telecommunication system for transacting direct emergency communication, so the traffic manager of Nógrádkövesd station could not communicate with the engine driver of the train with Reg. № 33512 directly and immediately. No voice communication contact was established between their public mobile phones.
- The traffic manager of Nógrádkövesd station contacted the ticket inspector in charge of the train with Reg. № 33512 via telephone, but failed to order her immediately to stop the train.
- The railway line has no contra-flow exclusion equipment in place.

Other risk factors

- The traffic manager of Nógrádkövesd station had no means to supervise the positions of the trains in his line sections directly. The crews of the trains passing through the station receive a lot of written instructions, the contents of which are not necessarily related to the actual traffic, but often serve only as receipt of delivery and acceptance. For this reason, an improper practice has developed, namely that the personnel involved in traffic do not pay sufficient attention to making familiar with the contents of the written instructions.
- The managerial inspections integrated in the process are crew-centred and not process-centred.
- The communication between the traffic manager of Nógrádkövesd station and the train crews takes place through a communication line which lacks voice recording.
- Logging of the traffic of trains at Nógrádkövesd station is not unambiguous.

SAFETY RECOMMENDATION

Actions taken

MÁV Zrt. took the following actions after the occurrence:

- A new MEFI instruction was issued relating to the Galgamácsa – Balassagyarmat section of the railway line № 78. Pursuant to that new instruction, in the case of regular services, the run authorization is not issued as a written instruction but as an entry in the data sheet of the train. A written instruction needs to be issued only when the actual run of the train differs from the timetable, and thus the number of written instructions has been reduced significantly. The position of the IC is that the new rules are suitable for solving the problems described in Section 2.3, so it is not necessary to issue a safety recommendation in this subject.
- The new instruction specifies detailed rules for the documentation of the movement of trains, so the traffic data of the trains running on the Nógrádkövesd

line section can be traced back clearly on the basis of the logbook at Nógrádkövesd station.

- An additional computer screen has been installed for the traffic manager at Nógrádkövesd station, so they can have accurate information on the current positions of the trains (where the locomotive is equipped with on-board equipment) running on the given line section.
- New voice recording equipment has been installed at Nógrádkövesd station, so the engine drivers' check-in can be tracked on a continuous basis.

Safety recommendation

BA2015-0845-5-1 *The Investigating Committee of TSB found during its investigation that, in the case of detection of danger situations, the contents of oral communication between traffic managers and train crews are not specified, the methodology of such communication is not part of their training, and thus, the transfer of relevant information, e.g. a message conveying an instruction to stop, may suffer delay or change of meaning during communication.*

TSB recommends TSB recommends Railway Authority Division, Ministry of National Development to review the rules relating to the elements of form and contents of oral communication between the traffic managers and the train personnel in the safety management system of MÁV Zrt., and take action as necessary.

The position of the IC is that, by acceptance and expected implementation of the safety recommendation, the probability of occurrences arising from unfocused or ambiguous communication of oral instructions can be reduced.

2015-1160-5

Overview of the occurrence

On 1 November 2015, at 22:18 o'clock, the rack railway vehicle in service between Széchenyi-hegy and Városmajor derailed with both axles of the leading bogie at the traffic turnout at Orgonás, after the guard iron broke away.

The investigation found that the immediate cause of derailment was the fracture of the fastening of the iron guard, however, all that can be attributed, in addition to shortcomings of track maintenance, to the fact that the rail track, and within that, the racks are extremely worn out, and the resulting knocks and vibrations badly damage the vehicle structure within a short time.

The track maintenance organisation cannot keep pace with the wear of the racks and/or they do not have the spare parts necessary to replace the racks.

The IC proposes that a safety recommendation be issued relating to the revision of the track maintenance processes.

Factual statements directly connected to the occurrence of the incident

The guard iron of the railway vehicle broke away and the leading bogie derailed when rolling over it.

Factual statements indirectly connected to the occurrence of the incident

Regular loosening of the guard iron is a well-known problem, but it is not fastened sufficiently as compared to its load; the welds are low quality.

The rack of the rail line is fairly worn out, and imparts harmful vibrations and force effects to the vehicle, which causes faster wear of the elements of the drive system and vehicle structure.

The maintenance costs were cut back just when the rail track had just got old, and its demand for maintenance began to increase.

Other risk factors

Due to subsidence of the track, knocks appeared at the supporting concrete blocks, which badly damage both the vehicle and the track.

The tooth pitch at the meeting of the racks often differs significantly from the specification in many cases, which may cause immediate derailment hazard in extreme cases.

Frequent replacement of the racks distracts resources from other transport safety tasks, endangering the implementation of such actions.

SAFETY RECOMMENDATION

BA2015-1160-5-01: *The IC found that the rail track of the rack railway of BKV is extremely worn out; it works with wear values beyond the specified limits and with inaccurate rack settings in many cases. As a consequence, measurable adverse effects have appeared and affect the vehicles.*

TSB recommends Railway Authority Division, Ministry of National Development to review the track maintenance system of the infrastructure manager in order to see how much it is suitable for identifying and eliminating excessive track defects (with special regard to the rack profile), and take action as necessary .

By acceptance and expected implementation of the safety recommendation, the effects causing damage to the vehicle structures and indirect hazard of derailment could be reduced, in addition to reducing direct hazard of derailment caused by the railway track.

2015-1171-5

Overview of the occurrence

The locomotive (reg. no.: 0478 306-1) of the train (reg. no.: 45 284) performing service between Almásfüzitő and Komárom caught fire on the right hand side track in Section no. 945.

While driving the locomotive, the engine driver detected abnormal light coming from the engine room of the Diesel engine (located at the leading end of the locomotive from the aspect of the direction of movement). Then he stopped the train by emergency braking, shut the Diesel engine off, and de-energized the locomotive. He went to the engine room and saw fire around the turbocharger at the right hand side of the Diesel engine. He put out the fire using a powder extinguisher, and prevented burn-back, and then notified the traffic managers of the occurrence.

The investigation by the IC found that the balance pipe of the gear oil heat exchanger had been installed without a fastening element, and it had fractured due to the vibrations generated by the mechanical equipment. Then the hydraulic oil circulating in the pipe was sprayed onto the hot exhaust pipe, where it caught fire.

Factual statements directly connected to the occurrence of the incident

The IC attributed the occurrence to the following direct causes:

- Because of the fracture of the balance pipe of the gear oil heat exchanger, the circulating oil was sprayed onto the hot exhaust pipe, and caught fire,
- As the balance pipe was not fastened with a gripping member, it fractured as an effect of the vibrations generated by the machinery.

Factual statements indirectly connected to the occurrence of the incident

The IC makes no such statement.

Other risk factors

The IC makes no such statement.

ACTIONS TAKEN

A MÁV-START Zrt. issued an instruction to the JBI maintenance units relating to the fastening of the balance pipe of the gear oil heat exchanger

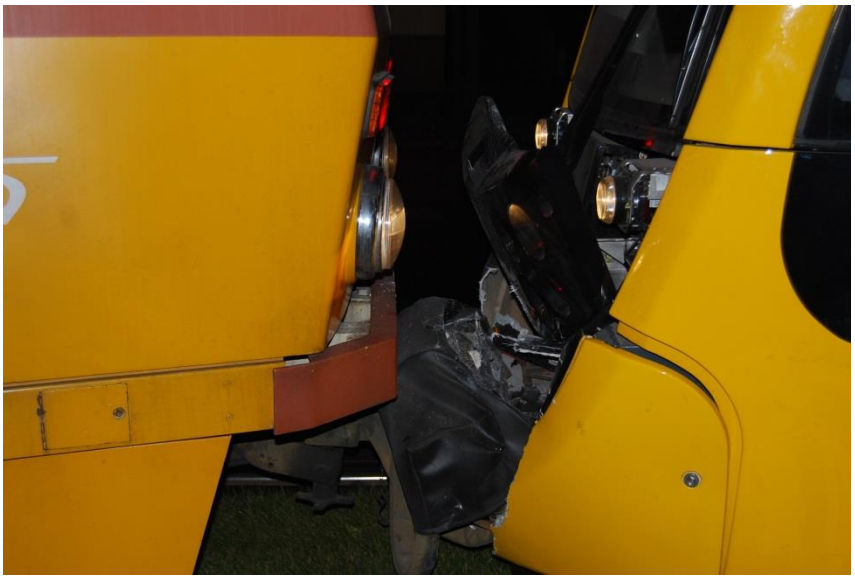
During the next “R” inspection after receipt of the instruction, the maintenance units will have to fasten the balance pipe in a suitable way on the locomotives equipped with a type MTU 12V R80 Diesel engine.

2015-1187-5

Overview of the occurrence

On 9 November 2015, at 16:25, in Hengermalom street, Budapest, a tram performing a test run crashed into a number 1 tram (at a speed of 5-6 km/h) which was staying on the track in front of the terminal due to traffic-related reasons.

No one was injured in the accident. The vehicles involved were damaged.



The service of the number 1 tram was performed by replacement buses along the affected section during the investigation of the site by the relevant authorities.

The IC found during the investigation that the occurrence can be attributed to exceeding the speed limit, malfunction of the track brakes, and slippery rail track.

Regarding that the affected parties took several actions after the occurrence which may reduce probability of similar occurrences, the IC propose no safety recommendation relating to the occurrence.

Factual statements directly connected to the occurrence of the incident

According to findings by the IC, the occurrence can be attributed to several factors:

- The vehicle, performing a test run, slightly exceeded the speed limit specified for the curved section.
- The driver of the vehicle was not prepared adequately for the risk of skidding, despite the warning signpost, so he was not able to stop the vehicle at the spot specified in the relevant rules.
- The track brake installation of the vehicle was not controllable from the C1 driving position because the circuit breaker shared by the track brake and track brake control of the C1 vehicle unit was in released state during the test run. Inoperability of the track brake installation was not identified during the technical acceptance of the vehicle either (2.2.1.1).

Factual statements indirectly connected to the occurrence of the incident

The track was lubricated at the location of the occurrence, which made the wheels of the vehicle skid while running along the curved section, which in turn activated the wheel slide protection, as a result of which the actual braking effect was significantly lower than the actuated braking force (1.10.2).

Other risk factors

The control and operation of the track brake of the vehicle running in a test run are connected to a common circuit breaker, which makes it more likely that a possible malfunction (e.g. short circuit) disables the track brake, and, in addition, the grading of the heavy current fuse applied is too high to protect a low-current control circuit.

Communication between the testing engineers and the driver of the vehicle was difficult during the test run due to language problems. No action had been taken during the planning of the project to resolve this communication problem.

SAFETY RECOMMENDATION

Actions taken after the occurrence

The trial runs of the type CAF Urbos 3/9 vehicles were temporarily suspended after the occurrence.

The modifications first applied in the type CAF Urbos 3/5 vehicle with reg. no.: 2209 were introduced at the official inspection held on 14 November 2015.

Such modifications were as follows:

- The vehicle cannot be started from its stationary position if the circuit breaker of the track brake circuit is in released position.
- Following the switch-off of the circuit breaker belonging to the circuit of the retarder while the vehicle is running, the speedometer will show a speed limit of 20 km/h, the HMI display will show “R2 heavy-current circuit breaker open” and “Maximum brake loop open”, and the vehicle will apply emergency braking using “Tram emergency brake 1 and 2” (maximum service brake), while emitting audio signal to the driver, and then stops, while ringing the tram bell device.

It was agreed during the inspection that software modification will be performed in each affected vehicle prior to returning the vehicles operated by BKV Zrt. to service.

Taking into account that the remarks made to the operation of the track brake may also apply to the vehicles type CAF Urbos 3/5, the vehicles already put into operation were also prevented from running, and the modifications reducing the risk of similar events significantly were performed in those vehicles as well.

In addition to the software modification mentioned above, connection of the track brake circuits and track brake control circuits to separate circuit breakers in the vehicles type URBOS 3/5 and the type URBOS 3/9 is performed on a continuous basis (2.2.4)

According to the IC, the actions taken after the occurrence will reduce the likelihood of similar occurrences significantly, so the IC does not propose that a safety recommendation be issued.

2015-1190-5

Overview of the occurrence

On 10 November 2015, at the crossing of Tisza Lajos krt. and Kossuth Lajos sgt. in Szeged, a № 3 tram running over an erroneously set switch crashed into a № 4 tram running in the opposite direction on the other track.

The IC found during the investigation that.

- the drivers did not realise that there was a forbidden simultaneous run at the scene of the case, so both vehicles entered the crossroads at the same time;
- the driver of the № 3 tram failed to observe the position of the switch in his way, which was not appropriate for him; his vehicle was diverted, and crashed into the № 4 tram coming from the opposite direction.

The layout of the switch operating apparatus also contributed to the drivers' practice which caused the occurrence (the setting point is too close to the switch), as well as the fact that the tram drivers are not aware enough with the rules, they had no real chance to acquire such rules, and the company did not always require that the rules be observed.

TSB issues a safety recommendation in the subject of issuing and inspection of internal rules.

Factual statements directly connected to the occurrence of the incident

The driver of the № 3 tram failed to observe the display of the switchpoint light and to check the position of the switch tongue, so he accessed the switch no. 409 which guided his tram to the no. 4 tram which was coming from the opposite direction.

Factual statements indirectly connected to the occurrence of the incident

The drivers of the vehicles did not realise that they were involved in situation of conflicting routes, so, despite the rules, both trams entered the crossroads simultaneously.

Setting the switch to home position requires no action from the driver of the vehicle, but it requires their attention.

The signal light program impels drivers to drive at a faster speed.

The safety system of the switch does not take into account the change of the setting of the switch after interlocking; and it also detects road vehicles which are not bound to the track, which results in false interlock state in certain traffic situations.

The driver of the no. 3 tram had just finished the driving course.

Other risk factors

Both drivers approached the switches at speeds exceeding the limit – they were not aware of the correct speed limit values.

The receiver of the switch is too close to the switch.

The system of instructions of the company consists of many instructions issued at different points of time, and even the safety management manual specifies quite lax rules relating to the issuance and learning of the instructions.

The system of rules includes some rules which cannot be followed, and there is a kind of "mutual agreement" relating to non-observance of the rules between the vehicle drivers and the supervisory personnel.

SAFETY RECOMMENDATION

BA2015-1190-5-01: *The investigation found that the drivers involved were not aware of or neglected the rules of traffic. Compliance with certain rules affecting the occurrence is not required during the inspections performed by the company.*

> **TSB recommends Railway Authority Division, Ministry of National Development to review the contents and operation of the safety management system of Szeged Transport Company to see whether the vehicle drivers are provided access to training in the internal rules of the Company, whether such training is documented, and whether compliance with the rules is inspected, and to take action as necessary.**

By acceptance and expected implementation of the safety recommendation, the awareness of and compliance with the rules by the vehicle drivers is expected to improve.

2015-1234-5

Overview of the occurrence

Several wagons of a freight train loaded with stone chippings derailed at the shunting yard of Hatvan; some of the derailed wagons got back onto the track, but the tailing wagon did not.

The investigation found that the course and causes of the occurrence are similar to several earlier occurrences: the combined effect of the worn-out state of the track, asymmetric load of the wagons, and asymmetric wear of the wheel pairs of the wagons lead to derailment. The sleepers of the track were fairly old; the asymmetric load values of the wagons were close to but inside the limit values; no specifications are available relating to the asymmetry of the wheel pairs.

The IC recommends that safety recommendation be issued relating to the dimension specifications of the wheel pairs of freight wagons.

Factual statements directly connected to the occurrence of the incident

The sleepers at the scene of derailment were outdated, and did not maintain the track gauge; the wheel dimensions of the derailed wagon were within the specifications, but the wheels were more worn-out than usual.

Factual statements indirectly connected to the occurrence of the incident

The wheel diameters of the first derailed axle were significantly different, and the general technical condition of the wagons inspected also influenced the occurrence of derailment adversely.

Other risk factors

No specifications are available relating to tolerable differences of wheel dimensions within a wheel pair.

BA2015-1234-5-01: *The IC found that asymmetric wear of the wheels within a wheel pair of freight wagons regularly occurs as contributing factor to accidents involving derailment, while the IC found no limit values specified for such asymmetry.*

> **TSB recommends Road and Railway Transport Division, Ministry of National Development to review whether there are adequate specifications relating to asymmetric wear of wheels within wheel pairs, and whether railway companies enforce such specifications properly in their safety management systems, and to take action as necessary.**

By acceptance and expected implementation of the safety recommendation, the wagons which are dangerous due to this problem may be identified and eliminated from the railway network.

2015-1269-5 and 2015-1279-5

Overview of the occurrence

On 28 November 2015, the locomotive of the passenger derailed with 1 axle, and its leading waggon with 2 axles and damaged the track in the section under repair (replacement of sleepers) of the Children's Railway on Széchenyi-hegy, Budapest.

On 1 December 2015, the wagons no. 8, 9 and 10 of the freight train with Reg. № 49899 owned by RCH derailed over Switch 12 while approaching Track IV of Miskolc-Gömöri Station. The derailed wagons as well as the track were damaged in the occurrence.

The IC attributed both occurrences to lack of fastening of the rails which was due to improperly performed replacement of sleepers. The IC found that the rules specified for such works properly had not been observed.

Factual statements directly connected to the occurrence of the incident

Sleepers had been replaced at the scene of each accident, and 11 sleepers (8.7m) at Hárshegy, and 9 sleepers at the Miskolc-Gömöri Station were not fastened.

Factual statements indirectly connected to the occurrence of the incident

At Miskolc-Gömöri Station, the locomotive driver started to brake the train during approach while the vehicles were still running over a switch with loose bedding.

At Miskolc-Gömöri Station, the locomotive driver neglected the speed restriction signal.

Other risk factors

At Hárshegy, the place of the speed restriction signal was not consistent with the area of works, and the placement of certain signals did not comply with the requirements.

At Hárshegy, the supervisor of the works did not have the qualification required by the relevant legal provision. At Miskolc-Gömöri Station, the supervisor of the works had appropriate qualification and experience of several decades.

The training and assessment required for supervisors of such works does not test basic technical competences (working methods, basic techniques, etc.), but focuses only on competences related to traffic management and safety.

2015-1346-5

Overview of the occurrence

On 12 December 2015, at 16:10 o'clock, at Jákó – Nagybajom station, the train with Reg. № 45083-2 approaching Track IV passed the exit signal "G" at danger (located at the end point of the track) without stopping, burst Switch 1 of the station open, left the station, and stopped on the open line.

The IC found that the occurrence had been due to the closed pneumatic line and the resulting braking force insufficiency. As the opinion of the IC is that the occurrence can be attributed to human factor, and similar occurrences can be prevented by observing relating requirements, it is unnecessary to issue a safety recommendation.

National Transport Authority took actions relating to the organisational shortcomings revealed by the investigation.

Factual statements directly connected to the occurrence of the incident

Braking of the train was insufficient because the air brake was only effective in the leading four wagons.

The Ackermann fitting between the wagons 4 and 5 in the train was shut, and the T brake test did not reveal the problem.

The locomotive driver did not detect the disorder of the brake system because he failed to perform a running brake test.

Factual statements indirectly connected to the occurrence of the incident

The technical state of the locomotive was not suitable.

The railway company AWT did not observe its Safety Management System: they failed to ensure proper maintenance of the locomotive.

The shut-off position of the Ackermann fitting could not be identified by performing the K brake test process.

The personnel who performed the brake test had insufficient knowledge of the braking technology.

Other risk factors

There was no sufficient braking force to make the train stand still, and the locomotive was not secured with chocks.

The locomotive driver had no adequate knowledge of the railway line.

2016-0041-5

Overview of the occurrence

The seventh wagon of the freight train with Reg. № 90770 derailed with two axles on the turnout № 553 while leaving the shunting yard Ferencváros-Keleti, Budapest. No one was injured, but the track and the derailed wagon were damaged. A securing chock with the signs of destruction typically caused by blockage was found at the switch diamond of the turnout № 553 during the investigation of the scene. The attributed the derailment to the chock left in front of the wheel of the train.

The IC proposes no safety recommendation, but invariably finds the implementation of the safety recommendation issued during the investigation of the occurrence № 2006-048-5-01 necessary.

Factual statements directly connected to the occurrence of the incident

- Prior to the start of the train with Reg. № 90770, the shunting master did not check if there were securing chocks under the first 10 wagons in the train, so he did not detect and remove the chock under the 7th wagon.

Factual statements indirectly connected to the occurrence of the incident

- During his visit of the area, the shunting master removed the securing chocks from under the train with Reg. № 90770 significantly earlier than the specified time.
- When assembling the train with Reg. № 90770, the shunter realised that the train was not secured properly against break away, which he then performed, but he placed the chock at a wrong place and failed to report on his placement of the chock.

Other risk factors

- Having evaluated the learnings from earlier similar accidents, MÁV Zrt. found it unnecessary to introduce any action to improve the visibility of securing chocks and thus reduce risk to safety, i.e. they found the level of safety satisfactory.

2016-0137-5

Overview of the occurrence

While heading to the shed in Ferencváros without passengers, a number 19 tram passed the signal "G" at danger at the terminal in Bécsi street, burst the switch № 6 open, and rolled on. In the meantime, a route was set up and secured for an outbound number 1 tram on the other branch of the switch № 6. As a result, the number 19 tram jeopardized the route of the number 1 tram. No one was injured and there was no damage to property.

The IC attributed the occurrence to human factors (shortage of knowledge, and increased stress level) and organisational factors which partly caused the human factor problems.

Factual statements directly connected to the occurrence of the incident

The tram driver erroneously thought that the Signal "G" applied to him, which was due to the following factors:

- elevated stress level as a consequence of physiological needs and a personal conflict,
- lack of knowledge of the place
- false information
- layout of the track section

Factual statements indirectly connected to the occurrence of the incident

The timetable used was not consistent with the capacity of the terminal station, so it could not be followed.

Other risk factors

The switches installed in the secured route area are not signposted to indicate the non-split nature of the switches.

2016-0210-5

Overview of the occurrence

Three tank wagons of a freight train derailed, each with 4 axles, while approaching Rajka Station. No one was injured, and no hazardous substance was released.

The occurrence can be attributed to the condition of the track and the structural defects of the freight wagons. The infrastructure operator realised the worn-out state of the track, but no adequate action was taken to repair it on time. The wagon which derailed first showed several running safety values beyond the limits, and the turning capacity of the bogies was restricted due to a structural defect.

The IC proposed no safety recommendation.

Factual statements directly connected to the occurrence of the incident

The wooden sleepers could not maintain the track gauge due to rot, while a directional defect of the track also added to the forces acting against the fastening of the track.

Due to structural defects, the turning capacity of the bogie of the derailed freight wagon was limited, so it exerted higher (than usual) deflecting force on the track.

The track contained a plane distortion almost reaching the wheel flange height within the bogie pivot pitch, while the wagon was definitely sensitive to such plane distortion, due to tight sliding supports in the bogies.

Factual statements indirectly connected to the occurrence of the incident

No adequate action was taken to repair the on time the track defect identified earlier.

Weathers with ground-level frost ended not long before the accident.

Uneven wheel loads of the first derailed wagon are likely to have contributed to derailment.

Other risk factors

The locomotive driver (employed by a Slovakian railway company) had no documentation to prove his qualifications and medical fitness.

2016-0278-5

Overview of the occurrence

On 7 March 2016, at 07:37 o'clock, at Mosonszolnok station, the train with Reg. № 42082-1 departed from the station without permit, and passed the K3 exit signal at danger. No its way out, the train burst the switch № 2 of the station open, and departed in the direction of Hegyeshalom Station. The train stopped in the second open line block after Mosonszolnok station.

There was no other train between Mosonszolnok and Hegyeshalom at the time of the occurrence.

The IC found that the occurrence can be attributed to human factors. The train with Reg. № 42082-1 departed from the station without permit, passing the individual exit signal at danger.

The locomotive driver identified the audio signal emitted by the EVM device of the locomotive as a change in the display of the exit signal, and started his train.

Safety-critical communication of the personnel responsible for traffic management was inadequate as regards prevention of the occurrence and mitigation of its consequences.

The IC concluded that similar occurrences can be avoided by observing the relevant rules, so the IC proposes no safety recommendation, but finds it necessary to remind the people involved that the likelihood of similar occurrences can be reduced by improving the station crews' and the train crews' competences of safety-critical communication.

Factual statements directly connected to the occurrence of the incident

The train with Reg. № 42082-1 departed from the station with the individual exit signal at danger on its exit route, and he had not been authorised to pass it.

On the basis of available data, the IC attributes the occurrence to human factors. The locomotive driver started his train on the basis of a wrong assumption, without checking whether the signal which applied to him showed clearance or danger.

Factual statements indirectly connected to the occurrence of the incident

The IC found that, from the part of the rail track, the EVR-120 device of the locomotive involved in the occurrence received unevaluable signal, due to which it entered its break-down state, and subsequently it was not able to perform its safety function, and, additionally, it gave an audio signal which was liable to mislead the locomotive driver.

The exiting train stopped in the switching zone, and, after identifying the dubious situation, it did not stay there until clarification of the situation but went on.

Other risk factors

Safety-critical communication of the personnel responsible for traffic management was inadequate as regards prevention of the occurrence and mitigation of its consequences, because:

- they were not able to contact the locomotive driver immediately after his unauthorised passing of the signal,
- earlier, they failed to tell the crew of the train held off the reason of hold-off,
- the instruction to stop the train was not the first information they issued to him when they contacted him.

The EVM device emits the same audio signal when the display changes and when it indicates break-down state.

2016-0363-5

Overview of the occurrence

The tram arriving from the direction of Boráros square, Budapest, derailed with five axles on the slope of the entrance of the tunnel in front of Fővám square. The derailed wheels returned onto the track, except for one axle.

According to findings of the IC, the derailment occurred due to earlier fracture of the fastening bolts of rail fastening, and, as a result, the vehicle pushed the rails apart, and the wheels dropped between the rails.

The construction of rail fastening, the dynamic effects of the directional error in front of the location of the occurrence, electrochemical corrosion, and the asymmetric wear of the wheels of the vehicle may have contributed to the fracture of the bolts.

The infrastructure operator had identified the track defect prior to the derailment, and took action to introduce speed restriction and repair, but the latter was scheduled for a period following the occurrence.

The IC proposes a safety recommendation relating to the construction of rail fastening.

Factual statements directly connected to the occurrence of the incident

The bolts of the rail fastening in the track were broken, which allowed the track to open under the vehicle, which in turn let the wheels drop between the rails.

Factual statements indirectly connected to the occurrence of the incident

The wheels on the wheel pair of the derailed train were worn out slightly asymmetrically.

The root of the fastening screws is exposed to significant bending moment, due to the design of rail fastening.

There was a slight directional error in the track prior to the occurrence, and the vehicle running over the defective section was exposed to an extra lateral force, and the resulting yaw motion then evoked a strike-back on the track in the opposite direction, which exposed the track to larger lateral forces than usual.

Other risk factors

Occasionally, the traction control of the vehicle malfunctions for a short time, which also renders the electrical brake ineffective.

2016-0490-5

Overview of the occurrence

On May 5 2016, at 16:45 o'clock, at the unprotected level crossing located in Section 103 at the upside end of Tószeg Station, the passenger train with Reg. № 37123 collided with a motor scooter. As a consequence of the accident, the driver of the scooter died on the spot.

The occurrence may be attributed to human factors on the part of the driver of the road vehicle. The driver of the scooter who lived nearby and knew the area well started crossing the level crossing without looking around or stopping, and was hit by the train arriving there.

The IC found that visibility of the level crossing was not provided in the manner as required by KM Decree № 20/1984 (XII. 21.), so the IC initiated the issuance of an immediate safety recommendation. Taking the driving dynamics of the road vehicle involved into account, reduced visibility did not make timely detection of the approaching train impossible, but made it more difficult.

Factual statements directly connected to the occurrence of the incident

Visibility of the railway track was not provided at the level crossing involved in the accident.

The approaching road vehicles were not enforced by a traffic sign to stop and give way at the entrance of the level crossing

Human factors on the part of the driver of the scooter played a significant part in the occurrence. The person involved in the accident had known the area well, and was aware of the hazards of crossing the level crossing, however, he approached the track without looking around and stopping.

Factual statements indirectly connected to the occurrence of the incident

The IC makes no such statement.

Other risk factors

Visibility of the entry signal "A" located in Section 102+22 at the upside end of Tószeg Station is not provided in the manner as required in the national Railway Rules.

The lack of visibility at the level crossings located in the vicinity of the occurrence also increases the likelihood of similar accidents.

Safety recommendation issued during the investigation

BA2016-0490-5-01A: *The IC found during the investigation of the scene that visibility of the level crossing was not provided in the manner as required by KM Decree № 20/1984 (XII. 21.). During inspection of the environment of the occurrence, it was revealed that the lack of visibility of the unprotected level crossing located in Railway Section 100 (200 m from the scene of the accident) TSB recommends represents similarly hazardous circumstances for both road and railway vehicles.*

> **TSB recommends Inspectorate of Transport of Jász-Nagykun-Szolnok County Government Office to review the design and environment of the level crossing affected in the accident and other adjacent level crossings and take action as necessary in order to provide the visibility of the rail track as required in the relevant rules of law.**

The position of the IC is that, by acceptance and expected implementation of the safety recommendation, the risk of accidents due to similar causes can be reduced significantly.

2016-0499-5

Overview of the occurrence

A tram derailed with two bogies on the Switch № 23, touched opposite the tongue, at the terminal in Bécsi street, Budapest. No one was injured, but the tram was slightly damaged.

The IC attributed the occurrence to technical malfunction and maintenance of the turnout involved. The IC formulates no safety recommendation.

Factual statements directly connected to the occurrence of the incident

The fastening bolts of the tension springs of the switch № 23 got loose and came off, so the switch tongues got unfastened. The switch tongue moved away from the stock rail under the tram running opposite the switch tongue, so the tram derailed.

Factual statements indirectly connected to the occurrence of the incident

The current maintenance technology is not suitable for identifying and preventing such defects within a short time.

Other risk factors

The IC makes no such statement.

BA2016-0499-5-01: *Due to the design of the switch setting structures with tensions spring and connecting link used in the tram network in Budapest, the fastening bolts of the tension spring may get loose, which may lead to loosening of the switch tongues, which I turn may lead to derailing.*

TSB recommends BKV Zrt. to review the design and maintenance technology of the switch setting structures with tensions spring and connecting link (necessity to secure the bolts) and take action as necessary.

By acceptance and expected implementation of the safety recommendation, the likelihood of loosening of the fastening bolts can be reduced, and accordingly, the likelihood of derailment due to similar causes can also be minimised.

2016-0534-5

Overview of the occurrence

On 16 May 2016, at 12:02 o'clock, the train with Reg. № 2425 collided with an automobile at the level crossing protected with warning lights located in Section 220+42 between the stations Veresegyház and Őrbottyán; the warning lights operated correctly. As a consequence of the accident, the driver of the automobile had severe, life-threatening injuries, but recovered subsequently.

The IC attributed the accident to human factors on the part of the driver of the automobile. The driver disregarded the danger signal displayed by the warning lights and turned his vehicle to the railway track which runs parallel with his earlier direction of travel, and collided with the train which was just arriving there.

The IC found during investigation of the scene that visibility of the railway track, the level crossing and its markings is not unobstructed, so TSB issued an immediate safety recommendation, under № BA2016-0534-1-5-01 to Pest County Government Office.

Factual statements directly connected to the occurrence of the incident

The accident was due to causes attributed to human factors on the part of the driver of the automobile. The driver disregarded the danger signal displayed by the warning lights working properly and started to cross the level crossing without looking around.

Factual statements indirectly connected to the occurrence of the incident

It is not easy to perceive a train coming from behind when one drives a road vehicle on the dirt road which is parallel with the railway track, so one must be very careful before using this level crossing. The manoeuvring required by the geometry of the road largely occupies the attention of the driver, which may adversely influence the driver's effort to look around before actually accessing the level crossing.

Other risk factors

Visibility of the railway track does not comply with the requirements specified in KM Decree № 20/1984. (XII. 21.) on traffic regulation and placement of traffic signs. Visibility of the rail track is not provided from all directions and, due to obstruction by the vegetation, the visibility of the road signs indicating the level crossing may raise doubts regarding safe access to the level crossing and sufficiency of time to take the necessary safety actions.

Safety recommendations issued during the investigation

BA2016-0534-5-01A: *The IC found during a posterior site survey that visibility of the level crossing and of the related signposts is restricted for those approaching on the road.*

TSB recommends Department of Road Transport of Pest County Government Office to review the layout and the environment of the level crossing involved in the occurrence, and take action as necessary in order to provide safer access to the level crossing.

By acceptance and expected implementation of the safety recommendation, the risk of accidents due to similar causes may be reduced significantly.

2016-0557-5 and 2016-996-5

Overview of the occurrence

The rack railway vehicle with reg. no. 55-65 on 22 May 2016, and the rack railway vehicle with reg. no. 56-66 on 8 September in the same year, derailed with its tailing bogie on the middle part of the switch at the entry of Széchenyi-hegy station.

The investigation found that the middle part of the switch fell apart during the run of the vehicle, due to shortcomings of maintenance. The track is extremely worn out and its design is also outdated, and the infrastructure operator cut back on maintenance staff in the previous years.

The railway company modified the construction of critical parts of the switch at the time of the investigation, started replacement of the worn-out racks of the track, and reorganised the maintenance staff, so it is not necessary to issue a safety recommendation.

Factual statements directly connected to the occurrence of the incident

The linking rod of middle part of the switch fell apart due to loosening and falling off of the fastening nut, and so the pinion of the vehicle was blocked by the track.

Factual statements indirectly connected to the occurrence of the incident

The fastening of the linking rod is not secured, and its changed dimensions require individual solutions during its installation.

The setting and inspecting rod of the setting apparatus is connected to the switch in such manner that it cannot check the position of one of the halves of the switch.

The worn-out rack causes significant vibration impact to the track structures.

The company did not have in-house staff for track maintenance, and maintenance staff and costs were cut back by the time the track had become quite aged and its maintenance demand had increased.

Other risk factors

The IC makes no such statement.

2016-0602-5

Overview of the occurrence

On 2 June 2016, at 16:02 o'clock, the train no. 2923 collided with an automobile at the level crossing located in Section 591-592 between the stations Táborfalva and Lajosmizse. The driver of the car died on the spot as a consequence of the accident. The damage caused to the locomotive of the train was not significant but rendered the vehicle unserviceable; the road vehicle was badly damaged.

The cause of the occurrence is attributable to the environment of the level crossing and to human factors. The driver of the road vehicle started to cross the level crossing – which lacked full visibility of the railway track and protection or any traffic sign requiring stopping – without due care.

Investigation of the scene showed that visibility of the railway track as well as the related traffic signs from the road is limited, so TSB issued an immediate safety recommendation (under no. BA2016-0602-1-5-01) to Pest County Government Office for the sake of action is taken as necessary.

The actions taken address only some of the danger sources indicated in the safety recommendation.

Factual statements directly connected to the occurrence of the incident

- The driver of the road vehicle could realise the entrance of the level crossing too late due to obstruction by the vegetation leaning over the road.
- The sight triangle was not clear at the level crossing, it was restricted by vegetation.
- Due to shortage of visibility, the level crossing was not protected, and the traffic sign 'Stop! Give way' was not placed either.
- The driver of the road vehicle accessed the level crossing without making sure in advance if crossing was safe.

Factual statements indirectly connected to the occurrence of the incident

- Visibility of the left-hand side of the road crossing the rail track is strongly limited from the rail track due to obstruction by the vegetation, and so the driver of the railway vehicle can perceive road vehicles approaching the level crossing in the last minutes only, and accordingly, they can take no safety action (e.g. warning audio signal) to prevent an accident.

Other risk factors

The reinforced concrete sleepers placed along the level crossing may worsen the consequences of a possible accident.

Immediate safety recommendation issued during the investigation

BA2016-0602-5-01A: *The IC found during the investigation of the scene that visibility of the level crossing and its indications is difficult for the vehicle coming on the road.*

TSB recommends Department of Road Transport of Pest County Government Office to review the layout and the environment of the level crossing involved in the occurrence, and take action as necessary in order to provide safer access to the level crossing.

By acceptance and expected implementation of the safety recommendation, the risk of accidents due to similar causes may be reduced significantly.

2016-0699-5

Overview of the occurrence

The passenger train with reg. no. 5108, approaching the station along Track IV collided with the end of the crane at work on Track V.

The IC found that the crane assisting a turnout replacement with track possession was in a turned aside position in the structure clearance of the adjacent track when a train was moving on the adjacent track, and the locomotive driver did not pay sufficient attention to realise the hazardous position of the crane in time.

The personnel working in the area did not know exactly the scope of the tack possession. The contractors responsible for track possession and the company performing work with the crane had no adequately regulated relation with each other; their relation was based on earlier working practices only. During the works, they mutually had false assumptions relating to safety measures.

The track assigned for the crane did not provide safe movement of the crane from the aspect of traffic on the adjacent track, and preparation of the works did not include identification and management of possible safety risks.

The person who subsequently was in charge of the works had not taken part in the preparation of the works, and did not have the chance to get information on the meetings due to lack of proper documentation.

As the above shortcomings did not infringe existing rules, TSB is issuing safety recommendations relating to revision of rules applicable to the preparation and management of track possession

Factual statements directly connected to the occurrence of the incident

The crane was in a turned aside position in the structure clearance of the adjacent track when a train was moving on the adjacent track.

Factual statements indirectly connected to the occurrence of the incident

Construction Foreman 1 did know exactly which tracks were included in the track possession, and people doing other works also thought, erroneously, that they were working in a situation of track possession provided for MÁV-FKG Kft.

The contracts of the company performing crane works did not specify adequately its relations with other enterprises working in the area; their relations were just based on earlier practices.

The crane team did not keep in touch with the traffic manager, and, according to their assumptions, they did not inform the contact person on the hazards and safety demands implied by their work.

The person who subsequently was in charge of the works had not taken part in the preparation of the works, and did not have the chance to get information on the meetings due to lack of proper documentation.

The track assigned for the crane did not provide safe movement of the crane from the aspect of traffic on the adjacent track.

The preparation of the works did not include identification and management of possible safety risks.

The required protection for the tracks included in track possession was not marked along Tracks V and VI.

The boundaries of the working area were not marked for sufficient visibility.

The training system is biased to the traffic, and lacks, among others, preparation for works management including coordination between participating organisations.

Other risk factors

The changes of shifts of construction foremen were not documented in any form with the traffic management service, and it is not regulated. The construction foreman staying in the area with the purpose of inspection got involved in actual work.

The various work functions have no exact internal boundaries in the territorial sense.

The overhead contact wire was shut down with delay.

The tracks possessed according to the track possession instruction issued are not the same as those included in the record of distribution of capacity.

BA2016-0699-5-01: *The IC found that, neither during the works performed at the time of the occurrence, nor during other inspected works performed with track possession was it provided that both the traffic managers and the people working under track possession be aware of the identity of the person responsible for track possession and being present at the site; the other party is not informed on the changes of the shifts.*

> **TSB recommends Railway Authority Division, Ministry of National Development to review whether the safety management system of MÁV Zrt. specifies a process to follow relating to the change of the person responsible for track possession, with special regard to the traffic management crew's being aware of the fact of the change and the identity and contact details of the new responsible person.**

By acceptance and expected implementation of the safety recommendation, the personnel of the various services working in the same area could contact one another faster and easier if necessary, which is indispensable for the sake of maintaining safety on a continuous basis.

BA2016-0699-5-02: *The preparation of the works did not include identification and management of possible safety risks*

> **TSB recommends Railway Authority Division, Ministry of National Development to review whether the safety management system of MÁV Zrt. adequately deals**

with the management of the risks associated to construction and maintenance works properly, and whether it is performed in practice.

By acceptance and expected implementation of the safety recommendation, it will be easier to foresee and prevent or prepare for hazardous situations by the people involved.

BA2016-0699-5-03: *The exact roles, subordinations, and safety tasks of the participating companies were not clarified during the preparation of the works; the process of preparation and execution of the works is not designed in a consolidated structure (project approach).*

TSB recommends Railway Authority Division, Ministry of National Development to review the rules and execution of rules of planning, execution and closing of the track possession process in the safety management system of MÁV Zrt. to see whether it provides that the organisations performing the works together be sufficiently aware of one another's needs and limits, and clarify their respective scopes of responsibility.

By acceptance and expected implementation of the safety recommendation, it will be more likely that each participant will be aware of the scopes of responsibility of other participants present in the area, of their own tasks as well as of the actions they may expect from other participants, with special regard to safety-related tasks and actions.

2016-0706-5

Overview of the occurrence

A train collided with an automobile at the unprotected level crossing located in Section 143 of the Közvágóhíd – Ráckeve suburban line.
The driver of the road vehicle was injured lightly in the accident; no one was injured on the train. The front left part and side of the car was badly damaged; the HÉV train was only damaged lightly; the level crossing was closed both for railway and road traffic for the time of the investigation of the scene.

Eight months before the accident there was another accident at this level crossing, so the investigating committee of TSB decided to survey the site immediately. The IC issued an immediate safety recommendation on the basis of the findings of the site survey, in order that the level crossing should be safer as soon as possible.

According to the findings of the IC, the occurrence can be attributed to human factors on the part of the driver of the automobile; however, the layout of the level crossing was incompliant with relevant legislation in effect from several aspects, which increases the risk of accident.

Factual statements directly connected to the occurrence of the incident

The driver accessed the level crossing without making sure whether a railway vehicle was approaching, and was not able to leave the level crossing before the train arrived there.

Factual statements indirectly connected to the occurrence of the incident

According to relevant legislation in effect, traffic density at the level crossing would justify protection with warning lights, but it is not installed.

Other risk factors

In certain quarters of the level crossing, the degree of visibility does not comply with the requirements of the use of the 'Stop! Give way!' traffic sign, which makes regular and safe crossing impossible in certain cases.

Public street lighting is installed near the level crossing, but the level crossing is not lit in the manner specified in relevant legislation.

Due to the aforesaid, TSB issued a safety recommendation during the investigation.

Safety recommendation issued during the investigation

BA2016-0706-5-01A: *The IC found during the site survey that visibility of the railway track and of the signposting of the level crossing is limited for the drivers of road vehicles.*

> **TSB recommends Department of Road Transport of Pest County Government Office to review the layout and the environment of the level crossing involved in the occurrence, and take action as necessary in order to provide safer access to the level crossing.**

By acceptance and expected implementation of the safety recommendation, the risk of accidents due to similar causes may be reduced significantly.

Additional safety recommendation

BA2016-0706-5-02: *The investigation found that the people arriving by road from the north and the drivers of railway vehicles arriving on the right-hand side track (wrong track) to the unprotected level crossing located in Section 143 the stations Közvágóhíd and Ráckeve cannot detect each other on time, so these traffic situations imply increased risk of accident.*

TSB recommends MÁV-HÉV Zrt. to control the speeds of the trains moving on the right-hand side track (wrong track) from the direction of Szigetszentmiklós-Gyártelep in such manner that the road vehicles accessing the level crossing with due care be able to leave it safely before the train arrives there. The action should be maintained until the level crossing becomes protected with warning lights.

According to the IC, by acceptance and expected implementation of the safety recommendation, safe traffic at the affected level crossing can be guaranteed even in this rare traffic pattern.

2016-0781-5

Overview of the occurrence

The light engine № 28558 passed the level crossing equipment AS 1242 in break-down state at a speed exceeding 15 km/h between the stations Zamárdi felső and Szántód-Kőröshegy. No one was injured and there was no damage to property during the occurrence.

The IC attributed the occurrence to human factors on the part of the locomotive driver and the traffic manager: The traffic manager failed to stop the train until release of the level crossing which was in break-down state, but notified the locomotive driver of the break-down state by telephone. The locomotive driver failed to record the notification in the travel documents, and to record the number of the level crossing, and he reduced the speed of the light engine before the wrong level crossing.

The IC formulates a safety recommendation relating to revision of the notification technology applied on KÖFI lines.

Factual statements directly connected to the occurrence of the incident

The traffic manager failed to stop the light engine at Zamárdi Felső station and to try to release the break-down state of the level crossing equipment, despite the fact that he would have had the opportunity.

The locomotive driver misunderstood the notification from the traffic manager, so he reduced the speed of his vehicle before the wrong level crossing. He failed to record in writing the information received from the traffic manager.

Factual statements indirectly connected to the occurrence of the incident

The traffic manager telephoned the locomotive driver while his vehicle was moving, so the locomotive driver could not record in writing the information received, despite the relevant rules.

Other risk factors

The IC makes no such statement.

2016-0808-5

Overview of the occurrence

On 25 July 2016, at 12:24 o'clock, the train with Reg. № 8902 collided with a truck at the level crossing № AS695 protected with warning lights between the stations Babócsa and Barcs.

The driver of the road vehicle died on the spot as a consequence of the accident; the locomotive driver and a passenger had minor injuries. The road vehicle caught fire after the collision, and the locomotive and a wagon of the passenger train was damaged.

The service provided by the train with Reg. № 8902 was partly cancelled, and the passengers of four other trains were transported by replacement buses.

According to findings of the IC, the occurrence can be attributed to human factors. Similar occurrences can be prevented by observing the relevant traffic rules.

It was found during the investigation of the site that the vehicles arriving from the direction of Táncsics Mihály street have no right of way over the vehicles coming from the direction of the industrial sites. As a result, the vehicle combinations including trailers or semitrailers using the level crossing regularly may get stuck on the rail track due to observing their obligation to give way. Due to this, TSB issued an immediate safety recommendation, as a result of which, Somogy County Governent Office obligated the local government of Barcs town to review the traffic order at the affected level crossing and the traffic junction connected to it.

Factual statements directly connected to the occurrence of the incident

Based on learnings from the investigation of the scene, and on analysis and evaluation of the documents obtained and video records available, the IC found that:

- The driver of the truck started to cross the level crossing despite the red warning light.
- The truck got into the structure gauge of the railway and could not leave it before the train arrived, which resulted in their collision.
- The train involved in the occurrence did not exceed the speed limit specified in its timetable, but, according to the opinion of the IC, the train had no chance to avoid the collision.

Factual statements indirectly connected to the occurrence of the incident

The IC makes no such statement.

Other risk factors

At the time of the occurrence, the layout of the level crossing did not comply with the requirements specified in Subsection (6) Section 9 of KM Decree 20/1984. (XII.21.), and, as a consequence, there may occur such traffic situations where vehicle combinations including trailers or semitrailers using the level crossing regularly may get stuck on the rail track.

SAFETY RECOMMENDATION

Based on the findings of the IC during the investigation of the scene after the occurrence, TSB issued an immediate safety recommendation on 16 July 2016.

BA2016-0808-5-01A: The IC found during the investigation of the scene that the vehicles arriving from the direction of Táncsics Mihály street and accessing the level crossing have no right of way over the vehicles coming from the direction of the industrial sites, and so the requirements specified in Subsection (6) Section 9 of KM Decree 20/1984. (XII.21.) are

not met. As a result, the vehicle combinations including trailers or semitrailers using the level crossing regularly may get stuck on the rail track due to observing their obligation to give way.

TSB recommends Department of Road Transport of Somogy County Government Office to review (from the aspect of traffic order) the layout and the environment of the level crossing (AS695) located between Barcs and Babócsa stations on the railway line № 60, and to take action as necessary in order to provide the safest possible layout for that level crossing.

According to the IC, by acceptance and expected implementation of the safety recommendation, the traffic through the level crossing can be made safer.

2016-0928-5

Overview of the occurrence

At Budaörs station, a shunting unit started at Track X without authorisation burst the switch № 13/a open, and accessed the route of the freight train with Reg. № 44327 which was accessing Track V. Noticing the wagons accessing his route, the locomotive driver of the freight train applied emergency braking immediately. Simultaneously, the foreman shunter in charge of the shunting unit noticed the approaching freight train, and instructed the shunting locomotive driver to stop. The freight train and the train of wagons involved in the shunting stopped at a distance of 200 metres from each other. No one was injured, but the switch burst open was slightly damaged.

The IC attributed the occurrence to human factors on the part of the personnel involved in the shunting move. The foreman shunter misunderstood an earlier conversation between him and the traffic manager, and authorised the locomotive driver to start shunting without being authorised by the traffic manager to do so. Regarding that similar occurrences can be prevented by observing the relevant rules, the IC proposes no safety recommendation.

Factual statements directly connected to the occurrence of the incident

The foreman shunter authorised the locomotive driver to start shunting without being authorised clearly by the traffic manager to do so, and he realised the wrong setting of the Switch № 13 too late.

Factual statements indirectly connected to the occurrence of the incident

The shunting personnel failed to perform the required brake test before starting shunting.

Other risk factors

The IC makes no such statement.

2016-0968-5

Overview of the occurrence

A passenger was injured due to heat from electric arch generated by the damage to the overhead contact wire.

According to the IC, the accident was caused by the metal particles which were melted and liberated from the aluminium window frame as an effect of the electrical arc impacting the train. Due to the electrical arc, the electrically insulated window frame gained significantly higher potential than that of the body of the wagon, and the accumulated charge found its way through the gluing of the insulation of the window frame to the wagon body which had earth potential at that moment. In absence of galvanic potential, the circuit closure took place with arcing accompanied by light and heat formation, and the resulting heat suddenly melted the aluminium window frame, and the molten particles splashed toward the passenger.

According to the position of the IC, the non-equipotential interface between the window frame and the wagon body implies hazards for the future as well, so the IC recommends revision of every vehicle with insulated metal window frames, and to make galvanic connection between the window frame and the wagon body.

Factual statements directly connected to the occurrence of the incident

The IC attributes the occurrence to the following direct causes:

- the post of the overhead contact wire was overgrown with vegetation, which resulted in a short circuit accompanied by electrical arcing,
- as a consequence of the short, the response insulator of the structure which prevents lifting of the contact wire broke, its arm fell onto the post, and its voltage fell below 25 kV,
- as a result, the earth-arrester and its wire exploded off the post, produced an electrical arc which was closed through the body of the wagon just passing the post.

Factual statements indirectly connected to the occurrence of the incident

The IC attributed the occurrence to the following indirect causes:

- as a result of electrical arcing, the frame of a ventilation window fully insulated from the body of the motor train set was subject to high voltage, and
- The resulting electrical arcing melted the aluminium frame, and the molten particles splashed and caused injury to a passenger.

Other risk factors

The IC makes no such statement.

SAFETY RECOMMENDATION

BA2016-0968-5-01: The IC found that the upper openable frames of the split windows in the passenger cabin of the Series 1415 (FLIRT) motor train sets are electrically insulated from the body of the vehicle. Should the window frames become of a potential level exceeding the threshold of hazard of electric shock for any reason, the hazard of electric shock appears.

TSB recommends Railway Authority Division, Ministry of National Development, for the sake of preventing accidents caused by electric shock, to order the operators of the Series 1415 motor train sets to evaluate the risks of electrical shock of the ventilation windows and to take action as necessary to make the window frames equipotential with the vehicle body, out of turn, involving the manufacturer.

By acceptance and expected implementation of the safety recommendation, shock hazard caused by touching the window frame can be excluded.

2016-1105-5

Overview of the occurrence

On 5 October 2016, at 14:30 o'clock, the train with Reg. № 8305 hit over several cattle at the unprotected level crossing located between the stations Nagydorog and Vajta.

The train derailed with one bogie as a consequence of the accident. Of the animals hit over, 14 died on the spot and two had to be transported for emergency slaughter.

The service provided by the train with Reg. № 8305 was partly cancelled, and the passengers of four other trains were transported by replacement buses.

According to findings of the investigation, accident took place because the large herd was driven through the level crossing without due care, and such crossing could not be finished before the train arrived.

Regarding that, during the investigation of an accident (hit-over of a road vehicle stuck at a level crossing) which took place between Győr and Öttevény stations on 23 December 2013, TSB issued a safety recommendation relating to the management of danger situations occurring at level crossings, TSB now issues another safety recommendation for the sake of modification of the rules of driving animals through level crossing, but TSB also confirms its earlier safety recommendation.

Factual statements directly connected to the occurrence of the incident

Based on learnings from the investigation of the scene, and on analysis and evaluation of the documents obtained and photographs available, the IC found that:

- The driver of the agricultural tractor stopped his vehicle before crossing that the front end of the tractor reached within the kinematic gauge, so when he detected the approaching train he finished is crossing, but the driven animals followed the vehicle.
- The train involved in the occurrence did not exceed the speed limit specified in its timetable, and, according to the position of the IC, the locomotive driver did his best to avoid collision.

Factual statements indirectly connected to the occurrence of the incident

Specification of the sight triangles applied in level crossings is based on a speed of minimum 5 km/h and maximum vehicle length of 22 metres (agricultural tractor with two trailers). However, crossing by a large group of animals, as in the case under investigation, may take significantly longer. Relevant regulation offers splitting the herd and driving them through the level crossing in sub-groups as a solution, which seems difficult or sometimes even impossible due to the behaviour of the animals, as in this case, where the young calves were walking at the front of the herd. Telephone contact and agreement between traffic managers and the drivers of animals is known in international practice, but it is not known in domestic regulative environment or practice.

Other risk factors

The IC makes no such statement.

2016-1219-5

Overview of the occurrence

The 24th wagon of the freight № 49491-2 derailed with 1 axle on the switch № 3 while departing through Track 5 of Kétegyháza station. No one was injured, but the affected infrastructure and rolling stock were damaged. The IC attributed the occurrence to the technical condition of the derailed wagon and the railway track. The 24th wagon of the freight train was running asymmetrically and so it derailed when treading on the worn-out switch tongue. The IC proposes no safety recommendation relating to the occurrence

Factual statements directly connected to the occurrence of the incident

The railway track contained a significant track gauge deviation (beyond the limit value) before the switch, which ended within a short distance, thus applying a significant lateral force on the vehicle.

The vehicle was largely sensitive to track defects due to it insufficiently maintained, unlubricated and rusty centre plate and worn-out side frames.

As a combined effect of worn-out (within the limits) stock rail and switch tongue and the wheel thinning (due to wear within the limits), the wagon rolling onto switch № 3 treaded onto the worn-out stock rail and switch tongue, which caused it to derail.

Factual statements indirectly connected to the occurrence of the incident

The IC makes no such statement.

Other risk factors

The IC makes no such statement.

2016-1362-5

Overview of the occurrence

At the Pillangó street station, the train with Reg. № K15 crashed into the train with Reg. № K11 (staying next to the station platform) from behind. Two passengers were injured severely and 14 passengers suffered minor injuries as a consequence of the occurrence, and both trains were significantly damaged.

The IC attributed the occurrence to the extremely adverse weather, the technical parameters of the train, and a factor on the part of the operating company: The railway track became extremely slippery due the weather, the wheel slide protection system of the train could not eliminate wheel slip, and the operator failed to take adequate preventive actions against overruns due to slip.

The IC proposes safety recommendations for the manufacturer and the operator relating to the occurrence, in which the IC recommends:

- reconstruction of the track-vehicle interface,
- modification of the training of the personnel affected,
- changing the technology applied in special situations.

Factual statements directly connected to the occurrence of the incident

- As an effect of the adverse weather in December (low temperatures, falling leaves, strong winds, ground frost) the rails became extremely slippery along the surface section of the underground line M2. The trains were not equipped with devices that increase adhesion, and the wheel slide protection system was not able to compensate for the given loss of adhesion, so the wheels started to skid.
- The actions taken to eliminate slipperiness of the rails caused by adverse weather were not adequate to prevent the occurrence, but continuous speed restriction was not introduced.

Factual statements indirectly connected to the occurrence of the incident

- The relevant policy of the underground company contains no requirement for the method of traffic management in the case of such extreme weather conditions.
- The drivers of the underground trains have no sufficient experience with manual driving skills to be applied in the case of bad weather conditions.

Other risk factors

- Immediate evacuation of passengers after the occurrence took longer than necessary, due to incapacity of the driver of the train with Reg. № K15.

BA2016-1362-5-01: *The wheel slide protection system of the type Alstom AM5-M2 in service on the M2 underground line in Budapest cannot in all cases compensate for slipping and improve wheel adhesion on the surface section of the line.*

TSB recommends BKV Zrt. to develop a technical solution, in a joint effort with the manufacturer of the vehicle, which provides sufficient adhesion between the wheels of the vehicle and the track even in adverse weather conditions.

According to the IC, by acceptance and expected implementation of the safety recommendation, stopping of the trains at the required points could be provided even in similarly adverse weather conditions.

BA2016-1362-5-02: *The policies of the Budapest underground company contain no requirements or procedures for traffic management in extremely adverse weather conditions: actions are taken exclusively on the basis of subjective judgements made by the KFM.*

TSB recommends BKV Zrt. to elaborate and implement rules for traffic along track sections which have become slippery due to the weather.

According to the IC, by acceptance and expected implementation of the safety recommendation, safe movement of the trains can be provided even in similarly adverse weather conditions.

BA2016-1362-5-03: *The drivers of the trains in service on the M2 underground line in Budapest rarely apply the manual driving mode, so they have little experience with this mode, and accordingly, they are more prone to making mistakes in a situation like the one under review.*

TSB recommends BKV Zrt. to elaborate a procedure for improving and maintaining the manual driving skills of the vehicle drivers.

According to the IC, by acceptance and expected implementation of the safety recommendation, the number of driving errors occurring in manual driving mode, and accordingly, the risk of incidents and accidents can be reduced.

2017-0033-5 and 2017-0214-5

Overview of the occurrences

Two wagons of a freight train departing from Debrecen station, and one wagon of a freight train departing from Székesfehérvár station derailed on a switch soon after departure.

The IC found in each case that the direct cause of derailment was a securing chock left under the train. The chock was not removed by the employee who connected the wagons to the locomotive, and subsequently, during the braking test, the same person performing the test did not detect the chock.

The station crew in Debrecen logs the locations of the chocks, but the technology used at the station does not provide that the traffic managing crew get this log-book information, so this measure is inadequate form the aspect of safety. In Székesfehérvár, the employee involved in the starting of the train failed to perceive the relevant entry due to hurry in the given case.

The infrastructure operator took action to modify the technology at Debrecen station. The IC proposes a safety recommendation relating to securing trains against run-away (regardless of the occurrence under review).

Factual statements directly connected to the occurrence of the incidents

A securing chock was left under the train when the train was started, and that chock got stuck on the switch and derailed the train.

Factual statements indirectly connected to the occurrence of the incidents

In Debrecen, the chock was placed under the train at an unusual location, although it was a meaningful solution in the given situation. Actually, the usual technology did not comply with the rules.

Locomotive Driver_db1 did not look for or remove the securing chock when connecting the vehicles, which can be attributed to lack of specific knowledge.

Wagon Examiner_sv performed the connection of vehicles despite he did not have this task among his regular duties; actually he did not look for or detect the securing chock.

In the traffic control office in Debrecen, no information was available on the securing chock at the time of starting the train.

In Székesfehérvár, a written record of the position of the securing chock was available to Pointsman_sv who took part in the starting of the train, but he failed to read it, and he did not check for any chocks when inspecting the route appointed for the train.

Other risk factors

In Debrecen, the rules for reporting readiness to start are not consistent, and the actual practice is different from the rules.

In Székesfehérvár, service duties are transferred to other persons on a regular basis.

BA2017-0033-5-01: *The IC found that only one securing chock is used to keep trains stand still instead of two as specified in the train loading and running regulations at Debrecen station, and the Station Instructions also requires one only. At Székesfehérvár station, the IC found that the Station Instructions defined the person appointed to remove the devices applied against run-away of trains in contradiction with the train loading and running regulations, and that the Station Instructions even include minor self-contradictions relating to the chocks and to the communication of instructions.*

> **TSB recommends Railway Authority Division, Ministry of National Development to review the harmony and effectiveness of the rules relating to prevention of run-away of trains in the F.2. Train Loading and Running Regulations and in the Station Instructions which documents are components of the inner rules which constitute the safety management system of a MÁV Zrt.**

By acceptance and expected implementation of the safety recommendation, the securing of rolling stock against run-away will become more reliable.

2017-0094-5

Overview of the occurrence

A passenger train approaching Esztergom station upon subsidiary signal derailed on Switch 2 of the station. No one was injured, but there was significant damage to the infrastructure and the vehicles. The IC attributed the occurrence to malfunction of the safety installation of the station, and to human factors on the part of the traffic manager: The traffic manager initiated the adjustment of Switch 2 while a train was running over it. The safety installation performed the switch adjustment despite the occupied state of the switch, and the train derailed on the switch which was just being opened and adjusted. The IC proposes no safety recommendation relating to the occurrence because similar occurrences can be prevented by maintaining the safety installations in good condition and observing the rules.

Factual statements directly connected to the occurrence of the incident

- The traffic manager at Esztergom station issued a switch adjustment order through the safety installation despite the fact that a train was running over the switch.
- As a consequence of an earlier unidentified defect of the safety installation, the switch adjustment order issued by the traffic manager was performed despite the fact that switch was occupied.

Factual statements indirectly connected to the occurrence of the incident

- The safety installation at Esztergom station does not allow closure of the route in the case of access to an occupied track.

Other risk factors

- The traffic manager at Esztergom station failed to fulfil his obligation related to the reception of trains.

2017-0176-5

Overview of the occurrence

The passenger train running from Kiskunfélegyháza to Lakitelek collided with an automobile at an unprotected level crossing in the inner area of Kiskunfélegyháza. The automobile caught fire as a consequence of the collision, the passenger occupying the front right seat in the automobile died on the spot, and the driver was severely injured; no one was injured on the train, but the railcar of the train was badly damaged and became unserviceable. The IC attributed the occurrence to human factors on the part of the driver of the automobile: The driver drove his vehicle without having a valid driving licence. The driver failed to make sure that crossing would be safe, and accessed the level crossing at high speed, despite the fact that a train was approaching. The IC proposes no safety recommendation relating to the occurrence.

Factual statements directly connected to the occurrence of the incident

The driver of the automobile accessed the level crossing at high speed, without slowing down his vehicle and looking around, so he did not perceived the approaching train which crashed into his vehicle.

Factual statements indirectly connected to the occurrence of the incident

The driver of the automobile had no driving licence, so he had no sufficient knowledge and experience of the driving behaviour necessary when using the level crossing.

Other risk factors

The IC makes no such statement.

2017-0275-5

Overview of the occurrence

The train with Reg. № 3325 was started from Újszász station opposite its scheduled direction toward Tápiógyörgye station. After identifying the danger situation, the affected traffic managers closed the railway barriers along the open line by manual control. Then the train ran at a speed of 15 km/h as far as Tápiógyörgye station.

The IC attributed the occurrence to malfunction of the safety installation and human factors on the part of the traffic manager. The traffic manager in charge initiated alteration of the direction of run by using the safety installation, but the direction was not altered, despite the fact that the traffic manager at Tápiógyörgye consented to it. Works were performed on the safety installation at the time of the occurrence, so, inadvertent human intervention cannot be excluded. The traffic manager in charge issued authorisation to start the train without making sure that the direction of run had been altered.

The IC proposes no safety recommendation relating to the occurrence, but reminds stakeholders of the risks of works associated by shut-off of the safety installations.

Factual statements directly connected to the occurrence of the incident

- Prior to departure of the train with Reg. № 3325, the safety installation maintenance staff initiated a test not permitted by the Instruction to Disabling of Safety Installations, and the traffic manager in charge gave them authorisation to do the test. As a result, the direction of run on the left-hand track of Tápiógyörgye was altered.
- Prior to departure of the train with Reg. № 3325, the traffic manager in charge at Újszász station failed to make sure whether the direction of run had been reverted to the appropriate position.

Factual statements indirectly connected to the occurrence of the incident

- At the time of the occurrence, works were underway on the safety installation, the safety installation of the station was disabled, so, the position of the direction of run on the open line could only be checked manually; however, no instruction had been issued apply such manual checks.
- The reduced service level of the station and the number of trains to be managed were not taken into account and the capacity reduction corresponding to the decreased throughput was not implemented during the elaboration of the Disabling of Safety Installations and planning the works to be performed.
- The traffic manager in charge at the time of the occurrence was performing his first shift in that position after five years, so, he had no current experience with normal or extraordinary operation.

Other risk factors

The IC makes no such statement.

2017-0373-5

Overview of the occurrence

The tram with Reg. № 1360 departing from the spur line at Városháza square derailed with one bogie on Switch V5. No one was injured, but the vehicle was slightly damage. The IC attributed the occurrence to the technical state of the switch involved: the fastening bolt of the fastening eyelet of the switch tongue of Switch V5 got loose, so, the switch tongue was not fastened firmly enough to the linking rod, and consequently, the switch tongue was not at proper distance from the stock rail. The leading wheel of the third bogie of the train treaded onto the switch tongue, which caused the tram to derail. As similar occurrences may be prevented by observing the relevant rules and maintaining the technical state of switch, the IC proposes no safety recommendation.

Factual statements directly connected to the occurrence of the incident

The fastening bolt of the fastening eyelet of the switch tongue of Switch V5 got loose, so, the switch tongue was not fastened firmly enough to the linking rod, and consequently, the switch tongue was not at proper distance from the stock rail. The leading wheel of the third bogie of the train treaded onto the switch tongue, which caused the tram to derail.

In contrast with the requirements, the inspection of the switch was not performed at the specified time and with the specified contents (thoroughness), so, the defect of the switch was not identified and eliminated.

Factual statements indirectly connected to the occurrence of the incident

The IC makes no such statement.

Other risk factors

The IC makes no such statement.

6. SAFETY RECOMMENDATIONS

SUMMARY OF RECOMMENDATIONS

In 2017, the addressee of the safety recommendations was primarily the National Transportation Authority, as National Safety Authority (NSA). TSB deviates from this practice only when it issues safety recommendations to organisations which are not under the scope of authority of the NSA (e.g. rescue services), or the supervision rights are at a regional authority (e.g. supervision of level crossings). This way it could be achieved that when the addressee of the recommendation is a railway undertaking, the response would not come from the addressee itself for which the implementation would involve considerable work and/or financial sources but an outside, impartial professional organisation would respond to the recommendation. The other advantage is that when the recommendation suggests eliminating conditions/factors that are unlawful or pose risks to transport safety, the NSA has the possibility to oblige the relevant parties with deadlines to take action, which would increase efficiency in the implementation of recommendations. Disadvantage of this process – laid down in the RSD – is that it brings delay in the implementation process, and there are some cases, when the NSA has no legal right to take action in topics, which could be solved easily by the IM or RU.

In 2017 the Railway Department of TSB published 35 final reports closing 40 investigations, including 16 safety recommendations. 2 of these recommendations have been implemented, implementation of 12 recommendations is in progress, in 2 cases we did not get any reply.

Az ajánlások kiadását általában megelőzi az érintett vasúti társaságokkal és a Nemzeti Közlekedési Hatósággal való egyeztetés. Ezeknek az egyeztető megbeszéléseknek eredményeképpen több esetben nem szükséges a biztonsági ajánlások formális kiadása, mert a vasúti társaságok felismerik a hiányosságokat és önként intézkedéseket tesznek a felszámolásuk érdekében. Ezért 2017-ben immediate preventive recommendation nem került kiadásra.

Response	2014	2015	2016	2017
Accepted and implemented	**9**	**1**	**7**	**2**
Accepted and partially implemented	-	-	-	-
Accepted, implementation in progress	**6**	**8**	**8**	**12**
Accepted, no information on implementation	-	-	-	-
Rejected	**1**	**8**	**-**	**-**
No answer	**2**	**-**	**1**	**2**
Total	**18**	**17**	**16**	**16**

THE SAFETY RECOMMAENDATIONS

BA2015-0639-5-01 *The Investigating Committee of TSB found during its investigation that Diesel-powered, outdated engines of the Series 628 emit such hot solid and gaseous substances through the exhaust system during normal operation which can light flammable substances situated nearby.*

> **TSB recommends Railway Authority Division, Ministry of Innovation and Technology to review the technical state of the Diesel-powered, non-modernised engines of the Series 628 in service in Hungary, with special regard to the risk of fire implied by the hot solid particle content of the exhaust leaving the exhaust system, and take action as necessary.**

The position of the IC is that, by acceptance and expected implementation of the safety recommendation, the risk of fire could be reduced in the case of freight trains towed by outdated Diesel-powered engines.

BA2015-0639-5-02 *The Investigating Committee of TSB found that the material used to prevent cargo spill in the case of bulk goods has a lower flashpoint than the temperature of the soot particles and oil drops emitted by Diesel-powered engines.*

> **TSB recommends National Directorate General for Disaster Management to review the conditions of use of cargo fasteners used in railway transport from the aspect of fire protection and propose a recommendation as necessary for a solution by legislation or other regulation.**

The position of the IC is that, by acceptance and expected implementation of the safety recommendation, the use of flammable materials used for fastening rail cargo could be avoided in the area of railway transport.

BA2015-0845-5-1 *The Investigating Committee of TSB found during its investigation that, in the case of detection of danger situations, the contents of oral communication between traffic managers and train crews are not specified, the methodology of such communication is not part of their training, and thus, the transfer of relevant information, e.g. a message conveying an instruction to stop, may suffer delay or change of meaning during communication.*

> **TSB recommends TSB recommends Railway Authority Division, Ministry of National Development to review the rules relating to the elements of form and contents of oral communication between the traffic managers and the train personnel in the safety management system of MÁV Zrt., and take action as necessary.**

The position of the IC is that, by acceptance and expected implementation of the safety recommendation, the probability of occurrences arising from unfocused or ambiguous communication of oral instructions can be reduced.

BA2015-1160-5-01: *The IC found that the rail track of the rack railway of BKV is extremely worn out; it works with wear values beyond the specified limits and with inaccurate rack settings in many cases. As a consequence, measurable adverse effects have appeared and affect the vehicles.*

> **TSB recommends Railway Authority Division, Ministry of National Development to review the track maintenance system of the infrastructure manager in order to see how much it is suitable for identifying and**

eliminating excessive track defects (with special regard to the rack profile), and take action as necessary .

By acceptance and expected implementation of the safety recommendation, the effects causing damage to the vehicle structures and indirect hazard of derailment could be reduced, in addition to reducing direct hazard of derailment caused by the railway track.

BA2015-1190-5-01: *The investigation found that the drivers involved were not aware of or neglected the rules of traffic. Compliance with certain rules affecting the occurrence is not required during the inspections performed by the company.*

TSB recommends Railway Authority Division, Ministry of National Development to review the contents and operation of the safety management system of Szeged Transport Company to see whether the vehicle drivers are provided access to training in the internal rules of the Company, whether such training is documented, and whether compliance with the rules is inspected, and to take action as necessary.

By acceptance and expected implementation of the safety recommendation, the awareness of and compliance with the rules by the vehicle drivers is expected to improve.

BA2015-1234-5-01: *The IC found that asymmetric wear of the wheels within a wheel pair of freight wagons regularly occurs as contributing factor to accidents involving derailment, while the IC found no limit values specified for such asymmetry.*

TSB recommends Road and Railway Transport Division, Ministry of National Development to review whether there are adequate specifications relating to asymmetric wear of wheels within wheel pairs, and whether railway companies enforce such specifications properly in their safety management systems, and to take action as necessary.

By acceptance and expected implementation of the safety recommendation, the wagons which are dangerous due to this problem may be identified and eliminated from the railway network.

BA2016-0499-5-01: *Due to the design of the switch setting structures with tensions spring and connecting link used in the tram network in Budapest, the fastening bolts of the tension spring may get loose, which may lead to loosening of the switch tongues, which I turn may lead to derailing.*

TSB recommends BKV Zrt. to review the design and maintenance technology of the switch setting structures with tensions spring and connecting link (necessity to secure the bolts) and take action as necessary.

By acceptance and expected implementation of the safety recommendation, the likelihood of loosening of the fastening bolts can be reduced, and accordingly, the likelihood of derailment due to similar causes can also be minimised.

BA2016-0699-5-01: *The IC found that, neither during the works performed at the time of the occurrence, nor during other inspected works performed with track possession was it provided that both the traffic managers and the people working under track possession be aware of the identity of the person responsible for track possession and being present at the site; the other party is not informed on the changes of the shifts.*

TSB recommends Railway Authority Division, Ministry of National Development to review whether the safety management system of MÁV Zrt. specifies a process to follow relating to the change of the person responsible for track possession, with special regard to the traffic management crew's being aware of the fact of the change and the identity and contact details of the new responsible person.

By acceptance and expected implementation of the safety recommendation, the personnel of the various services working in the same area could contact one another faster and easier if necessary, which is indispensable for the sake of maintaining safety on a continuous basis.

BA2016-0699-5-02: *The preparation of the works did not include identification and management of possible safety risks*

TSB recommends Railway Authority Division, Ministry of National Development to review whether the safety management system of MÁV Zrt. adequately deals with the management of the risks associated to construction and maintenance works properly, and whether it is performed in practice.

By acceptance and expected implementation of the safety recommendation, it will be easier to foresee and prevent or prepare for hazardous situations by the people involved.

BA2016-0699-5-03: *The exact roles, subordinations, and safety tasks of the participating companies were not clarified during the preparation of the works; the process of preparation and execution of the works is not designed in a consolidated structure (project approach).*

TSB recommends Railway Authority Division, Ministry of National Development to review the rules and execution of rules of planning, execution and closing of the track possession process in the safety management system of MÁV Zrt. to see whether it provides that the organisations performing the works together be sufficiently aware of one another's needs and limits, and clarify their respective scopes of responsibility.

By acceptance and expected implementation of the safety recommendation, it will be more likely that each participant will be aware of the scopes of responsibility of other participants present in the area, of their own tasks as well as of the actions they may expect from other participants, with special regard to safety-related tasks and actions.

BA2016-0706-5-02: *The investigation found that the people arriving by road from the north and the drivers of railway vehicles arriving on the right-hand side track (wrong track) to the unprotected level crossing located in Section 143 between the stations Dunaharaszti külső and Szigetszentmiklós-Gyártelep cannot detect each other on time, so these traffic situations imply increased risk of accident.*

TSB recommends MÁV-HÉV Zrt. to control the speeds of the trains moving on the right-hand side track (wrong track) from the direction of Szigetszentmiklós-Gyártelep in such manner that the road vehicles accessing the level crossing with due care be able to leave it safely before the train arrives there. The action should be maintained until the level crossing becomes protected with warning lights.

According to the IC, by acceptance and expected implementation of the safety recommendation, safe traffic at the affected level crossing can be guaranteed even in this rare traffic pattern.

BA2016-0968-5-01: The IC found that the upper openable frames of the split windows in the passenger cabin of the Series 1415 (FLIRT) motor train sets are electrically insulated from the body of the vehicle. Should the window frames become of a potential level exceeding the threshold of hazard of electric shock for any reason, the hazard of electric shock appears.

> **TSB recommends Railway Authority Division, Ministry of National Development, for the sake of preventing accidents caused by electric shock, to order the operators of the Series 1415 motor train sets to evaluate the risks of electrical shock of the ventilation windows and to take action as necessary to make the window frames equipotential with the vehicle body, out of turn, involving the manufacturer.**

By acceptance and expected implementation of the safety recommendation, shock hazard caused by touching the window frame can be excluded.

BA2016-1362-5-01: *The wheel slide protection system of the type Alstom AM5-M2 in service on the M2 underground line in Budapest cannot in all cases compensate for slipping and improve wheel adhesion on the surface section of the line.*

> **TSB recommends BKV Zrt. to develop a technical solution, in a joint effort with the manufacturer of the vehicle, which provides sufficient adhesion between the wheels of the vehicle and the track even in adverse weather conditions.**

According to the IC, by acceptance and expected implementation of the safety recommendation, stopping of the trains at the required points could be provided even in similarly adverse weather conditions.

BA2016-1362-5-02: *The policies of the Budapest underground company contain no requirements or procedures for traffic management in extremely adverse weather conditions: actions are taken exclusively on the basis of subjective judgements made by the KFM.*

> **TSB recommends BKV Zrt. to elaborate and implement rules for traffic along track sections which have become slippery due to the weather.**

According to the IC, by acceptance and expected implementation of the safety recommendation, safe movement of the trains can be provided even in similarly adverse weather conditions.

BA2016-1362-5-03: *The drivers of the trains in service on the M2 underground line in Budapest rarely apply the manual driving mode, so they have little experience with this mode, and accordingly, they are more prone to making mistakes in a situation like the one under review.*

> **TSB recommends BKV Zrt. to elaborate a procedure for improving and maintaining the manual driving skills of the vehicle drivers.**

According to the IC, by acceptance and expected implementation of the safety recommendation, the number of driving errors occurring in manual driving mode, and accordingly, the risk of incidents and accidents can be reduced.

BA2017-0033-5-01: *The IC found that only one securing chock is used to keep trains stand still instead of two as specified in the train loading and running regulations at Debrecen*

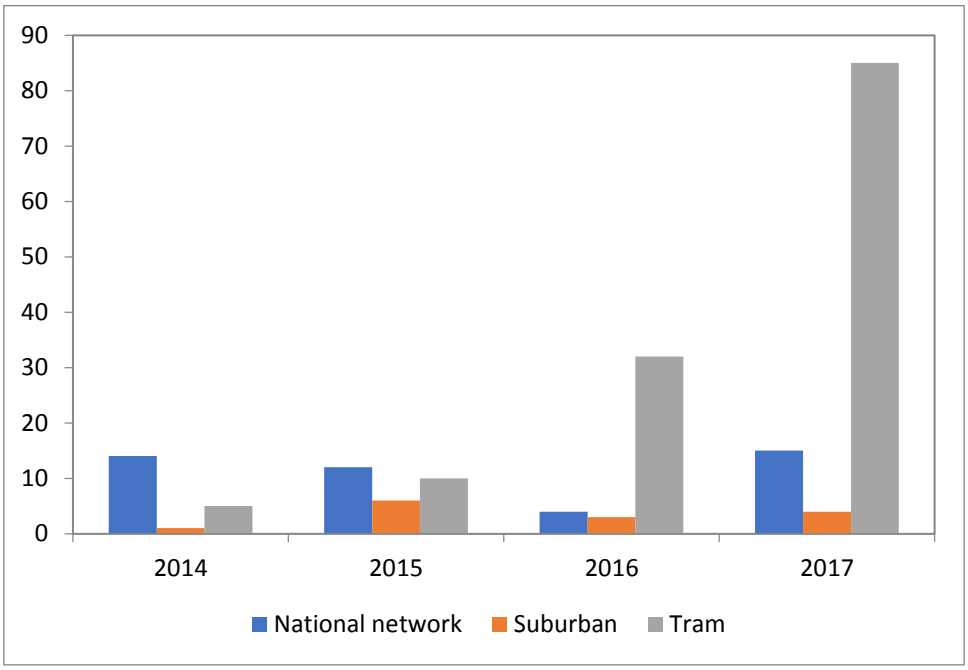
station, and the Station Instructions also requires one only. At Székesfehérvár station, the IC found that the Station Instructions defined the person appointed to remove the devices applied against run-away of trains in contradiction with the train loading and running regulations, and that the Station Instructions even include minor self-contradictions relating to the chocks and to the communication of instructions.

TSB recommends Railway Authority Division, Ministry of National Development to review the harmony and effectiveness of the rules relating to prevention of run-away of trains in the F.2. Train Loading and Running Regulations and in the Station Instructions which documents are components of the inner rules which constitute the safety management system of a MÁV Zrt.

By acceptance and expected implementation of the safety recommendation, the securing of rolling stock against run-away will become more reliable.

7. HIGH PRIORITY TOPICS IN 2017

Signal Passed at Danger (SPAD)



Numbers of SPADs

Unauthorised passing the signal at danger is one of the most hazardous incidents in railway transport. The number of incidents of passing the signal at danger increased in comparison to 2016 both in the national and the suburban networks: it practically returned to the level of 2014 in the national network, and more than doubled in the local networks.

The indicators show a seriously worsening situation in 2017. As many as 85 cases of this sort occurred in the local tram networks, which is especially alarming as compared to data from the year 2015. We can say that, similarly to 2016, there was no serious danger situation in 2017 either, but worsening data must be taken into consideration when evaluating vehicle drivers' activity. It should also be mentioned that, owing to the relatively lower speeds, better visibility and the traffic lights, passing a signal at danger implies significantly lower risks when committed by a tram driver than the same in the national railway network. 79 of this kind of tram incidents took place in the tram network of Budapesti Közlekedési Zrt. (BKV). The railway safety experts of the Company identified the unfavourable trend and drew up an action plan comprising 10 points in order to reduce the number of incidents involving the passing of signal at danger. Subsequently, TSB did not require detailed data service related to incidents without consequences any more, but let BVK Zrt. solve the problem on its own. We are going to sustain this practise until evaluation of the results of the action plan.

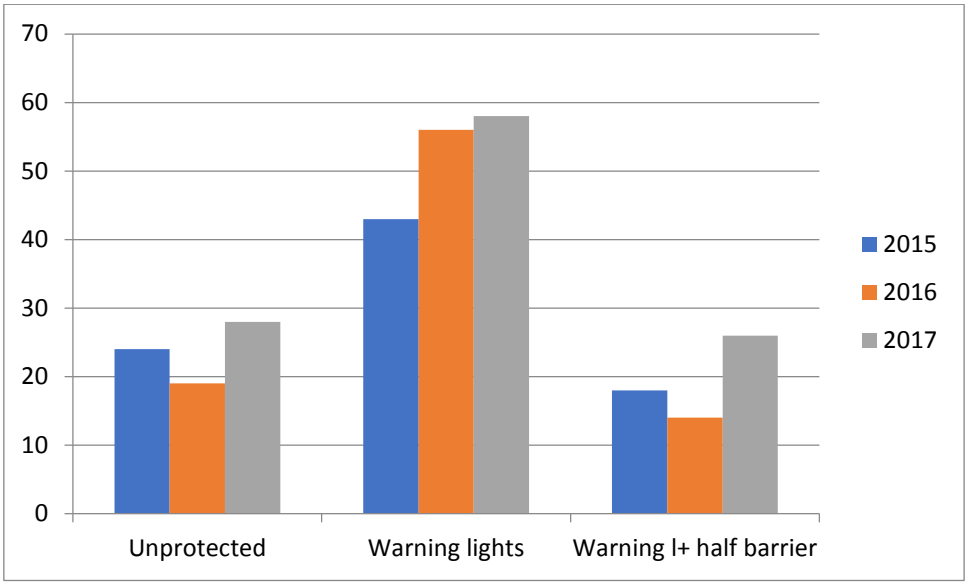
Human and organizational factors

During our investigations performed in 2017, we laid significant emphasis on investigating into human and organizational factors including elements of the Safety Management System.

During our investigations, we identified 49 direct causes in total, of which 25 were human or organizational factors, while 49 of the 53 indirect causes belonged to this category.

Such causes included fatigue, the loss of situational awareness, and dangerously low levels of safety critical communication and many times the poor safety culture.

Level crossings



The number of accidents at level crossings increased by 23 in 2017 compared to 2016, which indicates a significant increase (20%).

Taking a closer look at the figures, we can see that the number of accidents involving perfectly operable warning lights has increased further. The increase of the number of accidents at level crossings equipped with half-barriers (as additional safety installation) is more conspicuous, but only experiences of the years to come will show whether it is the beginning of an unfavourable trend or a single outlier only.

In 2017 there was one accident at level crossings due to malfunction of warning lights. The TSB opened a full investigation in this occurrence.

8. OTHER ACTIVITIES

Trainings

In order to maintain and improve the professional knowledge of the investigators, the trainings organised based on our training plan continued in 2017.

One colleague participated in the Applied Rail Accident Investigation course and successfully passed the exam in Cranfield University (UK).

Another colleague of ours obtained an additional degree in the investigation expert specialty at Széchenyi István University, Győr.

These studies can be utilised effectively in the investigations.

International Cooperation

TSB continued to participate actively in the work of the European Railway Agency (ERA) The cooperation with ERA (with its costs covered by the EU) offers the opportunity for TSB to participate in compiling the system and methodologies of the assessment of National Investigation Bodies, The possibility to participate the Human Factor Network was very useful, because the human factor plays a role in an overwhelming majority of the occurrences but we have the least investigation experience in this area.

Outside of the ERA, some of the European investigating bodies (e.g. Germany, Austria, Switzerland, Czech Republic, The Netherlands, Luxemburg, Denmark, Estonia etc) established a regional cooperation forum whose work TSB also participates in. Within the framework of this forum – besides discussing local problems and making recommendations towards ERA – there is an opportunity to learn about the investigation procedure of certain accidents and gain experience in the investigation of various types of rarely occurring occurrences.

International Activities

The personnel of R&DD took part in various international activities in 2017.

The European Union Agency for Railways (ERA) brings together the national investigating bodies into a working group. The head of Railway and Dispatcher Department attended the plenary session of the working group on three occasions.

One of our investigators is member of the ERA Human Factors Working Group. Our colleague attended the session of the WG twice.

One of our investigators attended an international conference of rail human factors held in London in the autumn of 2017.

The Regional Conference of Central & Eastern European Investigating Bodies is held twice a year; last year it was held in Germany and Switzerland, and was attended by one and two of our colleagues, respectively. In 2017, the spring conference was held in Prague, where the Deputy Head of TSB held a presentation on the investigation into the accident involving a crash of underground trains on the M2 line in 2016. The autumn event was hosted by our Bureau in Budapest on September 20-21 in Budapest.

International conferences, meetings and working group sessions offer excellent opportunities to establish good professional contacts, share experiences, and acquire new methods to be used in our own activities.