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MINISTRSTVO ZA PROMET

SEKTOR ZA PREISKOVANJE ŽELEZNIŠKIH NESREČ IN INCIDENTOV

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FINAL REPORT ON THE INVESTIGATION INTO A RAILWAY ACCIDENT – THE COLLISION OF PASSENGER TRAIN NO. 3508 WITH A ROAD FREIGHT VEHICLE



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1 SUMMARY

On 12 February 2009 at 13:24, a local passenger train, no. 3508, collided with a road freight vehicle, a Volkswagen Caddy 1.4, at the organised level crossing (provided with traffic signs) of the Šmartno ob Paki – Slatina – railway station no. 97950 local road with the Celje – Velenje single-track railway line.

The driver of the road freight vehicle, registration no. CE UK-229, was driving from the direction of the town of Slatina towards regional road II, no. 426, section 7949 (Gorenje – Rečica ob Paki).

Local passenger train no. 3508 was travelling from the direction of Celje towards Velenje. After a scheduled stop at the Šmartno ob Paki station, the train continued its journey at 13:22 towards the Paška Vas train stop. At 13:23:30, the train collided at the level crossing and at a speed of 59 km/h with the road freight vehicle, pushing it forward 137 m, and then stopped.

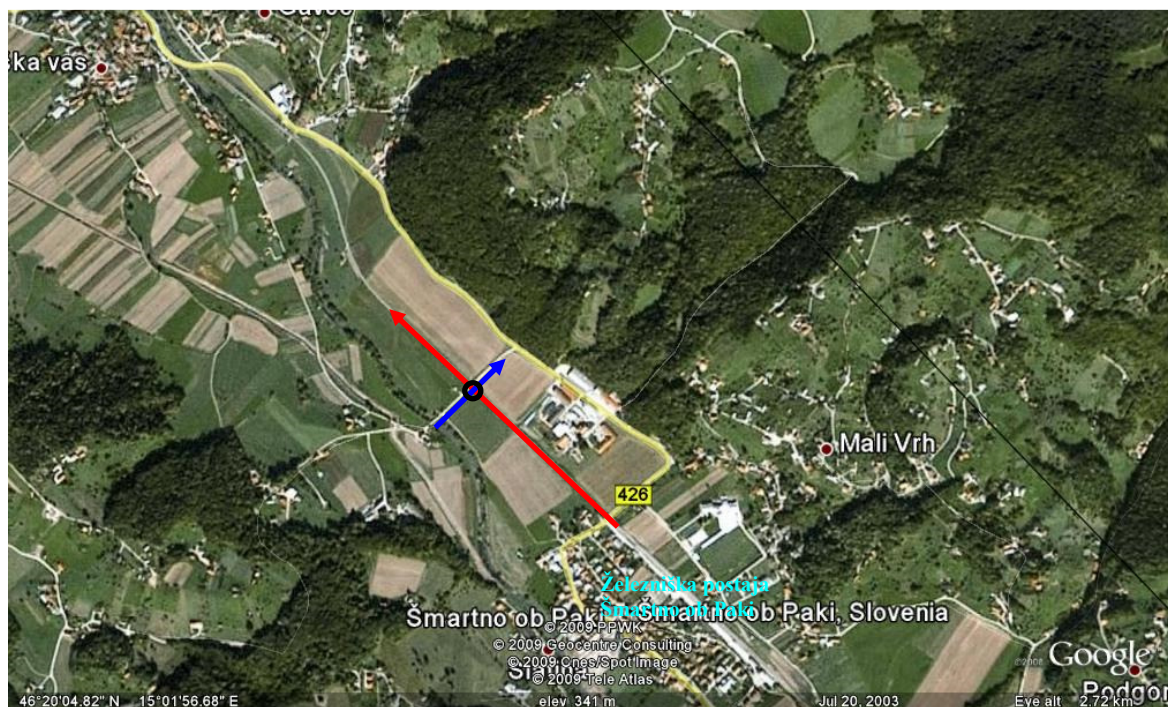


Figure no. 1: Travelling directions of the train and the road freight vehicle and the collision site

The red arrow shows the railway line and the travelling direction of the local passenger train, while the blue arrow shows the local road and the travelling direction of the road freight vehicle; the black circle marks the point of collision at the level crossing.

The driver of the road freight vehicle suffered fatal injuries and died at the site of the accident. The direct cause of the accident was the non-observance of the rules on right of way of railway vehicles over road vehicles at organised level crossings of a road with a railway line, marked with traffic signs, which are laid down in Article 50 of the Road Traffic Safety Act.

Recommendations:

In order to enhance the safety of all users of the level crossing concerned, it is recommended that:

- I-37 traffic signs signalling the approach to an unprotected level crossing should be set up at distances of 240, 160 and 80 metres at the side of the road before the level crossing;
- road humps should be installed on the road surface immediately preceding the level crossing, signalling to drivers that they must proceed with caution.

1.1. Copies of the Accident Report with Recommendations to:

Slovenske železnice, d.o.o.
Kolodvorska 11
1506 Ljubljana

Republic of Slovenia
Ministry of Transport
Minister, Dr Patrick Vlačič
Langusova, 4
1000 Ljubljana

Občina Šmartno ob Paki (Šmartno ob Paki Municipality)
Šmartno ob Paki 72
3327 Šmartno ob Paki

Agencija za železniški promet RS (The Public Agency for Rail Transport of the Republic of Slovenia)
Kopitarjeva 5
2000 Maribor

ERA – European Railway Agency
160 boulevard Harpignies
BP 20392
F-59307 VALENCIENNES Cedex

2 IMMEDIATE FACTS OF THE OCCURRENCE

Collision of local passenger train no. 3508 into the side of a road freight vehicle at an organised level crossing provided with traffic signs.

The speed of road users on the carriageway is limited to 40 km/h by means of traffic sign no. II-30.

The maximum permitted speed for train no. 3508 at this section of the railway line is 60 km/h as laid down in the timetable.

Immediately before the collision, the speed of train no. 3508 was 59 km/h.

Since it is not required to record driving speeds displayed on speedometers of road freight vehicles of this type by means of recording equipment, there is no information available as to what the vehicle's driving speed was immediately preceding the accident.

At this level crossing, drivers of road vehicles have a clear unobstructed view of the track.

The level crossing of the road with the railway line is marked for the benefit of road users with a St Andrew's Cross, with a stop sign located underneath on the same pole.

The width of the road at the level crossing is 3 m, of the right shoulder 0.6 m, and of the left shoulder 0.3 m, viewed from the driving direction of the road freight vehicle.

2.1 Date, exact time and location of the occurrence

The accident – the collision of local passenger train no. 3508 into the side of a road freight vehicle, a VW Caddy, at the level crossing at km 24+267 of the Celje – Velenje single-track railway line – occurred on 12 February 2009 at 13:23:30.

2.2 Description of the events and the accident site

On 12 February 2009 at 13:23:30, train no. 3508 crashed into the side of a road freight vehicle, a VW Caddy, at the unprotected level crossing of the local road with the railway line. The accident happened outside the town of Slatina at the level crossing of local road no. 97950 with the Celje – Velenje single-track railway line.

The driver of the road freight vehicle, a VW Caddy 1.4, was driving along the local road from the direction of Slatina towards regional road II, no. 426.

Local passenger train no. 3508 was travelling along the single-track railway line from the direction of Šmarje ob Paki towards the Šoštanj station.

The level crossing situated between the stations Šmartno ob Paki and Šoštanj, at km 24+267, is marked for the benefit of road users with a St Andrew's Cross and a stop sign.

The driver of the road freight vehicle drove onto the level crossing proper without stopping or braking at the same moment local passenger train no. 3508 did, from the road vehicle driver's right-hand side.

Train no. 3508 crashed into the right-hand side of the road freight vehicle at a speed of 59 km/h, pushing the vehicle forward 137 metres, and then stopped. The road freight vehicle ended up wedged under the front of the train.

The driver, trapped in the road vehicle, suffered fatal injuries and died at the scene.

2.3 The body that established the investigation

The investigation procedure was launched by the Section for investigating railway accidents and incidents of the Ministry of Transport of the Republic of Slovenia and by Slovenske železnice, d.o.o.

The two investigations were conducted separately.

2.4 The decision to establish an investigation, the composition of the team of investigators and the conduct of the investigation

The Section for investigating railway accidents and incidents of the Ministry of Transport of the Republic of Slovenia launched an investigation into this accident in order to establish all its direct and indirect causes with a view to arriving at relevant information to improve safety at this level crossing and at similar ones.

The Chief Investigator of the Ministry of Transport of the Republic of Slovenia conducted the investigation, and brought it to a close himself.

Slovenske železnice, d.o.o. conducted its investigation through an investigation commission.

2.5 The background to the occurrence

Involved in the event were: the 59-year-old driver of the road freight vehicle and the 45-year-old locomotive driver of train no. 3508.

The speed to be observed by road users on this part of the local road is limited to 40 km/h by means of a II-30 traffic sign.

The maximum permitted speed of local passenger train no. 3508 for this section of the railway line is limited to 60 km/h in compliance with the timetable.

Road users approaching the level crossing from the direction of the town of Slatina have a very good view of the track.

The road freight vehicle was registered and insured against accidents with the insurance company Adriatic Slovenia, Insurance Policy Number 692227. According to the certificate of registration, the vehicle was owned by the company Evrograding d.o.o., with its head office at Mlakarjeva ulica 32, Šenčur.

The local road surface is coated with a layer of coarse asphalt/concrete. The carriageway was dry at the time of the accident.

There is light traffic at this level crossing. An average of 12 pairs of trains constitute rail traffic on a single working day.

2.5.1 Staff involved

The locomotive driver of local passenger train no. 3508 is an employee of Slovenske železnice d.o.o., Poslovna enota vleka, Sekcija za vleko Maribor.

The driver of the road freight vehicle was a retired person, 59 years old, a citizen of the Republic of Slovenia.

The driver of the road freight vehicle had been in service for 21 years and 2 months.

2.5.2 The trains and their composition, including the registration numbers of the items of rolling stock involved

Train no. 3508 consisted of two coupled diesel multiple units nos. 9579 8 813 110-9 and 9579 8 813 124-0, and carriages nos. 9579 8 814 110-8 and 9579 8 814 124-9. The weight of the two diesel multiple units was 155 tons, they had 16 axles and their total length was 88 m.

2.5.3 The description of the infrastructure and signalling system – track types, switches, interlocking, signals, train protection

There is no integrated signalling and safety equipment on the Celje – Velenje railway line. Rail traffic on this railway line runs on the basis of inter-station spacing, which means that rail traffic is managed on the basis of arrangements made between the station masters of two neighbouring railway stations. On the inter-station section, only one train, or no train at all, can be positioned at one and the same time.

The level crossing between the railway stations Šmartno ob Paki and Šoštanj, at km 24+267, is not equipped with any signalling and safety device or any equipment that would alert road users to the approaching train. This is an organised level crossing, fitted with road signs for the benefit of road users.

The local road crosses the railway line at a right angle at this level crossing.

2.5.4 Means of communication

Diesel multiple unit 813-110 with carriage 814-110 and diesel multiple unit 813-124 with carriage 814-124 are not equipped with any telecommunication devices.

There are no built-in signal boxes containing telephones at organised level crossings fitted with road signs on the entire Celje – Velenje railway line.

2.5.5 Works carried out at or in the vicinity of the site

At the time of the accident, there were no building works in progress at the site of the accident or in its vicinity.

2.5.6 Trigger of the railway emergency plan and its chain of events

A passing road user reported the accident to the Velenje police station. A police patrol was dispatched from the Velenje police station to the site of the accident; the police patrol inspected the site and documented the situation after the accident.

2.5.7 Trigger of the emergency plan of the public rescue services, the police and the medical services and its chain of events

After the communication on the part of the locomotive driver and the passing-by road user, the plan of emergency response measures was triggered. A general practitioner at the Velenje Health Centre arrived at the site of the accident and confirmed, at 13:40, the death of the driver involved in the accident.

The victim, trapped in the vehicle, was removed from the vehicle – after his death was confirmed – by firemen from the Velenje Volunteer Fire Department who had arrived at the site of the accident with three special fire engines.

The road freight vehicle trapped under the front rolling stock unit of diesel multiple unit no. 814-124 of train no. 3508 was removed by firemen from the Velenje Volunteer Fire Department. There were 13 firemen at the site of the accident.

2.6 Fatalities, injuries and material damage

The driver of the company road freight vehicle, a pensioner, 59 years old, a citizen of the Republic of Slovenia, died in the accident.

In the accident, the front of the rolling stock unit of the diesel multiple unit was damaged, as follows: air ducts, remote cable, coupling, bent sheet metal at the front of the carriage. Material damage according to a non-expert assessment amounted to EUR 2,000.

The road freight vehicle was totally wrecked in the accident. Material damage sustained by the wrecked road freight vehicle was EUR 2,000 according to a non-expert assessment.

2.7 External circumstances

Weather conditions at the time the accident occurred: Sunny, +5 °C, good visibility.

The local road carriageway was dry, enabling a good grip on the road surface.

3 RECORD OF INVESTIGATIONS AND INQUIRIES

On 13 February 2009 at 09:30, the Chief Investigator of the Ministry of Transport inspected the site of the accident.

Incident notification no. 1/2009 from Slovenske železnice d.o.o., Sekcija za vodenje prometa Maribor, Nadzorna postaja Velenje, dated 13 February 2009, was received.

On 30 March 2009, the Chief Investigator received – at the District State Prosecutor's Office of Celje, External Department in Velenje – a copy of accident report no. 2240-111/2009/1 (3A692-22), dated 16 February 2009, elaborated by police officers from the Velenje police station.

On 30 March 2009, the Chief Investigator of the Ministry of Transport carried out measurements of the visibility at the level crossing.

Investigation material was acquired from Slovenske železnice d.o.o., Sekcija za vodenje prometa Ljubljana (Ljubljana Traffic Management System), no. 3.3.5.-551/09 KR, dated 24 February 2009.

A Commission report on incident investigation no. 1/2009 from Slovenske železnice d.o.o., Sekcija za vodenje prometa Maribor (Maribor Traffic Management System), dated 19 March 2009, was received.

An analysis of the speedometer tape taken from DMG carriage 814-12, dated 8 April 2009, was also received.

3.1 Summary of testimonies

The locomotive driver of train no. 3508 did not indicate in his daily report on emergency no. 217, dated 13 February 2009, anything of substance that would shed light on any direct or possible indirect causes of the accident. He merely stated that during the journey of train no. 3508 there had been a collision with a passenger vehicle, a Volkswagen Caddy, registration number CE UK-229, and that the driver had not survived the accident. The locomotive driver stated in his report that his replacement had arrived at 14:30.

3.2 The safety management system

Road users are alerted to the level crossing at km 24+267 between the stations Šmarje ob Paki and Šoštanj by two road signs: a I-38 St Andrew's Cross and a no. II-2 stop sign, fixed one beneath the other on poles on the right-hand side of the road surface from both directions. From the direction of Slatina, from which the road freight vehicle involved in the accident was driving, the speed for road users is limited to a maximum 40 km/h by a II-30 road sign. Road signs are clearly visible at a sufficient distance. There are no obstacles obstructing the visibility of road signs.

In the section approaching the level crossing, the road is straight without any bends. Road users who concentrate and pay attention to safe driving can notice an approaching train in good time without any obstacles. This is particularly true of circumstances prevailing at the time of the accident, when the sun was shining onto the back of the road vehicle driver; this made the train even more noticeable, excluding the possibility of oversight had the driver closely looked at the railway line.

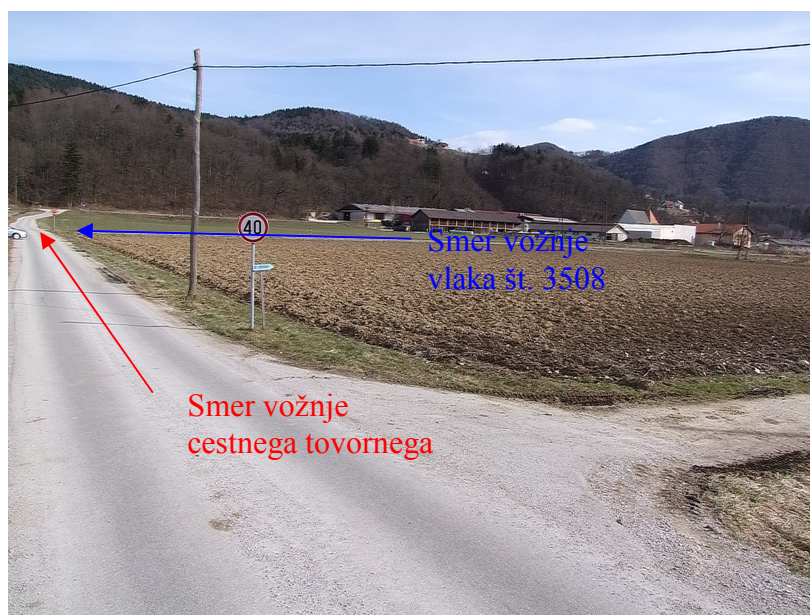


Figure no. 2: View of the travelling direction of the road vehicle and visibility of the level crossing

3.3 Rules and regulations

Crossings of roads and railways at unprotected level crossings are governed by Articles 51 and 52 of the Safety of Railway Transport Act (Uradni list RS [Official Gazette of the Republic of Slovenia], No. 61/2007), dated 10 July 2007, and Articles 50 and 51 of the Safety of Road Transport Act (Uradni list RS, No. 56/2008) dated 6 June 2008.

Crossings of roads and railways at level crossings are regulated in more detail in the Rules on railway level crossings published in Uradni list RS, No. 85/2008, dated 29 August 2008.

3.4 Functioning of rolling stock and technical installations

All diesel multiple units of Slovenske železnice d.o.o., Series 813, are fitted with Hasler speed recorders, recording speeds of up to 100 km/h. A recorder of this type also records the operation of individual features of braking and safety devices incorporated into the diesel multiple units.

The train speed recorded at the time of the collision was 59 km/h, which means that the locomotive driver activated the high-speed brake immediately before the train collided with the road freight vehicle. The train indeed travelled for at least another 100 m from the moment the brake was applied up to the moment the train stopped. Taking into consideration the locomotive driver's reaction time – approximately 1 second – and the time from activation until the start of the functioning of the brake – which in the case under consideration is from approximately 3.5 to 4 seconds – it can be established that the locomotive driver activated the high-speed brake no later than approximately 173.75 m before stopping after the collision, which amounts to approximately 36.75 m before colliding.

3.5 Documentation on the operating system

The unprotected level crossings between the stations Šmartno ob Paki and Šoštanj at km 24+267 are not equipped with an integrated operating system or any other safety system. Level crossings with heavier traffic along the entire Celje – Velenje railway line are, for the benefit of road users, protected with barriers, half barriers or road signal lights. Individual level crossings protected with barriers or half barriers are provided with four different devices:

- manually-controlled barrier operated by a railway employee at the level crossing proper;
- automatic barrier crossing locally monitored (station area);
- automatic crossing remotely monitored;
- automatic crossing provided with warning lights.

3.6 Man-machine-organisation interface

Locomotive drivers and drivers of road vehicles have no special integrated devices at their disposal to reduce speed and stop at the level crossing between the stations Šmarje ob Paki and Šoštanj at km 24+267. They operate their vehicles by pressing or releasing the accelerator and applying braking systems.

Diesel multiple units are fitted with a pneumatic braking system that takes 3.5 to 4 seconds to become effective.

The locomotive driver of train no. 3508 who was involved in the railway accident at the level crossing at km 24+267 between the stations Šmarje ob Paki and Šoštanj on 12 February 2009 at 13:24 had passed all the required qualifying examinations to operate the diesel multiple unit of the series 813; he was physically and mentally fit for driving, had had the statutory rest break between the two working shifts involved and had not exceeded the working hours in the shift.

The driver of the road freight vehicle killed in the accident was the holder of a statutory driving licence, category B, which complies with the regulations for the operation of the road vehicle of this type; the driver's length of service had been 21 years and 2 months.

3.7 Previous occurrences of a similar character

A similar accident happened at this level crossing on 28 September 2005 when train no. 52322, also travelling from the direction of Šmartno ob Paki towards the Šoštanj station, hit a road freight vehicle. Fortunately, there were no injuries or fatalities involved, only material damage and an 86-minute suspension of rail traffic.

4 ANALYSIS AND CONCLUSIONS

An analysis of the visibility at the level crossing was performed; the results obtained show that the visibility at the time of the accident at this level crossing was very good, both for the driver of the road freight vehicle and for the locomotive driver. The I-38 St Andrew's Cross sign and the II-2 stop sign, fixed one beneath the other on a pole at the right-hand side of the road surface from both directions of the level crossing, clearly indicated the crossing of the road with the railway.

Particularly incomprehensible is the conduct of the road vehicle driver, who drove onto the level crossing despite the stop sign, although he should have come to a complete stop in compliance with the Safety of Road Transport Act.

It is probable that the road vehicle driver misjudged the distance and speed of the train and of his own vehicle. This could be one of indirect causes of the driver not managing to drive off the dangerous level crossing area in good time. Such a misjudgement can be very deceptive in particular in cases when a road crosses a railway at a right angle, and when one of the vehicles involved is accelerating. In the case of this accident it was established that train no. 3508 had been accelerating the entire distance travelled, from the moment the road vehicle driver first caught sight of the train until the moment the high-speed brake was applied immediately preceding the collision. It can therefore be concluded that the driver of the road freight vehicle misjudged the distance the train should have covered from the moment the road vehicle driver had first caught sight of the train until the train had reached the level crossing, in particular on account of the acceleration of the train.

It is also a fact that the accident would not have happened had the driver of the road freight vehicle stopped at the stop sign. In this case the train would already have been at the level crossing at the moment the road freight vehicle had stopped before the traffic sign.

It is also probable that the driver of the road freight vehicle failed to notice the train because at that moment he was scanning the track to his right to see if it was clear. The figure below shows how well the train blends in with the surrounding buildings.



Figure no. 3: Train blending in with the surrounding buildings

4.1 Final account of the event chain

Taking into account the probability that road vehicle drivers may misjudge the distance a train travels from the moment it is noticed until the moment it reaches an unprotected level crossing – and this can be an accelerated run – the adoption of additional measures should be considered that would alert drivers to the distance they have to cover in order to leave the dangerous level crossing zone safely.

Since in many cases trains blend in extremely well with the surrounding buildings, drivers of road vehicles should be additionally alerted to the approaching crossing of the road with the railway line and, possibly, an approaching train, at an organised level crossing fitted with traffic signs. In this way, additional safety would be guaranteed at this level crossing.

4.2 Discussion

Motorists cannot be expected to be fully concentrating on traffic signs throughout the duration of their journey. Moreover, the reaction of drivers varies from individual to individual. There are a number of influencing factors: the driver's character, current state of health, weather, etc. We should also be aware that there is a series of distractions that drivers pay attention to, such as looking around, operating the car radio, using a mobile phone, and similar. Considering these potentially distracting factors, the safety provided by the current signage at unprotected level crossings is questionable.

4.3 Conclusions

It was established during the investigation that the direct cause of the collision between train no. 2508 and the road freight vehicle at the organised level crossing fitted with road signs between the stations Šmarje ob Paki and Šoštanj at km 24+267 was non-observance of the right of way of trains over road vehicles at unprotected level crossings.

The indirect cause of the accident could only have been misjudgement on the part of the road vehicle driver of the train speed approaching the level crossing and accelerating after pulling out of the Šmartno ob Paki station.

4.4 Additional observations

No special circumstances were established during the investigation that would shed more light on the causes of the accident.

4.5 Measures that have been taken

There is no record of any measures having been previously taken or taken as a result of the accident at this level crossing.

4.6 Recommendations

Given the possibility that road vehicle drivers may misjudge the speed of a train approaching a level crossing and accelerating in the process, we recommend:

- additional marking of the level crossing for the benefit of road users by means of I-37 road signs (approaching the level crossing of the road with a railway line without barriers or half-barriers);
- installation of road humps immediately preceding the level crossing, signalling to drivers that they must proceed with caution.

5 REFERENCES

Safety of Railway Transport Act, Uradni list RS, No. 61 of 10 July 2007

Traffic Rules, Uradni list RS, No. 123 of 28 December 2007

Signalling Rules, Uradni list RS, No. 123 of 28 December 2007

Rules on brakes, safety devices, special devices and equipment of railway vehicles, Uradni list RS, No. 122 of 28 December 2007

Rules on railway level crossings, Uradni list RS, No. 85/2008 of 29 August 2008

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Accidents and Incidents