DUTCH
SAFETY BOARD

Summary

Railway accident in Voorschoten

Railway accident in Voorschoten

The Hague, May 2024

The Dutch Safety Board's reports are public and available at www.safetyboard.nl.

Cover photograph: Aerial photo of the accident (source: Josh Walet Fotografie).

The Dutch Safety Board

When accidents or disasters happen, the Dutch Safety Board investigates how it was possible for these to occur, with the aim of learning lessons for the future and, ultimately, improving safety in the Netherlands. The Safety Board is independent and is free to decide which incidents to investigate. In particular, it focuses on situations in which people's personal safety is dependent on third parties, such as the government or companies. In certain cases, the Board is under an obligation to carry out an investigation. Its investigations do not address issues of blame or liability.

Dutch Safety Board
Chair: C.J.L. van Dam
E.A. Bakkum
Secretary Director: C.A.J.F. Verheij

Visiting address: Lange Voorhout 9, 2514 EA The Hague, The Netherlands
Postal address: PO Box 95404, 2509 CK The Hague, The Netherlands

Telephone: +31 (0)70 333 7000

Website: safetyboard.nl
Email: info@safetyboard.nl

N.B.: This report has been published in the Dutch and English language. If there are differences in interpretation the Dutch report prevails.

CONTENTS

Summary **5**

Consideration **10**

Recommendations **14**

SUMMARY

During the early hours of 4 April 2023 at 3.23 a.m., a freight train collided with a road-rail excavator near Voorschoten railway station. At the time of the collision, the excavator was located on an in-service track on which the freight train was running. The operator of the excavator did not survive the collision. The driver of the freight train was injured and the locomotive was severely damaged.

Due to the collision with the freight train, parts of the excavator and debris from the platform ended up on the adjacent track, which was also in service. An intercity collided with the debris, derailed and broke into two sections, one of which ended up in a nearby field. Of the 39 passengers, 2 train conductors and the driver, 28 passengers, a conductor and the driver were injured, some of them seriously.

The accident in Voorschoten took place during scheduled maintenance work. The work crew had to replace a rail between the Vinkbrug bridge and De Vink station, which required a road-rail welding vehicle and a road-rail excavator. The work was performed on a four-track section. Two tracks were temporarily taken possession of to reach and leave the worksite.

Investigation questions and approach

The questions that are central in this investigation are:

1. At the Voorschoten accident, how could the excavator leave the worksite and encroach on an in-service track and then collide with the freight train and subsequently the passenger train?
2. How are occupational and railway safety taken into account in the planning and execution of track works while rail traffic continues? How is this monitored by the responsible rail parties and inspectorates?

To answer these questions, the Dutch Safety Board has identified the course of events. The accident and the system of the parties involved were analysed using, among other things, information from the accident location, interviews and documents of the parties concerned. In addition, group discussions were held and a large number of similar accidents and near misses were analysed.

Answering the first investigation question: the cause of the accident
The Dutch Safety Board has been unable to determine the direct cause of the accident. On the basis of accident analysis, however, the Board has identified the factors that contributed or may have contributed to the occurrence of this railway accident and similar accidents and near misses. These are:

- trains running alongside works;
- shielding the worksite and knowability;
- communication and escorting work vehicles.

Trains running alongside works
An important accident-contributing factor was that trains were running alongside the works. Since the 1990s, following several major accidents, it has not been customary to carry out maintenance work while trains are running through the worksite. And since 2021, after several incidents, ProRail (infrastructure manager) has been stipulating that a double track section must be completely in possession when maintenance is carried out. However on a four-track section, trains may continue to run during maintenance (on two of the four tracks). The risks from and for train traffic along works on four-track sections seems to have been an insufficiently addressed aspect in the transition to taking full possession in the case of double track sections. This also applies to the worksite in Voorschoten where trains continued to run on two tracks while the work took place on the other two tracks. The work was therefore performed in a high-risk environment.

Railway infrastructure managers, railway companies and maintenance contractors do not analyse the risks caused by trains running alongside track maintenance works comprehensively, coherently and jointly. As a result, there is no complete picture of the risks involved in track maintenance work. For instance, ProRail and contractors consider the running of trains along works mainly as a risk for workers (occupational safety). To manage those risks, they collaborate in railAlert, a foundation that focuses on the occupational safety of rail workers. Railway companies also exclude the risks of works from the scope of their risk analyses by assuming that they have a safe route along works. Although the Board's analysis shows that accidents and near misses of trains colliding or almost colliding with equipment occurred more frequently, the industry as a whole has not drawn lessons or taken measures in this regard.

Shielding the worksite and knowability
Another important factor in the accident was the way in which the works were set up. In Voorschoten, the maintenance contractor opted for logistical reasons for a road-rail access point with workers having to cross in-service tracks to get to their worksite. This resulted (certainly in a material sense) in a so-called 'island possession'. These island possessions are high-risk for the rail workers involved and are allowed only if they comply with strict industry guidelines. According to the Board, the road-rail access point at Voorschoten did not comply with these industry guidelines. Since 2012, ProRail had been receiving indications that certain road-rail access points were dangerous. As a consequence, ProRail has been imposing requirements for new road-rail access points since 2016, but not, however, for those existing at that time, which meant that risks remained with regard to existing access points.

An analysis from ProRail *after* the accident shows that the road-rail access point in Voorschoten is one of the most dangerous in the Netherlands. At the time of the accident, for example, workers were dependent on temporary short time periods when tracks were in possession to reach and leave their worksites. Moreover, it was not visible on site to those working whether or not tracks were in possession. ProRail and maintenance contractors currently use practically no tools that allow those carrying out maintenance work on or near the track to determine for themselves or to actually see if tracks are in possession. Various tools - such as mobile workshops and handheld terminals - have been developed but are not being applied or not being applied nationwide.

Communication and escorting work vehicles

The analysed accidents and near misses show that miscommunication leads more often to accidents and near misses during railway works. Safety when crossing in-service tracks depends on error-prone verbal communication that takes place over multiple links, so miscommunication or misinterpretation can have major consequences. To achieve verbal communication discipline, it is essential that there are agreements on how to communicate and that workers are trained accordingly. Safety communication between safety officers and track workers is not recorded at present, which hinders learning from accidents and near misses.

The accident in Voorschoten and other accidents and near misses reveal that measures are being taken to prevent trains from entering a worksite. These measures target railway traffic controllers and rail traffic. They are not visible to track workers at a specific work location. For track workers, there is no robust (physical) barrier to prevent them from inadvertently venturing outside their worksite, which creates the risk of workers and their (heavy) equipment coming into contact with passing trains.

Night work and excessive shifts as risk-increasing factors

The activities of the excavator operator, worksite safety manager and local safety manager were carried out at night during a period when, according to scientific research, people are least alert. The risk of mistakes and miscommunication increases as people become less alert. No indications of fatigue were found in the case of the excavator operator based on the work schedule. However indications were found in the case of the worksite safety manager and local safety manager, as both had worked significantly more hours than is permissible based on the standards in the Dutch Working Hours Act. Records of the worksite safety manager's safety communication did not show that fatigue played a role in communication. Communications between the local safety manager and the excavator operator were not recorded.

Scheduled track maintenance work is mainly carried out at night. ProRail and railway contractors - including their collaboration within railAlert - pay little attention to the impact of this night work on the safety of their employees. In this respect, they fail to comply with applicable legislation and regulations.

The industry is currently exploring how to move maintenance work from night to day.

Answering the second investigation question: insufficient focus on rail safety
Within the Dutch railway industry, there is a strong focus on safety at all levels and organisations. No one wants people to get injured or to be killed. An accident like the one in Voorschoten touches all those involved deeply and motivates them even more to prioritise safety.

Nevertheless, the Dutch State Secretary for Infrastructure and Water Management is pressing the track maintenance industry - via ProRail - to ensure in particular the availability of rail infrastructure. Although generally speaking, there is a great deal of focus on safety, certification and safety requirements at organisational and employee level, there is no guidance or substance provided by the ministry on how this safety should actually be implemented in specific situations. For instance, how safety can be improved based on broad, industry-wide risk analyses or how safety innovation can be implemented (also in a financial sense).

ProRail is primarily responsible for ensuring that safe rail transport is possible, that people working on the tracks have a safe working environment and that people can live safely alongside the tracks. ProRail passes on much of that responsibility to other parties: industry party railAlert and maintenance contractors. In doing so, ProRail does not take the lead and informs subcontractors and railway companies about specific risks only to a limited extent.

The focus on safety in recent years has mainly been on occupational safety and not on railway safety. The industry does not fully exploit opportunities to learn from accidents or near misses. The lack of uniform registration and a shared database play a role in this respect. The industry's ability to jointly learn from incidents and build a shared picture of the actual risks is limited by the changing quality and depth of analyses and sporadic sharing of findings and recommendations with non-involved parties. As a result, involved parties, for instance, do not learn collectively from accidents and near misses and do not properly embed lessons and recommendations. In addition, safety innovations are not being applied nationwide, partly due to lack of clarity on ownership and funding.

Work safety and railway safety also lack connection at oversight level. The Netherlands Labour Authority (NLA) and the Human Environment and Transport Inspectorate (ILT), for example, each weigh up how they divide their staff between different industries due to limited capacity. Given the low number of casualties in the case of accidents, track maintenance accidents have low priority in their supervision. A further constraint lies in the Labour Authority's ability to call ProRail to account for its role as principal in the

event of accidents: the Labour Authority cannot order ProRail to cease operations, but it can call ProRail to account for its responsibility as principal.

Recap

The Board has not been able to establish what exactly caused the excavator to end up on an in-service track. However, the Board identified factors that may have contributed to the occurrence of the accident: trains were running alongside works and worksites were shielded from moving trains not robustly, but via verbal communication.

ProRail delegated much of its responsibility for trains being able to run safely on the tracks, for people to work safely on the tracks and to live safely alongside the tracks to railAlert and maintenance contractors, without actually taking the lead itself. The Ministry of Infrastructure and Water Management steers ProRail mainly towards availability and safe rideability, not towards the safety of works and the safe running of trains alongside works.

Work planning and execution focus on occupational safety, not on the risks of works from passing trains (railway safety).

The risk of people working excessive hours and nights has not yet been recognised in industry regulations.

CONSIDERATION

The Dutch rail network is the most intensively used rail network in Europe. ProRail has revealed in its 2022-2023 management plan that it is preparing for a 35 percent growth in track and station works over the next three years. In doing so, the ambition is to keep the track available for running trains as much as possible. This ambition is at odds with the safety of works, as the analysis of the Voorschoten accident makes clear.

The Dutch railway network is known as one of the safest in Europe and it provides one of the safest forms of transport in the Netherlands. In a European context, few fatal or serious train accidents occur in the Netherlands. The Voorschoten train accident and the accidents and near misses that were analysed show that such a sense of safety is fragile and continued focus on this matter is necessary.

This investigation into the Voorschoten collision provides an insight into how parties are steered towards availability in relation to safety and how both the Ministry of Infrastructure and Water Management and ProRail convey safety in the chain. In addition, this investigation raises awareness that working on the track is not only an occupational safety issue, but is also relevant to railway safety. In other words, the safety of track workers, passengers and train crew is an issue when maintenance work is taking place while trains are passing by.

The Dutch Safety Board has previously investigated accidents in the rail sector and has been able to contribute to paradigm shifts within the rail industry. Also following the Voorschoten accident, the Board recognises that a change in thinking is needed in key areas to address the issues raised in the investigation. Parties in the rail industry itself also indicate that a paradigm shift is needed in key areas.

Targeting safety in addition to availability

In the Dutch context, ensuring rail transport is largely a public task. The maintenance of the rail network is delegated by the State Secretary of Infrastructure and Water Management to private parties, in particular ProRail, on the basis of public funds. In doing so, the State Secretary has multiple interests to serve as a public principal and is accountable for them to the Dutch House of Representatives. In addition to availability, these include the quality and safety of the rail network. The safety of those working on the track during maintenance activities is also one of these public interests.

In practice, when it comes to track maintenance, the State Secretary primarily presses the parties to ensure availability: avoiding as much as possible the disruption of regular train services due to works. For example, when carrying out works, the State Secretary asks ProRail as a policy priority to continue to strive for cost reduction and reduction of nuisance per unit of work for passenger and freight transport. Labelling the execution of the maintenance assignment as a nuisance and not linking it to the safety interest

implies that safety may become subordinate to track availability. A certain degree of disruption is inevitable if a safe and reliable rail network is to be maintained for society as a whole. However, the State Secretary delegates responsibility to ProRail without actively monitoring how the various other public interests are weighed against each other.

Examples of priorities that the State Secretary could explicitly identify (require) in the transfer of responsibility to ProRail are the chain-wide collection, analysis and use of safety information (including that of the railway companies), working on the basis of an integral risk analysis, the introduction of plan-do-check-act cycles on high-risk work in particular and the removal of obstacles to encourage and make broad use of safety innovations.

Greater focus on railway safety

In recent years, there has been considerable investment in occupational safety on the railways. The key factor in this is railAlert, the foundation that brings together ProRail and rail contractors and subcontractors.

RailAlert is undeniably an invaluable body where much has been achieved in recent years with regard to the occupational safety of workers on the railways. However, this is limited to occupational safety regulations, and also to a limited range of risks (collision and electrocution hazards). Risks of night work and risks of working with heavy equipment for rail traffic are beyond the scope of railAlert.

Moreover, railAlert as a platform is focused on reaching consensus on how the work should be done. In practice, consensus does not mean opting for the safest solution. Ultimately, the safety implications of all the trade-offs and choices made or not made end up with a small group of safety officers and track workers.

Safety on and along the Dutch rail network could progress to the next stage of development by merging occupational safety and railway safety more closely, by having all parties work together on this issue based on an integrated and shared risk analysis. Occupational safety and railway safety cannot be viewed in isolation, especially in maintenance work on four-track sections.

From risk analysis to a comprehensive learning cycle

As manager of the infrastructure and as principal for maintenance contractors, ProRail is primarily responsible by law for implementing safety on the tracks and safety during works, both for those working on the tracks and train occupants, as well as residents living near the tracks. This investigation shows that ProRail is fulfilling this responsibility to a limited extent. For example, it is remarkable that ProRail places this responsibility almost entirely on railAlert.

When it comes to ProRail's responsibility as principal, the Board observes that ProRail largely transfers the management of work safety one-to-one to maintenance contractors without actually retaining control over safety or adding information of its own. For example, ProRail decides which sections of track to take into possession, but in the

actual preparation and operation, they do not inform maintenance contractors about specific risks, for example concerning road-rail access points.

At a more systemic level, ProRail needs to take the initiative to learn (comprehensively) from accidents and near misses. By 'comprehensively', the Board means both in breadth (occupational safety as well as railway safety) and in depth (from ProRail to maintenance contractors, subcontractors and other relevant parties such as railway companies).

This starts by collecting data on a broad basis from safety incidents and near misses and analysing it, and then producing risk analyses based on those data. European legislation already requires this, which creates a basis to work programmatically on the most dangerous situations or events. By harnessing professionalism alongside standardisation in the process, by deploying plan-do-check-act cycles and by triggering innovation, a new step in broad railway safety really can be taken.

Safe worksite important for track workers and people in trains
The Board's investigation revealed that there is currently no robust (physical) shielding for workers to prevent them (and their equipment) from inadvertently leaving the worksite and coming into contact with passing trains. On four-track sections, the current practice is to run trains past sites where people are working on the track. To manage worker safety, the rail industry relies heavily on communication (across multiple links).

Communication is a soft barrier to separating workers and their equipment from passing trains. Especially if they have to cross in-service tracks to reach the worksite, such as in the case of island possessions, this creates unnecessary additional risks. These are risks not only to those working on the track, but also (especially when heavy equipment is used) to the occupants of passing trains and those living near the track.

Protection against working excessively and at night
Regular track maintenance work currently focuses on night work. As things are organised at present, the maximum availability of tracks for the public mainly impacts on the health and safety of a small group of night workers. Maintenance work at night is only possible in a responsible manner if the working and rest times of all those involved comply - as an absolute minimum - with the Dutch Working Hours Act and if the principles of healthy scheduling are applied. From the perspective of both the individual employee and the organisations involved, there are factors that are more likely to lead to more and longer night work, rather than any consideration of protecting the welfare of individual rail workers. Self-employed workers are particularly vulnerable in this respect, as they are excluded from the regulations of the Working Hours Act and it is difficult to get a shared overview of their working hours. They often occupy safety positions but there is no insight into their working and rest times because the Working Hours Act does not apply to them.

Given labour market issues, the industry's ambition is to move maintenance work from night to day. This move creates new and different risks, also in view of growing maintenance needs. Not only will daytime trains run more frequently alongside works, there is also a risk that daytime safety will be compromised at the expense of

maintaining track availability. In this context, it is important to stress the need for and understanding of inconvenience caused by maintenance activities on the rail network, whether night or day. Not only for society to maintain a safe and reliable rail network, but also for rail workers to create a safe and healthy working environment.

RECOMMENDATIONS

The Dutch Safety Board has identified structural deficiencies in the management of risks during works on the track. The Board sees opportunities for the parties involved to take joint measures to eliminate these deficiencies in order to contribute to a safe working environment, the safe travel of rail users and a safe living environment near the tracks.

To this end, the Board is making the following recommendations[1]:

To the State Secretary for Infrastructure and Water Management

1. Ensure that in the commissioning of ProRail as infrastructure manager, values other than availability of the network and track integrity, such as safe working and the safe passing of trains at worksites, are embedded. In addition, remove the barriers for ProRail to develop and implement innovations in the industry with regard to safe working on the railways, on the one hand, and on the other, to create a facility for recording, analysing and sharing information on accidents and near misses (see recommendation 2).

To ProRail

2. Set up a facility where information on rail accidents and near misses is recorded and put to use. Require all rail stakeholders, including railway companies, to submit their incidents. Target in this facility the broad safety domain, i.e. including occupational safety and railway safety. Ensure that all relevant parties jointly learn from accidents and near misses and share lessons with each other.

3. Use the facility to be established (see recommendation 2) to improve safety based on risk analysis. Maintain control over the safety of works and rail traffic in all phases of maintenance work, from strategy and innovation to implementation. In particular use industry professionalism in addition to imposing rules to make situational trade-offs.

1 In accordance with the Dutch Safety Board's Order (*Besluit Onderzoeksraad voor Veiligheid*) all recommendations are also addressed to the Human Environment and Transport Inspectorate (ILT). ILT will assess the implementation of these recommendations by the relevant organisations and report back to the Board.

4. Promote the safety of railway workers. If you cannot take all tracks into possession, at least ensure the following:
   a. a robust (physical) worksite shielding.
   b. a work location that is safely accessible. Stop using island possessions and temporary crossing periods to worksites and road-rail access points.
   c. a facility so that track workers can see on site whether or not tracks are in possession. To this end, introduce tools complementary to verbal communication.
   d. record verbal safety communication to promote learning from accidents or near misses.

5. Reduce the negative health and safety consequences of night work and excessive working without increasing safety risks. Ensure that railAlert and maintenance contractors take measures to reduce the risks of night work. In doing so, ensure that when working on the track, the working hours of self-employed workers as a minimum comply with the Working Hours Act.

DUTCH
SAFETY BOARD

The Dutch Safety Board

When accidents or disasters happen, the Dutch Safety Board investigates how it was possible for these to occur, with the aim of learning lessons for the future and, ultimately, improving safety in the Netherlands. The Safety Board is independent and is free to decide which incidents to investigate. In particular, it focuses on situations in which people's personal safety is dependent on third parties, such as the government or companies. In certain cases, the Board is under an obligation to carry out an investigation. Its investigations do not address issues of blame or liability.

Dutch Safety Board

Chair: C.J.L. van Dam
E.A. Bakkum
Secretary Director: C.A.J.F. Verheij

Visiting address

Lange Voorhout 9
2514 EA The Hague
The Netherlands

Postal address

PO Box 95404
2509 CK The Hague
The Netherlands

Telephone

+31 (0)70 333 7000

Website

safetyboard.nl

Email

info@safetyboard.nl