



ANNUAL REPORT 2011
Dutch Safety Board
The Netherlands

THE DUTCH SAFETY BOARD

The Dutch Safety Board was established to investigate and determine the causes or probable causes of individual incidents or categories of incidents in all sectors. The sole purpose of a Dutch Safety Board investigation is to prevent future accidents or incidents and, if outcomes give cause to do so, issue associated recommendations. The organisation consists of a board with five permanent members, a professional Bureau manned by investigators and support staff and a number of permanent committees. Guidance committees are set up to oversee specific investigations.

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CONTENT

1	Introduction to the investigation body	4
1.1	Legal Basis (or Legal framework)	4
1.2	Role (description of the mandate) and Aim (and Mission)	4
1.3	Organisation.....	5
1.4	Organisational flow	6
2	Investigation processes	7
2.1	Cases to be investigated	7
2.2	Institutions involved in investigations.....	7
2.3	Investigation process or approach of the ib	8
3	Investigations	9
3.1	Overview of investigations completed, identifying key trends.....	9
3.2	Investigations completed and commenced in 2009.....	9
3.3	Research studies (or safety studies) commissioned and completed in 2009.....	9
3.4	Summaries of investigations completed in 2009.....	9
3.5	Comment and introduction or background to the investigations	10
3.6	Accidents and incidents investigated during last five years (in 2005–2009).....	11
4	Recommendations	12
4.1	Short review and presentation of recommendations	12
4.2	Recommendations 2010.....	12

1 INTRODUCTION TO THE INVESTIGATION BODY

1.1 Legal Basis

The Dutch Safety Board Act came into force on 1 February 2005, with the board officially being invested on 7 February of that year by the Minister of the Interior and Kingdom Relations.

The Board has specific and extensive competencies when it comes to the performance of its investigations, which competencies mean that it can compile and protect a lot of information that in some cases is unique. The Safety Investigation Board Act sets out safeguards for the protection of this information. Note that this information will not be passed on to third parties.

The competencies of the Dutch Safety Board's investigators are regulated in the Kingdom Act. The essence of the Act is that investigators must be given the greatest possible opportunity to acquire the relevant information. They are allowed to enter buildings in order to gather information, which may include radar images, tape recordings, documents and witness statements, and may take items with them for further investigation. In addition, the investigators can stipulate that wreckage left after an accident should not be removed from the scene straight away, and that during the initial phase of an investigation the accident site should as far as possible be left in its original state. Naturally, the victims' needs and the provision of aid will take precedence at all times, as do efforts to limit the damage done to equipment and the harm done to the environment. This is why the Board always works closely together with the emergency services, the police and the judicial authorities. Where possible, the Board's investigators will utilize information on an incident that has been compiled by the police and the judicial authorities. In contrast, the Dutch Safety Board's investigators do not give any information to the police or the judicial authorities.

In by no means all cases do the Dutch Safety Board's investigators go straight to the site of an incident. The various bodies involved will look at the facts based on their own remits. In this case, the Board may decide to refrain from launching an investigation until a later date, in which case it can then make use of the results of technical and other investigations already carried out by other parties. The Board will only follow this course of action if it is likely that its (later) investigation into the underlying causes will have added value.

1.2 Role and Aim

The Dutch Safety Board consists of a Board with five permanent members. Special guidance committees are set up for the purpose of conducting specific investigations. The Dutch Safety Board is supported by a bureau consisting of in total 35 investigators and 35 support staff.¹ The Safety Board conducts independent investigations into the causes of incidents. Its investigations look for any systematic safety-related shortcomings and it issues appropriate reports to the parties involved and to the general public. Accordingly, investigations constitute our primary process, with the product being a report in all cases. The key goal of this investigation is to establish the truth rather than to apportion blame.

The purpose of the Dutch Safety Board's work is to 'prevent incidents or to limit their after-effects'. Accordingly, the Board's investigation aims not only to uncover the actual causes of incidents but also – and in particular – to bring to light the underlying causes of the incident, so that any shortcomings in the applied system can be revealed. If the investigation reveals any systematic safety-related shortcomings then the Board can formulate recommendations so that these shortcomings can be put right. Any recommendations are usually addressed to the authorities but others may be intended for individuals, organizations or companies.

The Board would like to emphasize that it is no part of its remit to try to establish the blame, responsibility or liability attaching to any party. Information gathered during the course of an investigation – including statements provided by the Board, information that the Board has

¹ For the Rail-sector: 4 investigators including management.

compiled, results of technical research and analyses and drafted documents (including the published report) – cannot be used as evidence in criminal, disciplinary or civil law proceedings. However, it is still possible that a (criminal) inquiry to apportion blame could be instituted, although any such inquiry would be quite separate from the Board's own investigation.

1.3 Organisation

The primary goal of the Board's work is to prevent future incidents and to limit the after-effects of the ones that do occur. The Board's investigation uncovers both the actual causes of incidents and the underlying causes, an approach intended to reveal any shortcomings in the system(s) being used. If systematic safety shortfalls are uncovered then the Board may publish recommendations to put right these shortcomings.

Note that for less serious incidents, there may be official bodies other than the Board – such as inspectorates and judicial authorities – who are carrying out their own investigation on the basis of their statutory remit. Such investigations are quite separate from any investigation the Board may be carrying out.

The Board's investigative competence does not cover public order disturbances, law enforcement by competent authorities or the conduct of the armed forces in armed conflicts or during operations to enforce international law (peace missions). Note, however, that this does not prevent the investigation by the Board of incidents that occur during armed conflicts or during peace missions but do not appear to have been caused by an act of war.

The investigation process itself can be broken down into a number of phases: after an incident, the first stage is always to set in motion an exploratory investigation – which will take no longer than a few months – in order to establish whether there is a systematic safety shortcoming worthy of a full investigation by the Board. Note too that the occurrence of a series of incidents may be reason enough to launch an investigation. In the next phase, a plan of action is drawn up. The investigation itself will result in a (draft) final report that after verification will be approved and published.

Verification procedure

The Dutch Safety Board has instituted a procedure during which the involved parties get the opportunity to give a reaction on the facts in the report. The aim of this procedure is to keep errors to a minimum and to give stakeholders the chance to make use of their right to hear and be heard. Under this procedure, copies of the draft report – which at this stage does not yet have its guiding foreword or recommendations – are given to the stakeholders with a request to submit any comments within four weeks. Any stakeholders located abroad – for instance in connection with an aviation incident – will be given 60 days for this. If the Board agrees with the comments then it will incorporate them into the definitive version of the report. If the Board feels that a comment does not necessitate changes to the report then this will be stated in the definitive report, usually in an appendix to the report that also contains the justification for the investigation.

Once the report has been published and sent to those who are the subject of its recommendations, these stakeholders will be given a maximum of six months (in the case of government institutions) or twelve months (in the case of private individuals) to respond. The response has to be sent to the minister responsible for the relevant operational sector. A copy of this response must be sent simultaneously to the chairman of the Dutch Safety Board and to the Minister of the Interior and Kingdom Relations (the Home Office). In this way, the appropriate ministry can monitor the follow-up action taken in the light of the recommendations. In contrast to its predecessor (the Transport Safety Board), the Dutch Safety Board now has the legal authority itself to check up on the actual action taken in the light of its recommendations.

Assessment framework

The Board has its own assessment framework alongside the existing legislation, regulations and specific standards for the branch of industry in question. Amongst other things, this framework sets out the way in which – in the Board's opinion – the parties involved should have acted in accordance with their own responsibilities in connection with an incident. The Board's framework is

based on widely accepted and implemented standards and norms, as well as on national and international legislation and regulations.

The Kingdom Act recognizes a number of operational sectors where international obligations mean that in all cases the Board has to carry out an independent investigation. This applies in particular to the aviation industry, but is also true for rail transport and accidents involving the release of hazardous substances. As for the other investigation-sectors, the Board decides for itself which individual or series of incidents should be investigated, based on its own social responsibilities.

At the Safety Board, our current operational sectors are Aviation, Inland shipping, Maritime Transport, Railways, Road traffic, Defense, Health, Industry, pipelines and networks, Construction and service, Water and Crisis management.

The over all budget of the Safety Board in 2011 was € 11,6 mln.

2 INVESTIGATION PROCESSES

2.1 Cases to be investigated

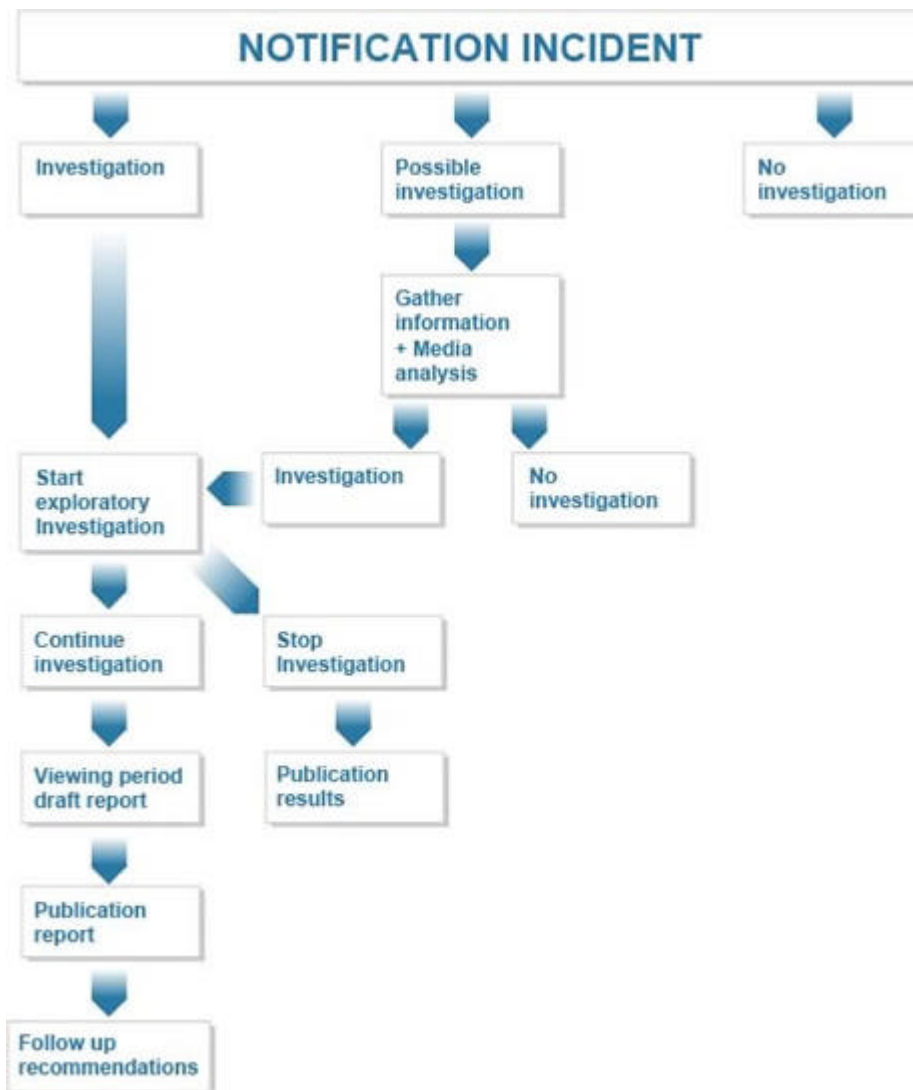
Cases to be investigated are accidents where the safety of passengers and staff members, level crossing safety, safety of infrastructure, safety of the rolling stock, safety of protective systems and external safety (the risk for neighbors in case of accidents with dangerous goods or serious derailments) is involved.

Mandatory are the 'serious accidents': collision or derailment of trains, at which at least one person dies or five or more persons get seriously injured or the damage can be instantly by the investigating organization valued at least at the amount of € 2 million.

2.2 Institutions involved in investigations

Investigations into direct causes of incidents are mainly performed by the involved parties and the National Safety Authority. The Safety Board itself is focused on the safety management systems that are implemented and used by the involved parties. Not the question 'How did the accident happen (technically)' but "why did it happen". Important focus is whether the involved parties have learned from former cases.

2.3 Investigation process or approach of the IB



3 INVESTIGATIONS

3.1 Overview of investigations completed in 2011, identifying key trends

(summary in list or table, grouped by type of accident, identifying key trends in terms of investigations done).

Type of accidents investigated in 2011	Number of accidents	Number of victims		Damages in € (approximation)	Trends in relation to previous years
		Deaths	Ser. Injur		
Collisions	2	1	1	50.000.000	None
Derailments					

3.2 Investigations completed and commenced in 2011

Date of occurrence	Title of the investigation (Occurrence type, location)	Legal basis	Completed (date)
25 September 2009	Train collision Barendrecht	i	18 January 2011
25 July 2010	Train collision with an obstacle at Stavoren	i	13 September 2011

Basis for investigation: i = According to the Safety Directive, ii = On national legal basis (covering possible areas excluded in Article 2, §2 of the Safety Directive), iii = Voluntary – other criteria (National rules/regulations not referred to the Safety Directive).

3.3 Research studies (or Safety Studies) commissioned and completed in 2011

NA

3.4 Summaries of investigations completed in 2011

Train collision Barendrecht (24 September 2009)

Two goods trains collided head-on at Barendrecht on 24 September 2009. The collision occurred because one of the trains involved had passed a signal set at danger without authorisation. This indicates that a critical railway traffic safety measure had failed, since signals constitute the backbone of the railway safety system. The two trains that collided at Barendrecht¹ on 24 September 2009 were a mixed goods train and a container train. The mixed goods train² was on the go from Onnen (in the Province of Groningen) to Kijfhoek (a shunting yard between Barendrecht and Zwijndrecht). The container train was on the go from the Maasvlakte (Rotterdam) to Warsaw. The mixed cargo train passed a signal set at danger at Barendrecht. At that moment the container train was approaching from the opposite direction on the same track. The trains collided head-on under the A15 motorway viaduct. Shortly afterwards an international passenger train approaching Barendrecht on another track collided at low speed with a wagon from the mixed goods train which had come to rest on the international passenger train's track following the collision. An express train travelling in the direction of Barendrecht stopped near the scene of the accident to offer assistance.

The collision resulted in the death of the driver of the mixed goods train. The driver of the container train was severely injured. Both the trains involved and the railway infrastructure were severely damaged. The A15 motorway viaduct was also damaged. The hazardous materials carried in the wagons of both trains were not released in the collision. Road traffic was closed for several hours after the collision, and no railway traffic was possible between Kijfhoek and the Port of Rotterdam for four days.

The reason why the train passed a signal set at danger cannot be established with complete certainty. However, on the basis of its investigation the Dutch Safety Board finds it plausible that the train driver had become unwell. There are several indications that this was the case. Firstly, during its journey the train had been stopped twice by an intervention of the dead man's system, a system that applies the brake should the train driver fail to respond to warning signals. An intervention of this nature twice during a train's journey is highly unusual and may suggest that the driver had become unwell. Secondly, the train driver applied the brakes only two to three seconds before the collision whilst the train had passed a highly visible signal set at danger shortly before the collision and had passed over points that were not set to the correct position for the train. Train drivers then usually respond by applying the brakes. In this instance there are no indications that the driver of the mixed goods train responded to the situation. In conclusion, the autopsy revealed that the train driver suffered from an hereditary heart disorder that can result in sudden death and can be associated with cardiac arrhythmia, dizziness and/or fainting. Complaints of this nature could explain both the two interventions of the dead man's system and the SPAD.

Since SPADs can have extremely serious consequences the Dutch Safety Board is of the opinion that all reasonable measures must be implemented to reduce the number of SPADs and limit the consequences of those SPADs that nevertheless occur. This implies that the maximum possible use must be made of the available measures.

The Board has investigated the measures that could have contributed to the SPAD issue at Barendrecht. These measures are classified into three categories:

- a. **Reduction of the number of signals set at danger** The primary issue of importance to the control of the SPAD issue is the minimisation of situations in which a train driver is confronted with a signal set at danger during the journey.
- b. **Prevention of signals passed at danger.** When a driver is nevertheless confronted with a signal set at danger during a journey then measures are conceivable which could prevent the train passing the signal set at danger.
- c. **Preventing a collision after passing a signal set at danger.** A number of options are available to prevent a collision after a train has passed a signal set at danger, namely measures intended to prevent the relevant train reaching the danger point and measures intended to warn other trains in time. In the first instance these measures are intended to prevent a collision, but they can also make a contribution to the limitation of the consequences.

So this investigation focused on the question as to how the relevant parties control the risk of a collision caused by a SPAD and the measures that can be implemented to improve the control of the SPAD issue.

Conclusions of the investigation:

- The train collision occurred because the mixed goods train passed a signal set at danger without authorisation. It is plausible that this occurred because the driver of the mixed goods train became unwell.
- The schedules were designed in a manner such that the mixed goods train and the container train would need to travel over the same section of track at the same time.
- Various options available for the control of the SPAD issue were not utilised in the case of the Barendrecht collision or were utilised to an inadequate extent.
- The collision at Barendrecht occurred in circumstances that are also encountered at other locations in the Dutch railway network. Options available to control of the SPAD issue are not utilised or are utilised to an inadequate extent.
- The approach to the SPAD issue in the past decades has not resulted in the adequate control of safety risks with suitable measures.
- The railway companies do not fulfil their responsibility to control the SPAD issue to an adequate extent.
- The Minister of Infrastructure and the Environment does not fulfil the Minister's responsibility to control the SPAD issue to an adequate extent.

Train collision with an obstacle at Stavoren (25 July 2010)

On Sunday evening, 25 July 2010 at approximately 11.30 pm a rail grinding train travelling at high speed ploughed through a buffer stop located at the end of the railway track at Stavoren Station. The train then crashed into a parked tanker and drove straight through a shop. The train was en route to Stavoren because it was scheduled to grind the rails of the track section located between Sneek and Stavoren later that night. The accident occurred while the rail grinding train was transferred to Stavoren Station. This was considered a regular train run and the track was in

service. The intention was to take the track section out of service after the train had arrived and to subsequently commence the rail grinding activities.

The accident occurred because the rail grinding train braked too late when approaching the end of the line, because the train driver failed to obey a signal (in the form of an approach marker or *keperbaken*) and the automatic train protection system (ATB) was inoperative. According to the investigation, the failure to obey the signal and the fact that the ATB system was inoperative can be attributed to various underlying causes.

The train driver's poor route knowledge played a role in respect of his inaccurate expectations of the signals/signs along the route. Another relevant aspect is that the work plan was changed at a late stage, as a result of which the final section of the transfer journey took place along part of a track section that was scheduled to be taken out of service in the original work plan (and for that reason would be carried out at low speed). The track layout plans also contained speed limitation signs that in reality (five years ago in fact) had been removed. In respect of the train driver's attention being diverted, the fact that the train driver himself was not operating the train but was acting as the pilot played a role, as this meant that his attention was more likely to have been focused on other matters. Another aspect that came into play in this connection is that (apart from the vehicle operator and the train driver) a rail grinding train employee was also present in the cabin. As a result of the change in the work plan, the employee was having a conversation with the train driver; during that conversation, which was conducted in German, the train driver looked at the relevant employee, who was located behind him, several times.

The ATB system was inoperative because the ATB equipment on the train was incompatible with the trackside ATB equipment. As a result the train driver did not receive an alert upon passing the approach marker, no warning signal was subsequently sounded when the braking system was not manually operated and no automatic braking intervention occurred when the driver failed to brake manually. Because the rail grinding train's ATB equipment was switched off, the train was able to travel faster than 40km/h despite the incompatibility of the ATB systems.

In the Safety Board's opinion the course of events described a disturbing picture of how the safety risks relating to the relevant transfer journey were controlled. In addition, a number of the underlying factors that played a role in Stavoren were not unique to this particular accident but also came into play during transfer journeys carried out by other self-propelled maintenance machines. These factors are as follows: driving without ATB protection on track sections equipped with New Generation ATB (ATB-NG), having several people in the cabin, a train driver piloting the train, having limited route knowledge, errors in track layout plans, missing location markers and deviating from work plans without following the mandatory escalation procedure. A further observation in respect of the above is that a total of 18 instances of self-propelled maintenance machines passing a signal set at danger took place in the Netherlands between 2001 and mid-2010, in which some of the same underlying factors played a role as in the Stavoren accident.

The key question in this investigation was: *What lessons can be learned from the accident in Stavoren in terms of risk management during transfer journeys carried out by rail grinding trains, the relevant regulations and supervision thereof?*

Conclusions of the investigation:

- The immediate cause of the accident in Stavoren on 25 July 2010 was that the rail grinding train braked too late when approaching the end of the line. This is because the train driver did not comply with the indicated signal and the ATB system was inoperative.
- The factors underlying the accident at Stavoren are not unique to this accident nor are they unique to transfer journeys carried out by rail grinding trains.
- The companies involved did not properly define the specific risks involved in transfer journeys carried out by rail grinding trains. They were under the obligation to do so pursuant to both Railway legislation and Working Conditions legislation.
- The companies involved did not adequately control the risks involved in the transfer journeys carried out by the rail grinding trains. This is mainly attributable to the fact that they were unaware of some of these risks, and in respect of controlling the other risks, restricted themselves to the specific regulations stipulated in the Railways Act. This means that they

inadequately fulfilled their own responsibility and duty of care (based on both the Railways Act and the Working Conditions Act). In the area of legislation, the Safety Board is of the opinion that the regulations particularly relating to the use of approach markers (*keperbaken*), the train driver's route knowledge and passengers travelling in the cabin must be made clearer and/or tightened.

- The companies involved have only learned to a limited extent from comparable incidents in the past.
- In the structure selected for contracting out the project, it would have been possible to control the risks adequately during the transfer journeys provided the companies had made proper agreements on the risks. Since the companies failed to do so, the situation arose in which risk control had been entrusted to a company (the subcontractor) which did not feel obliged to take adequate control measures of its own accord. In addition, the consultation among the companies failed to produce a joint approach.
- Supervision of risk control relating to transfer journeys carried out by rail grinding trains was not performed to ensure compliance with the Working Conditions Act. Supervision was indeed performed to ensure compliance with the Railways Act, however this focused mainly on the specific requirements with too little focus placed on the railway companies fulfilling their own responsibility or duty of care.
- As a result of the Stavoren accident, the companies involved and IVW have initiated a number of measures designed to tackle the underlying causes. In addition to finalising these measures, the Safety Board deems additional measures essential.

3.5 Comment and introduction or background to the investigations

(E.g. commenced but not followed through for specific reasons, issues or problems, resource issues etc. Some explanatory notes or comments if the IB feels it would be helpful to the reader to understand better the general or specific issues of context around investigations.)

Date of occurrence	Title of the investigation (Occurrence type, location)	Legal basis	Reason of non following or suspension of investigations	Who, why, when (decision)
NA				

Basis for investigation: i = According to the Safety Directive, ii = On national legal basis (covering possible areas excluded in Article 2, §2 of the Safety Directive), iii = Voluntary – other criteria (National rules/regulations not referred to the Safety Directive).

3.6 Accidents and incidents investigated during last five years (in 2007–2011)

Accidents investigated		2007	2008	2009	2010	2011	TOT
Serious accidents (Art 19, 1 + 2)	Train collision			1			1
	Train collision with an obstacle				1		1
	Train derailment		1				1
	Level-crossing accident						0
	Accident to person caused by RS in motion						0
	Fire in rolling stock						0
	Involving dangerous goods						0
Other accidents (Art 21.6)	Train collision						0
	Train collision with an obstacle						0
	Train derailment						0
	Level-crossing accident						0
	Accident to person caused by RS in motion						0
	Fire in rolling stock						0
	Involving dangerous goods						0
Incidents						0	
TOTAL			1	1	1		3

4 RECOMMENDATIONS

4.1 Short review and presentation of recommendations

In the past six years, the Dutch Safety Board published seven reports in the field of rail transport. All these reports included recommendations. In total 37 recommendations were made and 36 reactions were received. About half of the recommendations were directed to the Dutch Ministry of Transport, Public Works and Water Management or its Inspectorate. The other half were directed to a variety of other organizations, including for example ProRail (the infrastructure manager of the Dutch national railway) and Dutch Railways (the principal passenger railway operating company in the Netherlands).

Implementation of recommendations during 2005 - 2011

Recommendations issued		Recommendation implementation status					
		Implemented		In progress		Not to be implemented	
Year	No.	No.	%	No.	%	No.	%
2005	14	12	85.7%			2	14.3%
2006	4	2	50%	1	25%	1	25%
2007	3	3	100%				
2008	2	2	100%				
2009	0						
2010	6	4	66.7%	1	16.7%	1	16.7%
2011	8	6	75%			1 ^[1]	25%
TOTAL	37	29	78.4%	2	5.4%	6	16.2%

4.2 Recommendations 2011

In 2011 the following 4 recommendations were issued in the report on the train collision Barendrecht (25 September 2009)

- *Recommendation 1: Railway Undertakings*

Undertake joint adequate actions for the suitable control of the SPAD issue in both the short and long term. Begin by identifying all potential measures focused on the reduction of the number of signals set at danger, the prevention of SPADs and the prevention of collisions due to SPADs. Then implement these measures unless specific measures have demonstrably unreasonable consequences.

- *Recommendation 2: Railway Undertakings*

Develop a (technical or organisational) system within the near future which assigns the power to make a decision on the train driver's continuation of the journey following an intervention by the dead man's system to a functionary other than the driver.

- *Recommendation 3: Minister of Infrastructure and the Environment*

Make sure, as the party bearing the responsibility for the system, that the railway companies assume their responsibility for the adequate control of the SPAD issue in the short and long term. Explanatory note: the Board expects that in adopting this recommendation the Minister plays the

^[1] In 2011 one of the addressed parties did not respond to the recommendation issued by the Dutch Safety Board. We therefore assumed that this recommendation is not to be implemented.

- *Recommendation 4: Minister of Infrastructure and the Environment*

Within the next twelve months, specify which blocks of tracks, yards and rolling stock shall be equipped with ERTMS together with the associated timeframes, and specify which measures shall be implemented on blocks of track and yards that will not be equipped with ERTMS. Make sure that all parties involved invest in the necessary interim measures to be implemented before the actual introduction of ERTMS.

In 2011 the following 4 recommendations were issued in the report on the train collision with an obstacle at Stavoren (25 July 2010)

- *Recommendation 1: ProRail*

Take full responsibility for the safety of your own projects, including work that has been outsourced. This implies inter alia to implementing the required measures to adequately control the safety risks relating to transfer journeys carried out by rail grinding trains and other self-propelled maintenance machines.

- *Recommendation 2a: Netherlands Association for Railway Regulations and Documentation (VSD)*

Ensure that the sector regulations concerning passengers travelling in the cabin are tightened.

- *Recommendation 2b: railAlert Foundation*

Ensure that the issue of 'transporting staff/material/equipment' becomes an integral part of sector regulations for safety at work when working on the railways (Safety at Work Standards Framework, NVW, and the Safety at Work Regulations, VVW).

- *Recommendation 2c: ProRail*

Ensure that the rules relating to the application of uncommon signals and signs (such as the approach markers) are tightened.