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**REPORT OF THE OECD WORKSHOP ON SAFETY IN MARSHALLING YARDS**

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Safety in Marshalling Yards**

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## FOREWORD

This report presents the output of the OECD Workshop on Safety in Marshalling Yards, which took place on 15 – 16 October 2007 at the OECD headquarters in Paris. This event was sponsored by the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM). The workshop was organised under the auspices of the OECD Chemical Accidents Programme; it was held back-to-back with the 17<sup>th</sup> Meeting of the OECD Working Group on Chemical Accidents (WGCA).

73 experts from 16 OECD countries, two non-member countries (Estonia, Romania), and the European Commission participated in the workshop. Participants came from central government, including safety, transport, civil protection and spatial planning; railroad companies; local governments, international organisations and chemical industry. The list of Participants is presented in [Annex 3](#).

The objective of the workshop was to: (i) exchange views and share experiences on safety issues connected to railroad marshalling yards; (ii) identify the possible solutions used in OECD countries in the area of policy, civil design and technical measures, organisational measures and spatial planning; and (iii) make recommendations for good practices. The scope of the workshop was primarily safety on marshalling yards, but rail-transport of dangerous goods through densely populated areas was also taken into consideration.

The workshop consisted of four sessions addressing the following topics: (1) Safety Policy and Legislation; (2) Approaches to Risk Evaluation; (3) Feasible and Available Measures; and (4) Spatial Planning vs. Transport and Shunting. The Workshop Agenda-Programme is presented in [Annex 2](#).

The first part of this report consists of the Workshop Conclusions, Observations and Recommendations. This is followed by the Discussion Document prepared in advance of the Workshop; it is presented in [Annex 1](#).

The WGCA recommended that this report be forwarded to the Joint Meeting of the Chemical Committee and Working Party on Chemicals, Pesticides and Biotechnology, for consideration as an OECD publication.

The Joint Meeting agreed that it should be made available to the public. This document is published under the responsibility of the Joint Meeting of the Chemicals Group and Management of the Special Programme on the Control of Chemicals of the OECD.

## EXECUTIVE SUMMARY

Under the auspices of the OECD Chemical Accidents Programme a *Workshop on Safety in Marshalling Yards* took place on 15-16 October 2007 at the OECD headquarters in Paris. This event was sponsored by the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM) and was held back-to-back with the 17<sup>th</sup> Meeting of the OECD Working Group on Chemical Accidents (WGCA).

The objective of the workshop was to: (i) exchange views and share experiences on safety issues connected to railroad marshalling yards; (ii) identify the possible solutions used in OECD countries in the area of policy, civil design and technical measures, organisational measures and spatial planning; and (iii) make recommendations for good practices. The scope of the workshop was primarily safety on marshalling yards, but rail-transport of dangerous goods through densely populated areas was also taken into consideration.

The workshop consisted of an Opening Session and four sessions addressing the following topics: (1) Safety Policy and Legislation; (2) Approaches to Risk Evaluation; (3) Feasible and Available Measures; and (4) Spatial Planning *vs.* Transport and Shunting. Although safety on marshalling yards is a specific subject, it should be looked at/discussed in relation to transport, not only by rail but also by road and water.

### General conclusions

The observations and conclusions from the Opening Session are summarized below

- The following definition for 'marshalling yards' is used for this workshop: a place/process where trains/wagons are shunted, rearranged, temporarily kept for further transport and where no (un)loading of dangerous goods takes place.
- The issue of safety in marshalling yards is differently perceived. In some countries the risks related to marshalling yards are considered low compared with the open track. Some give more attention to the routing of dangerous goods, while others focus on the issue of temporary storage of wagons at railway stations. However, very few countries base their actions on detailed quantitative risk evaluations.
- Marshalling yards should not be considered an isolated safety problem. The safety of high speed train carriages through marshalling yards or railway stations and railroads should also be taken into account.
- It is expected that the number of marshalling yards in use will decrease (for example thanks to the concentration of marshalling yards and use of 'dedicated' transport).
- The quantities of dangerous goods transported have increased and will still increase.
- Security is a relatively new issue which should be taken into consideration in safety policies.
- A question arises whether information on transport of dangerous goods should be made available to all parties concerned. The 'right to know' and risk communication could go against security.

### **Session 1: Safety Policy and Legislation**

This session addressed transport and safety legislation involved/linked with safety on marshalling yards. One of the interesting items in this topic was the discussion whether marshalling yards are part of the railway system or should be considered as an industrial site.

### **Session 2: Approaches to Risk Evaluation**

This session focused on the different approaches to risk evaluation between countries. These differences concern the type of evaluated risk (individual, societal, environmental), and acceptance and tolerability limits. Each type of risk needs a risk criterion to evaluate whether a risk is tolerable. Interesting subjects were the criteria which are used in OECD countries. Also the advantages and disadvantages and the consequences of the use of these criteria were discussed.

### **Session 3: Feasible and Available Measures**

This session highlighted which feasible and recently found (railway-, spatial planning- and safety policy-) measures are available to reduce risk and/or to upgrade the level of safety for the population in the vicinity of marshalling yards/freight stations. These measures concern the railway system (infrastructure as well as trains/wagons), spatial planning and/or safety policy. The measures have been divided into process, technical or organizational measures. During the discussion several possible measures were explained and discussed among participants.

### **Session 4: Spatial Planning vs. Transport and Shunting.**

This session looked upon the developments around marshalling yards. From a social economical point of view areas around marshalling can be very interesting for spatial planning. Marshalling yards can also be located near or in city centers, where the wish for development is present. The discussions handled the issue of how to deal with the associated risks and how to address responsibilities: it is not always clear which party is responsible for measures, and responsibilities can also differ between member states. Another issue was if measures should be taken on the railway side, or in spatial planning. To start the discussion the following examples were brought in, like *what if* a stadium is built next to a marshalling yard: who will be responsible when an accident occurs? Or *what if* measures are obliged to make new building plans possible: who is responsible and has to search for and implement measures? Member states handle these kinds of questions in different ways, and the question rose if there is enough clear guidance to handle these and other related questions.

At the closing session the conclusions and recommendations from the workshop were presented and approved. The main observations, conclusions and recommendations were:

- marshalling yards shouldn't be looked upon as an isolated safety problem;
- marshalling yards are part of the transport system. International legislation is applicable (f.e. RID). National legislation and policies complement the international legislation with measures dealing with spatial planning and other local specific circumstances, such as population and vulnerable objects;
- contradictions between legislation should be avoided;

- it is important to have risk assessment methodologies accepted by all partners involved in a local/regional spatial development where increase of population will occur due to construction plans;
- emergency plans must be in place and response systems should work and emergency planning should be involved in an early stage of the new developments of the marshalling yard;
- an international database for incidents at marshalling yards should be developed;
- a wide variety of measures to improve safety at marshalling yards are available, as well as rerouting of hazardous cargo to reduce risks or relocation of marshalling yards should be considered and exchanged in national and international context;
- it is important to have a clear definition of responsibilities, rights and obligations of all parties involved in and around a marshalling yard;
- safety has to be looked upon in an integral way, taking into account the interests of transport, population, housing and vulnerable objects; and
- joint ownership of the problem, good cooperation and communication is a prerequisite for success. Technical and organizational measures which can be taken at marshalling yards have their limitations. Spatial planning measures and maintaining zones around marshalling yards can keep the risk at an acceptable level.

## CONCLUSIONS, OBSERVATIONS AND RECOMMENDATIONS

### INTRODUCTION

1. A Workshop on Safety in Marshalling Yards took place on 15-16 October 2007 at the OECD headquarters in Paris. This event was sponsored by the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM). The workshop was organised under the auspices of the OECD Chemical Accidents Programme; it was held back-to-back with the 17<sup>th</sup> Meeting of the OECD Working Group on Chemical Accidents (WGCA).

2. In the early 90's two OECD workshops were held on transport and safety, addressing the "strategies for transporting dangerous goods by road: safety and environmental protection" (1993) and "chemical accident, prevention, preparedness and response at transport interfaces" (1995). The recommendations from these workshops are included in the OECD *Guiding Principles for Chemical Accident, Prevention, Preparedness and Response* (2003).

3. In 2005, the WGCA decided to initiate activities on safety at marshalling yards. The rationale was that, although they are rare, accidents of trains/wagons carrying dangerous goods in marshalling yards can result in considerable environmental damage and, in some cases, lead to injuries or even fatalities. The WGCA has included the project on safety in marshalling yards in its 2006 – 2008 work plan for the following reasons:

- Large amounts of dangerous goods are present and handled in marshalling yards.
- (Small) incidents occur during shunting of trains.
- There is a potential severity of accidents in marshalling yards, especially when the surrounding areas are highly populated.
- The political and economical pressure is important: the free areas surrounding marshalling yards are more and more attractive for spatial planning involving vulnerable objects.
- It is not clear who is responsible in case of an accident or in cases where population is brought within the 'consequence' areas around marshalling yards, those being initially located in a non-residential area. It is important to address responsibilities.

4. Safety at marshalling yards should be considered in the broader perspective of safety, transport and transport interfaces.

### OBJECTIVES AND SCOPE OF THE WORKSHOP

5. The objective of the workshop was to: (i) exchange views and share experiences on safety issues connected to railroad marshalling yards; (ii) identify the possible solutions used in OECD countries in the area of policy, civil design and technical measures, organisational measures and spatial planning; and (iii) make recommendations for good practices.

6. The scope of the workshop was primarily safety on marshalling yards, but rail-transport of dangerous goods through densely populated areas was also taken into consideration. Although safety in marshalling yards is a specific subject, it should be looked at in relation to transport, not only by rail but also by road and water.

7. The workshop consisted of four sessions addressing the following topics: (1) Safety Policy and Legislation; (2) Approaches to Risk Evaluation; (3) Feasible and Available Measures; and (4) Spatial Planning vs. Transport and Shunting.

## **OBSERVATIONS, CONCLUSIONS AND RECOMMENDATIONS**

### **Opening Session**

#### ***Presentations***

8. *Ralph Brieskorn* on behalf of *Cees Moons*, Director of the department of external safety, VROM, Netherlands explained the reasons why the OECD Chemical Accidents Programme has organised this workshop. The aim was to: exchange views on marshalling yards safety issues; identify possible solutions; exchange and learn from practices of member countries; and make recommendations for possible future activities in this area, including the development of an addendum to the OECD *Guiding Principles*.

9. *Laurent Michel*, Directeur Délégué aux risques majeurs, DPPR, MEDAD, France<sup>1</sup> first stressed the fact that marshalling yards are part of a transport chain. The lecture addressed the transport of dangerous goods by rail in France. Risk analyses and preventive measures are based on the methods used for/by fixed installations regulated under Seveso II. For rail transport, the RID legislation (Regulations concerning the International Carriage of Dangerous Goods by Rail) is obligatory; furthermore there are rules for emergency planning and for temporary 'storage' (i.e. when a train has a stop during transport and stays a certain time on the spot). To date there are nine marshalling yards in France. Safety is an issue for four of them; every five years the infrastructure manager is obliged to perform a hazards investigation by providing a safety report for these marshalling yards. Urbanization becomes more and more an issue for the safe transport of goods.

10. *Monique Berrevoets*, Oranjewoud/Save, the Netherlands briefly introduced the Discussion Document. In the document, three items are addressed: safety; surroundings/populated area; and railway capacity. The relationship, sometimes the 'tension' between these three elements is discussed. The emphasis on or the prevalence of one of them is a policy choice that will obviously result in less 'space' for the other two items.

#### ***Discussion***

11. The issue of information to the public was discussed. On the one hand, should all information for risk analyses be made accessible, in regard to the security and the terrorist risk? On the other hand the public has the right to know what the risks in their surroundings are, so that they are better prepared to react in emergency situations. RID makes obligatory for rail operators to provide the rail infrastructure manager with detailed information on the dangerous goods transported. However this information is not directly accessible to the public.

12. The workshop also addressed the fact that the issue of safety in marshalling yards is differently perceived. One difference is that some countries consider marshalling yards as part of a transport-chain, other countries consider marshalling yards as (part of) a stationary site. The issue of domino effects was also mentioned (this discussion was pursued at Session 2).

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<sup>1</sup> DPPR : Direction de la Prévention des Pollutions et des Risques.  
MEDAD : Ministère de l'Écologie, du Développement et de l'Aménagement durables.

13. The level of risk for marshalling yards is not perceived in the same way in countries: in some countries the risks related to marshalling yards are considered low compared with the open track. Some give more attention to the routing of dangerous goods, while others focus on the problem of temporary storage of wagons at railway stations. However, very few countries base their actions on detailed quantitative risk evaluations.

### ***Conclusions and Recommendations***

14. The observations and conclusions from the Opening Session are summarized below

- The following definition for 'marshalling yards' is used for this workshop: a place/process where trains/wagons are shunted, rearranged, temporarily kept for further transport and where no (un)loading of dangerous goods takes place.
- Marshalling yards should not be considered an isolated safety problem. The safety of high speed train carriages through marshalling yards or railway stations, railroads and other modes of transport should also be taken into account.
- It is expected that the number of marshalling yards in use will decrease (for example thanks to the concentration of marshalling yards and use of 'dedicated' transport).
- The quantities of dangerous goods transported have increased and will still increase.
- Security is a relatively new issue which should be taken into consideration in safety policies.
- A question arises whether information on transport of dangerous goods should be made available to all parties concerned. The 'right to know' and risk communication could go against security.

### **Session 1: Safety Policy and Legislation – Setting the scene**

15. This session addressed transport and safety legislation involved in/linked with safety on marshalling yards. Are the marshalling yards a part of the railway system or are they considered to be an industrial site?

#### ***Presentations***

16. *Kurt Lentz*, European Railway Agency (ERA), compared the European legislation on rail transport of dangerous goods (including marshalling yards) with the legislation for fixed installations. The presentation addressed the following topics: (i) definition and description of the different types of marshalling yards; (ii) EU legislation for the railway system that is relevant for railway safety and interoperability of marshalling yards; (iii) description of the EU legislation for transport of dangerous goods especially in marshalling yards; and (iv) a comparison between this legislation and the one for fixed installations (establishments). Spatial planning is not directly addressed in the RID/UIC<sup>2</sup> legislation; it is considered that transport of dangerous goods is safe enough thanks to these legislations. However, chapter 1.9.2.b of RID states that additional safety requirements on carriage are possible in residential areas and environmentally sensitive areas. Some participants questioned whether the safety level in these situations is sufficient. Because the focus of the workshop is on safety in marshalling yards, the discussions should not deviate from its objective by shifting to safety in rail transport in general.

17. *Gustav Kafka*, Intergovernmental Organization for International Carriage by Rail (OTIF), presented to which extent (legal scope) provisions on the (safe) carriage of dangerous goods by rail (RID)

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<sup>2</sup> UIC = Union Internationale des Chemins de fer/International Union of Railways

are applicable to activities in marshalling yards. Which provisions of the current version of the RID address specifically safety in marshalling yards involving dangerous goods, and how possible gaps in RID would be filled when considering marshalling yards. The environment and spatial planning in built up areas is not addressed by RID.

18. *Henryk Ognik*, Transportation Department of Poland, presented the differences between the regulations concerning the International Carriage of Dangerous Goods by Rail (RID) as *Appendix C* of the Convention concerning International Carriage by Rail (COTIF) and the regulation concerning the Carriage of Dangerous Goods as *Appendix 2* of the Agreement concerning International Transport of Goods by Rail (SMGS). In Poland, the legislation on transport of dangerous goods is based on RID. However since Poland is also member of the Organization for Cooperation of Railways (OSJD) and that transport to non-RID countries occurs (e.g. Russia), the SMGS legislation is also in force. In the last few years, the SMGS and RID legislations have become closer to each other. Spatial planning and the increase of population in areas surrounding marshalling yards are not taken into consideration in both the SMGS and RID legislations.

### ***Discussion***

19. Which transport legislation is available? Should marshalling yards be regarded as an industrial site or as a part of the transport system? These issues were discussed and both options were deemed valid. The occurrence of domino effects was also addressed. In the option of the industrial site, domino effects are likely to be taken into consideration. Domino effects between a marshalling yard and fixed installations in the vicinity of the marshalling yard, were however not taken into consideration. Generally countries have different approaches to this topic, but all agreed that contradictions and discrepancies in legislation should be avoided. The fact that emergency planning guidelines are included in legislation was noted. The question remains whether spatial planning/land-use planning legislation in addition to transport legislation takes sufficiently into account the potential problem of the increase of population near/in the vicinity of marshalling yards and transport routes.

### ***Observations, Conclusions and Recommendations***

20. The observations, conclusions and recommendations from Session 1 are summarized below:

- Transport legislation is primarily about transport safety and merely contains rules for the transport sector.
- Marshalling yards are part of the transport system; international legislation on transport is applicable (e.g. RID).
- National legislation and policies complement the international legislation with measures addressing spatial planning or other local specific conditions, such as population and vulnerable objects.
- Contradictions between the existing legislations should be avoided.
- An emergency planning must be in place, and response systems should work – Education/training of fire fighters and other involved parties is important.
- Escalation of smaller incidents to larger accidents should be examined with attention: the Domino effects between transport systems and fixed installations, and in respect to vulnerable objects, should be taken into account.
- Where an increase of population will occur due to construction plans, it is important that the risk assessment methodologies be accepted by all the partners involved in a local/regional spatial development.

## Session 2: Approaches to Risk Evaluation

21. This session focused on the different approaches to risk evaluation between countries. These differences concern the type of evaluated risk (individual, societal, environmental), and acceptance and tolerability limits. Each type of risk needs a risk criterion to evaluate whether a risk is tolerable. Which criteria are used in OECD countries? What are the advantages and disadvantages and what are the consequences?

### *Presentations*

22. *Jean-Georges Heintz/Wieger Visser*, Union Internationale des Chemins de fer (UIC), Paris presented the viewpoint of the UIC concerning new data on accident statistics, and how to learn from real cases. Approaches integrating the risks related to transport of dangerous goods into land use planning have been developed for about twenty years; those are the result of the lessons learned from occurred or potential major accidents. The organizations responsible for risk assessment generally develop accident statistics using the information available, for example data on fires, BLEVE (Boiling Liquid Expanding Vaporous Explosion), UVCE (Unconfined Vapour Cloud Explosion), explosions, pollutions, toxic gases releases, etc. Data have taught us that, in Europe, there are few incidents on marshalling yards/transport of dangerous goods, and that no or little damage is made to the surroundings. It is a common practice to learn from each incident, and refine legislation in order to prevent such accidents from occurring again. In addition, these statistics have taught that most of the more severe incidents were due to the carriage of dangerous goods, not due to shunting processes. Although few accidents occur in marshalling yards, when there is one, the damage can be severe and the aftermath remain for many years. The international transport safety legislation was presented as a basis for policies and measures implementation:

- Chapter 1.9 of the RID (International Carriage of Dangerous Goods by Rail), restrictions on the carriage imposed by the competent authorities, sections 1.9.2b and 1.9.5;
- UIC-leaflet 201 emergency planning guidance for rail marshalling yards; and
- A generic guideline for the calculation of risk inherent in the carriage of dangerous goods by rail, approved by the RID-Committee of experts.

23. *Daniel Bonomi*, BAFU, Switzerland presented the criteria for acceptability of risk in Switzerland. The criteria for risk evaluation were published in September 1996 (installations involving hazardous substances) and August 2001 (transport routes of dangerous goods) by the Federal Office for the Environment (FOEN) falling into the scope of the Swiss Ordinance on Major Accidents (OMA). The presentation introduced the basics of the OMA, explained how the criteria for risk evaluation are selected, provided lessons learned from experiences, and looked at future developments. In Switzerland it is a common practice to conduct quantitative risk analyses and risk evaluations; this is the opportunity to make objective decisions on the acceptability and need/necessity for measures. Risk analyses are also used in land use planning.

24. *Claudia Fedler*, Hessian Regional Authority, Germany, gave a presentation on safety in marshalling yards located in large production sites. The lecture addressed the following topics: (i) technical and organizational preventive measures to be applied in order to reduce the risk in marshalling yards/ rail transport in large production sites; (ii) identification of the sources of major-accident risks in order to take suitable preventive measures; (iii) description of possible major-accident scenarios and their probability (e.g. chlorine and ethylene oxide); and (iv) considerations about the level of risk reduction and the cost of the measures to reduce risk. Where marshalling yards are part of an establishment which is under Seveso II, the marshalling yard also falls under the Seveso II legislation. However, if the same marshalling yard is located outside an establishment, it is not submitted to Seveso II legislation. Only

transport legislation is applicable in that case. Domino effects are taken into consideration when marshalling yards are part of a Seveso II establishment. However, when the marshalling yards is not located on the Seveso site, domino effects (for instance between transport and shunting, or between shunting and another industrial site in the vicinity of the marshalling yards) are not taken into account.

25. *Bob Fronczak*, Association of American Railroads (AAR), US, presented the measures that North American railroads take to assure safety and security in the transportation of dangerous goods, with a focus on marshalling yards. Safer tank cars, fewer shipments, and extra regulatory measures concerning the more hazardous commodities all lead to safer marshalling yards. The North American railroads have recently passed a new standard for tank cars carrying toxic inhalation hazard (TIH) materials which significantly improves the performance of the cars when they are involved in an accident. A consortium of Dow Chemical, Union Pacific Railroad and Union Tank Car are involved in a project to design the Next Generation Tank Car to meet and exceed AAR's standard. In USA there was a long period of no accidents (over 20 years). However, due to three large incidents insurance fees, the AAR decided to sharpen legislation and took measures. The second impulse to do so was the fact that insurance fees considerably increased, and will not directly decrease after implementing measures. Risk assessment is also commonly practised in AAR, by ways of calculating the reduction of the number of evacuees when measures are implemented. The improvement of the quality of tanks is considered one of the best options. There is no direct link to spatial planning procedures, but in general it is considered that rail transport should not be 'punished' if population increases in the surroundings. A remaining question is how the safety of the surrounding area is assessed.

### ***Discussion***

26. Although statistics indicate that the majority of the more severe incidents are due to the carriage of dangerous goods and not to shunting processes, when an accident occurs on a marshalling yard, the damage can be severe and the aftermath can remain for many years.

27. Although methods differ between member countries, most participants mentioned that it is a common practice to make risk analyses and risk evaluation. Few countries use quantitative analyses methods, thus loosing the opportunity to make 'objective' decisions concerning the acceptability and need/necessity for measures. Risk analyses are not commonly used in land use planning. This was pointed out as a (potential) problem.

28. The Seveso II legislation could take into consideration the increase of population in the vicinity of a marshalling yard. Seveso II is applicable to marshalling yards only when this is part of an establishment. However, most marshalling yards are located outside an establishment, and therefore only transport legislation applies.

29. There is no direct link to spatial planning procedures, but in general it was concluded that rail transport should not be 'punished' if population increases in the surroundings.

### ***Observations, Conclusions and Recommendations***

30. The observations, conclusions and recommendations from Session 2 are summarised hereafter:
- Statistics and incidents reports should be used to learn from incidents.
  - It should be possible to compare data at the international level; accidents reporting should be improved, in particular to have a 'good' notification of incidents.
  - It is recommended developing an international database for incidents at marshalling yards.

- Domino effects between transport systems and fixed installations and in respect to vulnerable objects should be taken into account.
- All countries use risk evaluation, however they do it in different ways (quantitative and/or qualitative scenarios, consequences, possible differences in the extent of evacuation).
- Identify the risks and effects and use them in designing measures.

### Session 3: Feasible and Available Measures

31. This session addressed which feasible and recently found (railway-, spatial planning- and safety policy-) measures are available to reduce risk and/or to upgrade the level of safety for the population in the vicinity of marshalling yards/freight stations<sup>3</sup>. These measures concern the railway system (infrastructure as well as trains/wagons), spatial planning and/or safety policy. They have been divided into three categories: process, technical and organizational measures.

#### *Presentations*

32. *Murad Orhan*, BASF, Germany, introduced the safety concept in a marshalling yard of BASF at Ludwigshafen, in Germany. This involves preventive measures like safety procedures, trainings, assessments, audits and modern technology, including handling manuals, checklists, BBS (Behaviour Based Safety), SQAS (Safety Quality Assessment System), automatic brake and weighing system, etc. The German chemical industry has implemented the TUIS (transportation, accident, information and emergency aid system) of which the BASF fire fighting brigade is an important partner. Since this marshalling yard has been located in the middle of an industrial site, spatial planning in the surroundings with vulnerable objects/population is not an important issue. Moreover, because the marshalling yard is located on an industrial site, the Seveso II legislation applies. In addition, a terminal has been built in order to avoid the carriage of goods through Ludwigshafen and Mannheim.

33. *Klaus-Jürgen Bieger*, DB-AG, Germany, introduced the emergency management of the German railway system: goal, scope, responsibilities, essential elements; requirements and duties; emergency control centers; information; training; cooperation; emergency plan according to UIC-leaflet 201; and RID. Emergency planning for the transport section (operator) is based on the transport and/or shunting on rail. Since it is not the responsibility of the operator to include the surrounding area, this is not taken into consideration and will not lead to additional measures, for example in densely populated areas. The emergency planning does not include a fire brigade on site of marshalling yards; it is the responsibility of the local community and their fire brigades. The local communities base their emergency planning in addition to the basic plans of the railway. There is generally no need for a special fire brigade on site of marshalling yards: this is by law a general responsibility of the local public fire brigades. This is considered reasonable for several reasons: (i) most fire brigades responsible for marshalling yards are well equipped and trained like professional fire brigades of larger towns; (ii) there is no difference in the way of handling hazardous materials in accidents when they occur on a railway or on a road. This has been absolutely confirmed by the German fire brigade associations and the responsible ministries of internal affairs of the sixteen German states. However, the training of the fire brigades plays a very important role, in particular the tank wagons for fire brigade training operated by DB AG (In Germany and the Netherlands). The Finnish representative noted that in some rural areas in Finland, not all fire brigades are that well equipped and trained. In the Netherlands, it is mandatory that some marshalling yards and freight stations have a fire brigade on site, and this is considered to be the responsibility of the infra-structure manager.

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<sup>3</sup> Freight station or goods yard: a railway station where limited shunting activities take place, e.g. the coupling of wagons, groups of wagons or locomotives.

34. *Michèle Provencher*, Transport Canada, addressed the risk analyses in the rail transport of dangerous goods, and how to best avoid releases. The Transport Dangerous Goods (TDG) Directorate in Transport Canada, served as the major source of regulatory development, information and guidance on dangerous goods transport. Work conducted by the directorate includes risk analyses by mode, such as a survey of the coupling speeds in hump yards to evaluate the applicability of imposing a speed limit, establishing the reliability of pressure relief valves and girth seams in railcars with a view to an alternative re-qualification interval, or establishing the probability that the width of a derailment would exceed a certain distance from the main track. A summary of the volume of dangerous goods transported in Canada by rail is presented along with accident statistics. An analysis is required when an accident occurs, a problem is perceived, or after a request for a permit for an equivalent level of safety. Increase of population is not a trigger for making risk analyses, since this is the responsibility of the local authorities. This can lead to situations where safety does not always obtain the best attention. Marshalling yards are not (yet) seen as a problem in Canada, but this can change if someone raises the issue. Carriage through densely populated areas is considered a bigger problem.

35. *Eric Gurke*, Dutch Railroad Infrastructure, the Netherlands, addressed the landscaping railway yards in the Netherlands. The presentation contained the following topics: (i) Brief explanation of structure and operation of the system of government in the Netherlands; (ii) Culture of turning a blind eye and consequences; (iii) Town and country planning, and solutions opted for in the past; and (iv) A proposal for possible solutions for the current situation: relocation of industrial estates, railway yards and airports; technical solutions; procedural solutions; and "chain" study. A number of issues were discussed: (i) relocating a marshalling yard is not automatically a long-lasting solution; since there is a lack of space and increase of population, it is better to solve the issue of location first; (ii) the 'Not In My Back Yard' effect (NIMBY) is to be considered; (iii) it is desirable that politicians and the central or local authorities consider the different interests involved; (iv) which transport routes are fully used for transport of dangerous goods; which routes are partly used or not used at all: asking these questions will help find a solution; (v) where the local authorities are the competent authority for controlling marshalling yards, is this efficient to ensure safety; and (vi) land-use planning is included in the Seveso II legislation (Article 12); making Seveso II applicable to marshalling yards could be part of the solution for improving safety in marshalling yards.

### ***Discussion***

36. How risk can be reduced on marshalling yards regarding the surrounding (populated) area. When a marshalling yard is in the middle of an industrial site which is under the Seveso legislation, spatial planning in the surroundings is not considered a problem. A large number of marshalling yards however are not part of an industrial site, so only the transport legislation is applicable. This legislation does not address the relation with the surrounding (populated) area. Therefore, in most countries, the increase of population is not a trigger to perform risk analyses and implement safety measures.

37. Measures to increase the safety level on marshalling yards vary a lot. Many technical railway related measures are possible and implemented. These measures will increase the safety level in general.

38. When considering safety on a specific location, sometimes the marshalling yards are relocated. This is not a good solution, because (future) new population may be located in the vicinity of this new location for the marshalling yard as well. The NIMBY effect should be taken into consideration: in general local communities reject the presence of a marshalling yard or transport route in, or near, their local community boundaries. To a certain extent, re-routing might be a solution when comparing two or more possible routes and considering the occurrence of marshalling yards on these routes. In conclusion, it was considered preferable to try to solve the problems on location instead of shifting the problem.

39. Marshalling yards are not considered a big problem in most of member countries. Carriage of (dangerous) goods through densely populated areas should possibly be considered a bigger problem.

40. Some participants raised the issue of whether local fire brigades are sufficiently equipped to face major incidents on marshalling yards or during carriage.

### ***Observations, Conclusions and Recommendations***

41. The observations, conclusions and recommendations of Session 3 are summarised hereafter:

- A wide variety of measures are available. Appendix 2 of the Discussion Document provides a detailed list of possible measures. The following items were stressed at the workshop:
  1. Railway technical measures: such as better tank wagons, crash element buffers head shields, good maintenance of technical infrastructure and equipment, and set timeframes to replace old wagons when new standards are set.
  2. Railway process measures: such as arranging trains and avoiding that dangerous goods are put together when they are incompatible, limiting the number of wagons which are shunted, e.g. no more than two wagons at a time and speed control when shunting.
  3. Organizational measures in safety policies: like training of personnel, and creating a zone around a marshalling yard where it is not allowed to build vulnerable objects.
- Re-routing and/or re-locating (to another marshalling yard) are/is an option to improve safety. It is however important to take into account the new risk levels at this new route and at the other location for the marshalling yard. If the (new) safer route/marshalling yard location is chosen, it is important to prevent any new problems (spatial planning), in order to keep the same level of safety.

### **Session 4: Spatial Planning vs. Transport and Shunting: How to Manage different Interests**

42. This session looked at the developments around marshalling yards. From a social economical point of view areas around marshalling yards can be very interesting for spatial planning. Marshalling yards can also be located near or even in city centers, where the wish for development is present. Risk evaluation is necessary in these cases. This raises the issue of addressing responsibilities: which party is responsible for measures? Should measures be taken on the railway side, or in spatial planning? For example, *what if* a stadium is built next to a marshalling yard: who will be responsible if an accident occurs? Or *what if* measures call for new building plans: who is responsible for implementing the measures?

### ***Presentations***

43. *Harry Killaars*, Network Proaction of the Dutch Association for Fire and crisis management (NVBR), Netherlands, addressed the obligation for the local authorities to ask advice of the fire brigade in case of the accountability for societal risk. The presentation discussed the following issues: (i) the benefits and disadvantages of other possibilities for spatial development, with a lower societal risk nearby a railway or railway yard; (ii) the self rescuing capacity of the population in the 1% fatality boundary; (iii) the accessibility for rescue cars and limitation of the effects of a disaster or major accident on a railway or railway yard; and (iv) Integral Safety Design nearby a railway or railway yard. This lecture leads to the conclusion that it is wise to take safety into account in spatial planning, and thus ask the fire brigade for advice at the early stage of the planning process. It is hereby necessary to prevent different demands because of the fact that the various marshalling yards are managed by different local authorities (each

marshalling yard has its 'own' local authority). This can be prevented by organising (the regulations of) local fire brigades on a national level.

44. *Ylva Gilbert*, GAIA, Finland addressed the topic of the translation of the major accident hazards in marshalling yards into land-use planning measures. The presentation was based on a unique series of case studies where the risks related to marshalling yards and other major hazard accident sources have been identified, quantified and translated into spatial planning criteria. The methodology has been developed with industry and authorities, and applied to six upper tier Seveso plants, a chemical port and a marshalling yard in the largest Nordic refinery site, the Kilpilahti industrial area near Helsinki. A current project is further probing the issues of enhancing communication relating to major accident risk – using the Turku marshalling yard sited in the city center as a concrete example. There are some interesting spatial planning issues in this case study, as the current plans include immediate plans for additional housing as well as an amusement park in the immediate vicinity of the marshalling yard where ammonia is one of the high volume chemicals. Risk is translated into land-use planning. In Finland there is a joined ownership of the dilemma 'transport/shunting' and land-use planning; this leads to a general understanding of the safety issue. Since the marshalling yard is considered, transport risks are not considered in this case. Looking continuously at other risks can lead to the situation that nothing will be done on the marshalling yards due to the fact that there are always (other) risks.

45. *Colin Bonnet*, BAV, Switzerland presented the case study of the marshalling yard of La Praille, Geneva including risk assessment, safety measures and spatial planning. La Praille handles around 150,000 wagons per year, including a significant number of tanks containing dangerous goods such as chlorine, LPG and gasoline. It is situated in a densely populated area, including a football stadium and a shopping mall in the immediate vicinity. The risks for the population (casualties) as well as for open water courses (pollution) were quantified; they were not acceptable for scenarios with a large number of casualties as well as for the pollution of the Rhone River. In order to bring the risk back to an acceptable level, safety measures were taken, especially to avoid accidents involving the people using the stadium and shopping mall. A basin for the retention of polluting liquids will also be built. On the other hand, the population density will strongly increase in the near future: large buildings (apartments, offices, school, etc.) will be built in the area, partly on the yard itself. In order to keep the risk at an acceptable level, a new risk analysis was made for the planned situation and it has been taken into account from the very beginning of the ongoing spatial planning process. A satisfying safety level can be obtained by combining four factors: (i) good communication and collaboration between all partners locally involved; (ii) use of a risk assessment methodology and evaluation criteria accepted by all local partners; (iii) implementation of organizational and technical safety measures; and (iv) early risk-oriented optimization of new projects in the neighbourhood. One important remark is the fact that, in this case, the marshalling yard manager and the state of Geneva are both involved in the La Praille development project, and thus are both willing to take appropriate measures to make it feasible.

### ***Discussion***

46. Considering spatial planning and marshalling yards, often responsibilities are not well defined. This leads to the question of who/which party is responsible in case of a problem. Safety is not always an integral part of both transport/marshalling yard/shunting and the surrounding area. This leads to an increase in the risk, and if an incident were to occur, it is not clear who will be responsible and who has to investigate and implement measures. A satisfying safety level can be obtained by combining various factors, as shown in the La Praille case.

### ***Observations, Conclusions and Recommendations***

47. The observations, conclusions and recommendations from Session 4 are summarized below:

- It is important to have a clear definition of responsibilities, rights and obligations of all parties involved in and around a marshalling yard, such as the operators, infrastructure manager, (local) governments and others.
- Safety has to be looked at in an integral way, taking into account the interests of: transport, population, housing and vulnerable objects.
- Joint ownership of the 'problem', good collaboration and communication are prerequisites for success. Technical and organizational measures which can be taken at marshalling yards have their limitations. Spatial planning measures and maintaining zones around marshalling yards can keep the risk at an acceptable level.
- A suggestion is to involve emergency planning at the early stage, so that related technical/civil engineering measures in the new buildings can be planned.
- Marshalling yards should have a system of measure/performance indicators to assess safety improvements.

#### **CLOSING SESSION: Conclusions and Recommendations**

48. During this session the conclusions and recommendations of the workshop were presented, discussed and amended. Further they were elaborated by the rapporteurs to produce the present document.

ANNEX 1

**OECD Workshop on Safety in Marshalling Yards**

*15 – 16 October 2007, OECD, Paris*

**Discussion Document**

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## 1. INTRODUCTION

The decision of initiating activities on marshalling yards/freight stations and organising a workshop on this subject was taken in 2005 by the OECD Working Group on Chemical Accidents (WGCA). This intention is based on the fact that, although rare, accidents can occur during shunting processes with trains/wagons carrying dangerous goods. These accidents can result in considerable damage and in some cases can lead to injuries or even fatalities. When related to the vicinity of marshalling yards/freight stations: Considering the fact that sometimes building projects are planned at a short distance, the probability of a larger accident will increase (higher amounts of casualties possible).

The question rises why the focus of the WGCA is on marshalling yards/freight stations: statistics show that most of the large scale incidents are not at all or at least not 100% related to shunting processes. Instead, they occur where trains carrying dangerous goods pass stations with large amount of rail tracks, switches and level crossings. In some cases these stations are connected to marshalling yards/freight stations.

To illustrate the severity of accidents on marshalling yards the following examples are given:

- May 1991: Collision of stationary freight train wagons stationed on a switch on a marshalling yard. Release of 50 ton acrylnitril, no ignition.
- February 1991: Collision between wagons. Release of 60 ton petrol, no ignition.
- February 2002: Derailment followed by fire of a train on a marshalling yard. Release of 42 ton acrylnitril.
- March 1993: Flank-collision on a marshalling yard, which caused rupture of a tank wagon loaded with methyl chloride. A safety zone of 800 m was required.

Note: None of these accidents casualties in the surrounding areas have occurred.

Another aspect is the fact that a large part of the casualties in large scale incidents concern people that are in a way directly involved in the train process (like passengers, drivers, see examples on the next page).

It is useful to discuss the subject of safety on marshalling yards/freight stations (including spatial planning in the vicinity) because of the following reasons:

1. A considerable amount of (smaller) incidents occur during the shunting process.
2. The presence of large amounts of dangerous goods.
3. The potential severity of accidents that could be caused by trains/wagons carrying dangerous goods (see examples of past accidents next page).

(Since statistics show that the more severe incidents are not due to shunting, it could be interesting to do research on this subject)

4. Political and economic pressure: the vicinity of marshalling yards and freight stations is sometimes very interesting for spatial planning purposes. Living near train stations increases possibilities for transport by train and decreases traffic problems. It is likely necessary/relevant to take into account safety reports when deciding on building plans around marshalling yards/freight stations.
5. Addressing responsibilities. Because several stakeholders are involved, the aspect of responsibility is an important issue.

To illustrate the possible severity of accidents the following examples with trains carrying dangerous goods are given:

- 1999: Thamesville, Ontario, Canada: a derailed passengers train collides with stationary rail wagons with a release of ammonium nitrate caused 2 fatalities and 186 injuries.
- 2000, Lillestrøm in Skedsmo, Norway: A freight train's brakes fail between Strømmen and Lillestrøm; it collides with another stationary freight train at Lillestrøm station. Two gas wagons loaded with propane catch fire and 2000 people are evacuated in fear of a BLEVE, but there are no casualties.
- 2005: Granitville, South Carolina, derailment of a tank car containing chlorine, 9 fatalities and 250 injuries, 5.400 residents evacuated (illustration).



The workshop will focus on the shunting process. However it is considered useful taking into account solutions and experiences based on regular rail transport as far as they can be applied to shunting processes as well. Since marshalling yards are part of the railway system, safety precautions during carriage can be of the same nature as those at marshalling yards; it is therefore likely that risk problems and definitions will be of the same nature.

## 1.1 Previous OECD activities on this subject

The OECD has organised previous events related to this subject:

- In 1993 the OECD has organised a workshop on strategies for transporting dangerous goods by road: safety and environmental protection. The report can be found on the OECD Public website<sup>4[2]</sup>.
- In 1995 the OECD has organised a special session on chemical accident prevention, preparedness and response at transport interfaces. The report can be found on the OECD Public website.
- In 1996 the OECD has published a guidance concerning chemical safety in port areas. An interesting feature of this report are the recommendations for checks/control of the wagons/tanks/tank-containers and other safety regulations before leaving the port-premises. These relate to the OECD workshop on safety on marshalling yards/freight stations. The report is available on the OECD public website, OECD/GD (96) 39.

## 1.2 Objective of the workshop

The intention of the workshop is to deepen knowledge and share experience in order to prevent/minimize the probability of a (large) accident with trains/ rail wagons carrying chemical goods on marshalling yards/freight stations in densely populated areas.

The objectives of the workshop are to:

- exchange views on safety issues connected with railroad marshalling yards/freight stations;
- identify possible solutions in the area of policy, technical measures, organization and spatial planning based on the experiences in OECD countries;
- identify best practices in several OECD countries.

It was agreed that each country would be given the opportunity to present/propose their input on the workshop. The result will be a maximum exchange of experiences and knowledge on the subject of external safety and safety measures at and around marshalling yards/freight stations.

## 1.3 Background

Marshalling yards/freight stations where trains and rail wagons with dangerous substances are shunted, present a risk for their surroundings.

The frequency/probability of an accident is in general low, but if the system fails, there might be a large damaging effect in the surrounding area. Cases over the last 30 years show that such an effect has not occurred yet. Considering the fact that marshalling yards and freight stations are regularly located near (densely) populated areas, incidents may cause harm to persons in the surrounding area. These persons are not involved in any process at this marshalling yard.

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<sup>4[2]</sup> OECD password-protected website for the workshop:  
[http://webdomino1.oecd.org/comnet/env/Workshops.nsf/Documents/MarshallingYards/\\$File/index.htm](http://webdomino1.oecd.org/comnet/env/Workshops.nsf/Documents/MarshallingYards/$File/index.htm)  
User name: Marshalling Yards , Password: MYards

It is therefore desirable to have policies in place, for instance based on a tolerable risk<sup>5[3]</sup> level, so optimal safety will be achieved.

Another important feature is the aspect of spatial planning: what criteria have to be considered before a building project is acceptable? When we also take into account the existing differences in safety policies between member states (different approaches on risk criteria, risk tolerance and risk acceptance levels) it is logical that different approaches on similar situations exist. These differences can lead to different measures/solutions.

### ***International regulations***

In RID chapter 1.9 measures, concerning risk reduction for the transport of dangerous substances, are included. The competent authorities have the possibility to take such measures if the necessity is obvious or proven. This can be done with help of a standard method for risk calculation (to be developed). As guidance the secretariat of OTIF transmitted a "*Generic Guideline for the Calculation of Risk inherent in the Carriage of Dangerous Goods by Rail*": this guideline can be used to decide if and what measures are helpful.

## **2. KEY SUBJECTS OF DISCUSSION**

We point out the following questions/issues for further discussion in the workshop. Although the issues are discussed separately, it is obvious that they are closely related to one another.

### **2.1 Fixed installation or transport: to which are marshalling yard/freight stations related?**

It seems obvious that marshalling yards/freight stations are related to transport by train. On the other hand, they are in a way similar to fixed installations. Sometimes fixed installations use their own marshalling yard. The question rises if both legislations<sup>6[4]</sup> are appropriate for marshalling yards/ freight stations. It is desirable that the ultimate safety levels should be similar. We will discuss the situation in different countries and find out whether this leads to a difference in safety level and related items.

The previous remarks also address the aspect of competent authority. Since transport is a national and international activity, it would be logical that the competent authority is the central/ international government department handling transport issues. For industrial sites however, local authorities also play a significant role. This may lead to contradictions and a different approach because of different interests.

### **2.2 Which risk criteria?**

Approaches to risk calculation and evaluation vary between countries. These differences concern the type of evaluated risk (individual, societal, environmental) and the acceptance and tolerability limits. Also the level of emergency response can be a factor in the acceptance of certain risk levels.

Each type of risk needs a risk criterion to evaluate whether a risk is tolerable. These risk criteria can be balanced with risk criteria for comparable types of risk, e.g. risks from industrial installations which fall under the regulations of the Seveso II Directive.

(Source "Guideline for Risk Assessment": produced by the OTIF)

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<sup>5[3]</sup> Tolerable Risk definition in appendix 1.

<sup>6[4]</sup> Fixed installations and transport legislation

Interesting questions on this subject are:

- Which criteria are used in different countries?
- What are the advantages and/or disadvantages?
- What are the consequences of the chosen risk criteria?

### **2.3 Which measures are feasible and available to reduce risk or upgrade safety levels?**

Another relevant discussion is the question which feasible and recently found measures are available to reduce risk and/or to upgrade the level of safety for the population in the vicinity of marshalling yards/freight stations. These measures concern the railway system (infrastructure as well as trains/wagons) and/or safety policy. Also safety can be upgraded by taking measures in spatial planning. The measures can be divided into process, technical or organizational measures. In chapter 4 these measures are discussed further. We will discuss and compare the experiences with different types of measures in the workshop. Other topics are: the way safety measures influence railway safety, spatial planning and safety policy.

### **2.4 Spatial planning versus transport and shunting**

Marshalling yards/freight stations can be located near or even in city centres, where the wish for development is present. From a social economical point of view, areas around marshalling yards/freight stations can be very interesting for spatial planning.

Risk evaluation is necessary in these cases. This raises the issue of addressing responsibilities: which party is responsible for measures? Also relevant is the issue where and which measures should be taken: on the railway side, or in spatial planning?

Although the effects of security items (like terrorism) can be the same as in safety, the workshop will exclude security items, because of the specific character of this subject. However, security can be taken into account as an extra factor in risk evaluation.

## **3. THE SAFETY SITUATION**

To analyze the situation of safety around marshalling yards/freight stations, the following figure may be helpful. The figure presents the three main factors on the subject. The isosceles triangle presents the relation between these factors. In this triangle the three factors are in balance:

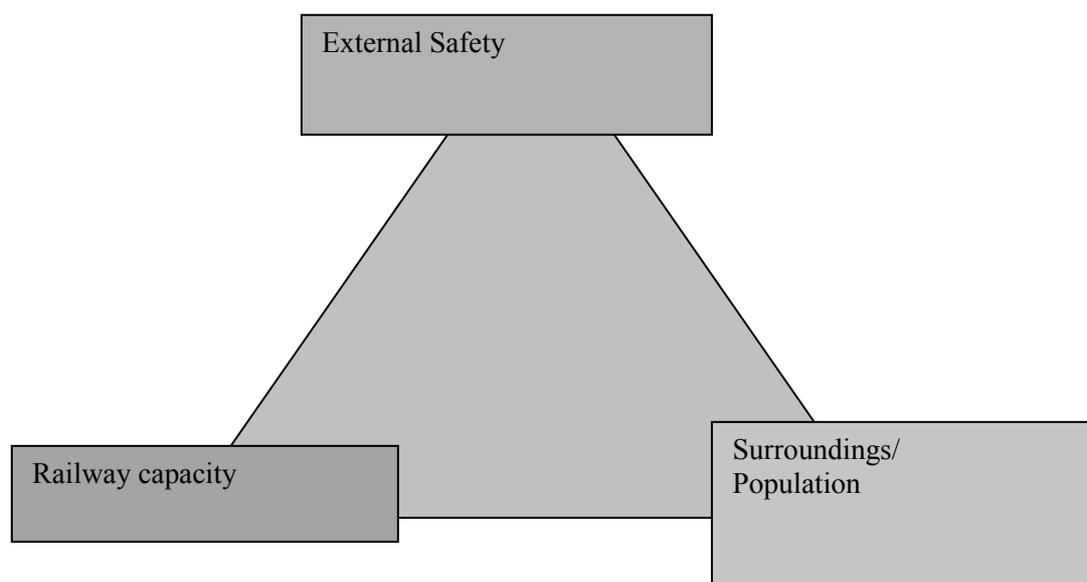


Figure 1 Factors in external safety of marshalling yards/ freight stations; in balance

Now let us assume that a narrow angle means a low level of the factor, and a large angle illustrates a high level. For instance: if we would achieve maximum (external) safety (a large angle) this means that one has to take maximal safety precautions on the capacity side and/or move away population that is near the marshalling yard.

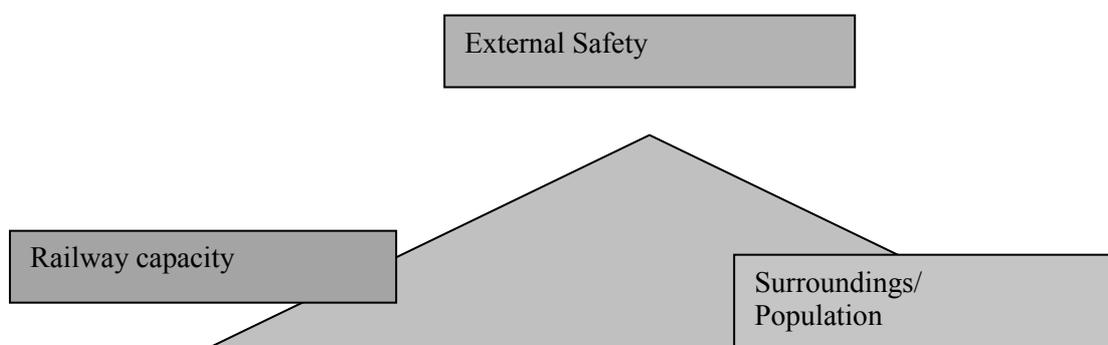


Figure 2: Factors in external safety of marshalling yards freight stations – Maximum (external) safety

The opposite choice could be to accept a lower safety level. That option would create more possibilities for maximum population growth and/or railway activities.

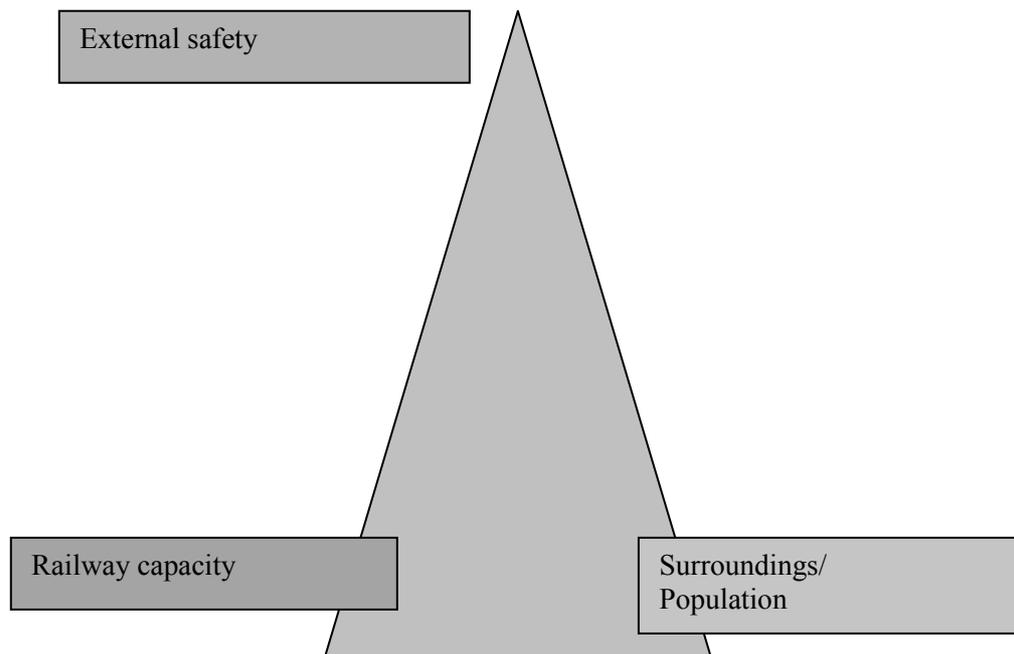


Figure 3: Factors in external safety: low/minimal (external) safety level

Most realistic would be to choose a tolerable risk level leading to a 'balanced' triangle, in which an optimal level of external safety is achieved. This will create opportunities for economic growth, room for spatial planning and the possibility to transport dangerous materials with a reasonable and well discussed/defined safety level!

These figures can be used for discussions that help reach the aim of the workshop: to deepen the knowledge, exchange experiences and make recommendations for best practices among OECD members.

The eventual goal is to bring safety – within reasonable terms (ALARA) – on a higher level.

#### **4. SAFETY MEASURES / PRECAUTIONS / POSSIBLE SOLUTIONS**

##### **4.1 Introduction**

This chapter presents an outline of measures that are possible in increasing safety. Before considering these measures, it is necessary to identify the possible incident scenarios relevant for dangerous goods transport. In the "Guideline for Risk Assessment": produced by the OTIF the following scenarios are identified:

##### ***Primary incidents***

- Derailment
- Train-train collision
- Train-car collision
- Collision with other objects

- Fire (similarly to an explosion or toxic release, a fire is also to be considered as a subsequent potential effect of other primary incidents)
- Sudden tank failure
- 'Runaway' scenario in mountainous regions (may also be considered as a cause of derailment or collision).

### ***Release Scenario***

Given a primary accident/incident, the final damage is highly dependent on the question whether the tank resists the impact. If loss of containment (LOC) occurs, one has to distinguish between the seriousness of the release. In risk analysis we normally define:

- Instantaneous release (release within a short period, less than 30 minutes)
- Continuous outflow

Instantaneous release of substances can result in the following relevant scenarios of impact on people and the environment:

- Explosion
- Fire (flash or pool fire)
- Atmospheric dispersion of toxic substances
- Contamination of water and soil

Having described the scenarios, and relating this to the vicinity of a marshalling yard, the process of risk calculation and evaluation can take place. Risk evaluation is necessary to decide whether a certain (existing or future) situation is acceptable or tolerable. The outcome of that process can vary between member states, based on differences in legislation.

In the Netherlands local communities are the competent authority for environmental permits for marshalling yards within their boundaries. This led to the following case:

In Venlo (a city in the Netherlands) the risk level of a marshalling yard was considered intolerable by the local authorities. So they decided to refuse a permit for a large part of the shunting activities. As a result, more carriage on other routes was required because the shunting process had to take place on another marshalling yard. This led to an increase of risk at other locations due to the necessity of more carriage and the location where the shunting process was transferred to. It is obvious that the increase of risk at other locations is not always acceptable by other parties (local authorities of other locations or the infrastructure manager).

Since member states have different approaches on tolerability of risk, this will lead to differences in risk evaluation and in measures to be taken.

With this (summarized) introduction on the subject 'how to identify a possible problem or situation', the next step is to search and discuss possible measures.

The figure given in chapter 3 can be helpful to explain how decisions taken in one sector (for instance a new building plan) can have an effect on the other two sectors (railway and/or external safety / level of safety).

When a certain situation is considered unacceptable or intolerable, measures are necessary to obtain an acceptable level of safety again. The next chapter includes an introduction of possible measures

#### **4.2 In general: Measures/precautions/solutions**

Considering the triangle in the previous chapter, and considering the different stakeholders, measures can be applied to the railway system, the surroundings/vicinity of the marshalling yard and finally in safety policy. It is helpful to divide these three items, because different stakeholders are responsible for each item and are in control of taking specific measures on each item.

This chapter (together with appendix 2<sup>1)</sup>) can serve as a starting point for one of the key subjects of discussions: the possible measures and experiences with these measures.

<sup>1)</sup> *In appendix 2 a first inventory list of possible precautions, the effect of the measure and the side-effects are presented; an inventory of common practices is to be completed before or at the workshop.*

#### **4.3 Railway measures**

Since the carriage of dangerous goods is the source of risk, it is obvious to start with an inventory of possible railway measures. The measures are divided in technical (divided in railwagoon and infrastructure), organizational and process measures. Because the main subject of the workshop is safety on shunting processes, only measures that benefit safety on shunting premises are mentioned. But when a measure during carriage can be useful for shunting processes as well, this is mentioned too.

##### **4.3.1 Technique**

Railway technique measures can be divided in two subjects, because often different organizations are responsible for these subjects:

- Rail wagons technique measures
- Infrastructural technique measures

##### **4.3.2 Railway organizational measures**

In this item possible measures are based on organizational procedures. For instance emergency procedures, accident data bases or special regimes for substances with high risk. UIC published a leaflet where guidelines are provided for emergency planning (UIC leaflet 201). In the workshop we will compare the way this leaflet is implemented in different countries.

***The following examples illustrate this group of possible measures.***

In Canada one has an obligation to make an Emergency Response Assistance Plan (ERAP) for a number of dangerous goods when the quantity of any of these goods exceeds a certain value (for rail it is generally the volume of a railcar). The ERAPs are reviewed and need to be approved. Requirements for a plan include a telephone number for its activation, and appropriate response capability in terms of time, specialized people and equipment.

In the Netherlands chlorine is transported under a special regime, with maximum speed, routing to avoid high density populated areas, a green wave and permanent attention of the infrastructure-manager during transport. In 2006 the regular chlorine transports were stopped. This was formulated in the so called chlorine agreement in the Netherlands. The production location of this substance made it necessary to transport a reasonable amount of this highly toxic gas through populated areas. Although this transport took place with extra precautions it was decided to build a production unit in the same area as it was needed. Interesting fact is that the aspect of security played a role in the decision process.

#### 4.3.3 *Process measures*

In this item measures in the shunting process are considered, that will reduce the risk. Before implementing these measures, it is important to make a risk analyses to determine whether the risk is actually reduced without creating another/higher risk situation on a different location. For instance, stopping the shunting process of coupling trains can lead to more carriage with smaller trains, and this will result in higher risk for carriage.

The following examples illustrate this group of measures:

In Canada one has regulations about the train composition. In Transportation of Dangerous Goods regulations (TDG) part 10 there are restrictions on specific combinations located next to each other. For instance, it is precluded to place any class of dangerous goods next to an operating engine or a railway vehicle that has a continual source of ignition.

In the Netherlands there are some locations where, in the shunting process, having flammable gas next to flammable liquids is prohibited.

The SBB marshalling yard La Praille in Geneva is situated in a densely populated area. A football stadium, a shopping mall and a hotel were recently built within 50 meters of the marshalling hump. Another important project is being planned, with large buildings (apartments, offices, school, etc.) to be built partly on the yard itself (some tracks will be dismantled).

A risk analyses has been made, and the risks have been considered intolerable. Therefore measures have been proposed. One of the proposed measures is a restriction of the handling and the storage of wagons containing dangerous goods during the week-ends, when a large number of people using the stadium and commercial centre are exposed. Also some of the activities have been moved to the marshalling yard of Denges, situated in a (still) less populated area.



#### **4.4 Safety Policy measures**

Possible measures can be found in safety policy regulations. These can be taken on an international or national level. It is in this respect important to prevent the introduction of national safety policy that is not in line / in contradiction with international transport regulations and safety policy. The following groups of measures are possible.

##### **4.4.1 Technical measures**

In (inter-)national safety regulations, the use of risk model and tolerable risk criteria based on these models can be defined.

##### **4.4.2 Organizational measures**

This group of measures refer to general measures or guidelines in legislation to create a good and proper basis for finding solutions. For instance, in safety policy regulations it is possible to address responsibilities in general in an early stage or create good safety education possibilities.

For instance the Dutch program called "PAGE" ("Plan van Aanpak Goederen Emplacementen") in which the marshalling yards which are at higher risk (now or in the future) than tolerated in the current policies are determined. PAGE has made it possible to take actions to improve the safety situations at these yards, and in some cases also to make new spatial developments possible.

#### **4.5 Spatial planning measures**

Finally the third corner of the triangle in chapter 3 refers to spatial planning measures. There are cases where plans are created/proposed leading to a higher population density near marshalling yards/freight stations. This will create a possibility of large scale incidents, which are difficult to deal with

(for instance difficult to reach for fire fighters, evacuation problems). Discussion on this subject could focus on:

- What measures can be implemented to avoid/minimize the amount of population near locations of high risk?
- How can we optimize the spatial planning and the emergency plans?

Also it is wise to look at other subjects like noise: with regards to both safety and noise regulation it is not desirable to bring large amounts of people in the vicinity of marshalling yards/ freight stations.

#### **4.5.1 Technical measures**

Since this paper and the workshop are not focused on building constructions, this subject is not considered in detail.

#### **4.5.2 Organizational measures**

As in safety policy, it is also necessary to make safety one of the issues in spatial planning procedures. For instance, when planning the area around and next to a marshalling yard, it is wise to take account of the risk analyses and infrastructural situation of a location. The following example including an image illustrates this group of measures.



Image: In Arnhem, Netherlands, a LPG tankstation was located next to an up-level marshalling yard / freight station in a densely populated area. In the shunting process some wagons were incidentally pushed off the marshalling yard and nearly hit the LPG stationary below the shunting yard.

#### **4.5.3 Process measures**

When the aspect of safety is considered in an early stage of the planning process, the necessary investments can be on an acceptable level (ALARA). Once an intolerable situation is created, it often is very difficult - sometimes impossible - to implement measures and thus reach a tolerable level again. It is therefore wise to consider risk in every aspect of the spatial planning process. Some suggestions are mentioned in the appendix.

## Appendix 1

### Glossary – Information – Definitions

#### Sources

1. Generic Guideline for the Calculation of Risk inherent in the Carriage of Dangerous Goods by Rail" Transmitted by the Secretariat of OTIF.
2. UIC 201 "Emergency planning for rail marshalling yards"<sup>7[5]</sup>

#### **Marshalling yards**

As a place in transit and a link in the transport chain, railway marshalling yards are a special sort of station. They have a number of sets of sidings for receiving and preparing (*shunting*) freight trains and for sorting the rail wagons to destination, with the aim of forming new trains and dispatching these to their destinations.

#### **Freight station or goods yard**

A railway station where limited shunting activities take place like the coupling of wagons, groups of wagons or locomotives.

#### **Carriage**

Carriage means the change of place of dangerous goods, including stops made necessary by the conditions of carriage and including any period spent by the dangerous goods in rail wagons, tanks and containers made necessary by traffic conditions before, during and after the change of place.

#### **Risk**

Combination of the probability (between 0 and 1) of occurrence of harm and the severity of harm ("combination" typically means "product", whereas additional factors, such as risk aversion are part of the risk evaluation process).

#### **Individual risk**

Risk of an individual person to come to harm (also called "place-bound risk", depends on the location, definition is not part of ISO/IEC Guide 51 or 73).

#### **Societal risk**

Risk of all potentially involved persons to come to harm (probability density function (PDF) of individual risks or the integral of this PDF, definition is not part of ISO/IEC Guide 51 or 73).

#### **External risk**

Risk of harm caused to persons who are not involved in carriage or passengers or risk of harm to property which is not part of the transport system or infrastructure. (also called "third party risk", opposite to

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<sup>7[5]</sup> For more definitions on this subject see the UIC 201 and RID **Generic Guideline for the Calculation of Risk inherent in the Carriage of Dangerous Goods by Rail**.

internal risk, definition is not part of ISO/IEC Guide 51 or 73). The definition of risk to passengers as internal or external risk differs between Member States.

### **External Safety'**

NB This definition is not literally mentioned in one of the two mentioned sources, but is based on definitions which are mentioned in these sources.

*Safety measures taken to reduce* the risk of harm caused to persons who are not involved in carriage or passengers or safety measures taken to reduce the risk of harm to property which is not part of the transport system or infrastructure.

### **Risk perception**

The way in which a stakeholder views a risk, based on a set of values of concern.

### **Stakeholder**

Any individual, group or organization that can produce a risk or that can be affected by, or perceive itself to be affected by, a risk. Note: The decision-maker is also a stakeholder.

### **Harm**

Physical injury or damage to the health of people, or damage to property or the environment.

### **Risk assessment**

Overall process of risk analysis and risk evaluation.

### **Risk evaluation**

Procedure based on the risk analysis to determine whether the tolerable risk has been achieved.

### **Risk criteria**

Terms of reference by which the significance of risk is assessed.

### **Risk treatment**

Application of adopted measures dealing with risk reduction.

### **Tolerable risk**

Risk which is accepted at the decision phase on the basis of the decision criteria and which, in a given context, in particular embraces the justifiable ideals of society.

### Short explanation of terms and definitions relevant for the typing of measures

#### **Primary incident:**

For a risk assessment in the context of RID chapter 1.9 only major accidents (and incidents with the potential to become major) are considered. The relevant scenarios are the following:

- Derailment
- Train-train collision
- Train-car collision

- Collision with other objects
- Fire (similarly to an explosion or toxic release, a fire is also to be considered as a subsequent potential effect of other primary incidents)
- Sudden tank failure
- 'Runaway' scenario in mountainous regions (may also be considered as a cause of derailment or collision).

In a particular context, influences such as vandalism, terrorism, storm, earthquake and flood may also be of importance. Most of these scenarios need no further explanation. The scenario 'sudden tank failure' incorporates a variety of incidents with sudden release of tank contents due to overpressure after violating filling regulations, corrosion, brittleness or fatigue of the tank material etc.

### Abbreviations

#### **ALARA**

As low as reasonably achievable

#### **ATB**

"Automatische treinbeïnvloeding" (Dutch) which means Automatic Train Control.

#### **CTC**

Centralized Traffic Control

#### **EIM**

European Rail infrastructure Managers

#### **ERA**

European Railway Agency

#### **ETCS**

European train control system

#### **OTIF**

Intergovernmental Organization for International Carriage by Rail

#### **T.S.I.**

Technical Specification for Interoperability

#### **UIC**

International union of railways

#### **VPT**

VPT ("Vervoer per trein") which means 'transport by train')

## Appendix 2

### 1 Railway measures

#### 1.1 *Technique*

##### **Rail wagon technique measures**

- Civil design and technical measures on rail wagons. In Europe this is regulated by the RID, UIC leaflets, CEN-standards and TSI's.
- Transport of cooled liquids instead of pressurized substances. The effect of this option is a reduction of the consequences in case of a release after an incident/accident. The vaporization of the substance after release is reduced when the substance is transported at low temperature. That means a lower toxic or heat/pressure load for the environment after the release. It is important to check the design standards of the tank wagons on this topic. Moreover: one has to take into account a temperature rise on long distance tracks or during a long presence on marshalling yards/freight stations.
- Crash buffers on rail wagons to prevent penetration of tank wagons with toxic gas (for instance for chlorine tank wagons);
- Multifunctional locomotives. In Europe there is a difference between the voltage of the transport systems in different countries. This means that trains sometimes have to change locomotives, when they cross the border. In the Netherlands we use diesel and electricity locomotives. Sometimes those trains have to change locomotive/traction on a marshalling yard. That leads to extra risk for the environment; otherwise they just proceed to their destination on the free track and don't enter the marshalling yard. Multifunctional locomotives solve that problem.

##### **Infrastructural technique measures**

- Safety of switches: at switches the possibility collision exists. By coupling switches flexibility decreases which reduces the possibility of collisions.
- Eliminate switches: when switches can be avoided or eliminated, this will reduce the chance of collisions. In the Netherlands this measure is used. The side effect of this measure is a reduction of the infrastructure management costs.
- Train safety systems:
- There are a number of train safety systems introduced (for instance CTC, VPT, ERTMS), but they are merely beneficial for the carriage on the free track.
- ATB = "Automatische Trein Beïnvloeding" which means Automatic Train Control. The system operates as follows. When a train with a speed > 40 km/h passes a red sign, the train will automatically be stopped by ATB. Although the average speed on marshalling yards/freight

station is mostly under 40 km/h, there is an additional system that is named ATB ++. This works the same as ATB, but will also stop trains with a speed < 40 km/h. This system can therefore be useful for trains and locomotives on marshalling yards/freight stations.

- Eliminate level-crossings: this will eliminate the probability of collisions with road traffic. More relevant for the free track, however there can be level crossings located on marshalling yards/freight stations.
- Retention of liquid: this prevents pollution of the environment and will have a positive effect on safety.
- Speed control in shunting processes with or without use of a hump. See for instance the previously mentioned ATB ++ system

## 1.2 Organizational measures

- Emergency procedures are very important in case of an incident. Moreover it is also important to practice these procedures. This should be done by all parties involved, i.e. the fire brigade, the authorities, the police and the ambulance personnel. Also a good evaluation of training exercises should be made.
- Measures taken by the infrastructural manager to minimize the response time, for instance use of a real time info system.
- The presence of equipment to fight the consequences of a large scale release is also an important aspect. The workshop may also discuss this aspect. In some countries there are demands on the response time of personnel/organizations in case of an incident. Sometimes fire fighting equipment is available and ready for use at marshalling yards. Colin will give an example to illustrate this measure
- The composition of the train is important in case of an accident. Fire fighters have to know very quickly what kinds of substances are present in the train. They also have to know the contents of every tank car. Since 01-01-2007 in RID it is prescribed that railway companies are obliged to immediately provide information to the infrastructure manager when asked for. It is good to exchange the experiences and demands in each country
- Put limits and conditions on the transport of certain loads of dangerous goods, such as Ammonia, LPG or Chlorine.
- In general quality systems and risk management systems are also very important in the control of the risk caused by the transportation of dangerous substances.
- Accident databases, for two reasons:
  - the main reason is to put the cause and results of an incident in a database, and if necessary adjust procedures to prevent accidents in the future;
  - use of the database to create a good base for casuistic; this can be used in decisions on which measure will be most beneficial in reducing the overall risk.

RID 1.8.5. gives instructions for reporting accidents.

### 1.3 Process measures

- One measure that is often discussed is the option of limited speed of a train. This leads to a lower probability of leakage and a lower risk. This option can be applied in marshalling yards/freight stations as well as the free track.

The disadvantage of this option is a reduction in the capacity of the railway system and therefore maybe sometimes less obvious at first glance.

- One very important specific aspect of the composition of the train is the presence of tank wagons with flammable liquids and pressurized substances like LPG, chlorine and ammonia in one train. This is important because of the danger of escalation in case of a fire from the escaped liquid and the presence of the pressurized tank wagons in the vicinity. This point was also mentioned before. Are there experiences or examples where this combination is not allowed?
- Use of dedicated tracks on marshalling yards/freight stations. By indicating/ nominating certain tracks for specific substances and thus reducing the number of points where trains can derail/collide it is possible to reduce the danger/risk to the environment.
- Another option to reduce the probability of collision is to stop the shunting process and arrival/ departure of trains on a yard during the arrival/departure of certain trains with very dangerous substances, that determine the external risk. This option leads also to a less efficient process on the yard, but it should be compared with the gain in risk reduction. If such a measure is taken, it is necessary to include it in the risk management system or otherwise.
- Storage time:
  - Reduce storage time of trains carrying dangerous substances as much as possible.
  - Possible other limitations on storage time during transport, such as minimum distances to (vulnerable) buildings. Several countries have experiences with this measure, for instance maximum duration of storage time, and minimum distances to buildings. There is a great variety of these measures.
- Wagon check before and after the shunting process. Also extra checks on industrial sites before trains leave to public railway.
- Concentrate the shunting of dangerous substances in the period where the surrounding population is not present during 100% of the time. In general the traffic density will be less. This will lead to less possibilities of collision with other train traffic. In certain areas with the presence of many people in offices in the daytime the risk will also be reduced. On the other side the stability of the atmosphere differs from the daytime. During the night the general wind speed in certain countries is sometimes lower and the atmospheric stability higher. This leads to less air entrainment in case of dispersion of toxic vapour and therefore a higher risk and larger effect areas.

## 2 Safety Policy measures

### 2.1 Technical measures

- For the calculation of the external risk, models are used for calculating the probability of an incident and the seriousness of the consequences. For the probability we use casuistic for

marshalling yards/freight stations as well as the free track. These figures have to be updated on a regular basis to account for new developments. Besides that aspect a very important other parameter is the probability of a serious release given a derailment/collision. In Europe there is a very good record on this point, meaning that large scale releases of dangerous substances from railway tank wagons in incidents hardly occur. Therefore the reliability of risk calculations is low, whereas the authorities use the results for decisions on spatial planning etc. It is important to gather enough reliable data for a proper calculation of the external risk. This is important for marshalling yards/freight stations as well as the free track.

- Vary in tolerable risk level: use different risk levels for certain areas, depending on the vulnerability of the area and the economic activities in that area. This is a very sensitive subject. Nevertheless, it might be good to discuss it, depending on the situation in different countries.

## 2.2 *Organizational measures*

- Create a logical decision 'tree' before a new situation is realized, for instance start with answering the following questions and make choices:
  - Is it possible to produce substances on site?
  - What is the best (safer) way of transport for a certain situation?
  - If rail is chosen, is it possible to avoid/minimize the shunting process?
  - If shunting is necessary, what would be the best location (look at facilities, population in the vicinity)
  - Add more questions.
- In one of the Council Directives that transposes the regulations concerning the International Carriage of Dangerous Goods by Rail (RID) the transport of dangerous substances by rail is regulated. Work conducted in this area led to general agreement on the adequacy of existing measures for the prevention of major accidents.
- Address responsibilities in an early stage: not only in accident response, but also in spatial planning, responsibilities in safety checks (wagon checks for instance), legislation, etcetera.
- The objective of the Intergovernmental Organisation for International Carriage by Rail (OTIF) was principally to develop uniform systems of law which apply to the carriage of passengers and freight internationally through traffic by rail. This will have a positive effect on safety. Also the OTIF focuses on the removal of obstacles to the crossing of frontiers in international rail transport
- The Community of European Railways developed a multi stakeholder approach, the “Emergency Planning Guidance for Rail Marshalling Yards” (1<sup>st</sup> edition, March 2003, UIC leaflet 201) and a reference to this leaflet is incorporated in the RID. In this guidance a further review of measures aimed at limiting the consequences of major accidents are given.
- Alternatives for railroad transport (modal shift, avoid need for transport by swapping, etc.). Important here is to choose the best (= less risk) possible transport system for a specific transport of dangerous goods.

- Safety policies in place that also cover railroad marshalling yards/freight stations. For instance the Dutch program called "PAGE" ("Plan van Aanpak Goederen Emplacementen") where the marshalling yards/freight stations which are at higher risk (now or in the future) than tolerated in the current policies are determined. Page made it possible to take actions to improve the safety situations at these yards, and in some cases also to make new spatial developments possible.
- Education of people involved in safety issues on marshalling yards/freight stations. Safety and risk education can be useful not only for railroad-employees, but also for employees of central/local government, fire brigades, etcetera. .

### **3. Spatial planning measures**

- - Avoid/minimize the amount of population near marshalling yards/freight stations or the locations on these yards with highest risks.
- - Take other relevant subjects in account for instance noise: mostly in both subjects it is *not* desirable to increase the population in the vicinity of marshalling yards/freight stations.

#### **3.1 Technical measures**

- Building constructional measures for instance avoid ventilation systems on the wrong place and place fire/explosive resistant walls/windows.

#### **3.2 Organizational measures**

- Civil design: no vulnerable buildings nearby marshalling yards or freight stations. This leads to a reduction in risk, but also to economic/financial losses in highly populated areas. For instance: no hospitals or schools near high risk areas.
- Civil design: plan/locate buildings near the rail way track where few people are present during times of transport and shunting. For instance parking garages.
- Civil design: avoid or relocate other sources of risk whenever possible.
- Smart design for accessibility of marshalling yards/freight stations by the fire fighters;
- For instance place buildings in a 90 ° angle with the rail way track.
- Smart design in planning buildings and streets, use of rooms and spaces in buildings. Place buildings underground if possible. The disadvantage of this option is that these are not desirable places for people to live and work for large parts of the day.

#### **3.3 Process measures**

Involve parties who are responsible for disaster management in an early stage of the design process. This makes it possible to make choices upfront without a high risk of loss of money or non-dissolvable situations.

- Address responsibilities in an early stage of the planning process, so risk is looked upon in an early stage.

- Look at economical benefits: what will it cost to make a spatial plan possible when considering legislation.
- Make risk assessment obligatory during the complete phase of the planning process.
- Emergency and evacuation planning must be up to date and frequently practiced. Interesting here is ;
- Involve responsible authorities/organizations for emergency plans in an early stage of the planning process.

## ANNEX 2

### Workshop Agenda

#### INTRODUCTION

A *Workshop on Safety in Marshalling Yards* will take place on 15-16 October 2007 at the OECD headquarters in Paris. This event is sponsored by the Dutch Ministry of Housing, Spatial Planning and the Environment. The workshop will be held back-to-back with the 17<sup>th</sup> Meeting of the OECD Working Group on Chemical Accidents (WGCA).

The workshop is organised under the auspices of the OECD Chemical Accidents Programme. In 2005 the WGCA decided to initiate activities on safety at marshalling yards. The rationale was that, although they are rare, accidents of trains/wagons carrying dangerous goods in marshalling yards can result in considerable environmental damage and, in some cases, lead to injuries or even fatalities.

#### OBJECTIVES AND SCOPE

The workshop will aim to: (i) exchange views and share experiences on safety issues connected to railroad marshalling yards; (ii) identify the possible solutions used in OECD countries in the area of policy, civil design and technical measures, organisational measures and spatial planning; and (iii) make recommendations for good practices.

The workshop will likely consist of four sessions addressing the following topics: (1) Safety Policy and Legislation; (2) Approaches to Risk Evaluation; (3) Feasible and Available Measures; and (4) Spatial Planning vs. Transport and Shunting. The structure of every session would be as follows: (i) General lecture; (ii) Presentation of a case-study; and (iii) Discussion and proposal for solutions.

#### STRUCTURE OF THE WORKSHOP

The workshop is structured as follows:

- |                          |  |
|--------------------------|--|
| <b>Opening Session</b>   | Welcome addresses / Opening speeches<br>Presentation of the <u>Discussion Document</u> |
| <b>Thematic Sessions</b> | Four sessions consisting of speakers' presentations and discussion among participants  |

**EACH PRESENTATION OF THE THEMATIC SESSIONS SHOULD LAST  
15-20 MINUTES AND MUST NOT EXCEED 20 MINUTES**

- |                        |  |
|------------------------|--|
| <b>Closing Session</b> | Conclusions and recommendations – General Discussion |
|------------------------|--|

## **PARTICIPANTS**

The workshop will be open to representatives of: central government, including safety, transport, civil protection and spatial planning; railroad companies; local governments; international organisations, including the UN ECE; chemical industry and academia.

## **DISCUSSION DOCUMENT**

A discussion document has been developed. Its purpose is to: provide an overview and perspective of the safety issues in marshalling yards; describe the themes of sessions; and identify issues for consideration. It is expected to "set the scene" with a clear and exhaustive description of the subject, to be possibly 'provocative' if relevant or just 'stimulating' in order to foster discussions among participants.

## **OUTPUT**

The workshop report will be published as an OECD Environment, Health and Safety Publication, in the series on Chemical Accidents. It would include conclusions from the workshop, proposed solutions to the case studies presented and possibly recommendations concerning 'best practices' if relevant, as well as a list of topics requiring further activities. Moreover, the main conclusions and recommendations from the workshop will be further included as an addendum to the *OECD Guiding Principles for Chemical Accident Prevention, Preparedness and Response*.

## **PLANNING COMMITTEE**

<i>Ralph Brieskorn (CHAIR)</i>	Ministry of Housing, Spatial Planning & Environment, Netherlands
<i>Danielle Kretz</i>	Ministry of Housing, Spatial Planning & Environment, Netherlands
<i>Monique Berrevoets</i>	Consultant, Save, Netherlands
<i>Gert Hoftijzer</i>	Consultant, Save, Netherlands
<i>Michèle Provencher</i>	Transport of Dangerous Goods, Government of Canada
<i>Colin Bonnet</i>	Federal Office of Transport, Switzerland
<i>Jean-Georges Heintz</i>	Union Internationale des Chemins de fer (UIC), Paris
<i>Tobias Biermann</i>	EC DG Environment, Brussels
<i>Michalis Christou</i>	EC Major Accident Hazards Bureau, JRC, Ispra, Italy
<i>Marie-Chantal Huet</i>	OECD Secretariat, Paris

## **WORKSHOP LANGUAGE**

The workshop language will be English.

## **WORKSHOP WEB SITE**

All the documents for the workshop are available on a password-protected web site at:

[http://webdomino1.oecd.org/comnet/env/Workshops.nsf/Documents/MarshallingYards/\\$File/index.htm](http://webdomino1.oecd.org/comnet/env/Workshops.nsf/Documents/MarshallingYards/$File/index.htm)

User name: Marshalling Yards

Password: MYards

<b>Monday 15 October 2007</b>	
10:45	<b>Reception desk – Distribution of badges</b>
11:00–12:15	<p><b>OPENING SESSION</b></p> <p><b>Welcoming remarks</b></p> <p>Workshop Chair: <i>Kees van Kuijen</i>, VROM<sup>8</sup>, Netherlands  OECD Secretariat: <i>Marie-Chantal Huet</i>, Administrateur</p> <p><b>Introduction lectures</b></p> <p><i>Cees Moons</i>, Director of the department of external safety, VROM, Netherlands  <i>Laurent Michel</i>, Directeur Délégué aux risques majeurs, DPPR, MEDAD, France<sup>9</sup></p>
12:15–13:00	<p><i>Monique Berrevoets</i> and <i>Gert Hofstijzer</i>, Save, the Netherlands</p> <p><b>Presentation of the Discussion Document</b></p> <p>Plenary discussion</p>
13:00–14:30	<i>Lunch</i>
14:30–16:00	<p><b>SESSION 1: Safety Policy and Legislation – Setting the scene</b></p> <p>This session will address transport and safety legislation involved/linked with safety on marshalling yards. Are marshalling yards a part of the railway system or are they to be considered as an industrial site?</p> <p><i>Kurt Lentz</i>, European Railway Agency (ERA)</p> <p><b>EU legislation for the railway system including transport of dangerous goods especially in marshalling yards, compared with the legislation for fixed installations</b></p> <p>The presentation will address the following topics: (i) definition for the railway system including marshalling yards and fixed installations, and description of different types of marshalling yards; (ii) description of the EU legislation for the railway system relevant for railway safety and interoperability for marshalling yards; (iii) description of the EU legislation for transport of dangerous goods especially in marshalling yards; and (iv) a comparison between the above mentioned legislation and the legislation for fixed installations (establishments).</p>

<sup>8</sup> VROM : Dutch Ministry of Housing, Spatial Planning and the Environment

<sup>9</sup> DPPR : Direction de la Prévention des Pollutions et des Risques

MEDAD : Ministère de l'Écologie, du Développement et de l'Aménagement Durables

	<p><b>Gustav Kafka</b>, OTIF  <b>Safe carriage of dangerous goods by rail (RID): Application to marshalling yards</b></p> <p>This lecture will present to which extent (legal scope) provisions on the (safe) carriage of dangerous goods by rail (RID) are applicable to activities in marshalling yards. Which provisions in the present version of the RID are of specific concern regarding the safety of dangerous goods in marshalling yards, and how would possible gaps in RID be filled when considering marshalling yards?</p>
	<p><b>Henryk Ognik</b>, Transportation Department (TDT), Poland  <b>Differences in international legislations</b></p> <p>This presentation will describe the differences between Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) as <i>Appendix C</i> of Convention concerning International Carriage by Rail (COTIF) and Regulation Concerning the Carriage of Dangerous Goods as <i>Appendix 2</i> of Agreement Concerning International Transport of Goods by Rail (SMGS) in range of tank-wagons for carriage of dangerous goods. The following topics will be addressed: (i) legislation for carriage of dangerous goods by rail in Poland; (ii) description of the COTIF legislation for carriage of dangerous goods; (iii) description of the Organization for Cooperation of Railways (OSJD) legislation for carriage of dangerous goods; (iv) a comparison between the above mentioned legislation in range of tank-wagons for carriage of dangerous goods; and (v) internal emergency plans for marshalling yards.</p>
16:00–16:30	<i>Coffee break</i>
16:30–18:00	<p><b>SESSION 2: Approaches to Risk Evaluation</b></p> <p>Approaches to risk evaluation currently differ between countries. These differences concern the type of evaluated risk (individual, societal, environmental), and acceptance and tolerability limits. Each type of risk needs a risk criterion to evaluate whether a risk is tolerable. Which criteria are used in OECD countries? What are the advantages and disadvantages and what are the consequences?</p> <p><b>Jean-Georges Heintz/Wieger Visser</b>, Union Internationale des Chemins de fer (UIC), Paris  <b>What do accidents statistics tell us? Learning from real cases</b></p> <p>From occurred or potential major accidents, approaches which take into account the risks related to transport of dangerous goods in the land use planning have been developed for about twenty years. The organisations responsible for risk assessment generally develop accident statistics using the data available, for example on fires, BLEVE, UVCE, explosions, pollutions, toxic gases releases, etc. This presentation will try to respond to the following questions: What are these data? What do they tell us? And what lessons can be learned?</p> <p><b>Daniel Bonomi</b>, BAFU, Switzerland  <b>Criteria for acceptability of risk in Switzerland</b></p> <p>This paper will present the risk criteria published in September 1996 and August 2001 by the Federal Office for the Environment (FOEN) for installations with chemical hazard or transport routes for dangerous goods falling into the scope of the Swiss Ordinance on Major Accidents (OMA). After a short introduction into the basics of the OMA, the concept of risk evaluation and the criteria will be explained. An evaluation of the experiences made and a look at the future developments will conclude the presentation.</p>

	<p><b>Claudia Fedler</b>, Hessian Regional Authority, Germany  <b>Safety in marshalling yards on large production sites</b></p> <p>The lecture will address the following topics: (i) technical and organizational preventive measures to be applied in order to reduce risk in marshalling yards and rail transport of large production sites; (ii) identification of the sources of major-accident risks in order to take suitable preventive measures; (iii) description of possible major-accident scenarios and their probability (e.g. chlorine and ethylene oxide); and (iv) considerations about the level of risk reduction and the cost of the measures to reduce risk.</p>
	<p><b>Bob Fronczak</b>, Association of American Railroads (AAR), US  <b>Steps Being Taken to Improve the Transportation of Dangerous Goods in North America</b></p> <p>The presentation will cover the measures that North American railroads take to assure safety and security in the transportation of dangerous goods, with a focus on marshalling yards. Safer tank cars, fewer shipments, and extra regulatory measures concerning the more hazardous commodities all lead to safer marshalling yards. The North American railroads have recently passed a new standard for tank cars carrying toxic inhalation hazard (TIH) materials which significantly improves the performance of the cars when they are involved in an accident. A consortium of Dow Chemical, Union Pacific Railroad and Union Tank Car are involved in a project to design the Next Generation Tank Car to meet and exceed AAR's standard.</p>
18:00	End of day 1

<b>Tuesday 16 October 2007</b>	
09:00–12:00	<p><b>SESSION 3: Feasible and Available Measures</b></p> <p>Which feasible and recently found (railway-, spatial planning- and safety policy-) measures are available to reduce risk and/or to upgrade the level of safety for the population in the vicinity of marshalling yards/freight stations? These measures concern the railway system (infrastructure as well as trains/wagons), spatial planning and/or safety policy. The measures can be divided into process, technical or organizational measures.</p> <p><b>Murad Orhan</b>, BASF, Germany  <b>Safety Concept in Marshalling Yard of BASF at Ludwigshafen, Germany</b></p> <p>This presentation will deal with the marshalling yards operated by BASF at Ludwigshafen in Germany. BASF builds safer trains from Ludwigshafen to several destinations and back in conventional and inter-modal traffic. The BASF' safety concept for the marshalling yard involves preventive measures like safety procedures, trainings, assessments, audits and modern technology, including handling manuals, checklists, BBS (Behaviour Based Safety), SQAS (Safety Quality Assessment System), automatic brake and weighing system, etc. The German chemical industry has implemented the TUIS (transportation, accident, information and emergency aid system) which the BASF fire fighting brigade is an important partner.</p> <p><i>With coffee break at some time</i></p>

	<p><b>Klaus-Jürgen Bieger</b>, DB-AG, Germany  <b>Emergency Management of the Deutsche Bahn AG</b></p> <p>This presentation will describe the emergency management of the German railway system: goal, scope, responsibilities, essential elements; requirements and duties; emergency control centres; information; training; cooperation; emergency plan according to UIC-leaflet 201; and RID (règlement international concernant le transport des marchandises dangereuses par chemin de fer).</p> <hr/> <p><b>Michèle Provencher</b>, Transport Canada  <b>Risk Analyses in the Rail Transport of Dangerous Goods: How to Best Avoid Releases</b></p> <p>The Transport Dangerous Goods (TDG) Directorate, Transport Canada, serves as the major source of regulatory development, information and guidance on dangerous goods transport. Work conducted by the directorate includes risk analyses by mode, such as a survey of the coupling speeds in hump yards to evaluate the applicability of imposing a speed limit, establishing the reliability of pressure relief valves and girth seams in railcars with a view to an alternative re-qualification interval, or establishing the probability that the width of a derailment would exceed a certain distance from the main track. A summary of the volume of dangerous goods transported in Canada by rail is presented along with accident statistics.</p> <hr/> <p><b>Eric Gurke</b>, Dutch Railroad Infrastructure, the Netherlands  <b>Landscaping railway yards in the Netherlands</b></p> <p>The presentation will address the following topics: (i) Explanation of structure and operation of the system of government in the Netherlands; (ii) Culture of turning a blind eye and consequences; (iii) Town and country planning, and solutions opted for in the past; and (iv) A proposal for possible solutions for the current situation: relocation of industrial estates, railway yards and airports; technical solutions; procedural solutions; and "chain study.</p>
12:00–13:30	<i>Lunch</i>
13:30–15:30	<p><b>SESSION 4: Spatial Planning vs. Transport and Shunting: How to Manage different Interests?</b></p> <p>From a social economical point of view areas around marshalling can be very interesting for spatial planning. Marshalling yards can also be located near or even in city centers, where the wish for development is present. Risk evaluation is necessary in these cases. This raises the issue of addressing responsibilities: which party is responsible for measures? Should measures be taken on the railway side, or in spatial planning? For example, <i>what if</i> a stadium is built next to a marshalling yard: who will be responsible when an accident occurs? Or <i>what if</i> measures are obliged to make new building plans possible: who is responsible and has to search for and implement measures?</p>

	<p><b>Ylva Gilbert</b>, GAIA, Finland  <b>Translating major accident hazard in marshalling yards into land-use planning measures</b></p> <p>This paper is based on a unique series of case studies where the risks related to marshalling yards and other major hazard accident sources have been identified, quantified and translated into spatial planning criteria. It will present the methodology which has been developed with industry and authorities, and applied to six upper tier Seveso plants, a chemical port and a marshalling yard in the largest Nordic refinery site, the Kilpilahti industrial area near Helsinki. A current project is further probing the issues of enhancing communication relating to major accident risk – using the Turku Marshalling Yard sited in the city centre as a concrete example. There are some interesting spatial planning issues in this case, as the current plans include immediate plans for additional housing as well as an amusement park in the immediate vicinity of the marshalling yard, where ammonia is one of the high volume chemicals.</p>
	<p><b>Colin Bonnet</b>, BAV, Switzerland  <b>Marshalling yard La Praille, Geneva: Risk assessment, safety measures and spatial planning</b></p> <p>The marshalling yard La Praille in Geneva handles around 150,000 wagons/year, including a significant number of tanks containing dangerous goods such as chlorine, LPG and gasoline. It is situated in a densely populated area, including a football stadium and a shopping mall in the immediate vicinity. The risks for the population (casualties) as well as for open water courses (pollution) were quantified. They turned out to be not acceptable for scenarios with a large number of casualties as well as for the pollution of the Rhone River. In order to bring the risk back to an acceptable level, safety measures were taken, especially to avoid accidents involving the people using the stadium and shopping mall. A basin for the retention of polluting liquids will also be built. On the other hand, the population density will strongly increase in the near future: large buildings (apartments, offices, school, etc.) will be built in the area, partly on the yard itself. In order to keep the risk at an acceptable level, a new risk analysis was made for the planned situation and it has been taken into account from the very beginning of the ongoing spatial planning process.</p>
	<p><b>Harry Killaars</b>, Network Proaction of the Dutch Association for Fire and crisis management (NVBR), Netherlands  <b>Incorporate emergency planning into spatial planning</b></p> <p>This presentation will address the obligation of the local authorities to ask advice of the fire brigade in case of the accountability for social risk. The following issues will be explained: (i) the benefits and disadvantages of other possibilities for spatial development, with a lower social risk nearby a railway or railway yard; (ii) the self rescuing capacity of the population in the 1% fatality boundary; (iii) the attainableness for rescue cars and limitation of the effects of a disaster or major accident on a railway or railway yard; and (iv) Integral Safety Design nearby a railway or railway yard.</p>
15:30–16:00	<i>Coffee break</i>
16:00–17:00	<b>CLOSING SESSION: Conclusions and Recommendations</b>
17:00	End of Workshop

**ANNEX 3**

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