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Working Party on the Transport of Dangerous Goods

Joint Meeting of the RID Committee of Experts and the Working Party on the Transport of Dangerous Goods

Geneva, 13–17 September 2010
Item 6 of the provisional agenda
Reports of informal working groups

Report of the informal working group on reduction of the risk of a BLEVE

Transmitted by the Government of the Netherlands on behalf of the working group[1, 2]

1. The informal working group held a seventh session from 19–21 April 2010 in Berlin, Germany under the chairmanship of Mr. Claude Pfauvadel (France). The session was attended by representatives of France, Germany, the Netherlands, Norway, Poland and the following non-governmental organisations: the International Union of Private Wagons (UIP) and the International Union of Railways (UIC).

2. The documents on the agenda were as follows:

- Report Joint Meeting March 2006, ECE/TRANS/WP.15/AC.1/102 (OCTI/RID/GT-III/2006-A), para. 5-12, 20 and 21;
- Report Joint Meeting Working Group on Tanks, ECE/TRANS/WP.15/AC.1/102/Add. 1 (OCTI/RID/GT-III/2006-A/Add.1), item 4;
- ECE/TRANS/WP.15/AC.1/2006/8 (OCTI/RID/GT-III/2006/8) (Netherlands);
- Informal document March 06/ INF. 3 (Netherlands);
- Informal document March 06/ INF. 26 (AEGPL);

[1] In accordance with the programme of work of the Inland Transport Committee for 2006-2010 (ECE/TRANS/166/Add.1, programme activity 02.7 (c)).

[2] Circulated by the Intergovernmental Organisation for International Carriage by Rail (OTIF) under the symbol OTIF/RID/RC/2010/47.

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- ECE/TRANS/WP.15/AC.1/2007/11 (OTIF/RID/RC/2007/11) - Report of the first informal working group on the reduction of the risk of a BLEVE (meeting in The Hague);
- Informal document March 07/INF.22 (AEGPL);
- Report Joint Meeting March 2007 ECE/TRANS/WP.15/AC.1/106 (OTIF/RID/CE/2007-A), para. 62;
- Informal document September 07/INF. 9 – Report of the second informal working group on the reduction of the risk of a BLEVE (meeting in Tønsberg);
- Report Joint Meeting September 2007 ECE/TRANS/WP.15/AC.1/108 (OTIF/RID/CE/2007-B), para. 105;
- Informal document March 08/INF.5 – Report of the third informal working group on the reduction of the risk of a BLEVE (meeting in Rome);
- Informal document September 08/INF.6 – Report of the fourth informal working group on the reduction of the risk of a BLEVE (meeting in The Hague);
- Report Joint Meeting September 2008 ECE/TRANS/WP.15/AC.1/112 (OTIF/RID/RC/2008-B), para. 41;
- Informal document March 09/INF.25 – Report of the fifth informal working group on the reduction of the risk of a BLEVE (meeting in Paris);
- Report Joint Meeting March 2009 ECE/TRANS/WP.15/AC.1/114 (OTIF/RID/RC/2009-A), para. 62;
- ECE/TRANS/WP.15/AC.1/2010/9 (OTIF/RID/RC/2010/9) - Report of the sixth informal working group on the reduction of the risk of a BLEVE (meeting in Paris).

Furthermore several working documents and presentations submitted by participants were scheduled.

3. The meeting was welcomed by Mr. Claude Pfauvadel, Chairman of the working group session. The Chairman referred to the key elements of the mandate given by the RID/ADR/ADN Joint Meeting:

- Prevention of a BLEVE;
- Reduction of the effect of a BLEVE;
- Hot BLEVE and cold BLEVE should be considered;
- Technical and other measures should be taken into account;
- Other matters of principle.

4. The meeting discussed on the collection of data of accidents and visited the test facility of the BAM in Horstwalde. The working group attended a test of a partly coated storage tank in a pool fire.

5. A roadmap has been settled for the proceeding in the working group on the collection of data of accidents.

6. The Government of France invites the working group for the next meeting in Paris. The meeting will be held from 15 to 17 December 2010.

Annex I

Report of the informal working group[3]

1. Several documents are presented to the working group for discussion and validation in this meeting.

- Documentation by UIC on revised rail bow tie models and a report with significant rail accidents;
- Information by the Netherlands on the expert meeting held in Utrecht 12/13 January 2010 and on the follow up of that meeting;
- A document by France on rail accident data;
- A document by ERA on railway accidents reported in EU and historical data;
- An analysis of TNO on rail accident data delivered by participants.

Presentation on data collected after the Utrecht meeting, and discussion

2. The representative of the Netherlands informed the meeting of the results of the Utrecht meeting and its follow up.

3. The representative of France said in Utrecht some experts had looked at real accident data of SCNF and considered how these data can be useful for ranking the measures. After that meeting France had improved the presentation of the data in an Excel sheet. The United Kingdom had reported one accident according to 1.8.5 of RID. Germany had in general information from the statistic office and reported accidents according to regulation 1.8.5 ADR/RID. The Netherlands had compiled information on road accidents. The UIC had sent data on rail accidents (Annual Safety Report UIC – 2009). The ERA had sent compiled information on rail accidents.

4. At this meeting no data were available on road accidents collected by AEGPL, because AEGPL could not come due to the closing of the airports and had not distributed data to the participants in advance.

5. The representative of the Netherlands presented the available data on rail.

6. The French data showed 2430 significant accidents including 43 accidents according to RID 1.8.5, over the past ten years. The main causes of accidents on the free track are 330 derailments and 112 collisions. There were also 13 combined accidents of a collision with a derailment. The accidents on the shunting yards were not considered because there are specific systems to prevent accidents on shunting yards where the speed of the train is less than 30 km/hour. The 43 accidents RID 1.8.5 show two releases of liquefied gas in Class 2, one small release and a bigger one (Ammonia-UN No. 1005).

7. The German data show 950 incidents concerning dangerous goods in the period between June 1996 en February 2010. It is not certain that these data are correct, perhaps every derailed wagon of a train is reported as a singular incident.

8. The one reported accident in the United Kingdom is a derailment of a train carrying Class 3 goods.

[3] Note by the secretariat: this report is reproduced as submitted.

9. The Dutch data show 42 accidents with general freight trains in the period between 1996 and 2005. The main causes of accidents on the free track are 10 derailments, 4 collisions and 2 combined accidents of collision and derailment. The collisions in shunting yards are all caused by passing a red sign and most of the derailments in shunting yards were in switches.

10. The UIC Safety Database Activity Report 2009 shows 2263 significant accidents with passenger and freight trains in 2008. In 2006 there were 2327 accidents and in 2007 2272 accidents. Remarkably the UIC data show relatively few derailments and many collisions. Even when personal accidents are excluded there are far more collisions than derailments. This presents a difference between the French/Dutch data and the UIC data and no explanation is found yet. The UIC data on 2008 also show that accidents have an external cause in most cases. Trespassing and non-compliance with regulations are the major causes of accidents.

11. The UIC also reported in 2004 to the RID Committee of Experts working group Risk Analysis that in the period 1970-2003 there were 12 releases of Class 3 goods and 6 releases of Class 2 goods from wagons [4]. There is more transport of Class 3 goods than Class 2 goods by train. In total there were 50 major leakages of goods of all Classes in this period.

12. The ERA reported data on significant accidents and serious accidents in the period 2006–2009. There were 234 accident investigation reports on freight trains involved and only 14 trains with dangerous goods. The ERADIS historical data over the period 1990-2007 shows serious accidents. There were 131 freight trains involved and 42 trains with dangerous goods. The fatalities resulting from these accidents are mainly related to collisions and level crossing accidents (305), derailments having resulted in 27 fatalities. The effects of the accidents with trains carrying dangerous goods were: 19 fires, 7 explosions, 6 leakages of toxics and no BLEVE. [5]

13. The representative of the Netherlands noted that the data of UIC and ERA are partly the same data. It is difficult to draw conclusions from this data because all data are collected on different criteria.

14. The representative of France said the accident report system should be improved to be able to draw better conclusions. Reporting accidents according to 1.8.5 of RID is not enough and therefore more information was needed. The UIC database with more information is not very useful to analyse dangerous goods accidents and should be improved. For instance only 10% of the derailments had serious consequences. The probability of a rail accident with dangerous goods is 10^{-4} for Class 3 and 10^{-5} for Class 2 wagons. That is a relatively high probability for a big number of casualties. The probability is higher for Class 3 wagons because there is more transport of Class 3 goods by rail.

[4] See www.otif.ch/otif/_dpdf/11_04_gt_analyse_risque_INF_UIC_1_D.pdf

[5] Comments by the representative of ERA, not participating in the meeting: The investigation data as well as data on serious accidents are not relevant for statistical purposes, but for information on accident lessons, causal factors and safety recommendations.
Statistical data on freight transport need to be extracted from the Common Safety Indicators in the future and from specific detailed assessment studies. To this end ERA is studying in great detail prevention and mitigation measures against freight train derailments (More information on this study is available at the following link http://www.era.europa.eu/The-Agency/Procurement/Pages/ERA-2010-SAF-OP-01.aspx). ERA will inform the working group with relevant results as soon as they will become available.

15. The representative of UIP said that many incidents occur in shunting yards at low speed caused by personal mistakes.

16. The representative of France suggested to discuss in the Joint Meeting the need to harmonize accident data. France has more detailed information on causes of accidents.

17. The representative of Germany said that 1.8.5 of RID is not sufficient for statistic analysis, for that purpose not only accidents should be reported but all significant incidents.

18. The representative of the Netherlands though that the collection of better data than now available will take a lot of effort and time and suggested that the working group should prioritise the measures on the basis of expert judgement on the causes of accidents together with the data now available. Also the costs of measures should be considered and the principle that the environmental effects of human activity should be as low as reasonable achievable.

19. The representative of France said that the improved table with French accidents/incidents can give more information about the causes of accidents and can help prioritising the measures on a quantitative method. The French experts never agree on things without data.

20. The representative of Germany said better data are necessary to draw conclusions.

21. The representative of the Netherlands said that the previous meetings of the working group proved it difficult to get more information about accidents and that even more information in the long term does not guarantee results that lead to conclusions.

22. The representatives of France and Germany said that they have time available for this subject the coming time and that a proposal to the Joint Meeting solely on experts judgement will not be accepted.

Presentation on French database of road accidents since 1980

23. The representative of France showed the French database adapted to 1.8.5 of RID. The data is in French because translation of the full database is too much work. The framework can be used by other countries to collect their data on the same criteria. The French data are not confidential and everyone can use them. Before the obligation of 1.8.5 of RID the data came from police reports. The company that is involved in an accident must report the accident. The report is usually sent by the company within two months after the police has reported an accident. The report has no legal consequences. No report will be punished with a fine. The SNCF has similar information available for rail transport. Data should be collected on a European level and sometimes you can show that there is no problem.

24. The representative of Germany said that it is possible to make the German data available in the same database as France.

25. The representative of Poland said that tanks should be as strong as possible and that more detailed information is necessary to draw conclusions.

26. The representative of France suggested that after an agreement on the information needed in the database a proposal to the Joint Meeting is possible to improve the collection of accident data in general. The data will help to identify possible causes for a BLEVE and see if selected measures work on that causes.

27. Presentation of Germany on the test in Horstwalde

28. The representative of Germany shows a test of a fully coated storage tank in a pool fire that was presented in the previous meeting. The test scheduled for tomorrow is a partly

coated storage tank in a pool fire. The top part of the tank (approximately 25 % of the tank surface) is coated and the tank has a safety valve and is 50% filled with LPG. During the bonfire test the temperature and pressure are continuously measured. The question is whether the combination of a safety valve and a partly coated top side of the tank can delay the occurrence of a BLEVE.

29. The representative of the Netherlands reminds to the available information on other tests and predicts that the unprotected steel of the tank will fail at high temperature and high pressure.

30. The test took place at the open air bonfire test facility of BAM near Horstwalde, a small village south of Berlin.

31. The pool fire was lit and the test showed that all the gas inside the tank was released by the safety valve and the storage tank did not fail even when the wall temperature of the tank exceeded 700 degrees Celsius.

Discussions on the results of the test

32. The representative of Germany says that their expectation was that the tank would fail in a pool fire and that there is not yet a sufficient explanation for this result. The coating of the top part of the tank was meant to prevent that the heat radiation of the flare on the safety valve would heat up the top surface of the tank too much.

33. The representative of France finds it interesting to see how a tank reacts in not ideal conditions of a partly coated tank. If a partly coated tank can resists a fire, than the question is which part is enough and what is the aim we set for a coating.

34. The representative of the Netherlands says the Dutch aim is that the tank should be able to resist 75 minutes in a pool fire. The coating on the Dutch tank vehicles for delivery to LPG refuelling stations meets that aim.

35. The representative of Germany says that there is experience with the coating of buildings and with the coating of storage tanks that is mandatory in Germany. A good coating can resist a pool fire for 100 minutes depending on the quality and the thickness of the coating.

36. The representative of France says that the influence of vibrations, cracks and weather conditions on the coating should be examined because the representative of Canada showed in an earlier meeting that the coating degenerated after time.

37. The representative of the Netherlands remarks that the material stress in the test tank wall was lower than in a road or rail tanker. The ratio of the wall thickness divided by the set-point pressure of the safety valve in a transport tank is lower than for the tested tank. The thermocouples that measured the tank wall temperature were attached on the outside of the tank. For that reason the wall temperature might be too high because they were directly radiated by the bonfire. A good analysis of the test measurements and results is necessary before conclusions can be drawn.

38. The representative of France says that if a partly coated tank can prevent a BLEVE it will be much cheaper and easier to apply than a full coating. But there remain a lot of questions to be answered, such as the impact resistance and the sort and place of the coating for different tanks.

39. The representative of UIC asks for the reason of the partly coating.

40. The representative of the Netherlands answers that it would be a big advantage if it is not necessary to coat the underside of the tank were the equipment is located. For further

testing it can be an option to define the questions and look for parties interested in solving these questions.

41. The representative of Germany says the first thing is to set our aim. Is it the resistance of fire for 60 or 75 minutes? And what kind of fire should be resisted? The resistance and scenarios should be defined. For instance chapter 6.7 of RID asks for a test of every prototype of a tank to meet the regulations.

42. The representative of the Netherlands suggests to set the main goals and to let the market come with the different coatings or other solutions. In the Netherlands that was the way to get the delivery tank vehicles for LPG coated. In the Netherlands the government first demonstrated that the standard could be realised by a full coating and a safety valve on the tank. After that the industry was free to prove that other solutions also complied to the standard. And Canada has a general standard for coatings as an example.

43. The representative of UIP raised his concerns about a general requirement for thermal protection in form of coatings due to cost benefit discussion. He said that there has been no BLEVE accident so far and that the immense costs for such a protection could lead to enormous competitive disadvantages for the transport of LPG in rail tank wagons. The representative of UIC supported this and said that the UIC accident database clearly shows the correctness of the UIP arguments.

44. The representative of the Netherlands answers that according to the method of risk analysis there can be a risk even when there has not been a BLEVE accident yet. The method of risk analysis has been accepted by the RID Committee of Experts and WP.15.

45. The representatives of France and Germany both think that preliminary testing is needed to make regulations on a coating. But there is no agreement on the need for a coating and a safety valve.

Work proceeding

46. The working group discussed on a roadmap for proceedings of a next working group. The result is in **annex II**.

47. Other conclusions on how to proceed:

- Report to the Joint Meeting that accident data is insufficient and should be improved. Some countries have data available but not in a form good enough to analyse accidents. The need and management of a good database is not fully part of the work of this working group and should be discussed in the Joint Meeting. Risk analysis needs good data for a reliable risk assessment. Provision 1.8.5 of ADR/RID does not apply to that purpose.

Next meeting

- France invites the working group for the next meeting from 15 to 17 December 2010 in Paris. France is willing to chair the meeting. The Netherlands offers to make the report.

Annex II

Roadmap Working group BLEVE reduction

Defined by the working group in Berlin 21 April 2010

Nr	Action	who	deadline
A1	Road: To fill French accident excel data table in Utrecht format (see attached table), at least tank accident 1.8.5, but preferably all tank incidents	Road: F, D, ?	30 Sept 2010
A2	Rail: Complete German table for excel for rail.	Christiane + Jean George + ERA	30 June 2010
A3	Rail: To fill accident excel data table in Utrecht format, at least tank accident 1.8.5, but preferably all tank incidents	Rail: F, D, N, UIC, ERA, ?	30 Sept 2010
A4	Pragmatic analysis of events that occurred (accident data excel tables)	Rail: UIC+France Road: AEGPL	15-17 Dec 2010
A5	Complete analysis with other freight accident	Rail: UIC+France, ERA? Road: AEGPL	
A6	Complete pragmatic analysis with expert judgement	Working group with invited expert	
T1	Exchange research info coatings + PRV	TNO + BAM	April 2010
T2	Identify open questions and uncertainties: -Existing standards for coatings -substances concerned -negative effects -maintenance -life time -technical question coatings	BAM	Nov 2010
T3	Define tank in fire scenario	BAM discussion paper	Nov 2010
T4	What are the tank resistance criteria	BAM discussion paper	p.m.

Remark:

In column 3 points have been assigned to organisations, however every other organisation is encouraged to contribute.

Rail tankers accident database	
items to be collected (if available, last 10 years)	
•Date • Location • Abstract • UN number • Class • Full/empty • Loading/unloading • Causes – (Bow tie hazard categories + others if available, 1.8.5)	• Derailment (one wheel out track, wagon on the side, impact on tank) • Collision with object (with/without tank impact on tank) • Collision other train (,,,,) • External fire • Spill • Fire • Explosion (VCE, BLEVE) • Victims • Comment