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INLAND TRANSPORT COMMITTEE

Working Party on the Transport
of Dangerous Goods

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

REPORT OF THE SESSION*

held in Geneva from 10 to 14 September 2001

Addendum 4

Annex 2

Report of the Working Group on Tanks

1. The working group began work in the afternoon of 10 September 2001. The Joint Meeting had initially given it the mandate of considering the following official (TRANS/WP.15/AC.1/- or OCTI/RID/GT-III/-) and informal documents:

2001/11	INF.11	INF.28
2001/34	INF.12	INF.31
2001/46	INF.13	
2001/51	INF.14	
2001/52	INF.22	
INF.10	INF.26	

* Distributed by the Central Office for International Carriage by Rail (OCTI) under the symbol OCTI/RID/GT-III/2001-B/Add.4.

2. The working group comprised 17 experts from 12 States and five non-governmental organizations.

3. For practical reasons, the working group began with a discussion of document TRANS/WP.15/AC.1/2001/34, submitted by EIGA.

Document: TRANS/WP.15/AC.1/2001/34

4. EIGA proposed in this document that provisions adopted in the United Nations Recommendations for the use and construction of multiple element gas containers (MEGCs) should be included in RID/ADR. The aim was to incorporate in the restructured RID/ADR amendments and additions to Chapters 4.3, 6.7 and 6.8 for MEGCs and battery vehicles/wagons.

5. The objective was also to harmonize requirements for MEGCs and introduce United Nations certified MEGCs into the scope of RID/ADR. Since the United Nations Recommendations and RID/ADR diverged on the subject of MEGCs and there was a need to maintain a European “land MEGC”, full harmonization of the provisions was not considered advisable. The working group decided instead to take up as far as possible the original MEGC texts contained in the United Nations Recommendations in Chapters 4.2 (as 4.2.4) and 6.7 (as 6.7.5) and to submit a recommendation to the plenary. For reasons of clarity, the working group also recommended that a definition of a “UN” multimodal MEGC should be inserted in section 6.7.5.1. In its opinion, the secretariats could be entrusted with these adaptations, thus making it unnecessary to submit a proposal.

6. Since EIGA’s request to have “UN” certified MEGCs included in RID/ADR had been satisfied, it withdrew the additional proposed amendments concerning Chapters 4.3 and 6.8 contained in document TRANS/WP.15/AC.1/2001/34 as being practically unnecessary if the Joint Meeting accepted the working group’s recommendations. EIGA’s proposal would thus have been met.

Informal document: INF.26

7. In this document, EIGA proposed a modified basis for calculation of the minimum wall thickness of spherical tanks in terms of pressure in accordance with 6.8.2.1.17, in addition to the existing requirements of this paragraph. The present formula

$$e = \frac{P_T D}{2\sigma\lambda} \quad \text{or} \quad e = \frac{P_C D}{2\sigma}$$

referred originally to cylindrical tanks, while a calculation of the minimum wall thickness of spherical tanks purely in terms of pressure would give the formula

$$e = \frac{P_T D}{4\sigma\lambda} \quad \text{or} \quad e = \frac{P_C D}{4\sigma}$$

8. All the members of the working group accepted that the application of the second formula would result in the minimum wall thickness being halved for normal calculations. Some members considered, however, that the proposed halving of the minimum wall thickness meant a reduction in the present level of safety for tanks in relation to the external effects of accident situations. In other words, the present formula basically took safety aspects into account, while the proposed additional formula was exclusively limited to a conception in terms of working pressure.

9. It was not possible to reach a consensus. The working group agreed, however, that no scientific conclusion could be put forward that was sufficiently soundly based on performance in the event of an accident, in particular with reference to spherical tanks, to allow an unambiguous opinion to be formed. For that reason the working group had decided to continue work on the subject, taking into account the initiative by Germany to endeavour to take tank safety levels into consideration through an approach that would be generally applicable. On the one hand, there needed to be a joint effort to proceed with conclusive tests; on the other hand, Germany would clarify its ideas on the general level of safety required; these ideas had already been submitted in a general form in the documents on alternative arrangements. The working group therefore asked the Joint Meeting to keep the issue on the agenda under "Future work".

Informal document: INF.14

10. RID and ADR contained requirements for mild steel where minimum wall thicknesses for tanks were concerned. If metals other than mild steel were used, these minimum wall thicknesses should be converted according to the characteristics of the metal selected. When the original conversion formula (cubic root formula) was modified in the new equivalence formula, minimum wall thicknesses had been agreed on in 6.8.2.1.19, depending on the metal selected. These minimum wall thicknesses were listed in a table in the aforementioned paragraph. According to the table, the minimum wall thickness for steels was 3 mm. When this decision was taken, however, the fact had been overlooked that double-walled vacuum-insulated tanks in stainless steel (high-grade) already existed, in which the inner wall of the tank proper was less than 3 mm thick, although the sum of the thicknesses of the inner and outer tanks naturally corresponded to the thickness required for the complete wall. Since to date there had been no provision for a technical safety reservation in respect of the calculation for such tanks, France requested the possibility of maintaining this dispensation from the value given in the aforementioned table for the minimum wall thickness of steel tanks, i.e. the authorization of lower values for the thickness of the inner tank wall, which would then be less than 3 mm.

11. The working group unanimously approved France's request in this regard.

12. No consensus was reached on whether a still lower minimum wall thickness of 2.5 or 2 mm depending on the tank diameter was required for these (inner) tanks, or whether this minimum wall thickness requirement should be abolished altogether.

13. Since approval had been given in principle, France announced that the document under discussion, INF.14, would be transmitted in its present form or amended in the light of the discussion, to WP.15 for a decision.

Document: TRANS/WP.15/AC.1/2001/11

14. The proposal submitted by CEN in this document referred to the introduction of a new reference to standard EN 1252-2:2001 in RID/ADR and also to the relevant insertion in RID/ADR of references to standard EN 1252-1:1998, "Cryogenic vessels - Materials - Part 1: Toughness requirements for temperature below -80° C, and standard EN 1252-2:2001, "Cryogenic vessels - Materials - Part 2: Toughness requirements for temperature between -80° C and -20° C".

15. The great majority of the working group considered that a reference should be included to standard EN 1252-2:2001 although the working group had not been able to make a complete examination of its applicability in the context of RID/ADR and of its conformity with RID/ADR during the meeting. The representative of CEN had nevertheless amply demonstrated its applicability.

16. The working group also followed up CEN's proposal to put the references to the two standards or parts of those standards in a new section 6.8.5.4 entitled "Reference to standards", and at the same time delete the existing reference to EN 1252-1:1998 in section 6.2.2. This made the references to the two parts of EN 1252 clear and unambiguous, both for receptacles and for tanks. The working group therefore recommended that CEN's proposal should be adopted.

Informal document: INF.31

17. In this document, Germany informed the Joint Meeting of the consequences of a rear collision involving a battery vehicle comprising nine tubes. Following the collision, three valves closing the tubes had been wrenched off while two had been deformed to such an extent as to be no longer gastight and hydrogen had escaped. The rear protection - a grille made of tubular elements - had not been sufficient to prevent satisfactorily the effect of the vehicle hitting the tube valves, which were not otherwise protected. The exposed location of the closing devices would appear to be a problem from a technical safety point of view since the forward placing of the cylinder valves was a weak point. In reflecting on how to improve the rear protection of the tubes, the idea came up of direct protection of the valves - for example, a bell-shaped protective steel support - as already similarly tested for mounting on normal gas cylinders and applied appropriately. Germany took the accident as an opportunity to concentrate once again on the subject of rear collision protection and announced pertinent activities. The working group took note of this and said that it was ready to discuss problems of this nature, which could also be raised in plenary or in the form of accident reports. Reference was also made to informal document INF.20 containing the report of the Joint Meeting's informal group on section 1.8.5 (accident/incident).

18. Germany would come back to these problems in due course with the appropriate documents.

Document: TRANS/WP.15/AC.1/2001/51

19. This document concerned the use of vacuum valves on certain tanks with tank codes L4BH and SGAH. It was an old problem, as emerged from the details set out in

document TRANS/WP.15/AC.1/2001/51. In brief, the situation was as follows: although the use of vacuum valves on tanks was not compatible with the definition of “hermetically closed tank”, WP.15 had nevertheless decided, under certain conditions, to authorize the use of vacuum valves on hermetically closed tanks. The Joint Meeting had in principle accepted this decision and had given a working group the responsibility of establishing the necessary conditions. A number of proposals had been put forward since then but for various reasons it had not been possible to adopt them.

20. The substance of the proposal submitted by the Netherlands was accepted by the working group; some amendments were nevertheless made to aspects of detail. The proposal, as amended by the working group, took the following form:

- (a) **6.8.4 (b)** Add the following new provision TE 15 for tank-vehicles, tank-containers and tank wagons:

“TE 15 Tanks fitted with vacuum valves which open at a negative pressure of not less than 20 kPa (0.21 bar) shall be considered as being hermetically closed.”

For tank wagons only, add:

“Tanks equipped with controlled ventilation (autovent) valves which open at a negative pressure greater than [0.4] [0.21] bar are also considered as being hermetically closed.”

- (b) **ADR, Chapter 3.2, Table A**, amend as follows:

For all substances for which tank codes L4BH and SGAH are assigned in column (12) add “TE 15” in column (13).

- (c) **6.8.2.1.7** For tank-vehicles/tank wagons and tank-containers, add the following text:

“Shells, other than shells according to 6.8.2.2.6, designed to be equipped with vacuum valves shall be able to withstand, without permanent deformation, an external pressure of not less than 20 kPa (0.2 bar) above the internal pressure. The vacuum valves shall be set to relieve at a vacuum setting not greater than the tank’s design vacuum pressure. Shells, which are not designed to be equipped with a vacuum valve shall be able to withstand, without permanent deformation an external pressure of not less than 30 kPa (0.3 bar) above the internal pressure.”

- (d) **6.8.2.2.3** This paragraph should be kept.

- (e) **6.8.2.5.1** The following should not be added:

“- external design pressure ... bar/kPa*(gauge pressure)”.

(f) **1.6.3.20/1.6.4.13** New (to be added):

[Fixed tanks (tank-vehicles) and demountable tanks/tank-containers

[Tank wagons/Tank-containers

constructed before 1 July 2003 in accordance with the requirements applicable up to 31 December 2002, but which do not, however, conform to the requirements of 6.8.2.1.7 and special provision TE 15 of 6.8.4 (b) applicable as from 1 January 2003, may still be used.”]

RID only: “1.6.3.19 (reserved)”.

21. The basic justification for these proposals comes from document -/2001/51. The working group, however, decided to adopt the pressure values of Chapter 6.7 for reasons of harmonization and also to extend the requirements to tank wagons. The RID Committee of Experts would be required to establish certain details.

Document: TRANS/WP.15/AC.1/2001/46

22. The proposal by the United Kingdom concerned the carriage of liquefied gases in tanks with a recessed valve chest.

23. Some gases (chlorine, for example) could only be carried in tanks with no opening below the level of the liquid (tank code D). The United Kingdom proposed that openings below the level of the liquid could nevertheless be permitted under certain conditions of construction.

24. Although the proposed solution had some advantages (mounting of the inspection opening and its fittings at a particularly advantageous position from the point of view of stress), the working group nevertheless considered that the system had a serious disadvantage: in this case, mounting the openings below the level of the liquid, regardless of how well it was done, represented a radical change in the safety principles underpinning the requirement of exclusively maintaining openings above the level of the liquid. The working group was unable to support this proposal solely for this reason, although the possibility of further discussion was not excluded. The Joint Meeting was recommended not to follow up the proposal (as yet).

Document: TRANS/WP.15/AC.1/2001/52

25. In accordance with special provision TU 11, coal dust (carbon, UN No. 1361) could only be filled at a maximum temperature of 80° C when the tanks intended for its carriage were, inter alia, hermetically closed. By analogy with special multilateral agreement M63, UIP proposed that this requirement should be dispensed with and the use of non-hermetically closed tanks permitted.

26. The working group was in principle in favour of this proposal since special provision TU 11 envisaged other measures also guaranteeing the safe service of tanks when not hermetically closed; other requirements were additionally anticipated for the tank (tank code SGAN). The working group, however, proposed a modified wording of the UIP proposal, so as to avoid the term “leakproof” which had not been so far defined. The amended text of special provision TU 11 of 4.3.5, second sentence, should read:

“A maximum temperature of 80° C is allowed provided that smoulder spots are prevented during filling and the following conditions are met.”

27. The working group recommended that the Joint Meeting should take action on the UIP proposal, as amended.

Informal document: INF.10

28. Chapters 4.5 and 6.10 (vacuum-operated waste tanks) of ADR referred only to tank-vehicles. Germany proposed that tank-containers and tank swap bodies should also be included.

29. Some members of the working group confirmed the need for this extension of the scope and the working group finally considered that this would be a wise move.

30. However, the working group was unable, for lack of time, to prepare a proposed text. The representative of Germany therefore suggested that he would prepare a proposal for the next Joint Meeting and submit it to the working group for discussion. The working group approved this step.

Informal document: INF.12

31. In this document UIP proposed that the explanation of the N code in the table in 4.3.4.1.1 should be amended so as to permit the coding of tanks with venting valves and vacuum valves but without safety valves.

32. In the opinion of the working group, in view of the provisions of 6.8.2.2.6 et seq., tanks with vacuum valves but without safety valves did not satisfy the provisions of RID/ADR. The proposal was therefore considered unnecessary and was rejected. In the event of the existence of such tanks, the submission of a proposal for relevant transitional measures would need to be considered.

Informal document: INF.13

33. This document dealt with a matter which erroneously appeared in the list of documents for discussion by the working group (placarding of tanks). It was discussed in plenary.

Informal document: INF.11

34. This document concerned the problem of “(+)” substances, the alternative use of tanks and hierarchy of tanks in that context and came back to problems raised at the last Joint Meeting (see TRANS/WP.15/AC.1/2001/37 and INF.44).

35. At the previous Joint Meeting there had been agreement on the principle that for all substances (according to table 3, including (+) substances), regardless of the tank hierarchy, more efficient tanks (e.g. with higher test pressure) could be deployed. It had further been accepted that alternative transport of (+) substances was permissible only when specified in the certificate of type approval.

36. Since a proposed text (INF.44) had not been accepted in full by the Joint Meeting, new wording would have to be prepared.

37. The working group prepared the proposal from some parts of INF.44 (from the previous session) and INF.11 (from the current session) to read:

New requirement to be added at the end of 4.3.4.1.2:

“In addition to the tank codes given in this table and in Chapter 3.2, Table A, for the carriage of substances permitted under this tank code, other tank codes may be permitted, provided that in Part 2 and/or 3 and/or 4 of these other tank codes only figures and/or letters relating to a higher level of safety of the tank are used.”

Safety hierarchy for the different parts of the tank code:

Part 2: Calculation pressure

G→1.5→2.65→4→10→15→21

Part 3: Openings

A→B→C→D

Part 4: Safety valves/devices

V→F→N→H

Amend the first paragraph of 4.3.4.1.3 to read:

“The following substances and groups of substances, where a ‘(+)’ appears in column (12) of Table A in Chapter 3.2 are subject to special provisions. In that case the alternative use of the tanks for other substances and groups of substances is permitted

only if it is specified in the certificate of type approval. The hierarchy of 4.3.4.1.2 is not applicable. However, taking account of the special provisions indicated in column (13) of Table A in Chapter 3.2, tanks with more stringent requirements according to the provisions set out at the end of the table in 4.3.4.1.2 may be used.”

The Joint Meeting was requested to approve this proposed text.

Informal document: INF.12

38. In view of the number of detailed comments, only the working group’s decisions on items 1 to 6 are given below:

- Item 1: Fibre-reinforced plastics tanks: the proposal contained in document TRANS/WP.15/AC.1/2001/48 to refer to the applicable sections of the chapter was approved. The Joint Meeting should accept the proposal contained in -/2001/48.
- Item 2: It was noted that a tank code for vacuum-operated tanks would fall outside the tank hierarchy. An independent code should be introduced for these tanks (L4AH or S4AH). Belgium and France would submit a relevant proposal for the next session of WP.15.
- Item 3: There was no need to add provisions to 6.8.2.2.2 since it was unambiguous.
- Item 4: This proposal should be regarded as unnecessary following the discussion of INF.11.
- Item 5: The problem should be resolved. Otherwise, a clearer proposal would need to be submitted.
- Item 6: It was not possible to take a decision. A more detailed proposal should be submitted.

Informal document: INF.28

39. Again, only decisions on the various items set out in the document are given below.

- Item 1: The proposal was adopted with an addition:

TU 14: “The caps shall be locked during carriage”.

Comment: TEX should be added in column (13) of Table A each time that TU 14 appears.

Item 2: Adopted.

Item 3: Proposal 3-1 was adopted.

Proposal 3-2 has become unnecessary since the provisions of 6.8.2.2.2 are unambiguous.

Item 4: The discussion was interrupted since no decision seemed possible.

Item 5: The comments are practically unnecessary since this question cannot be settled.

40. The Joint Meeting was asked to adopt items 1, 2 and 3-1, as well as the proposal in item 1 of informal document INF.22.
