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Economic Commission for Europe**Inland Transport Committee****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**

Bern, 17-21 March 2014

Item 2 of the provisional agenda

Tanks**Carriage of liquefied refrigerated natural gas (UN 1972) in
non-vacuum insulated vessels****Transmitted by the Government of Spain^{1, 2}***Summary***Executive summary:** The aim of this proposal is to clarify the applicability of non-vacuum insulation for carriage of LNG**Related documents:** Informal document INF.49 (CEN) of the March 2003 session
ECE/TRANS/WP.15/AC.1/2013/38 (France)
ECE/TRANS/WP.15/AC.1/132, para. 7
ECE/TRANS/WP.15/AC.1/132/Add.1, para.5-7**Background**

1. In the September 2013 meeting, France brought up an interpretation issue to the Working Group on Tanks of the Joint Meeting, regarding the possibility to use non-vacuum insulated tanks to transport liquefied natural gas (LNG).

¹ In accordance with the programme of work of the Inland Transport Committee for 2012–2016 (ECE/TRANS/224, para. 94, ECE/TRANS/2012/12, programme activity 02.7 (A1c)).

² Circulated by the Intergovernmental Organisation for International Carriage by Rail (OTIF) under the symbol OTIF/RID/RC/2014/24.

2. For designs and construction of tanks, two different standards are mentioned in 6.8.2.6.1, which are mandatory since 1 January 2009:

(a) EN 13530-2: Cryogenic vessels – Large transportable vacuum insulated vessels

(b) EN 14398-2 (except table 1): Cryogenic vessels – Large transportable non-vacuum insulated vessels.

3. In standard EN 13530-2, paragraph 3.1, a reference is made to EN 13530-1, paragraph 3, to use the definitions and terminology given in EN 13530-1. In this EN 13530 part 1, paragraph 3, in table 1, there are given different substances for which vacuum isolated tanks can be used. In EN 13530-1, table 1, LNG is explicitly mentioned.

4. In the second standard, EN 14398-2, paragraph 3.1, a reference is also made to EN 14398-1, paragraph 3, to use the definitions and terminology given in EN 14398-1. In this EN 14398 part 1, paragraph 3, in table 1 there are given different substances for which non-vacuum isolated tanks can be used. In EN 14398-1, table 1, LNG is not included.

5. On the other hand, in 6.8.2.6.1 the reference to standard EN 14398-2 mentions explicitly “except table 1”. This could lead to the interpretation that the table in part 1, in which the different substances are listed for which this standard can be used, must not be applied.

6. Nevertheless, the Working Group on Tanks confirmed the interpretation made by France that, as LNG was not listed in table 1 of EN 14398-1, non-vacuum isolated tanks could not be used to carry LNG (ECE/TRANS/WP.15/AC.1/132/Add.1, para.5-6):

“The Working Group supported the interpretation made by France in document 2013/38 that currently only vacuum insulated tanks shall be constructed for LNG in accordance with the standards referenced in 6.8.2.6 of ADR. The group confirmed that UN 1972 is referenced in part 1 of EN 13530, but is not referenced in part 1 of EN 14398. It was also clarified that tanks without vacuum insulation which predate the mandatory entry into force of these relevant standards still exist and are covered through a transitional measure.

Further analysis showed that currently part 2 of the standard EN 14398 is listed in 6.8.2.6.1, and table 1 of this standard is excluded. For the scope of standard EN 14398-2, reference is made to part 1 of the same standard, which contains the applicable substances in its Table 1. However, table 1 of part 2 of the standard deals with roundness of the tank and the group did not understand why this part of the standard was excluded. It was decided to raise this issue with the Working Group on Standards at their next session and depending on the outcome propose an amendment to clarify the issue to WP.15 (standard only referenced in ADR).”

7. The Joint Meeting in its report (ECE/TRANS/WP.15/AC.1/132) reflected this saying that “In particular, it confirmed the interpretation in paragraph 7 that tanks intended for the carriage of LNG and constructed after the mandatory date of application of the standards referenced in 6.8.2.6 must be vacuum insulated.”.

Analysis of standard EN 14398

EN 14398-2, table 1

8. The standard EN 14398-2 has 3 different parts, with different publishing dates. The version referenced in ADR is EN 14398-2:2003. A newer version also exists, which is EN 14398-2:2003+A2:2008.
9. In EN 14398-2:2003, table 1, vessel minimum wall thickness is given.
10. In EN 14398-2:2003+A2:2008, the former table 1 has been deleted, because the table that was formerly there now has been substituted by a reference to ADR/RID 6.8.2.1.19. The new table 1 is the one related to the roundness of the tank.

Introduction of EN 14398-2 into ADR/RID

11. EN 14398-2:2003 was introduced for the first time to ADR/RID in 2005, with the addition of “except table 1”. The proposal for the introduction of this standard is contained in informal document INF.49 of the March 2003 session (CEN).
12. The procedure that was in place at that time for introduction of a standard was that, for each standard, before its introduction into ADR/RID, a table should be prepared by CEN. This has been done for EN 13530-2 (see informal document INF.17 of the sixty-ninth session of WP.15 (5-7 November 2001), Presentation of EN standard for future reference in chapter 6.8 of ADR), but was not done for EN 14398-2.
13. At the time of introduction of EN 14398-2:2003 into ADR/RID, this standard was not mandatory to fulfil.
14. In the prologue of EN 14398-2: 2003, and in all other prologues of standards issued at that time referenced in ADR/RID, it is stated that: “The standard has been submitted for reference into the RID and/or in the technical annexes of the ADR. Therefore the standards listed in the normative references and covering basic requirements of RID/ADR not addressed within the present standard are normative only when standards themselves are referred to in the RID and/or the technical annexes of the ADR”.
15. This statement means that EN 14398-1, which is not directly referred to in ADR/RID, cannot be considered as normative.

EN 14398-1, table 1

16. In EN 14398-1, table 1, a list of gases to which EN 14398-1 can be applied is given. This list is much smaller than the complete list of cryogenic gases contemplated in ADR/RID, and also the list of gases included in EN 13530-1.
17. As stated generally in 1.1.5, “Where the application of a standard is necessary, and there is any conflict between the standard and the provisions of ADR/RID, the provisions of ADR/RID take precedence.”. Also in paragraph 6.8.2.6.1 is stated that independently of which requirements of construction are indicated in the standards, the requirements of chapter 6.8 prevail over in all cases.
18. In this case, a clear conflict seems to appear in between EN 14398-1, table 1 and ADR/RID. In no place of the ADR/RID it is mentioned that for some kind of gases one type of thermal insulation cannot be applied. EN 14398-1 applies additional restrictions to the range of gases.

19. Furthermore, there seems to be no clear logic behind the gases which are listed in EN 14398-1 table 1. In the scope of EN 14398-1 and in table 1 contained in paragraph 3 it is said that this standard is valid for refrigerated, but not toxic gases. But in table 1, only two specific gases are mentioned (one asphyxiating and one oxidizing), and also two N.O.S. entries in which mixtures of the other gases not listed could be transported. If the gases not mentioned in the list are not mentioned because of safety concerns, no N.O.S. entry should be listed. Also the flammable gases should be included, as they are not toxic.

20. EN 14398-1 table 1 only includes asphyxiating and oxidizing gases. But EN 14398-2 and EN 14398-3 both mention flammable gases. EN 14398-2:2003 in paragraphs 4.2.10 and 4.2.11 and EN 14398-3:2003 in paragraph 16 (whole range from 16.1 to 16.8). It is not logical that part 2 and 3 of a standard elaborate on something that is not included in the scope of the standard. This also indicates that the flammable gases should be included into the applicability EN 14398 and that the scope of EN 14398-1 and the gases defined in EN 14398-1:2003, table 1 are too restrictively defined.

21. For all three given reasons, EN 14398-1 should be revised.

Table included in ADR 6.8.2.6.1

22. In 6.8.2.6.1, a table is included, in which are mentioned all of the different standards which shall be applied for issuing type approvals. In column 1 and 2 of this table, the reference and the title of the standard are included. In column 3 the applicable subsections and paragraphs of ADR are included. The paragraphs which are included into column 3 are the ones on which the standard elaborates. Paragraphs of ADR not mentioned here are supposed to not be affected by the contents of the standard.

23. In column 3 for EN 14398-2 (except table 1) the following subsections and paragraphs are included: 6.8.2.1 (except 6.8.2.1.17, 6.8.2.1.19 and 6.8.2.1.20), 6.8.2.4, 6.8.3.1, 6.8.3.4.

6.8.3.2 is not included into column 3 for EN 14398-2, and therefore it is understood that the specifications given in 6.8.3.2 are not affected by EN 14398-2. Specifically, both types of thermal insulations for tanks should be able to be used, as specified in 6.8.3.2.14 to 6.8.3.2.17.

Conclusions

24. Analysing EN 14398 with detail, several conclusions have been drawn:

- EN 14398-1 cannot be considered as normative;
- EN 14398-1, table 1 restricts in its scope the ADR/RID regulations, in conflict with the general rule that ADR/RID take precedence;
- EN 14398-1, table 1 restricts the scope of the applicable gases, also in conflict with EN 14398-2 and EN 14398-3;
- The types of thermal insulation introduced in 6.8.3.2.14-17, are not affected by EN 14398-2, as they are not mentioned in column 3 of 6.8.2.6.1 for EN 14398-2 and therefore EN 14398-1 table 1 cannot be accepted as an added restriction to ADR/RID.

25. Two different interpretation possibilities are still possible:

- (a) Table 1 mentioned in “except table 1” in ADR 6.8.2.6.1 is the table 1 in EN 14398-1.

No additional restrictions in the scope of the standard EN 14398-2 would have been imposed; all kind of cryogenic gases could be transported in non-vacuum insulated tank vehicles.

(b) Table 1 mentioned in “except table 1” in ADR/RID 6.8.2.6.1 is the table 1 in EN 14398-2:2003

This would mean that the table listed in part 2: 2003 related to the minimum wall thickness would not be applicable, which nowadays is not relevant anymore anyway, because the table has been included in 6.8.2.1.19. Applying the general principle that ADR/RID takes precedence, this table couldn't be applied anyway.

But as stated in paragraph 25 of this document, the applicability of EN 14398-1 table 1 is not adequate anyway.

GNL tank vehicles in Spain

26. Tank vehicles for carriage of LNG in Spain were introduced in 1980. Currently, 234 tank vehicles are dedicated to LNG transport in Spain. The present fleet of vehicles is composed almost completely by non-vacuum insulated tanks (219 out of 234, representing a 95%). The oldest vehicles still in use were built in 1991.

27. The fleet of tank vehicles for LNG in Spain is, by far, the largest in Europe. Two important accidents have occurred (Tivissa, 2002 and Lorca 2011); but bearing in mind that around 80.000 transports are made annually, in comparison this is still a fairly good safety record. Considering a constant increase in traffic for GNL carriage since 1980, around 1 320 000 trips have been done; 2 accidents mean a probability of 1.5×10^{-6} of having an accident.

28. Vacuum insulated tanks have only begun to be used in recent years (from the 15 Spanish ones, only 9 are already circulating), so no comparative data concerning safety is available.

29. Spanish GNL tank vehicles distribute GNL also to France, Italy, Portugal and occasionally to other countries.

30. In Spain, since the use of both standards, EN 13530-2 and EN 14398-2, was made mandatory in 2009, both standards have been applied for the design and construction of tanks for carriage of LNG.

31. According to this, between 1 January 2009 and September 2013 36 non-vacuum insulated tank vehicles for carriage of LNG were built in Spain, and eventually other 5 in Portugal. In some cases, the non-vacuum insulated tank vehicles built between 1. January 2009 and September 2013 make up the 100% of the vehicle fleet of the proprietary company.

32. Following the interpretation made by the Joint Meeting in September 2013, Spain's competent authority has already issued a decree banning the construction of non-vacuum insulated tanks for carriage of LNG.

Non-vacuum insulated tank vehicles built between 2009 and 2013

33. With all the arguments given above, Spain is of the opinion that EN 14398-1, table 1 cannot be applied to restrict the thermal insulation type for GNL (or other cryogenic gases). To restrict the thermal insulation types indicated within ADR/RID to vacuum insulation, this should be directly included into ADR/RID.

34. EN 14398-1 should be revised, including into its range of substances for which it can be applied the complete range of substances for which it can be applied in ADR/RID.

35. If this is not accepted by the Joint Meeting, Spain is interested in at least permitting the circulation of non-vacuum insulated tank vehicles built between January 2009 and September 2013, built in accordance to standard EN 14398-2, and therefore include a transitional measure under 1.6.3.

36. Permitting the continued use of these tank vehicles has no safety implications; non-vacuum insulated tank vehicles built before 2009 can still be used, also in international transport, according to 1.6.3.31. More recent non-vacuum insulated tank vehicles will be safer than more ancient ones, as they will have incorporated general safety improvements developed in the last years. Not permitting the newer non-vacuum insulated tank vehicles to circulate will force LNG distribution to be done with older vehicles, also internationally.

Proposal

37. The following proposals are presented for discussion:

Proposal 1: Accepting that EN 14398-1 cannot be used to apply restrictions on the type of thermal insulation.

To include a special provision for UN 1972:

“TC XX: For fixed tanks (tank vehicles) and demountable tanks, only vacuum insulation can be used as thermal insulation.”

No transitional measures would be needed, as 1.6.3.31 already covers the continued use of tank vehicles and demountable tanks constructed in accordance with standards applicable at the time of their construction.

Additionally, the standard EN 14398-1 should be revised by the relevant CEN technical Committee (CEN/TC/268).

A similar proposal to include a special provision for UN1972 should be brought forward to the United Nations-Sub-Committee of Experts on the Transport of Dangerous Goods.

Proposal 2 (only if proposal 1 is not accepted): Adding a new paragraph 1.6.3.XX as following (ADR only):

1.6.3.XX Fixed tanks (tank vehicles) and demountable tanks non-vacuum insulated constructed and approved for the carriage of LNG before 30 September 2013 in accordance with the requirements in force up to 31 December 2014, but which do not conform to the requirements of 6.8.2.6 relating to standard EN 14.398-2:2003 (except table 1) applicable as from 1 January 2009, may continue to be used for the transport of LNG only.