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Working Party on the Transport of Dangerous Goods

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Item 9 of the provisional agenda

Any other business

Definitions of reference steel and mild steel

Transmitted by the Government of Romania^{1, 2}

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² Circulated by the Intergovernmental Organisation for International Carriage by Rail (OTIF) under the symbol OTIF/RID/RC/2016/10.



Summary

Executive summary:	<p>The aims with this document are:</p> <ol style="list-style-type: none"> 1) To extend the definition of reference steel in order to cover the metal IBCs; and 2) To analyse whether the limits of the tensile strength of mild steel covers the provisions of Chapters 2.7, 6.4, 6.7 and 6.8 of RID/ADR.
Action to be taken:	Amend the definitions of “ <i>reference steel</i> ” and “ <i>mild steel</i> ” located in section 1.2.1.
Related documents:	Informal document INF.35 (September 2014 session), item 8 of the report of the September 2014 session of Working Group on Tanks of the Joint Meeting (ECE/TRANS/WP.15/AC.1/136/Add.1), informal document INF.30 of the forty-seventh session of the United Nations Sub-Committee of Experts on the Transport of Dangerous Goods (SCETDG), ST/SG/AC.10/C.3/2015/44, ST/SG/AC.10/C.3/2015/55 and para. 99 and 100 of the Report of the forty-eighth session of SCETDG (ST/SG/AC.10/C.3/96).

Introduction

1. As stipulated in paragraphs 99 and 100 of the Report of the December 2015 session of the Sub-Committee of Experts on the Transport of Dangerous Goods:

“99. The Sub-Committee noted that in RID and ADR, the definitions of “mild steel” and of “reference steel” were located in section 1.2.1 and in Chapter 6.7, while in the Model Regulations they were located in Chapter 6.7. Some delegations were reluctant to move these definitions to section 1.2.1 because the definition of “reference steel” is not the same when applied to IBCs, and the term “mild steel” is used in other chapters, e.g. Chapter 6.4 and experts for Class 7 should be consulted to check whether the definition in Chapter 6.7 was also appropriate in the context of Chapter 6.4.

100. After discussion it was decided not to proceed with the proposed changes at this stage.”.

2. The current definitions in section 1.2.1 of RID/ADR are:

“Reference steel” means a steel with a tensile strength of 370 N/mm² and an elongation at fracture of 27%;

“Mild steel” means a steel having a minimum tensile strength between 360 N/mm² and 440 N/mm²;

NOTE: *For portable tanks, see Chapter 6.7.”.*

3. The current definitions in Chapter 6.7 of RID/ADR are:

Reference steel means a steel with a tensile strength of 370 N/mm² and an elongation at fracture of 27%;

Mild steel means a steel with a guaranteed minimum tensile strength of 360 N/mm² to 440 N/mm² and a guaranteed minimum elongation at fracture conforming to 6.7.2.3.3.3;

Mild steel means a steel with a guaranteed minimum tensile strength of 360 N/mm² to 440 N/mm² and a guaranteed minimum elongation at fracture conforming to 6.7.3.3.3.3;

Where the text of 6.7.2.3.3.3 and 6.7.3.3.3.3 is the same, as follows:

“Steels used in the construction of shells shall have an elongation at fracture, in %, of not less than 10 000/Rm with an absolute minimum of 16% for fine grain steels and 20% for other steels.”

4. The same condition appears in 6.5.5.1.5 and 6.5.5.1.6 for metal IBCs, as follows:

6.5.5.1.5 Metal IBCs shall be made of metals which meet the following requirements:

a) for steel the elongation at fracture, in %, shall not be less than $\frac{10000}{R_m}$ with an absolute minimum of 20%; where R_m = guaranteed minimum tensile strength of the steel to be used, in N/mm², and

6.5.5.1.6 *Minimum wall thickness:*

a) for a reference steel having a product of $R_m \times A_o = 10\,000$, the wall thickness shall not be less than (...); where: A_o = minimum elongation (as a percentage) of the reference steel to be used on fracture under tensile stress (see 6.5.5.1.5);

5. It must be said here also that reference steel as defined now is a particular case of mild steel.

6. The proposals contained in our documents at the forty-eighth session of the SCETDG were:

ST/SG/AC.10/C.3/2015/44:

Insert the definition “Reference steel” in section 1.2.1, as follows:

“Reference steel means a steel with a tensile strength of 370 N/mm² and an elongation at fracture of 27%;

Note: For metal IBCs, see 6.5.5.1. and,

Delete the definitions of “Reference steel” from 6.7.2.1, 6.7.3.1 and 6.7.4.1.

ST/SG/AC.10/C.3/2015/55:

Insert the definition “Mild steel” in section 1.2.1, as follows:

“Mild steel means a steel with a minimum tensile strength of 360 N/mm² to 440 N/mm²;

Delete the definitions of “Mild steel” from 6.7.2.1 and 6.7.3.1.

Reference steel

7. For the defined reference steel, the product of the tensile strength (370 N/mm²) and the elongation at fracture (27%) is equal to 9990 (370 x 27 = 9990) and differ from the 10000 by 0.1%, which falls within the tolerances (limits of deviation) of any steel characteristics.

8. During the discussions the question whether the definition of reference steel may cover the metal IBCs was raised.

9. There is a difference here in the fact that in 1.2.1 and 6.7 the reference steel is defined as an unique steel while in 6.5.5.1.6 there is a formula to select a reference steel (for metal IBCs).

Proposal 1

10. Starting from these elements we propose to analyse the appropriate arrangements in order to extend the definition of reference steel to include the metal IBCs.

11. A solution might be to define the reference steel by using the formula of 6.5.5.1.6 with the portable tanks case as a particular case. In this context the definition may be:

“*Reference steel*” means a steel for which the product of the tensile strength (in N/mm^2) and the elongation at fracture (in %) is equal to 10 000. For portable tanks *reference steel* means a steel with a tensile strength of 370 N/mm^2 and an elongation at fracture of 27%;

Mild steel

12. An expert attending the forty-eighth session of the SCETDG expressed the opinion to keep the terms used to define mild steel in Chapter 6.7: “guaranteed minimum tensile strength” and “guaranteed minimum elongation at fracture”.

13. The analysis of the *mild steel* definition should also include the differences of the limits of the tensile strength used in the various definitions (section 1.2.1, Chapter 6.7 and Chapter 6.8).

14. The use of a reference to a paragraph in a definition as it is used in the definition of *mild steel* in Chapters 6.7 and 6.8 is not completely correct (e.g. 6.7.2.3.3.3, 6.7.3.3.3.3 or 6.8.2.1.12).

Implications of defining mild steel for the tests of Class 7

15. Another issue considered by the experts was the one of the consequences of the application of the mild steel definition in the Class 7 tests (2.2.7.2.3.3.5, 6.4.17.2 and 6.4.20.2) where: the steel plate falling from 9 meters or the probe falling from 3 meters over the specimen and the cylindrical bar which strike the specimen or is drop onto the specimen, are made of mild steel.

16. In our understanding the mild steel tools (plates and bars), used for the tests described in paragraph 2.2.7.2.3.3.5 and sections 6.4.17 and 6.4.20, must be primarily solid. This point of view will be communicated to the Sub-Committee of Experts on the Transport of Dangerous Goods.

We included in the analyses the provisions of the Regulations for the Safe Transport of Radioactive Material - 2012 Edition – SSR-6 supplemented by a hierarchy of Safety Guides, including:

- Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material, IAEA Safety Standards Series No. TS-G-1.1 (Rev. 1);
- Planning and Preparing for Emergency Response to Transport Accidents Involving Radioactive Material, IAEA Safety Standards Series No. TS-G-1.2 (ST-3);
- Compliance Assurance for the Safe Transport of Radioactive Material, IAEA Safety Standards Series No. TS-G-1.5;
- The Management System for the Safe Transport of Radioactive Material, IAEA Safety Standards Series No. TS-G-1.4; and

Radiation Protection Programmes for the Transport of Radioactive Material, IAEA Safety Standards Series No. TS-G-1.3.

Proposal 2

17. In order to improve the definition of mild steel, we propose to analyse whether:

- the limits of the tensile strength of the mild steel covers the provisions of the Chapters 2.7, 6.4, 6.7 and 6.8 of RID/ADR;
 - the second part of the definition of 6.7 is important to be included or may remain as independent provision where necessary,
 - the various *tensile strengths* and *elongations at fracture* might be covered by generic terms (e.g. in 6.8.2.1.12 is used the term *determined tensile strength*).
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