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Item 2 of the provisional agenda

Tanks

Calculation of the minimum shell thickness (6.8.2.1.13, 6.8.2.1.16, 6.8.2.1.17, 6.8.2.4.1)

Transmitted by the Government of the Russian Federation*,**

Summary

Executive summary: The purpose of this document is to make the requirements of 6.8.2.1.13, 6.8.2.1.16, 6.8.2.1.17 and 6.8.2.4.1 more precise for a clear determination of the conditions (pressure, permissible stress) for calculating the minimum tank wall thickness.

Proposed decision: Add to 6.8.2.1.16 permissible stress values at calculation pressure. Delete from 6.8.2.1.13 the requirement that the pressure on which the shell thickness is based is not to be less than the calculation pressure.

Introduction

1. The current version of 6.8.2.1.13 requires that the pressure on which the shell thickness is based is not to be less than the calculation pressure (*emphasis* added to relevant reference below):

6.8.2.1.13 The pressure on which the shell thickness is based *shall not be less than the calculation pressure*, but the stresses referred to in 6.8.2.1.1 shall also be taken into account, and, if necessary, the following stresses.

* In accordance with the programme of work of the Inland Transport Committee for 2018–2019, (ECE/TRANS/WP.15/237, annex V (9.2)).

** Circulated by the Intergovernmental Organisation for International Carriage by Rail (OTIF) under the symbol OTIF/RID/RC/2020/33.



2. The current version of 6.8.2.1.16 contains requirements for determining the permissible stress in the calculation of the thickness of the walls of the shell only at the test pressure (*emphasis* added to the relevant references below):

6.8.2.1.16 For all metals and alloys, the stress σ at the test pressure shall be lower than the smaller of the values given by the following formulae: $\sigma \leq 0.75 R_e$ or $\sigma \leq 0.5 R_m$.

3. The current version of 6.8.2.1.17 contains requirements that the wall thickness of the shell is to be calculated at the calculation and test pressures (*emphasis* added to the relevant references below):

6.8.2.1.17 The shell thickness shall not be less than the greater of the values determined by the following formulae: $e = (P_T D)/(2\sigma\lambda)$; $e = (P_C D)/(2\sigma)$ where $P_T =$ test pressure in MPa; $P_C =$ calculation pressure in MPa as specified in 6.8.2.1.14.

Proposals

Proposal 1

Add to 6.8.2.1.16 permissible stress values at the calculation pressure.

Proposal 2

Delete from 6.8.2.1.13 the requirement that the pressure on which the shell thickness is based is not to be less than the calculation pressure.

Justification

4. The requirements under 6.8.2.1.17 establish the need for determining the tank wall thickness at the test and calculation pressures. Furthermore, the permissible stress for determining the wall thickness in accordance with 6.8.2.1.16 are determined only at the test pressure. It is not clear how the permissible stress at the calculation pressure is to be determined.

5. In accordance with the requirements of 6.8.2.4.1 for calculation pressures of 10, 15 and 21 bar, the test pressure is to be lower than the calculation pressure:

Calculation pressure (bar)	Pressure ratio	Test pressure (bar)
G	=	G
1.5	=	1.5
2.65	=	2.65
4	=	4
10	>	4
15	>	4
21	>	10 (4)

6. Taking into account the requirements of 6.8.2.1.13 to the effect that the pressure used to determine the tank wall thickness is not to be less than the calculation pressure, it is not clear what value is to be used as the test pressure to determine the tank wall thickness for calculation pressures of 10, 15 and 21 bar.

7. It is assumed that the test pressure values according to 6.8.2.4.1 are to be used for the calculation. If that is indeed the case, it is necessary to delete from 6.8.2.1.13 the requirement that the pressure on which the shell thickness is based is not to be less than the calculation pressure.