**UNITED NATIONS**

**E**

Distr.
GENERAL

TRANS/WP.15/161/Add.2
15 December 2000

Original: ENGLISH

# Economic and Social Council

**ECONOMIC COMMISSION FOR EUROPE**

**INLAND TRANSPORT COMMITTEE**

**Working Party on the Transport of Dangerous Goods**

## REPORT OF THE WORKING PARTY ON ITS SIXTY-EIGHTH SESSION (15-19 May 2000)

## Addendum 2

## Summary and conclusions from the technical group meeting held on 17 May 2000 from 10-11.30 a.m. */

1. Adequate equivalence wall thickness formula

Overall, the countries represented agreed to change in the equivalence the minimum wall thickness formula from the German proposal in document -/2000/10.

Only two countries and one non-governmental organization expressed concerns based on the lack of justification. However, with the exception of one country, all were prepared to accept the proposal from Germany to change the present cubic-root-formula.

There was concern from some members of the technical group over table 1 of document -/2000/1 and the figure of 2.2. mm for stainless steel therein. It appears possible from this table to reach a minimum wall thickness which is below the absolute minimum wall thickness adopted at the last WP.15 session in November 1999 following the proposal of Spain in document -/1999/13.

It was clarified that the figures in table A of document -/2000/10 are of a totally hypothetical nature and do not override the absolute minimum figures adopted at the last WP.15 meeting. The absolute minimum figures must at least be achieved. Both - the adopted Spanish proposal and the German proposal – have to be applied and are related to each other.

---

*/ Reproduced by the secretariat as transmitted (and read out at the end of the session) by the Chairman of the technical group Mr. J. Ludwig (Germany).

Therefore, the alternative formula should be adopted at this session for inclusion in the 2000 ADR.

Some editorial changes are needed with regard to the new system of the restructured ADR. The group with the exception of one country recommended the inclusion into the ADR first, because the problems with tanks made of aluminium alloys primarily concern the ADR. Later on a similar proposal should be submitted to the UN-Committee of Experts to cover tanks for all kind of modes.

2. Alternate Arrangements

All the countries represented at the technical group meeting were in favour of accepting the principle of alternate arrangements (with the exception of one country).

However, all members expressed the need to develop the proposal further before including it in the ADR.

Discussion was directed towards a debate as to whether the proposal should be developed in WP.15 technical groups or in a CEN technical committee (i.e. CEN/TL 2561).

The general conclusion was that the principle and performance criteria should be developed in WP.15 technical group meetings and that these results should be presented to working groups on CEN-standards for full detailed development in the technical standards.

All countries represented were prepared to adopt this principle. However, the proposal from Germany in document -/2000/9 is not accepted for changes to ADR 2001, but could be considered for ADR 2003 provided that it has been sufficiently developed by then.

If WP.15 should share this view, Germany would like to announce the organization of technical group meetings.

So, at present, Germany asks WP.15 to postpone the proposal in document -/2000/9 until the necessary work is accomplished.

Technical justification concerning document 2000/1 on adequate equivalent minimum wall thickness formula

The 6 mm – respectively 4 mm - mild-steel requirement of marginal 211 127 paras. 3 and 4 represents a material - a wall thickness criterion. Even if another metal than mild steel will be or has to be chosen, the kind and amount of the above-mentioned requirement has to be reached. Therefore, the material properties of the chosen metal have to be in proportion to the properties of mild steel in a suitable kind of way and from that ratio the wall thickness of a tank made of some chosen metal has to be determined related to the 6 mm – respectively ½ mm – criterion based on mild steel. In other words: a comparison of tank wall characteristics has to be carried out bearing in mind that the tank wall characteristics as a whole have to be identical, no matter what kind of metal will be chosen. Accidental behaviour with all its different aspects is an entirely different matter.

Therefore, it can be stressed that a suitable ratio of specific material properties concerning tensile strength and elongation at fracture is needed for the determination of equivalent wall thicknesses, if different metals are chosen.

These material characteristics have to be determined by carrying out standardized uniaxial tensile tests.

Even the present cubic root formula (being applied for the transformation of the 6 mm – respectively 4 mm – mild steel criterion) is based on that principle, but in a insufficient i.e. wrong manner.

Inevitably, the German proposal is also based on the above-mentioned principle, but in a suitable, correct and demonstrative manner.

During uniaxial tensile tests, the stress-elongation curve, respectively the stress strain curve up to the fracture of a specimen of specific dimension, will be recorded. The strain energy up to fracture is equal to the area beneath these curves.

Specimens made from different metals are comparable, if equal strain energies have to be applied up to fracture. Comparisons of prismatic-like tank walls and their characteristics have to be based on the determination of the characteristics of prismatic-shaped specimens during an uniaxial tensile test.

So, the necessary equivalent dimensions (i.e. wall thickness) of prismatic specimens made out of another metal can be determine based on the dimensions (i.e. wall thickness of the specimen made out of reference mild steel if the same amount of strain energy up to fracture has to be applied and the material properties of the specimen are known.

Thus, the proposed adequate equivalence minimum wall thickness formula can be derived as shown in documents TRANS/WP.15/2000/10 and -/1999/49.

As it is difficult to fix the ability of tank walls to withstand accidental stresses – nobody really knows the kind and amount of accidental stresses in each case – an (suitable) equivalence minimum wall thickness formula should be based on material properties which are applied for the design of tanks, respectively the dimensioning of tank walls in general.

However, even if one bears accidental stresses in mind, the proposed equivalence minimum wall thickness formula is still valid, as shown in document -/1999/49 based on the results of research projects, already. Dimensioning of tanks with respect to accidental stresses in depth could be the subject of a German proposal on alternate arrangements and may be discussed under this agenda item respectively during the next session of WP.15.