

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

Geneva, 11-21 September 2007
Agenda Item 2

TANKS

Interpretation of 6.8.2.2.3

Transmitted by the Government of Germany

1. In OTIF/RID/RC/2007/36 respectively ECE/TRANS/WP.15/AC.1/2007/36 Belgium noticed that the criterion of resistance to explosion according to par. 6.8.2.2.3 RID/ADR could result in construction requirements that differ widely from one Contracting Party to another. Belgium proposed therefore to ask the Working Group on Tanks to determine the methods by which resistance to explosion must be demonstrated.
2. Germany would like to provide the Joint Meeting with a solution of the problem being developed and applied in Germany for several years, already. The attached approach could ease discussions on the subject and form the basis for additional requirements in RID/ADR or related standardisation work.

Explosion Pressure Shock Resistance

According to 4.3.4.1.1 Tank Coding „F“ and 6.8.2.2.3 RID/ADR

1. Tanks are explosion pressure shock resistant if they are designed and constructed in such a way that these tanks are able to resist an explosion pressure occurring due to an internal explosion without bursting. Permanent deformations are permissible.

The explosion pressure relevant for the proof of the explosion shock resistance depends on the ignition characteristics of the inflammable substance and on the internal initial pressure at which an ignition takes place. Concerning tanks for the transport of inflammable substances it has to be assumed that an interference-related ignition occurs outside the tank causing an explosion running via an operationally free opening (unclosed tank opening) inside the tank.

The initial pressure inside the tank can be set equal to the atmospheric pressure of 1000 mbar, therefore. Among all substances examined so far¹ at an initial pressure of 1000 mbar a mixture of 8.0 (volume)% ethylene in air exhibits the highest value for the explosion pressure of 9.7 bar (absolute).

2. A tank is considered to be explosion pressure shock resistant if the tank design will be examined experimentally, mainly by carrying out successfully an explosion test with a specimen of that design under atmospheric conditions applying a gas/air-mixture as mentioned above.
3. Furthermore a tank is considered to be explosion pressure shock resistant if the calculation of all pressure bearing parts of the tank will be carried out on the basis of the maximum explosion pressure (i.e. 9.7 bar (absolute) at least) following the requirements of the European Standard EN 14025. Due to the high ductility of the tank materials assigned (elongation at rupture in accordance with par. 6.8.2.1.12 and 6.8.3.1.1 RID/ADR) a safety factor of 1.3 with respect to tensile strength (R_m) is thus regarded as sufficient. Dished ends and partitions can be regarded as explosion pressure shock resistant on the adherence to the following conditions, even if the calculation would result in a higher wall thickness than those of the cylindrical part of the tank:
 - the cylindrical part, dished ends and partitions have to be manufactured from uniform material,
 - the wall thickness has to be appropriate for a test pressure of at least 4 bar,
 - the wall thickness has to be not smaller than the wall thickness of the cylindrical part which results from its explosion pressure shock resistant design,
 - other additional wall thicknesses (compatibility related additions e.g.) must find consideration, likewise.
4. A tank is considered as explosion pressure shock resistant, too, if it is proven that the tank is able to withstand a hydraulic pressure test carried out at a test pressure equal to 1.3 times the maximum explosion pressure (i.e. 9.7 bar (absolute) at least) without bursting.
5. Verifications according to 3. and 4. can be applied only for tanks without installations which do decrease the tank cross section considerably (like surge plates in particular) which can lead to a further increase of explosion pressure and effect.

¹ Substances which are inclined to a spontaneous decomposition have to be excluded from the application of the measures mentioned above