Economic Commission for Europe

Inland Transport Committee

Working Party on the Transport of Dangerous Goods **12 September 2014**

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Reports of informal working groups

Justification of risk reducing measure thermal protection of a tank against hot BLEVE

Transmitted by the Government of the Netherlands

1. The consequences of a cold and hot BLEVE of a tank with liquefied gases in an urban, populated area during transport, parking and (un)loading are very serious. The number of fatalities is much higher for a hot BLEVE than a cold BLEVE, because of the higher burst pressure of the tank. The impact area of a hot BLEVE is larger than that of a cold BLEVE. For example, for propane the lethal consequence area for the hot BLEVE is 2.5 times larger than for the cold BLEVE. Apart from pressure effects, for some categories of gases flammability effects and toxicity effects shall be taken into account as well.

2. To withstand a cold BLEVE as consequence of material failure, mechanical impact and overfilling the RID/ADR has settled some measures to prevent an event which could cause a cold BLEVE. Examples of these measures are improved impact strength of tanks, protection against overfilling of tanks, energy absorbing elements (crash buffers) and protection against overriding.

3. To withstand a hot BLEVE we are of the opinion that a thermal protection is an effective measure. Risks of fires in transport accident situations which could lead to a hot BLEVE are realistic. And even if large consequences of transport accidents with dangerous goods are rare, this will not automatically mean that societal risks are acceptable, as you can read in the 'Generic guideline for the calculation of risk inherent in the carriage of dangerous goods by rail/road' as referred to in Chapter 1.9 of RID/ADR.

4. Preventing causes that could lead to an event (fire) which could lead to a hot BLEVE should be attempted as much as possible, but having a fire mitigating measure to avoid a BLEVE is sensible as well. A nationwide risk assessment in the Netherlands showed that the risk of road and rail transport of liquefied flammable gases in populated areas are higher than our national acceptable safety levels. This risk can be reduced by a thermal insulation coating.

5. Based on scientific research BAM and TNO concluded:

- A road or rail tanker exposed to a fire will give a hot BLEVE after 10 - 20 minutes fire exposure.

- A pressure safety valve delays the hot BLEVE only by a few minutes, not enough for safe emergency response (fire fighting, evacuation)
- Only a thermal insulating coating can delay a hot BLEVE by 60 minutes; just enough delay for a safe emergency response (fire fighting, evacuation).

6. Our impression of the deliberations in the last working group meeting on certain uncertainties with respect to thermal protection (e.g. corrosion, ageing, inspection) is that these uncertainties are solvable and should not withstand a positive attitude against thermal protection.

7. The costs for a prototype retrofit of an existing 50 m^3 tank-vehicle are estimated on 30 000 - 40 000 euro, for a 90 m^3 tank-wagon 60 000 - 80 000 euro. However costs will be lower for retrofitting large numbers of tanks and for new tank-vehicles and tank-wagons. While the initial costs of thermal protection are rather high, they will be rather low related to the life time of the tank and thermal protection (for example a 50 000 euro per tank, 50 000 km/year, lifetime 20 years, 30 ton payload, means 0,16 cents per ton kilometre).