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Working Party on the Transport of Dangerous Goods
(Bern, 24-28 March 2003)

SAFETY EQUIPMENT ON HERMETIC TANKS

Transmitted by the Government of Belgium */

1. Introduction

1.1. The RID/ADR Joint Meeting agreed during its session in September 2002 upon the following general principles (cfr. INF 17 and point 67 of the preliminary report) :

For tanks with a calculation pressure < 4 bar:

- safety equipment against an internal overpressure is always required (no hermetic tanks allowed);
- the calculation pressure with respect to external overpressure is at least – 0.21 bar when a vacuum-relief device is installed, and at least – 0.4 bar without one;

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- the vacuum-relief device shall be set to relieve at a vacuum setting not greater than – 0.21 bar (this set pressure can be less, e. g. – 0.17 bar).

For hermetic tanks with a calculation pressure ≥ 4 bar:

- vacuum-relief devices without preceding bursting disc are only allowed when TE15 is indicated in column (13) of table A in chapter 3.2 (limited to the substances with L4BH as the least stringent tank provisions acceptable). These vacuum-relief devices shall be set to relieve at a vacuum setting of at least – 0.21 bar;
- in all other cases, hermetic tanks are never to have pressure relief devices (protecting against an external or internal overpressure), unless when these are preceded by a bursting-disk.

1.2. The tank working group stated in its report that improvements to paragraphs 6.8.2.2.7 and 6.8.2.2.8 are needed in order to reflect these principles clearly and completely in ADR and RID. Belgium was of the opinion that this would not be sufficient and that other changes to ADR and RID are necessary; it was invited by the Joint Meeting to propose these in writing.

2. Provisions dealing with safety equipment on hermetic tanks

2.1. The following provisions exist or will be introduced on 1.1.2003:

- 1.2.1 “Hermetically closed tank” means a tank whose openings are hermetically closed and which is not equipped with safety valves, bursting discs or other similar safety devices. Tanks having safety valves preceded by a bursting disc shall be deemed to be hermetically closed;
- 4.3.4.1.1 N = tank with a safety valve according to 6.8.2.2.7 or 6.8.2.2.8 and not hermetically closed ; these tanks may be fitted with vacuum valves;
H = hermetically closed tank (see 1.2.1).
- 6.8.2.1.7 Measures shall be taken to protect shells against the risk of deformation as a result of a negative internal pressure. Shells, other than shells according to 6.8.2.2.6, designed to be equipped with vacuum valves shall be able to withstand, without permanent deformation, an external pressure of not less than 21 kPa (0.21 bar) above the internal pressure. The vacuum valves shall be set to relieve at a vacuum setting not greater than the tank’s design vacuum pressure. Shells, which are not designed to be equipped with a vacuum valve shall be able to withstand, without permanent deformation an external pressure of not less than 40 kPa (0.4 bar) above the internal pressure.

- 6.8.2.2.3 Unless otherwise prescribed in the provisions of 6.8.4, tanks may have valves to avoid an unacceptable negative internal pressure, without intervening bursting discs.
- 6.8.2.2.6 Tanks intended for the carriage of liquids having a vapour pressure of not more than 110 kPa (1.1 bar) (absolute) at 50 °C shall have a venting system and a safety device to prevent the contents from spilling out if the tank overturns; otherwise they shall conform to 6.8.2.2.7 or 6.8.2.2.8.
- 6.8.2.2.7 Tanks intended for the carriage of liquids having a vapour pressure of more than 110 kPa (1.1 bar) but not exceeding 175 kPa (1.75 bar) (absolute) at 50 °C shall have a safety valve set at not less than 150 kPa (1.5 bar) (gauge pressure) and which shall be fully open at a pressure not exceeding the test pressure ; otherwise they shall conform to 6.8.2.2.8.
- 6.8.2.2.8 Tanks intended for the carriage of liquids having a vapour pressure of more than 175 kPa (1.75 bar) but not exceeding 300 kPa (3 bar) (absolute) at 50 °C shall have a safety valve set at not less than 300 kPa (3 bar) (gauge pressure) and which shall be fully open at a pressure not exceeding the test pressure ; otherwise they shall be hermetically closed⁶.

⁶ For the definition of “hermetically closed tank” see 1.2.1.

- 6.8.4 TE12 (limited to organic peroxides of type F)
TE15 Tanks fitted with vacuum valves which open at a negative pressure of not less than 21 kPa (0.21 bar) shall be considered as being hermetically closed.

Tanks are also to be considered hermetically closed when they are equipped with controlled ventilation (auto-vent) valves that open at a negative pressure exceeding [0.4][0.21] bar.
[RID only]

2.2. Moreover, the last Joint Meeting decided to replace TE1 of 6.8.4 with the following new paragraph (cfr. point 8 of INF. 17):

- 6.8.2.2.10 *When hermetically closed tanks are fitted with safety valves, these have to be preceded by a bursting disc and the following provisions have to be obeyed. The arrangement of the bursting disc and safety valve shall be such as to satisfy the competent authority. A pressure gauge or another suitable indicator shall be provided in the space between the bursting disc and the safety valve, to enable detection of any rupture, perforation or leakage of the disc which may disrupt the action of the safety valve.*

3. Deficiencies in the existing provisions

3.1. The definition of “hermetically closed tank” in 1.2.1 lacks clarity and is not complete:

- it does not reflect the fact that certain provisions have to be obeyed when safety valves are preceded by a bursting disc;
- it is not clear whether or not the “similar safety devices” that are mentioned also englobe vacuum valves;
- it does not reflect the fact that the use of vacuum valves is subject to certain provisions.

3.2. The table of 4.3.4.1.1 has been introduced to explain the meaning of the four parts of the tank code; it should not contain new provisions (such as “these tanks may be fitted with vacuum valves”).

Contrary to what is stated, the letter N may apply to a tank without a safety valve according to 6.8.2.2.7 or 6.8.2.2.8 (when it is equipped with a vacuum valve not fulfilling the requirements for hermetically closed tanks).

3.3. The text of 6.8.2.1.7 reflects the requirements set out for tanks with a calculation pressure < 4 bar, but not those set out for tanks with a calculation pressure of 4 bar (where the vacuum-relief valves shall be set to open at a pressure of at least – 0,21 bar).

3.4. Paragraph 6.8.2.2.3, in combination with 6.8.4, leads nowhere:

hermetic tanks may have vacuum valves, without intervening bursting discs, unless otherwise prescribed in 6.8.4 → TE15 is the only pertinent prescription in 6.8.4 → 2 possibilities:

- when TE15 is indicated in table A (in all cases where L4BH are the least stringent tank provisions acceptable), vacuum valves which open at a negative pressure of not less than 21 kPa are allowed on hermetically closed tanks;
- when TE15 is not indicated in table A (in all other cases, e.g. with L21DH as the least stringent tank provisions acceptable), 6.8.2.2.3 is applicable on its own, meaning that vacuum valves are allowed without any restriction.

3.5. The provisions of 6.8.2.2.10 do not apply to vacuum valves, even when these are only allowed because they are preceded by a bursting disc (e.g. in the case of hermetic tanks with a calculation pressure > 4 bar).

3.6. There are no provisions in the present RID/ADR prohibiting hermetic tanks with a calculation pressure < 4 bar.

4. Proposals

4.1. Replace the definition of “hermetically closed tank” in 1.2.1 with:

"Hermetically closed tank" means a tank with a calculation pressure of at least 4 bar, whose openings are hermetically closed and which:

- is not equipped with safety valves, bursting discs, other similar safety devices or vacuum valves, or
- is equipped with safety valves or vacuum valves preceded by a bursting disc according to 6.8.2.2.10, or
- is equipped with vacuum valves, as allowed by an applicable special provision of 6.8.4."

4.2. Replace the explanation for N in 4.3.4.1.1 with:

"N = tank without a venting system according to 6.8.2.2.6 and not hermetically closed;"

4.3. Replace 6.8.2.1.7 with:

"Measures shall be taken to protect shells against the risk of deformation as a result of a negative internal pressure. A shell which is to be equipped with a vacuum-relief valve shall be designated to withstand, without permanent deformation, an external over pressure that is at least equal to the vacuum setting at which the vacuum-relief valve is set to relieve. A shell which is not to be equipped with a vacuum relief device shall be designed to withstand, without permanent deformation, an external pressure of not less than 40 kPa (0.4 bar) above the internal pressure."

4.3. Replace 6.8.2.2.3 with:

"Tanks that are not hermetically closed may be fitted with vacuum valves to avoid an unacceptable negative internal pressure; these vacuum-relief valves shall be set to relieve at a vacuum setting not greater than – 21 kPa (– 0.21 bar). Hermetically closed tanks may not be fitted with vacuum valves to avoid an unacceptable negative internal pressure unless when these are preceded by a bursting disc according to 6.8.2.2.10, or unless otherwise prescribed in the provisions of 6.8.4."

4.4. Replace 6.8.2.2.10 with:

"When tanks are fitted with safety valves or vacuum valves that need to be preceded by a bursting disc, the following provisions apply:

- the bursting disc, the safety valve or vacuum valve and their arrangement shall be such as to satisfy the competent authority;

- a pressure gauge or another suitable indicator shall be provided in the space between the bursting disc and the safety valve or vacuum valve, to enable detection of any rupture, perforation or leakage of the disc which may disrupt the action of the safety system."

4.5. Replace TE15 of 6.8.4 with:

"TE15 Hermetically closed tanks may be fitted with vacuum valves to avoid an unacceptable negative internal pressure, without intervening bursting discs ; these vacuum-relieve valves shall be set to relieve at a negative pressure of not less than 21 kPa (0.21 bar)".
