Economic Commission for Europe

Inland Transport Committee

29 June 2012

Working Party on the Transport of Dangerous Goods

Joint Meeting of Experts on the Regulations annexed to the European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN) (ADN Safety Committee)

Twenty-first session
Geneva, 27–31 August 2012
Item 5 (b) of the provisional agenda
Proposals for amendments to the Regulations annexed to ADN: Amendments for entry into force on 1 January 2015

Report on the first session of the Informal Working Group on "Explosion protection on tank vessels" (6-7 June 2012, Strasbourg)

Transmitted by the Central Commission for the Navigation of the Rhine (CCNR)[1]

Introduction

1. The first session of the Informal Working Group "Explosion protection on tank vessels" was held on 6 and 7 June 2012 at the Central Commission for the Navigation of the Rhine (CCNR) in Strasbourg, on the invitation of the Central Commission for the Navigation of the Rhine (CCNR). In this session participated:

Ms Y. Adebahr-Lindner
Mr T. Dosdahl (GL)
Mr T. Hoving (Netherlands)
Mr F. Krischok (Germany)
Mr D. Saha (CCNR)
Ms Dr. E. Brandes (Germany, chairmanship)

Results

2. In accordance with the mandate of the Safety Committee (ECE/TRANS/WP.15/AC.2/42 Point 16), the Group discussed the following subject:

Development of a proposal for general decisions on the improvement of the explosion protection requirements of the Regulations annexed to the Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN)

3. Based on the INF paper WP15-AC2-20-inf12e/WP15-AC2-20-inf12g, the members of the Informal Working Group have developed proposals on **general** decisions concerning explosion protection on tank vessels that require explosion protection.

[1] Distributed in German by the Central Commission for the Navigation of the Rhine under the symbol CCNR/ZKR/ADN/WP.15/AC.2/21/INF.10.

4. These proposals on general decisions relate to:

- zoning
- protective measures to be taken within the zones, and
- additional measures to be taken during loading and unloading.

5. The proposals are set out in the Annex.

6. As it is a matter of proposals on general decisions, these proposals do not include any specific proposals for amendments to the Regulations annexed to the Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN).

7. The Safety Committee is asked to examine these proposals on general decisions concerning explosion protection on tank vessels.

Annex

Proposal for general decisions on the improvement of the explosion protection requirements of the Regulations annexed to the Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN)

I. Introduction

A number of accidents on tank vessels caused by explosions have happened because of unclear or missing explosion protection measures (**zoning, associated protective measures, additional protective measures**).

The assignment of zones (zoning) and the associated protective measures as described in the current ADN are not in any case sufficient. Currently zone two is not assigned and therefore there is no secure area defined where air can be sucked in for ventilation.

Scientific investigations on gas dispersion on tank vessels carried out in Germany between 1996 and 2002 provide a reliable basis for the modification of explosion protection on tank vessels that require explosion protection.

On this basis the dangerous goods group (MDG) of CCNR started the discussion on the modification of the explosion protection and found solutions to some extent. Some of these solutions have become part of the ADN.

In 2009 the Netherlands and Germany started discussions on the open issues again.

As a result, INF. 12 (WP15-AC2-20-inf12e, WP15-AC2-20-inf12g) was transmitted and discussed in the twentieth session of the Safety Committee.

As a result of this discussion, the Safety Committee mandated an informal working group to develop and transmit a proposal based on the INF document.

Primarily, a decision between alternative 1 and alternative 2 concerning zoning according to INF 12 should be developed.

After a detailed discussion the informal working group considered alternative 2 of INF 12 to be more appropriate.

The Safety Committee is asked to examine the proposal listed below on general decisions concerning explosion protection on tank vessels that require explosion protection.

II. Proposal

The proposal includes:

1. Modified classification of the explosion-hazardous areas into zones (**zoning**);
2. A precision of the measures to be taken within the zones (**associated protective measures**);
3. A modification of the additional measures to be taken during loading and unloading (**additional protective measures**).

Note 1: These additional measures aim at preventing explosive atmosphere to occur outside of the assigned zones at a minor release of liquid/vapour leakages. In this context a minor release is considered a maximum 1 m³ liquid and 10 m³/min gas/vapour over a period of

a maximum 10 min. These additional protective measures do **not** aim to cover accidents with the release of large amounts of liquid/vapour e.g. breakaway of piping.

1. Zoning

The zoning should make use of zone 0, zone 1 and zone 2. Such a zoning which is permanent provides a clear classification as well as a specification of areas without explosion hazard. The latter is especially important for the ventilation of accommodation, wheelhouse and service areas outside the cargo area.

Zone 0: comprises:

- Inside all cargo tanks, tank-containers or portable tanks, pipings containing cargoes or cargo vapours including their equipment as well as pumps and compressors.

Zone 1: comprises:

- Inside all compartments within the part of the cargo area below deck being not part of zone 0.
- Compartments on deck within the cargo area.
- The deck from one side of the vessel to the other within the cargo area up to the borders indicated in the drawing.

Whereas every opening in zone 0 except HJ valve and shore connections/vessel pumps (manifold) has to be surrounded cylindrically by at least 2.5 m zone 1 up to a height of 2.5 m above the opening.

- An area surrounding cylindrically the HJ/safety valve with a radius of 3.0 m up to a height of 4.0 m above the opening of the HJ/safety valve.
- A spherical segment surrounding the ventilation openings of the service spaces located within the cargo area which are actively ventilated, comprising a radius of 1.0 m centred over the opening.

Zone 2: comprises:

- An area on deck of 1.0 m in height and length following zone 1 (see drawing).
- On the afterdeck an area of the entire width of the vessel adjacent to the end of the cargo area, with a complete length of 7.5 m. The area from the side of the vessel to the lowering of the wheelhouse limiting coaming this area equals the length and height of the dimensions of the lateral side. Otherwise, the height is 0.5 m.
- On the foredeck an area of the entire width of the vessel, adjacent to the end of the cargo area with a length of 7.5 m. The height of this area is accompanying the hatchways 1.0 m and otherwise 0.5 m.
- An area following zone 1 around the HJ/safety valves having an expansion of 3.0 m.
- A spherical segment following zone 1 which surrounds the ventilation openings of the service spaces located within the cargo area which are actively ventilated, comprising a radius of 1.0 m centred over the opening.

The interior of closed compartments extending into zone 2 and being constructed in such a way that the penetration of gases from zone 2 is avoided, will not be part of the explosion-hazardous area.

The zones extend to a maximum from one side of the vessel to the other.

Differences to the current ADN

The main differences of the proposed zoning to the current ADN are the dimensions of zone 1 and the clear assignment of a zone 2. Concerning zone 0 there are no changes. However, the following constructional measures may be required.

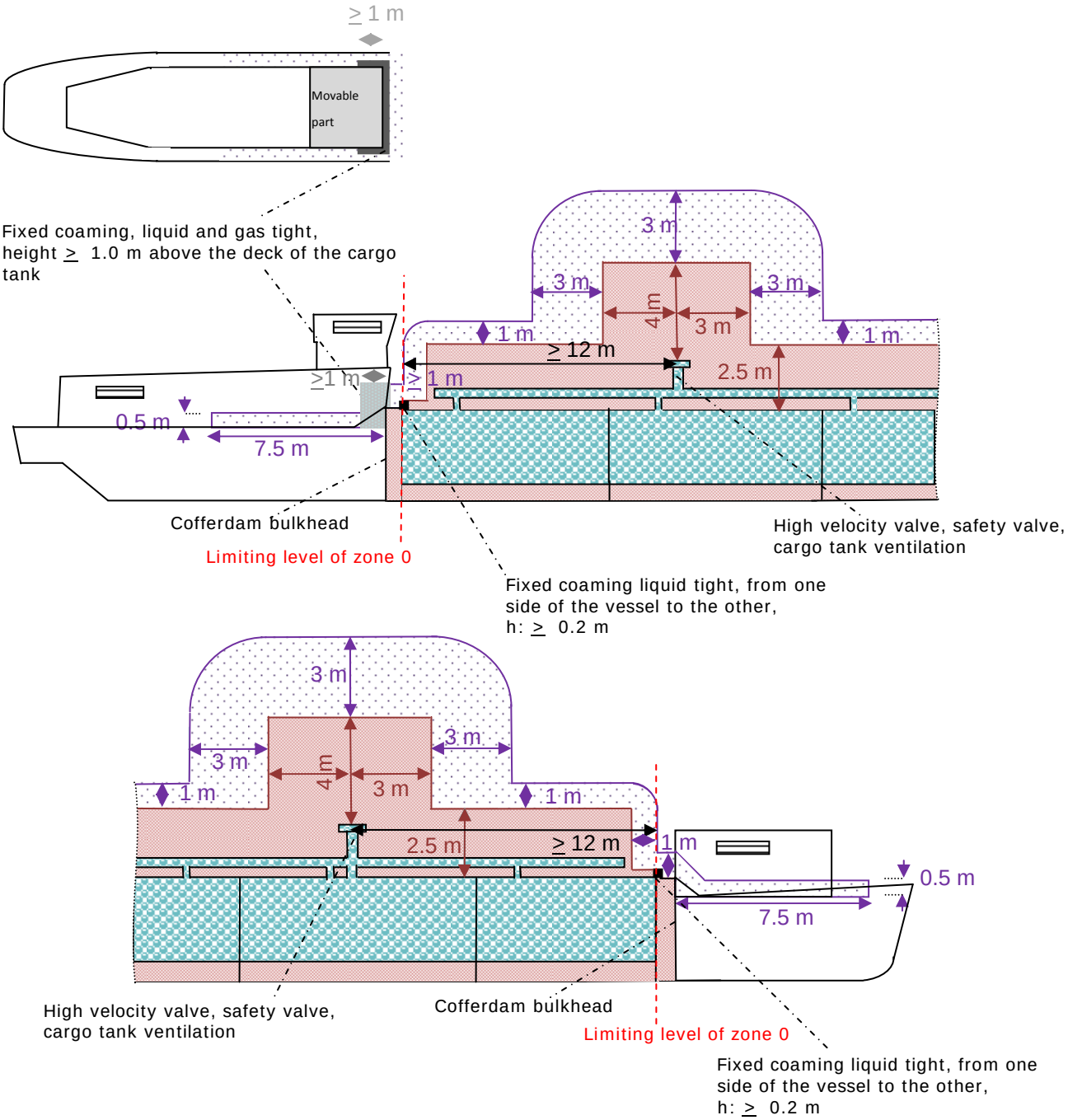
a) Enlarging the distance between the levels limiting the end of zone 0 and the high velocity valve to at least 12 m in length.

Note 2: The distance of 12 m results from the scientific research carried out. At that distance the lower explosion limit is well underrun so an explosive atmosphere is very unlikely to occur at distances from the HJ valve equal to or greater than 12 m.

b) Liquid and gas tight coaming on deck from one side of the vessel to the other at the end of zone 0; h: > 0,2 m

c) Liquid and gas tight coaming with dimensions corresponding with the drawing delimiting the wheelhouse partly, facing the cargo area and the hatchways in case the wheelhouse is movable.

Note 3: Since this coaming is determined to prevent a penetration of explosive atmospheres in the area of the lifting mechanism of the wheelhouse and its propulsion, its height must equal the height of the bordering zone 2.



Schematic representation of the proposed zoning

2. Protective measures

The electrical and non-electrical (mechanical) equipment (devices and autonomous protective systems) to be used within the zones should fulfil the requirements of the corresponding categories according to *Directive 94/9/EC OF THE EUROPEAN PARLIAMENT AND THE COUNCIL of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres.*

Zone 0 ⟺ category 1 equipment

Zone 1 ⟺ category 2 equipment

Zone 2 ⟺ category 3 equipment

Note 4: Equivalent requirements should be fulfilled in the territory of signatory States outside the scope of application of the Directive 94/9/EU.

Differences to the current ADN

The main differences to the current ADN are the requirements for and non-electrical (mechanical) equipment and for equipment for use in zone 2.

3. Additional protective measures

These additional measures aim at preventing the leakages during loading and unloading:

i generated explosive vapour (gas)/air mixtures,

ii leaking gases and vapour,

iii leaking liquid

enter accommodation, wheelhouse and service areas outside the cargo area.

This is achieved by the following additional protective measures:

For i, ii: There must be a minimum distance between the shore connections/vessel pumps (manifold)

- in length 6 m from one side of the vessel to the other of zone 0 as well as
- 12 m from any kind of opening of accommodation, wheelhouse and service areas outside the cargo area.

Note 5: The distance of 12 m results from the scientific research carried out. At that distance the lower explosion limit is well underrun so an explosive atmosphere is very unlikely to occur at distances equal to or greater than 12 m.

If a distance of at least 12 m between the shore connections/vessel pumps (manifold) and any kind of opening of accommodation, wheelhouse and service areas outside the cargo area is not feasible a minimum distance of 6 m has to be met and the further measures as stated in the current ADN (9.3.x.52.3 and 9.3.x.52.4) have to be met.

However, if flammable gas detectors are used they have to have a response time (t90, time to reach 90% of the final displayed signal) of ≤ 4 s and the ventilation of accommodation, wheelhouse and service areas outside the cargo area has to be cut off automatically when the flammable gas detector trips.

Note 6: Currently used flammable gas detectors have a response time of 20 s and more. This is not fast enough with respect to the spreading of explosive vapour (gas)/air mixtures.

For iii: Fixed liquid tight coamings from one side of the vessel to the other at the end of the cargo area, equal in height to the limiting sides of zone 0 with a minimum height of 0.2 m.

Note 7: Research has shown that in the case of acetone and gasoline in the presence of cross-ventilation the concentration of the vapour/air mixtures generated above the surface of the liquid is below 25% of the LEL at a height of 10 cm above the surface of the liquid.

Differences to the current ADN

The main difference to the current ADN is the clear assignment of a distance between the manifold and the openings to accommodation, wheelhouse and service areas outside the cargo area and the requirements for the t90 time flammable gas detectors.

III Transitional periods

For implementing the related measures, the informal working group proposes a transitional period until 2034.