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**Economic Commission for Europe****Inland Transport Committee****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-third session**

Geneva, 26–30 August 2013

Item 4 (b) of the provisional agenda

**Proposals for amendments to the Regulations annexed to ADN:  
Other proposals****Report of the second informal working group on the carriage of UN No. 1972****Transmitted by the Government of the Netherlands<sup>1</sup>****I. Introduction**

1. The second meeting of the informal working group on the carriage of UN No. 1972 was held on 4-5 April 2013 in Bonn and was attended by delegates from Austria, Germany, Switzerland, EBU, classification societies, CCNR and other parties.

**II. Results**

2. The informal working group supported the idea of anticipating the carriage of refrigerated liquefied gases in general while drafting the necessary amendments to the ADN for the carriage of UN No. 1972. Therefore, the proposed amendments are also relevant for the carriage of other refrigerated liquefied gases.

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<sup>1</sup> Distributed in German by the Central Commission for the Navigation of the Rhine under the symbol CCNR/ZKR/ADN/WP.15/AC.2/2013/27.

3. The main safety issues regarding the transport of refrigerated liquefied gases by inland vessels were identified. These issues are:

- to keep the refrigerated liquefied gas(es) close to its low loading temperature;
- the compatibility of the cargo tanks and piping system with the low temperature of the cargo;
- protection of the vessel's structure against brittle-fracture due to cold transfer.

The necessary amendments to ADN regarding these issues can be found in part III of this proposal.

4. UN No. 1972 is not listed in Table C of ADN 2013. To allow the carriage of UN No. 1972, and additional to the proposed amendments in part III, an entry in Table C for UN No. 1972 "METHANE, REFRIGERATED LIQUID or NATURAL GAS, REFRIGERATED LIQUIFIED with high methane content" has been developed. This entry is presented in part IV of this proposal.

### **III. Proposed amendments to the ADN for the carriage of UN No. 1972**

#### **A. Part 1, Chapter 1.2.1 Definitions**

5. Add the following definitions to 1.2.1:

"*Boil-off* means boil-off is the vapour produced above the surface of a boiling cargo due to evaporation. It is caused by heat ingress or a drop in pressure."

"*Holding time* means the time that will elapse from the establishment of the initial filling condition until the pressure has risen due to heat influx to the lowest set pressure of the safety valves."

"*Liquefied natural gas (LNG)* means is natural gas (predominantly methane, CH<sub>4</sub>) that has been converted to liquid form for ease of storage or transport."

"*Liquefied petroleum gas (LPG)* means a low pressure liquefied gas composed of one or more light hydrocarbons which are assigned to UN Nos. 1011, 1075, 1965, 1969 or 1978 and which consist mainly of propane, propene, butane, butane isomers, and butane with traces of other hydrocarbon gases."

"*Water film* means a deluge of water for protection against brittle fracture."

#### **B. Part 1, Chapter 1.4.2.2 Carrier**

6. Add to the current provisions of 1.4.2.2.1:

"(k) when carrying refrigerated liquefied gases, ascertain that the provisions for the carriage of refrigerated liquefied gases have been met."

**C. Part 7, Chapter 7.2.4. Additional requirements concerning loading, carriage, unloading and other handling of cargo**

7. Add the following provisions:

“7.2.4.16.16

Measures to be taken before loading refrigerated liquefied gases

Unless the temperature of the cargo is controlled in accordance with 9.3.1.24.1 (a) or 9.3.1.24.1 (c) guaranteeing the use of the maximal boil-off in any service conditions, the holding time has to be calculated by, or on behalf of, the master before loading and validated by, or on behalf of, the master during loading and shall be documented on board.”

“7.2.4.16.17

Calculation of the holding time

A table, approved by the classification society that certified the vessel, giving the relation between holding time and filling conditions, incorporating the parameters below shall be kept on board.

The holding time of the cargo shall be calculated on the basis of the following parameters:

- The heat transmission coefficient as defined in 9.3.1.27.9;
- The set pressure of the safety valves;
- The initial filling conditions (temperature of cargo during loading and degree of filling);
- The ambient temperatures as given in 9.3.1.24.2.
- When using the boil-off vapours, the minimum guaranteed use of the boil-off vapours (that is the amount of boil-off vapours used under any service conditions), may be taken into account.

Adequate safety margin

To leave an adequate margin to ensure safety, the holding time is at least three times the expected duration of the journey of the vessel, including the following:

- To ensure safety for short journeys of (as expected) no more than 5 days, the minimum holding time for any vessel with refrigerated liquefied gases is 15 days.
- For long journeys of (as expected) more than 10 days, the minimum holding time shall be 30 days, adding two days for each day the journeys takes more than 10 days.

As soon as it becomes clear that the cargo will not be unloaded within the holding time, the master shall inform the nearest emergency services according to 1.4.1.2.”

“7.2.4.29

Transport of refrigerated liquefied gases

During loading or unloading the drip tray as mentioned in 9.3.1.21.11 shall be placed under the manifold in use, and a water film as mentioned in 9.3.1.21.11 shall be activated on the manifold in use.”

**D. Part 8, 8.1.2 Documents**

8. Add to 8.1.2.1:

“(k) When transporting refrigerated liquefied gases, the calculation of the holding time (ADN 7.2.4.16.16, 7.2.4.16.17).”

**F. Part 8, Chapter 8.2 Requirements concerning training**

9. Add to 8.2.2.3.3.1 “Practice”:

“- Handling refrigerated liquefied gases”.

**G. Part 8, Chapter 8.6.3 Checklist**

10. Add to 8.6.3 Checklist:

“19. When transporting refrigerated liquefied gases, has the holding time been calculated, and is known and available on board?”

**H. Part 9, Chapter 9.3.1 Rules for construction of type G tank vessels**

11. Amend 9.3.1.11.2 (a), first indent, second paragraph, as follows : (new text underlined)

“Refrigerated cargo tanks and cargo tanks used for the transport of refrigerated liquefied gases shall be installed only in hold spaces bounded by double-hull spaces and double-bottoms. Cargo tank fastenings shall meet the requirements of a recognised classification society; or”

**I. Part 9, Chapter 9.3.1.11 Hold spaces and cargo tanks**

12. Add the following new provisions:

“9.3.1.11.2 (e)

Cargo tanks intended to contain products at a temperature below -10°C shall be suitably insulated to ensure that the temperature of the vessel’s structure does not fall below the minimum allowable material design temperature. The insulation material shall be resistant to fire and flame spread. ”

“9.3.1.11.9

In case the vessel has insulated cargo tanks, the tank spaces shall only contain dry air to protect the insulation of the cargo tanks against moisture.”

“9.3.1.21.11

On vessels certified to carry refrigerated liquefied gases the following protective measures shall be provided in the cargo area:

- A drip tray to protect the deck, made of materials able to resist the temperature of the cargo and with sufficient capacity (maintained with an overboard drain);
- On vessels intended to carry flammable or toxic products, or both, a water spray system (or a fire monitor) for cooling, fire prevention and crew protection shall be installed to cover:

1. exposed cargo tank domes and exposed parts of cargo tanks;
2. exposed on-deck storage vessels for flammable or toxic products;
3. cargo liquid and vapour discharge and loading manifolds and the area of their control valves and any other areas where essential control valves are situated and which should be at least equal to the area of the drip trays provided.

The capacity of the water spray system (or a fire monitor) shall be such that when all spray nozzles are in operation, the outflow is of 300 liters per square meter of cargo deck area per hour. The system shall be capable of being put into operation from the wheelhouse and from the deck;

- A water film around the manifold in use to protect the deck and the shipside in the way of the manifold in use to protect against brittle fracture during connecting and disconnecting the loading arm or hose. The water film shall have sufficient capacity. The system shall be capable of being put into operation from the wheelhouse and from the deck. ”

“9.3.1.21.12

Vessels carrying refrigerated liquefied gases shall have on board, for the purpose of preventing damage to the cargo tanks during loading, a procedure for pre-cooling of the cargo tanks. This procedure shall be executed before the vessel is put into operation and after long-term maintenance.”

“9.3.1.21.13

Vessels carrying refrigerated liquefied gases shall have on board, for the purpose of preventing damage to the cargo piping during cargo transfer, a procedure for pre-cooling of the cargo piping. This procedure shall be executed before the vessel is put into operation and after long-term maintenance.”

#### **J. Part 9, Chapter 9.3.1.22 Cargo tank openings**

13. Amend 9.3.1.22.5 as follows, new text underlined:

“9.3.1.22.5

Each tank in which refrigerated substances are carried shall be equipped with a safety system to prevent unauthorized vacuum or overpressure. The safety system shall have sufficient relieving capacity.”

#### **K. Part 9, Chapter 9.3.1.24 Regulation of cargo pressure and temperature**

14. Amend 9.3.1.24.1 as follows:

“(c) For UN No. 1972 only: a system for the regulation of cargo tank pressure whereby the boil-off vapours are utilized as fuel for shipboard use.

As long as LNG as fuel is not permitted the use of boil-off may be admitted on a trial basis according to 1.5.3.2.”

The current provision (c) will become (d) “other systems for regulation of cargo pressure and temperature deemed acceptable by a recognised classification society.”

**L. Part 9, Chapter 9.3.1.25 Pumps and piping**

15. Add to 9.3.1.25.2:

“For transport of refrigerated liquefied gases

9.3.1.25.2 (h)

The cargo piping and cargo tanks shall be protected from excessive stresses due to thermal movement and from movements of the tank and hull structure by the use of offsets, loops or bends.”

“9.3.1.25.2 (i)

Where necessary, pipes for loading and unloading shall be thermally insulated from the adjacent hull structure, to prevent the temperature of the hull falling below the design temperature of the hull material.”

“9.3.1.25.2 (j)

All cargo piping which may be insulated in a condition containing liquid (residue) shall be provided with safety valves. These safety valves shall discharge into the cargo tanks and shall be protected against inadvertent closing.”

**M. Part 9, Chapter 9.3.1.27 Refrigeration system**

16. Replace 9.3.1.27.9 with:

“9.3.1.27.9 Heat transmission coefficient

The heat transmission coefficient as used for calculation of the holding time (7.2.4.16.16 and 7.2.4.16.17) shall be determined by calculation. Upon completion of the vessel, the correctness of the calculation shall be checked by means of a heat balance test. The calculation and test shall be performed under supervision by the recognised classification society which classified the vessel.

The heat transmission coefficient shall be documented and kept on board. The heat transmission coefficient shall be verified at every renewal of the certificate of approval.”

**N. Part 9, Chapter 9.3.1.52 Type and location of electrical equipment**

17. Amend 9.3.1.52.3 (b) (iv) (2) with the new text underlined:

“9.3.1.52.3 (b) (iv) (2)

- at the suction inlets of the ventilation inlets
- at the top edge of the sill of the entrance doors of the accommodation and service spaces when the cargo in the gas phase is heavier than air directly; otherwise the gas detection system with sensors shall be fitted close to the ceiling.”

#### IV. Proposed addition to Table C

(1)	(2)	(3)a	(3)b	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
UN No. or substance identification No.	Name and description	Class	Classification code	Packing group	Dangers	Type of tank vessel	Cargo tank design	Cargo tank type	Cargo tank equipment*	Opening pressure of the high velocity vent valve in kPa	Maximum degree of filling	Relative density at 20°C	Type of sampling device	Pumproom below deck permitted	Temperature class	Explosion group	Anti-explosion protection required	Equipment required	Number of cones/ blue lights	Additional requirements/ Remarks
1972	METHANE, REFRIGERATED LIQUID or NATURAL GAS, REFRIGERATED LIQUIFIED, with high methane content	2	3F		2.1	G	1	1	1		95		1	no	T1	IIA	yes	PP, EX, A	1	31, 41, 42

**Note 41:** Loading of refrigerated liquefied gases shall be carried out in such a manner as to ensure that unsatisfactory temperature gradients do not occur in any cargo tank, piping or other ancillary equipment.

**Note 42:** When calculating the holding time (as described in 7.2.4.16.17), it shall be assured that the degree of filling does not exceed 98% in order to prevent the safety valves from opening when the tank is in liquid full condition.