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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-fourth session**

Geneva, 27–31 January 2014

Item 5 (b) of the provisional agenda

**Proposals for amendments to the Regulations annexed to ADN:
Other proposals****Refrigeration system for type C and type N vessels****Transmitted by the Recommended ADN Classification Societies^{1,2}**

1. Having reviewed Informal document INF.21 at its 23rd session, the Safety Committee shared the opinion of the Recommended ADN Classification Societies that there was a need to develop provisions for refrigeration systems on board type C and type N vessels, and asked them to submit a proposal at the next session (ECE/TRANS/WP.15/AC.2/48, paragraph 71).

Current requirements

2. In Table C (3.2.3), Ammonia Solution (UN No. 2672) which can be transported in a type C vessel requires a refrigeration system (column (9) – Item 1 “Refrigeration System”).

¹ In accordance with the programme of work of the Inland Transport Committee for 2012-2016 (ECE/TRANS/224, para 94, ECE/TRANS/2012/12, programme activity 02.7, (A1b)).

² Distributed in German by the Central Commission for the Navigation of the Rhine under the symbol CCNR/ZKR/ADN/WP.15/AC.2/2014/13.

Use of flowchart (3.2.3.3)

3. For classification of products, the use of the flowchart could require a refrigeration system (see Scheme B) for carriage of product in a type N vessel.
4. For the time being, in 9.3.1.27 there are requirements for the “refrigeration system” of type G vessels but paragraphs 9.3.2.27 and 9.3.3.27 are marked as “(Reserved)”.
5. This means that there are no requirements for the refrigeration system of a type C or a type N vessel.

Proposal

6. It is necessary to add provisions regarding the refrigeration system under 9.3.2.27 and 9.3.3.27 (by analogy to 9.3.1.27).
7. Amend 9.3.2.27 and 9.3.3.27 to read as follows:

“9.3.x.27 Refrigeration system

9.3.x.27.1 The refrigeration system referred to in 9.3.x.24.1 (a) shall be composed of one or more units capable of keeping the pressure and temperature of the cargo at the upper limits of the ambient design temperatures at the prescribed level. Unless another means of regulating cargo pressure and temperature deemed satisfactory by a recognised classification society is provided, provision shall be made for one or more stand-by units with an output at least equal to that of the largest prescribed unit. A stand-by unit shall include a compressor, its engine, its control system and all necessary accessories to enable it to operate independently of the units normally used. Provision shall be made for a stand-by heat-exchanger unless the system’s normal heat-exchanger has a surplus capacity equal to at least 25% of the largest prescribed capacity. It is not necessary to make provision for separate piping.

Cargo tanks, piping and accessories shall be insulated so that, in the event of a failure of all cargo refrigeration systems, the entire cargo remains for at least 52 hours in a condition not causing the safety valves to open.

9.3.x.27.2 The security devices and the connecting lines from the refrigeration system shall be connected to the cargo tanks above the liquid phase of the cargo when the tanks are filled to their maximum permissible degree of filling. They shall remain within the gaseous phase, even if the vessel has a list up to 12 degrees.

9.3.x.27.3 When several refrigerated cargoes with a potentially dangerous chemical reaction are carried simultaneously, particular care shall be given to the refrigeration systems so as to prevent any mixing of the cargoes. For the carriage of such cargoes, separate refrigeration systems, each including the full stand-by unit referred to in 9.3.x.27.1, shall be provided for each cargo. When, however, refrigeration is ensured by an indirect or combined system and no leak in the heat exchangers can under any foreseeable circumstances lead to the mixing of cargoes, no provision need be made for separate refrigeration units for the different cargoes.

9.3.x.27.4 When several refrigerated cargoes are not soluble in each other under conditions of carriage such that their vapour pressures are added together in the event of mixing, particular care shall be given to the refrigeration systems to prevent any mixing of the cargoes.

9.3.x.27.5 When the refrigeration systems require water for cooling, a sufficient quantity shall be supplied by a pump or pumps used exclusively for the purpose. This pump or pumps shall have at least two suction pipes, leading from two water intakes, one to port, the other to starboard. Provision shall be made for a stand-by pump with a satisfactory flow; this may be a pump used for other purposes provided that its use for supplying water for cooling does not impair any other essential service.

9.3.x.27.6 The refrigeration system may take one of the following forms:

(a) Direct system: the cargo vapours are compressed, condensed and returned to the cargo tanks. This system shall not be used for certain cargoes specified in Table C of Chapter 3.2. This requirement is indicated by remark 35 in column (20) of Table C of Chapter 3.2;

(b) Indirect system: the cargo or the cargo vapours are cooled or condensed by means of a coolant without being compressed;

(c) Combined system: the cargo vapours are compressed and condensed in a cargo/coolant heat-exchanger and returned to the cargo tanks. This system shall not be used for certain cargoes specified in Table C of Chapter 3.2. This requirement is indicated by remark 36 in column (20) of Table C of Chapter 3.2.

9.3.x.27.7 All primary and secondary coolant fluids shall be compatible with each other and with the cargo with which they may come into contact. Heat exchange may take place either at a distance from the cargo tank, or by using cooling coils attached to the inside or the outside of the cargo tank.

9.3.x.27.8 When the refrigeration system is installed in a separate service space, this service space shall meet the requirements of 9.3.x.17.6.

9.3.x.27.9 For all cargo systems, the heat transmission coefficient shall be determined by calculation. The correctness of the calculation shall be checked by means of a refrigeration test (heat balance test).

This test shall be performed in accordance with the rules set up by a recognised classification society.

9.3.x.27.10 A certificate from a recognised classification society stating that 9.3.x.24.1 to 9.3.x.24.3, 9.3.x.27.1 and 9.3.x.27.4 above have been complied with shall be submitted together with the application for issue or renewal of the certificate of approval.”

Complementary proposals

8. In 9.3.x.27.1 and 9.3.x.27.10 there is a reference to 9.3.x.24. It is also necessary to add provisions in 9.3.2.24 and 9.3.3.24 by analogy to 9.3.1.24.

9. Amend 9.3.2.24 and 9.3.3.24 to read as follows:

“9.3.x.24 *Regulation of cargo pressure and temperature*

9.3.x.24.1 Unless the entire cargo system is designed to resist the full effective vapour pressure of the cargo at the upper limits of the ambient design temperatures, the pressure of the tanks shall be kept below the permissible maximum set pressure of the safety valves, by one or more of the following means:

(a) a system for the regulation of cargo tank pressure using mechanical refrigeration;

(b) a system ensuring safety in the event of the heating or increase in pressure of the cargo. The insulation or the design pressure of the cargo tank, or the combination of these two elements, shall be such as to leave an adequate margin for the operating period and the temperatures expected; in each case the system shall be deemed acceptable by a recognised classification society and shall ensure safety for a minimum time of three times the operation period;

(c) other systems deemed acceptable by a recognised classification society.

9.3.x.24.2 The systems prescribed in 9.3.x.24.1 shall be constructed, installed and tested to the satisfaction of the recognised classification society. The materials used in their construction shall be compatible with the cargoes to be carried. For normal service, the upper ambient design temperature limits shall be:

air: +30° C;

water: +20° C.

9.3.x.24.3 The cargo storage system shall be capable of resisting the full vapour pressure of the cargo at the upper limits of the ambient design temperatures, whatever the system adopted to deal with the boil-off gas. This requirement is indicated by remark 37 in column (20) of Table C of Chapter 3.2.”

10. It may be necessary to complete 9.3.2.11.2 (a) second paragraph like 9.3.1.11.2 (a) first indent, second paragraph by “Cargo tank fastenings shall meet the requirements of a recognised classification society”.

11. Amend 9.3.2.11.2 (a) as follows , new text underlined :

“9.3.2.11.2 (a) In the cargo area (except cofferdams) the vessel shall be designed as a flush-deck double-hull vessel, with double-hull spaces and double bottoms, but without a trunk.

Cargo tanks independent of the vessel’s hull and refrigerated cargo tanks may only be installed in a hold space which is bounded by double-hull spaces and double bottoms in accordance with 9.3.2.11.7 below. The cargo tanks shall not extend beyond the deck.

“Refrigerated] cargo tank fastenings shall meet the requirements of a recognised classification society.”

12. It may be necessary to complete 9.3.3.11.2 or 9.3.3.11.7 with the text of 9.3.1.11.2 (a) first indent, second paragraph, second sentence (“Cargo tank fastenings shall meet the requirements of a recognised classification society”).

13. Amend 9.3.3.11.2 (a) as follows , new text underlined :

“9.3.3.11.2 (a) The cargo tanks independent of the vessel’s hull shall be fixed so that they cannot float. “Refrigerated] cargo tank fastenings shall meet the requirements of a recognised classification society.”

14. Amend 8.1.2.3 (o) as follows, new text underlined :

“The certificate concerning the refrigeration system, prescribed in 9.3.1.27.10, 9.3.2.27.10 or 9.3.3.27.10; and”

15. No transitional provisions are to foreseen.

16. It is necessary to add provisions under 9.3.2.21.10 and 9.3.3.21.10 (by analogy to 9.3.1.21.10) to read as follows:

“9.3.x.21.10 When refrigerated substances are carried the opening pressure of the safety system shall be determined by the design of the cargo tanks. In the event of the

transport of substances that must be carried in a refrigerated state the opening pressure of the safety system shall be not less than 25 kPa (0.25 bar) greater than the maximum pressure calculated according to 9.3.2.27.”

Additional question

17. In Table C, for UN No. 2672 (C22), the cargo tank has to be equipped with a refrigeration system. The Safety Committee is asked to confirm whether a refrigeration system is required or whether a cooling system is sufficient.

Additional proposed correction to the English and Russian text (the French text is correct)

18. In 9.3.1.27.10, replace “9.2.1.27.1” by “9.3.1.27.1”.
