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of Dangerous Goods by Inland Waterways (ADN)
(ADN Safety Committee)

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Agenda item 4 (c)

**PROPOSALS FOR AMENDMENTS TO THE REGULATIONS
ANNEXED TO ADN**

Inerting or blanketing of the cargo

Communication from the Government of Austria^{1,2}

Introduction

1. Parts 3, 7 and 9 of the annexes to ADN currently contain provisions relating to inerting or blanketing of the cargo. The discussion at the 14th meeting of the Safety Committee showed that the texts as currently worded are not sufficiently clear and may be misinterpreted. The Austrian delegation was invited to present a document citing the unclear formulations and contradictions and to propose a solution.

¹ Distributed in German by the Central Commission for the Navigation of the Rhine (CCNR) under the symbol CCNR/ZKR/ADN/WP.15/AC.2/2009/18.

² In accordance with the programme of work of the Inland Transport Committee for 2006-2010 (ECE/TRANS/166/Add.1, programme activity 02.7 (b)).

2. All the provisions of ADN in its 2009 version relating to inerting and blanketing of cargoes are reproduced below. Proposed changes are underlined, and proposed deletions are presented in struck-out text. Explanations are in italics. Text differing from ADN appears in bold.

Part 3

3.2.3 Explanations for column (20)

2. Before loading, air shall be removed and subsequently kept away to a sufficient extent from the cargo tanks and the accessory cargo piping by the means of inert gas (see also 7.2.4.18).

(This text is in conformity with 7.2.4.18; it relates to inerting.)

3. Arrangements shall be made to ensure that the cargo is sufficiently stabilized in order to prevent a reaction at any time during carriage. The transport document shall contain the following additional particulars:

(a) Name and amount of inhibitor added;

(b) Date on which inhibitor was added and expected duration of effectiveness under normal conditions;

(c) Any temperature limits having an effect on the inhibitor.

When stabilization is ensured solely by blanketing with an inert gas it is sufficient to mention the name of the inert gas used in the transport document. When stabilization is ensured by another measurement, e.g. the special purity of the substance, this measurement shall be mentioned in the transport document.

5. This substance is liable to clog the vapour pipe and its fittings. Careful surveillance should be ensured. If a close-type tank vessel is required for the carriage of this substance the vapour pipe shall conform to 9.3.2.22.5 (a) (i), (ii), (iv), (b), (c) or (d) or to 9.3.3.22.5 (a) (i), (ii), (iv), (b), (c) or (d). This requirement does not apply when the cargo tanks and the corresponding piping are inerted in accordance with 7.2.4.18 nor when protection against explosions is not required in column (17) and when flame-arresters have not been installed.

(According to 7.2.4.18.1, inerting also applies to the corresponding piping.)

9. (a) While the vessel is under way, an inert-gas pad shall be maintained in the ullage space above the liquid level.

(b) Cargo piping and vent lines shall be independent of the corresponding piping used for other cargoes.

(c) Safety valves shall be made of stainless steel.

11. (a) Stainless steel of type 416 or 442 and cast iron shall not be used for cargo tanks and pipes for loading and unloading.

(b) The cargo may be discharged only by deep-well pumps or pressure inert gas displacement. Each cargo pump shall be arranged to ensure that the substance does not heat significantly if the pressure discharge line from the pump is shut off or otherwise blocked.

(c) The cargo shall be cooled and maintained at temperatures below 30° C.

(d) The safety valves shall be set at a pressure of not less than 550 kPa (5.5 bar) gauge pressure. Special authorization is required for the maximum setting pressure.

(e) While the vessel is under way, a nitrogen pad shall be maintained in the ullage space above the cargo (**see also 7.2.4.18**). An automatic nitrogen supply system shall be installed to prevent the pressure from falling below 7 kPa (0.07 bar) gauge within the cargo tank in the event of a cargo temperature fall due to ambient temperature conditions or to some other reason. In order to satisfy the demand of the automatic pressure control a sufficient amount of nitrogen shall be available on board. Nitrogen of a commercially pure quality of 99.9%, by volume, shall be used for padding. A battery of nitrogen cylinders connected to the cargo tanks through a pressure reduction valve satisfies the intention of the expression “automatic” in this context.

The required nitrogen pad shall be such that the nitrogen concentration in the vapour space of the cargo tank is not less than 45% at any time.

(f) Before loading and while the cargo tank contains this substance in a liquid or gaseous form, it and the corresponding piping shall be inerted with nitrogen.

(g) The water-spray system shall be fitted with remote-control devices which can be operated from the wheelhouse or from the control station, if any.

(h) Transfer arrangements shall be provided for emergency transfer of ethylene oxide in the event of an uncontrollable self-reaction.

12. (a) The substance shall be acetylene free.

(b) Cargo tanks which have not undergone appropriate cleaning shall not be used for the carriage of these substances if one of the previous three cargoes consisted of a substance known to promote polymerization, such as:

1. mineral acids (e.g. sulphuric acid, hydrochloric acid, nitric acid);
2. carboxylic acids and anhydrides (e.g. formic acid, acetic acid);
3. halogenated carboxylic acids (e.g. chloroacetic acid);
4. sulphonic acids (e.g. benzene sulphonic acid);
5. caustic alkalis (e.g. sodium hydroxide, potassium hydroxide);
6. ammonia and ammonia solutions;

7. amines and amine solutions;
8. oxidizing substances.

(c) Before loading, cargo tanks and their piping shall be efficiently and thoroughly cleaned so as to eliminate all traces of previous cargoes, except when the last cargo was constituted of propylene oxide or a mixture of ethylene oxide and propylene oxide. Special precautions shall be taken in the case of ammonia in cargo tanks built of steel other than stainless steel.

(d) In all cases the efficiency of the cleaning of cargo tanks and their piping shall be monitored by means of appropriate tests or inspections to check that no trace of acid or alkaline substance remains that could present a danger in the presence of these substances.

(e) The cargo tanks shall be entered and inspected prior to each loading of these substances to ensure freedom from contamination, heavy rust deposits or visible structural defects.

When these cargo tanks are in continuous service for these substances, such inspections shall be performed at intervals of not more than two and a half years.

(f) Cargo tanks which have contained these substances may be reused for other cargoes once they and their piping have been thoroughly cleaned by washing and flushing with an inert gas.

(g) Substances shall be loaded and unloaded in such a way that there is no release of gas into the atmosphere. If gas is returned to the shore installation during loading, the gas return system connected to the tank containing that substance shall be independent from all other cargo tanks.

(h) During discharge operations, the pressure in the cargo tanks shall be maintained above 7 kPa (0.07 bar) gauge.

(i) The cargo shall be discharged only by deep-well pumps, hydraulically operated submerged pumps or pressure inert gas displacement. Each cargo pump shall be arranged to ensure that the substance does not heat significantly if the pressure discharge line from the pump is shut off or otherwise blocked.

(j) Each cargo tank carrying these substances shall be ventilated by a system independent from the ventilation systems of other cargo tanks carrying other substances.

(k) Loading pipes used for these substances shall be marked as follows:

“To be used only for the transfer of alkylene oxide.”

(l) *(Reserved)*

(m) No air shall be allowed to enter the cargo pumps and cargo piping system while these substances are contained within the system.

(n) Before the shore connections are disconnected, piping containing liquids or gas shall be depressurized at the shore link by means of appropriate devices.

(o) The piping system for cargo tanks to be loaded with these substances shall be separate from piping systems for all other cargo tanks, including empty cargo tanks. If the piping system for the cargo tanks to be loaded is not independent, separation shall be accomplished by the removal of spool pieces, shut-off valves, other pipe sections and by fitting blank flanges at these locations. The required separation applies to all liquid pipes and vapour vent lines and any other connections which may exist such as common inert gas supply lines.

(p) These substances may be carried only in accordance with cargo handling plans that have been approved by a competent authority.

Each loading arrangement shall be shown on a separate cargo handling plan. Cargo handling plans shall show the entire cargo piping system and the locations for installations of blank flanges needed to meet the above piping separation requirements. A copy of each cargo handling plan shall be kept on board. Reference to the approved cargo handling plans shall be included in the certificate of approval.

(q) Before loading of these substances and before carriage is resumed a qualified person approved by the competent authority shall certify that the prescribed separation of the piping has been effected; this certificate shall be kept on board. Each connection between a blank flange and a shut-off valve in the piping shall be fitted with a sealed wire to prevent the flange from being disassembled inadvertently.

(r) During the voyage, the cargo shall be covered with nitrogen. An automatic nitrogen make-up system shall be installed to prevent the cargo tank pressure from falling below 7 kPa (0.07 bar) gauge in the event of a cargo temperature fall due to ambient temperature conditions or to some other reason. Sufficient nitrogen shall be available on board to satisfy the demand of automatic pressure control. Nitrogen of commercially pure quality of 99.9%, by volume, shall be used for padding. A battery of nitrogen cylinders connected to the cargo tanks through a pressure reduction valve satisfies the intention of the expression “automatic” in this context.

(s) The vapour space of the cargo tanks shall be checked before and after each loading operation to ensure that the oxygen content is 2%, by volume, or less.

(t) Loading flow

The loading flow (LR) of cargo tanks shall not exceed the following value:

$$L_R = 3600 \times U/t \text{ (m}^3\text{/h)}$$

In this formula:

U = the free volume (m³) during loading for the activation of the overflow prevention system;

t = the time (s) required between the activation of the overflow prevention system and the complete stop of the flow of cargo into the cargo tank;

The time is the sum of the partial times needed for successive operations, e.g. reaction time of the service personnel, the time needed to stop the pumps and the time needed to close the shut-off valves;

The loading flow shall also take account of the design pressure of the piping system.

Part 7

7.2.4.18 ~~Monitoring of gaseous phases in cargo tanks and adjacent empty spaces~~ ~~Blanketing of the cargo and inerting~~

(This does not relate to “monitoring”, and there is no requirement for adjacent empty spaces in column (20).)

7.2.4.18.1 For the gaseous phases of cargo tanks and the corresponding piping, inerting or blanketing may be necessary. These are defined as follows:

- **inerting**: cargo tanks and their piping ~~and other spaces for which this process is prescribed in column (20) of Table C of chapter 3.2~~ are filled with gases or vapours which prevent combustion, do not react with the cargo and maintain this state;
- **blanketing of the cargo**: spaces in the cargo tanks above the cargo and their piping are filled with a liquid, gas or vapour which separates the cargo from the air and maintains this situation.

7.2.4.18.2 For certain substances the requirements for inerting and blanketing of the cargo ~~the monitoring of the gaseous phases in cargo tanks and the corresponding piping and in adjacent empty spaces~~ are given in column (20) of Table C of Chapter 3.2.

(This does not relate to “monitoring”. Here too, the corresponding piping should be mentioned.)

~~7.2.4.18.3 Inerting of tanks~~

(18.3 has a title, while 18.1, 18.2 and 18.4 do not. It is unclear whether this title relates only to 18.3, or to 18.4 as well.)

7.2.4.18.3 (Reserved)

(7.2.4.18.3 is unnecessary, as the requirements of 7.2.4.18.2 are mentioned in column (20).)

~~7.2.4.18.3 When anti-explosion protection is required in column (17) of Table C of Chapter 3.2 and inerting is required in column (20) of Table C of Chapter 3.2, cargo tanks and their piping shall be purged in an appropriate form of any air that may be present using inert gas and maintained in an air-free state.~~

7.2.4.18.4 Inerting or blanketing of flammable cargoes shall be carried out in such a way as to reduce the electrostatic charge as far as possible when the inerting agent is added.

7.2.4.19 *(To be deleted in ADN 2011, as the transitional period will have passed.)*

~~7.2.4.19 Inerting of tank vessels~~

~~The cargo tanks of a closed tank vessel, loaded or empty, which have not been cleaned of substances for which the use of a closed tank vessel of type C or type N with anti-explosion protection is prescribed in columns (6), (7) and (17) of Table C of Chapter 3.2 shall be inerted in accordance with 7.2.4.18. The inerting shall be performed so as to ensure that the oxygen content is less than 8% in volume.~~

~~Inerting is not prescribed when the tank vessel is in conformity with 9.3.2.22.5 or 9.3.3.22.5.~~

Part 9

9.3.3.18 Inerting facility

In cases in which inerting or blanketing of the cargo is prescribed, the vessel shall be equipped with an inerting system.

This system shall be capable of maintaining a permanent minimum pressure of 7 kPa (0.07 bar) in the spaces to be inerted. In addition, the inerting system shall not increase the pressure in the cargo tank to a pressure greater than that at which the pressure valve is regulated. The set pressure of the vacuum-relief valve shall be 3.5 kPa (0.035 bar).

A sufficient quantity of inert gas for loading or unloading shall be carried or produced on board if it is not possible to obtain it on shore. In addition, a sufficient quantity of inert gas to offset normal losses occurring during carriage shall be on board.

The premises to be inerted shall be equipped with connections for introducing the inert gas and monitoring systems so as to ensure the correct atmosphere on a permanent basis.

When the pressure or the concentration of inert gas in the gaseous phase falls below a given value, this monitoring system shall activate an audible and visible alarm in the wheelhouse. When the wheelhouse is unoccupied, the alarm shall also be perceptible in a location occupied by a crew member.

9.3.3.22.5 (a) Insofar as anti-explosion protection is prescribed in column (17) of Table C of Chapter 3.2, a vapour pipe connecting two or more cargo tanks shall be fitted, at the connection to each cargo tank, with a flame arrester with a **fixed or** spring-loaded plate stack, capable of withstanding detonation. This equipment may consist of:

- (i) a flame arrester fitted with a **fixed plate stack**, where each cargo tank is fitted with a vacuum valve capable of withstanding a deflagration and a **high-velocity vent valve** capable of withstanding steady burning;
- (ii) a flame arrester fitted with a spring-loaded **plate stack**, where each cargo tank is fitted with a vacuum valve capable of withstanding a deflagration;

- (iii) a flame arrester **with a fixed plate stack**;
- (iv) a flame arrester **with a fixed plate stack**, where the pressure measurement device is fitted with an alarm system in accordance with 9.3.3.21.7;
- (v) a flame arrester with a spring-loaded **plate stack**, where the pressure measurement device is fitted with an alarm system in accordance with 9.3.3.21.7.

Only substances which do not mix and which do not react dangerously with each other may be carried simultaneously in cargo tanks connected to a common vapour pipe;

or

- (b) Insofar as anti-explosion protection is prescribed in column (17) of Table C of Chapter 3.2, a vapour pipe connecting two or more cargo tanks shall be fitted, at the connection to each cargo tank, with a pressure/vacuum valve incorporating a flame arrester capable of withstanding a detonation/deflagration.

Only substances which do not mix and which do not react dangerously with each other may be carried simultaneously in cargo tanks connected to a common vapour pipe;

or

- (c) Insofar as anti-explosion protection is prescribed in column (17) of Table C of Chapter 3.2, an independent vapour pipe for each cargo tank, fitted with a pressure/vacuum valve incorporating a flame arrester capable of withstanding a deflagration and **a high-velocity vent valve** incorporating a flame arrester capable of withstanding steady burning. Several different substances may be carried simultaneously;

or

- (d) Insofar as anti-explosion protection is prescribed in column (17) of Table C of Chapter 3.2, a vapour pipe connecting two or more cargo tanks shall be fitted, at the connection to each cargo tank, with a shut-off device capable of withstanding a detonation, where each cargo tank is fitted with a vacuum valve capable of withstanding a deflagration and a high-velocity vent valve capable of withstanding steady burning.

Only substances which do not mix and which do not react dangerously with each other may be carried simultaneously in cargo tanks connected to a common vapour pipe.
