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Working Party on the Standardization of Technical and Safety Requirements in Inland Navigation

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Item 6 (b) of the provisional agenda

Standardization of Technical and Safety Requirements in Inland Navigation: Recommendations on Harmonized Europe-Wide Technical Requirements for Inland Navigation Vessels (Resolution No. 61, Revision 2)

Amendments to the Annex to Resolution No. 61 Based on the European Standard Laying Down Technical Requirements for Inland Navigation Vessels, Edition 2023

Note by the secretariat

Mandate

1. This document is submitted in line with the proposed Programme Budget for 2024, part V, Regional cooperation for development, section 20, Economic Development in Europe, Programme 17, Economic Development in Europe (A/78/6 (Sect. 20), table 20.5).
2. At its sixty-sixth session, the Working Party on Inland Water Transport (SC.3) was informed about the adoption of the European Standard Laying Down Technical Requirements for Inland Navigation Vessels (ES-TRIN) edition 2023/1 by the European Committee for Standards in Inland Navigation (CESNI) on 13 October 2022 (ECE/TRANS/SC.3/217, paragraph 69). The new version of the standard will enter into force from 1 January 2024. SC.3 asked the secretariat to continue work on harmonizing the annex to resolution No. 61 with ES-TRIN.
3. The annex to this document contains a number of revised or newly introduced provisions of ES-TRIN edition 2023/1¹ that may be relevant for the annex to resolution No. 61 and can be used by the Working Party on the Standardization of Technical and Safety Requirements in Inland Navigation as the basis for further work.

¹ www.cesni.eu/wp-content/uploads/2022/11/ES-TRIN23_signed_en.pdf.

Annex

Provisions of the European Standard Laying Down Technical Requirements for Inland Navigation Vessels Edition 2023 That May Be Relevant for the Annex to Resolution No. 61

Annex 8 “Supplementary Provisions Applicable to Craft Operating on Fuels with a Flashpoint Equal to or Lower Than 55° C”

Section I “Definitions”

For the purposes of this Annex, the following definitions shall apply:

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3 Fuel cells

1.3.1 Fuel cell system: the system comprising the fuel cell components as well as other components and systems required to operate the fuel cells and to supply electrical power to the craft. This excludes the bunkering, storage and fuel supply systems.

1.3.2 Fuel cell components: all components of a fuel cell system which may contain fuel or hazardous vapours.

1.3.3 Fuel cell space: any enclosed space or enclosure containing a part or all fuel cell components.²

1.3.4 Fuel cell: an energy converter in which, by oxidation, the chemical energy of the fuel is directly converted to electrical and thermal energy.

1.3.5 Reformer: a device to convert gaseous or liquid primary fuels to reformat that can be used in fuel cells.

1.3.6 Primary fuel: fuel supplied to a fuel cell system.

1.3.7 Fuel: primary fuel or reformat with which the fuel cell is fed to convert energy.

1.3.8 Reformat: a hydrogen-containing gas generated in the reformer from primary fuel.

1.3.9 Buffer vessel: a device forming part of the fuel cell system to temporarily hold fuel in order to secure the stable operation of the fuel cell system, in particular to balance the flow of fuel to a fuel cell.

Section II “Fuel storage”³

Section III Energy converters

Chapter 1 Propulsion or auxiliary systems with fuel cells

3.1.1 Fuel cell spaces

3.1.1.1 The requirements of this Chapter shall apply to fuel cell spaces located either on deck or below deck.

3.1.1.2 Only components necessary for the operation of the fuel cell systems shall be permitted in fuel cell spaces.

3.1.1.3 Fuel cell components shall be surrounded by a secondary barrier. The boundary of a fuel cell space may act as a secondary barrier.

² Note by the secretariat: the figure is not reproduced here.

³ Note by the secretariat: section II is not reproduced here.

3.1.1.4 Fuel cell spaces shall be designed in such a way that their geometrical form ensures good air circulation or good distribution of inert gas, as to minimise the possibility of entrapping explosive mixture.

3.1.1.5 A permanently installed, continuously measuring gas detection system shall be in place in fuel cell spaces.

3.1.1.6 Fuel cell spaces containing fuel reformers shall also comply with the requirements for the relevant fuel storage in accordance with Annex 8, Section II.

3.1.1.7 Appropriate fire partition requirements of fuel cell spaces shall be established by the risk assessment in accordance with Article 30.04, with special consideration given to the installation location and fire load of the fuel cell space.

3.1.1.8 Fuel cell spaces shall not be located less than:

- a) 1,00 m or B/5 from the craft's side whichever is less, and
- b) 0,60 m from the craft's bottom.

The inspection body may allow shorter distances in the absence of hazardous areas, based on the risk assessment, according to Article 30.04.

3.1.1.9 One of the following concepts shall be applied to fuel cell spaces:

- a) inerted fuel cell space,
- b) explosion-protected fuel cell space, or
- c) ventilated fuel cell space.

3.1.1.10 Requirements for inerted fuel cell spaces

3.1.1.10.1 Inerted fuel cell spaces are fuel cell spaces protected by inert gas. They shall be considered as non-hazardous areas.

3.1.1.10.2 The boundary of the fuel cell space that acts as secondary barrier shall be gastight. The design pressure of the boundary shall be suitable for the intended application.

3.1.1.10.3 During normal operation of the fuel cell system, the fuel cell space shall be inerted.

3.1.1.10.4 In the event of leakage of gas being detected or loss of inertion:

- a) the fuel supply to the fuel cell space concerned, and
- b) the fuel cell components in the fuel cell space concerned shall be shut down automatically.

3.1.1.10.5 Gas tightness and integrity of the secondary barrier shall be permanently monitored by appropriate measures. In the event of leakage of inerted gas being detected in adjacent rooms where persons are present during normal operation, an optical and acoustic alarm shall be triggered:

- a) in the affected rooms and
- b) in the wheelhouse or at any other permanently manned location.

In the event of failure of the gas tightness and integrity of the secondary barrier, the fuel supply to the fuel cell system shall be shut down automatically.

3.1.1.11 Requirements for explosion-protected fuel cell spaces

3.1.1.11.1 Explosion-protected fuel cell spaces shall be considered as hazardous areas (Zone 1).

3.1.1.11.2 In accordance with Article 10.04, only explosion-protected equipment (certified safety) is permitted. This shall be deemed to be fulfilled if the equipment meets the relevant provisions of the European Standard series EN 60079.

3.1.1.11.3 The function of the secondary barrier shall be achieved by mechanical ventilation ensuring permanent negative pressure relative to adjacent rooms.

3.1.1.11.4 The ventilation system shall:

- a) guarantee a sufficient capacity of ventilation to ensure that the gross volume of air inside the fuel cell space is changed at least 30 times per hour, and
- b) be independent of all other ventilation systems of the craft.

3.1.1.11.5 In the event of leakage of gas leading to a concentration above 20 % of the lower explosive limit (LEL), an optical and acoustic alarm shall be triggered in the wheelhouse or at any other permanently manned location.

3.1.1.11.6 In the event of leakage of gas leading to a concentration above 40 % of the LEL or the ventilation system fails,

- a) the fuel supply to the fuel cell space concerned, and
- b) the fuel cell components in the fuel cell space concerned shall be shut down automatically.

3.1.1.12 Requirements for ventilated fuel cell spaces

3.1.1.12.1 The possible hazardous areas within the ventilated fuel cell spaces shall be classified in accordance with Article 10.04.

3.1.1.12.2 In accordance with Article 10.04, only equipment suitable for the hazardous areas as classified in (3.1.1.12.1) is permitted. This shall be deemed to be fulfilled if the equipment meets the relevant provisions of the European Standard series EN 60079.

3.1.1.12.3 The function of the secondary barrier shall be achieved by mechanical ventilation ensuring permanent negative pressure relative to adjacent rooms.

3.1.1.12.4 The ventilation system shall:

- a) guarantee a sufficient capacity of ventilation to ensure that the gross volume of air inside the fuel cell space is changed at least at the rate which has been assumed for the hazardous area calculation referred to in (3.1.1.12.1). This shall be deemed to be fulfilled if the dilution is determined in accordance with Article 10.04(1), and
- b) be independent of all other ventilation systems of the craft.

3.1.1.12.5 In the event of leakage of gas leading to a concentration above 20 % of the LEL, an optical and acoustic alarm shall be triggered in the wheelhouse or at any other permanently manned location.

3.1.1.12.6 In the event of leakage of gas leading to a concentration above 40 % of the LEL or the ventilation system fails:

- a) the fuel supply to the fuel cell space concerned and
- b) the fuel cell components in the fuel cell space concerned shall be shut down automatically.

3.1.1.13 Specific requirements or derogations for fuel cell spaces on deck

3.1.1.13.1 For fuel cell spaces on deck, the inspection body may allow derogation from (3.1.1.13) and (3.1.1.12.3) provided that:

- a) the fuel cell space is located on open deck with no directly adjacent rooms on the same deck;
- b) the fuel cell space is naturally ventilated to ensure that the gross volume of air inside the fuel cell space is changed in accordance with (3.1.1.12.4);
- c) the risk assessment according to Article 30.04 does not identify any contraindication.

3.1.1.14 Access to fuel cell spaces

3.1.1.14.1 Access to fuel cell spaces shall not be possible before the fuel cell components inside are safely shut down, isolated from the fuel supply system, drained of leakages and the inside atmosphere is confirmed gas-free.

It shall be possible to remotely operate and monitor from outside the fuel cell space all controls and all parameters required for safe operation of the fuel cell system and gas freeing of the fuel cell space.

3.1.1.14.2 The fuel cell space openings shall be equipped with an interlock preventing operation of the fuel cell system when the fuel cell space is open.

3.1.1.14.3 Doors to fuel cell spaces shall bear on the outside the symbol corresponding to Figure 1 in Annex 4 (“No entry for unauthorised persons”) as well as the fuel specific symbol in accordance with Article 30.06.

3.1.1.14.4 For the purpose of entering the inerted fuel cell spaces, it shall be possible that the inerted atmosphere in the fuel cell space is replaced by air that is safe to breathe. It shall be indicated outside the fuel cell space whether the air is safe to breathe.

3.1.1.14.5 The inspection body may allow derogation to (3.1.1.14.1), provided that:

- a) the opening of the fuel cell space leads directly to open deck,
- b) the opening of the fuel cell space is through an air lock, or
- c) the fuel cell space is considered as non-hazardous in accordance with (3.1.1.12.1).

3.1.1.14.6 For safe maintenance, it shall be possible that the fuel cell components are:

- a) isolated from the fuel supply system, and
- b) drained and purged of fuel.

3.1.1.14.7 Fuel cell systems and their components shall be installed and fitted in such a way as to be adequately accessible for operation and maintenance and shall not endanger the persons assigned to those tasks.

3.1.2 Fuel Piping systems in the fuel cell spaces

3.1.2.1 The piping used for the supply of primary fuel shall comply with the respective requirements of Annex 8, Section II.

3.1.2.2 Fuel piping shall be protected against hazards arising from electrostatic charges.

3.1.2.3 The maximum working pressure for piping inside fuel cell spaces shall not exceed 1000 kPa (gauge value). The inspection body may allow higher working pressure, based on the risk assessment according to Article 30.04.

3.1.3 Reformer

3.1.3.1 The volume of fuel in the reformer shall be limited to the volume required for a stable continuous operation. Storage of fuel in the reformer shall not be permitted.

3.1.3.2 Reformer with a design pressure of more than 50 kPa shall comply with the requirements of Article 8.01(2).

3.1.3.3 Unintended accumulations of inflammable mixtures in burner systems and oxidation units of the reformer shall be avoided.

3.1.3.4 An automatic burner control system shall be installed to enable the safe start, operation and shutdown of the burner system of the reformer.

3.1.3.5 The complete combustion of the gases in the burner shall be monitored.

3.1.3.6 Surfaces likely to reach high temperatures shall be provided with insulation or protection against contact.

3.1.4 Buffer vessel

3.1.4.1 Fuel buffer vessels in fuel cell systems, if present, may only be used to provide process-related fuel and temporary reserves but not as an additional fuel storage.

3.1.4.2 The buffer vessels shall be arranged near the fuel cells and shall comply with the requirements of (3.1.2).

3.1.5 Fuel cell systems

3.1.5.1 Fuel cell systems shall be constructed and tested in accordance with the applicable standards of the International Standards series IEC 62282 or equivalent standards.

3.1.5.2 Materials used for the fuel cell systems shall be suitable for the intended application. This shall be deemed to be fulfilled when the materials comply with:

- a) the International Standard IEC 62282-3-100 : 2019 or
- b) an equivalent regulation or Standard recognised by one of the Member States.

3.1.6 Ventilation systems

3.1.6.1 The ventilators used for ventilation of hazardous areas shall be of a certified safe type.

3.1.6.2 Electric motor driving ventilators shall comply with the required explosion protection in the area where it is installed.

3.1.6.3 An optical and acoustic alarm shall be triggered in the wheelhouse or at any other permanently manned location in the event of any loss of the required ventilating capacity.

3.1.6.4 At least two ventilators shall be installed for the ventilation of hazardous areas to guarantee 100 % of the required ventilation capacity if one ventilator fails. The supply from the emergency power source shall also enable the ventilation system to provide 100% of the required ventilation capacity.

3.1.6.5 Air for ventilation shall be taken from non-hazardous areas.

3.1.6.6 The air intake from non-hazardous areas shall be located at least 1,50 m away from the boundaries of any hazardous area.

3.1.6.7 Where the inlet duct passes through a hazardous room, the duct shall have overpressure relative to this room. Overpressure shall not be required if it is ensured that gases will not leak into the duct.

3.1.6.8 Air outlets from hazardous areas shall be located in an open area which has the same or lower risk of hazard than the ventilated room.

3.1.6.9 Air outlets from non-hazardous areas shall be located outside hazardous areas.

3.1.6.10 Air inlets and outlets shall be located in appropriate positions, taking into account the characteristics of the fuel used.

3.1.7 Exhaust systems

3.1.7.1 The following provisions apply to systems for exhaust air and exhaust gas from fuel cell systems.

3.1.7.2 The exhaust systems of the fuel cell systems shall

- a) not be connected to the exhaust pipes of systems other than fuel cell systems and
- b) shall lead the gases to open air.

However, the exhaust pipes of the fuel cell systems may be combined with the fuel cell space ventilation at the ventilation outlet of the fuel cell space.

3.1.7.3 The exhaust systems shall be made of an appropriate material regarding its temperature limit, fire resistance, material strength and resistance to the action of condensate.

3.1.7.4 All suitable measures shall be taken to avoid ingress of exhaust air and exhaust gas into the various compartments of the craft.

3.1.7.5 Outlets of exhaust systems shall be designed in such a way that they cause no immediate danger to the people on board. They shall be located in appropriate positions, taking into account the characteristics of the exhaust air and exhaust gas.

3.1.7.6 The exhaust systems and their outlets are to be classified in accordance with Article 10.04.

Only equipment suitable for the hazardous area as classified is permitted.

3.1.7.7 The exhaust systems shall be configured to keep accumulation of unoxidized gaseous fuel as low as possible.

3.1.7.8 Routing and isolation of the exhaust system shall take the accumulation of condensate into account.

3.1.7.9 Exhaust gas systems must allow safe condensate drainage.

3.1.7.10 If the exhaust systems are not provided by the fuel cell manufacturer, they must comply with the fuel cell manufacturer's instructions.

3.1.8 Purging system

3.1.8.1 For fuel cell systems requiring purging for safe operation, especially before the start-up or after the shutdown of the fuel cell system, a suitable purging system that uses a medium specified by the fuel cell manufacturer shall be used.

3.1.9 Control, monitoring and safety systems

3.1.9.1 In addition to Article 30.10, the provisions of (3.1.9) apply.

3.1.9.2 Each fuel cell system shall be fitted with its own control and monitoring system and its own safety system. The safety system shall be designed to operate independently of the control and monitoring system. All elements of these systems shall be capable of being functionally tested.

Software for programmable electronic systems shall be developed in accordance with an acceptable quality management system considering all software lifecycle activities as design, development, supply and maintenance.

3.1.9.3 Sensors for the safety system shall be first routed to safety system and particular information may be also routed towards control and monitoring systems. Alarm sensors shall be directly routed to the monitoring system.

3.1.9.4 It shall be possible to manually shut down the fuel cell system from the following locations:

- a) wheelhouse,
- b) from the outside in the direct vicinity of the fuel cell space,
- c) any permanently manned location.

The safety system shall be manually reset before the propulsion or auxiliary system can be restarted.

3.1.9.5 Suitable devices shall monitor chemical reactions in the reformer and in the fuel cells by means of temperature, pressure and voltage control.

Chapter 2 Propulsion or auxiliary systems with internal combustion engines using LNG⁴ as fuel⁵

Chapter 3 Propulsion or auxiliary systems with internal combustion engines using methanol as fuel

(left void)

⁴ Note by the secretariat: liquefied natural gas.

⁵ Note by the secretariat: chapter 2 is not reproduced here.