CESNI/PT/FC (22) 7 rev. 3
CESNI/PT (22) 44 rev. 1
12th July 2022
Or. en fr/de/nl/en

TEMPORARY WORKING GROUP ON TECHNICAL REQUIREMENTS FOR FUEL CELLS (ABOARD INLAND NAVIGATION VESSELS)
WORKING GROUP ON TECHNICAL REQUIREMENTS

Final draft requirements for methanol storage (June 2022)

Communication from the Secretariat

In June 2022, the Working group CESNI/PT approved

- the final draft requirements for methanol storage (**Annex 1**), as an addition to ES-TRIN 2023 (especially Chapter 30 and Annex 8);
- the sketches regarding the arrangements of the tanks and piping systems (**Annex 2**), as possible instructions to the inspection bodies (ESI).

As these draft requirements are not part of ES-TRIN 2023, the Working group recommended using them as guidelines. These provisions are not binding and only reflect the current state-of-play of the regulatory work.

The early approval of these draft requirements for methanol storage aims to facilitate pilot projects, especially the submission of requests of derogations to ES-TRIN and the related vessel certification. The experience collected in implementing these draft requirements should allow for a revision, before the end of 2023, with a view to include them in ES-TRIN 2025.

The Working group CESNI/PT invited the recognised associations, in particular those representing the shipowners, the shipyards and the classification societies, to disseminate the draft requirements.

Annex 1 to CESNI/PT/FC (22) 7 rev. 3 = CESNI/PT (22) 44 rev. 1

"*ANNEX 8*
SUPPLEMENTARY PROVISIONS APPLICABLE TO CRAFT EQUIPPED WITH PROPULSION OR AUXILIARY SYSTEMS OPERATING ON FUELS WITH A FLASHPOINT EQUAL TO OR LOWER THAN 55 °C

Section I
Definitions

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1.1.3a *Pressure Vacuum (P/V) valve*: a valve or set of valves which keeps the tank overpressure or underpressure within tank design limits

1.1.3b *Controlled tank venting system*: a system fitted with P/V valves to relieve overpressure and underpressure.

[…]

1.1.14 *Lowest possible waterline*: the waterline corresponding to the displacement of the craft without ballast and without load.

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Section II
Fuel Storage

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Chapter 2
Methanol

…

2.2.1 General

2.2.1.1 Equipment or piping containing liquid methanol fuel shall be arranged in enclosures, spaces or ducts providing a secondary barrier. This requirement applies notably to pump filters and fittings.

No secondary barrier is required on open deck.

2.2.2 Methanol fuel tanks

2.2.2.1 Methanol fuel shall be stored in tanks which are

a) either an integral part of the hull or which are firmly attached to the hull;

b) made in way that they are able to withstand the mechanical, chemical and thermal stresses to which they are likely to be subjected.

Materials other than steel may be used for methanol fuel tanks (consisting of primary barrier and where applicable secondary barrier), provided that these materials have structural and integrity properties equivalent to steel, at the end of the applicable fire exposure according to the standard one-hour fire test. These requirements are deemed fulfilled when the materials used provide Type A60 partitions.

2.2.2.2 Methanol fuel tanks and their piping shall be designed to prevent electrostatic charges. Independent fuel tanks shall be electrically bonded to the craft's structure.

2.2.2.3 Methanol fuel tanks and their piping and other accessories shall be laid out and arranged in such a way that neither fuel nor fuel vapours may accidentally reach the inside of the craft.

2.2.2.4 No methanol fuel tanks may be located ahead of the collision bulkhead or aft of the aft-peak bulkhead.

2.2.2.5 Methanol fuel tanks and their fittings shall not be located directly above engines or exhaust pipes.

2.2.2.6 Directly at tank outlets, the pipework for the supply of fuels shall be fitted with a quick-closing valve that can be operated from the deck, even when the spaces in question are closed.

If the operating device is concealed, the lid or cover shall not be lockable.

The operating device shall be marked in red. If the device is concealed it shall be marked with a symbol for the “quick-closing valve on the tank” in accordance with Figure 9 of Annex 4 with a side length of at least 10 cm.

2.2.2.7 Methanol fuel tanks shall be safeguarded against fuel spills during bunkering by means of appropriate onboard technical devices which shall be entered in item 52 of the inland navigation vessel certificate. Derogation from this requirement is acceptable if fuel is taken on from bunkering stations with their own technical devices to prevent fuel spills on board during bunkering.

2.2.2.8 A fixed piping system shall be arranged to allow safe gas freeing of each fuel tank.

2.2.3 Inerted methanol fuel tanks

2.2.3.1 Inerted methanol fuel tanks shall be inerted at all times during normal operation.

2.2.3.2 The design of the inerted tank system shall eliminate the possibility of an explosive atmosphere in the fuel tank, during any part of the gas change, gas-freeing or inerting operation by using an inerting medium.

2.2.3.3 According to 2.2.1.1, below deck, inerted methanol fuel tanks shall be surrounded by a secondary barrier for leakage containment and detection. However, the secondary barrier can be omitted on those surfaces bound by

a) shell plating,
b) tank tops which are not under the static pressure of the liquid and facing open deck,
c) tank tops which are not under the static pressure of the liquid and facing spaces permanently ventilated with at least 15 air changes per hour (e.g. engine rooms, pump rooms or similar), or
d) other methanol fuel tanks or spaces with equipment containing methanol fuel.

2.2.3.4 For inerted methanol fuel tanks below deck,

a) the distance between the craft's side (shell plating) and the secondary barrier of the tank shall be at least 0,60 m and

b) the distance between the craft's bottom (shell plating) and the secondary barrier of the tank shall be at least 0,50 m.

For the case referred to in (2.2.3.3)(a), this means:

a) the distance between the craft's side (shell plating) and the vertical part of the secondary barrier of the tank opposite to the craft's side, shall be at least 0,60 m.

b) the distance between the craft's bottom (shell plating) and the horizontal part of the upper secondary barrier of the tank, opposite to the craft's bottom, shall be at least 0,50 m.

Because the boundaries of the spaces referred to in (2.2.3.3)(c) and (d) act as secondary barrier,

a) the distance between the craft's side (shell plating) and the boundaries of these spaces shall be at least 0,60 m and

b) the distance between the craft's bottom (shell plating) and the boundaries of these spaces shall be at least 0,50 m.

In accordance with the risk assessment referred to in Article 30.04, the inspection body might require greater values for the distances mentioned above.

2.2.3.5 For inerted methanol fuel tanks on open deck, the distance between the vertical planes defined by the craft's sides (shell plating) and the tank shall be at least 0,60 m.

2.2.4 Non-inerted methanol fuel tanks

2.2.4.1 In accordance with 2.2.1.1, below deck, non-inerted methanol fuel tanks shall be surrounded by a secondary barrier for leakage containment and detection. However, the secondary barrier can be omitted on those surfaces bound by

a) shell plating below the lowest possible waterline, or

b) other methanol fuel tanks or spaces with equipment containing methanol fuel.

2.2.4.2 For non-inerted methanol fuel tanks below deck,

a) the distance between the craft's side (shell plating) and the secondary barrier of the tank shall be at least 0,60 m and
b) the distance between the craft's bottom (shell plating) and the secondary barrier of the tank shall be at least 0,50 m.

For the case referred to in (2.2.4.1)(a), this means:

a) the distance between the craft's side (shell plating) and the vertical part of the secondary barrier of the tank opposite to the craft's side, shall be at least 0,60 m.
b) the distance between the craft's bottom (shell plating) and the horizontal part of the upper secondary barrier of the tank, opposite to the craft's bottom, shall be at least 0,50 m.
c) the distance between the craft's side (shell plating) and the tank, above the lowest possible waterline, shall be at least 0,60 m.

Because the boundaries of the spaces referred to in (2.2.4.1)(b) act as secondary barrier,

a) the distance between the craft's side (shell plating) and the boundaries of these spaces shall be at least 0,60 m and
b) the distance between the craft's bottom (shell plating) and the boundaries of these spaces shall be at least 0,50 m.

In accordance with the risk assessment referred to in Article 30.04, the inspection body might require greater values for the distances mentioned above.

2.2.4.3 For non-inerted methanol fuel tanks on open deck, the distance between the vertical planes defined by the craft's sides (shell plating) and the tank shall be at least 0,60 m.

2.2.5 Tank venting systems

2.2.5.1 Tank venting systems for fuel vapours shall be designed and arranged in such a way that releases are safely led overboard and do not lead to an unsafe situation.

Vent lines shall be designed and arranged in such a way that neither fuel nor fuel vapours may accidentally reach the inside of the craft.

2.2.5.2 Design and arrangement of tank venting systems shall prevent flame propagation into the fuel containment system. Each tank shall be protected by a suitable flame arrestor. Where the venting lines cannot withstand the deflagration, pressure flame screens shall be fitted to the overboard outlet.

2.2.5.3 Tank venting systems shall be sized to permit bunkering at nominal loading rate without overpressurizing the fuel tanks.

2.2.5.4 The tank vent outlets shall be arranged in such a way that no water ingress is possible.

2.2.5.5 In the tank vent lines, no shut-off valves shall be installed. For tank segregation purposes during maintenance work, shut-off valves in common vent lines may be accepted if a secondary independent overpressure or underpressure protection is provided for all connected tanks.

2.2.5.6 If a controlled tank venting system is provided for the fuel tanks:

a) Pressure Vacuum (P/V) valves (combined or separate valves) shall be fitted to each fuel tank. The controlled tank venting system may be designed with individual vent outlets from each fuel tank or with vent lines from each individual fuel tank connected to a common header; and

b) The controlled tank venting system shall be designed with redundancy for the relief of full flow overpressure and/or underpressure. As alternative to this redundancy, the inspection body may accept pressure sensors fitted in each fuel tank and connected to an alarm system.

2.2.5.7 The vent lines below deck shall be either:

a) located at least 0,60 m from the craft's side (shell plating); or

b) surrounded by a secondary barrier. The distance between the craft's side (shell plating) and the vertical part of the secondary barrier of the vent line opposite to the craft's side shall be at least 0,60 m.

If vent lines pass through accommodations, only double wall piping is allowed.

2.2.6 Methanol fuel piping systems

2.2.6.1 Methanol piping shall be electrically bonded to the craft's structure.

2.2.6.2 Methanol piping and other accessories shall be laid out and arranged in such a way that neither fuel nor fuel vapours may accidentally reach the inside of the craft.

2.2.6.3 In accordance with 2.2.1.1, below deck, methanol piping shall be surrounded by a secondary barrier for leakage containment and detection.

2.2.6.4 The horizontal distance between the secondary barrier of methanol piping below deck and the craft's side (shell plating) shall be at least 0,60 m.

In accordance with the risk assessment referred to in Article 30.04, the inspection body might require greater values for the distance mentioned above.

2.2.6.5 The design pressure of the secondary barrier around a fuel pipe shall not be less than the maximum working pressure of the fuel pipe. As an alternative the secondary barrier around a fuel pipe shall be dimensioned in accordance with the calculated maximum built-up pressure in the case of a pipe rupture.

2.2.6.6 In accordance with 2.2.1.1, on open deck, a secondary barrier is not required, however:

a) single walled methanol fuel piping shall be located as far away as practicable from the electrical installations, sources of ignition, and tanks containing flammable liquids;

b) the number of connections of fuel pipes shall be kept to a minimum; and

c) where necessary, connections of fuel pipes shall be screened or otherwise suitably protected to avoid fuel spray or leakages onto hot surfaces, into machinery air intakes, or other sources of ignition.

2.2.6.7 All pumps in the fuel system shall be protected against running dry (i.e. protected against operation in the absence of fuel or service fluid).

All pumps which are capable of developing a pressure exceeding the design pressure of the system shall be provided with pressure relief valves. Each pressure relief valve shall be in closed circuit, i.e. arranged to discharge back to the piping upstream of the suction side of the pump.

2.2.6.8 The design pressure for any section of the fuel piping system is the maximum gauge pressure to which the system may be subjected in service, taking into account the highest set pressure on any relief valve on the system.

2.2.6.9 For maintenance, it shall be possible that all sections of the fuel system can be safely

a) isolated, and

b) drained and purged of fuel.

2.2.7 Drainage systems and drip trays

2.2.7.1 Suitable drainage and purging arrangements shall be provided for dealing with any leakage of methanol fuel into the interbarrier spaces.

2.2.7.2 Drainage systems for areas where methanol fuel can be present shall be independent and separate from the drainage system of areas where methanol fuel cannot be present.

2.2.7.3 For the purpose of draining methanol leakages from interbarrier spaces, provisions shall be made such that the leakages can be drained into suitable mobile or fixed collecting tanks or be lead directly overboard below the lowest possible waterline.

2.2.7.4 Leakage on open deck from single walled tanks or fuel containing equipment shall be contained and drained by a dedicated drain discharging below the lowest possible waterline.

2.2.8 Arrangement of entrances and other openings

2.2.8.1 Access to a hazardous space shall not be possible before

a) the fuel components and piping inside are safely shut down, and

b) the inside atmosphere is confirmed gas-free by the means of sensors.

All controls and all parameters required for safe operation of the fuel system and gas freeing of the space shall be remotely operated and monitored from outside the hazardous space.

2.2.8.2 Doors or hatches to hazardous 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.

2.2.8.3 The inspection body may allow derogation to (2.2.8.1), provided that

a) the opening of the space leads directly to open deck;

b) the opening of the space is through an air lock;

c) the space is considered as non-hazardous in accordance with Article 10.04; or

d) the entering of the space does not lead to extending any zone to where a source of ignition is present.

Before allowing a derogation according to d), a classification and evaluation of areas at risk of explosion in accordance with Article 10.04 shall be conducted with accesses opened. Non-hazardous spaces to which a hazardous area could extend while accessing the hazardous space shall be appropriately marked.

2.2.8.4 Air locks shall be mechanically ventilated at an overpressure relative to the adjacent hazardous space. Doors shall be of self-closing type and shall not be fitted with holding back arrangements.

2.2.8.5 Air locks shall be designed in a way that no gas can be released to non-hazardous spaces in case of the most critical events in the hazardous spaces separated by the air lock. The events shall be evaluated in the risk assessment according to Article 30.04.

2.2.8.6 Air locks shall be free of obstacles, shall provide easy passage and shall not be used for other purposes.

2.2.8.7 An optical and acoustic alarm shall be given on both sides of the air lock, if more than one door is moved from the closed position or if gas is detected in the air lock.

2.2.9 Ventilation systems

2.2.9.1 Any ducting used for the ventilation of hazardous spaces shall be separate from that used for the ventilation of non-hazardous spaces.

2.2.9.2 The ventilators used for ventilation of hazardous spaces shall be of a certified safe type.

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

2.2.9.4 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.

2.2.9.5 Ventilation systems required to avoid any explosive atmosphere shall have at least two ventilators with independent power supply, each of sufficient capacity. This requirement does not apply for ventilation of spaces that do not require continuous ventilation.

2.2.9.6 It shall be possible to safely ventilate overboard the spaces where methanol fuel may accumulate to ensure a safe atmosphere when entering the spaces is necessary.

2.2.9.7 Air for ventilation of hazardous spaces shall be taken from non-hazardous areas.

2.2.9.8 Air for ventilation of non-hazardous spaces shall be taken from non-hazardous areas which are located at least 1,50 m from the boundaries of any hazardous area.

2.2.9.9 Where the outlet duct from a hazardous space passes through a non-hazardous space, the duct shall have underpressure relative to this space. Underpressure shall not be required when structural measures on the duct ensure that gases cannot leak into the room.

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

2.2.9.11 Air outlets from hazardous spaces shall be located in an open area which has the same or less hazard than the ventilated space.

2.2.9.12 Air outlets from non-hazardous spaces shall be located outside any hazardous area.

2.2.10 Methanol bunkering system

2.2.10.1 Bunkering stations shall be located on open deck so that sufficient natural ventilation is provided. However, the inspection body may accept enclosed or semi-enclosed bunkering stations subject to special consideration with respect to provisions for mechanical ventilation.

2.2.10.2 Bunkering stations shall be so positioned and arranged that any damage to the methanol piping does not cause damage to the craft’s methanol tank system.

2.2.10.3 Suitable means shall be provided to relieve the pressure and remove liquid contents from bunker piping.

2.2.10.4 Each fuel tank filler neck shall be designed to withstand the mechanical loads during bunkering.

2.2.10.5 The coupling of the bunkering system shall be in accordance with European Standard EN 14420-6 : 2013.

The need for a safety dry break-away coupling shall be considered in the risk assessment in accordance with Article 30.04.

2.2.11 Methanol fuel supply system

2.2.11.1 The methanol fuel supply system to each room or space with consumers shall be equipped with a remotely controlled master fuel valve to shut-off fuel supply lines to consumers. The master fuel valve shall be situated outside the room or space where the consumers are located. For tanks serving only one room or space, the master fuel valve may be combined with the quick closing tank valve.

2.2.11.2 The master fuel valve shall be operable

a) within and outside the engine room,

b) from the inside and outside of the fuel cell space, and

c) from the wheelhouse.

2.2.11.3 The arrangement of the methanol fuel supply system shall ensure safe isolation during maintenance work.

2.2.12 Fire Safety

2.2.12.1 In addition to Article 30.08, the following provisions apply.

2.2.12.2 Spaces, where equipment containing fuel is installed and where a fire hazard cannot be excluded, shall comply with the fire protection requirements for engine rooms. These requirements are deemed fulfilled when:

a) walls, ceilings, doors and hatches of this space is made of steel or another equivalent non-combustible material;

b) insulation material used in this space is protected against the intrusion of fuel and fuel vapours;

c) all openings in walls, ceilings, doors and hatches of this space can be closed from outside the space. The locking devices shall be made from steel or an equivalent non-combustible material; and

d) this space is equipped with a permanently installed firefighting system in accordance with Articles 13.05 or 13.06.

The firefighting system referred to in (d) is not required in small enclosed spaces which do not contain source of ignition.

Continuously operated electric motors, even if certified as safe according to Article 1.01(3.24), shall be considered a source of ignition, unless they are protected against overheating.

2.2.12.3 Suitable fire detectors shall be selected based on the characteristics of the fuel. Smoke detectors should be used only in combination with detectors which can more effectively detect methanol fires.

2.2.12.4 The fire detection system shall have the means to identify each detector individually.

2.2.12.5 At least one portable fire extinguisher in accordance with Article 13.03(2) shall be available on deck no more than 10 m walking distance away from each bunkering stations.

2.2.13 Control, Monitoring and Safety Systems

2.2.13.1 General

2.2.13.1.1 In addition to Article 30.10, the following provisions apply.

2.2.13.1.2 Without prejudice to Article 30.07, upon failure in systems essential for the safety and upon fault conditions which may develop too fast for manual intervention, the methanol fuel safety system shall shut down the fuel supply system automatically.

2.2.13.1.3 The safety functions shall be arranged in a dedicated fuel safety system that is independent of the fuel control system.

2.2.13.1.4 Instrumentation devices shall be fitted to allow a local and a remote reading of essential parameters, where they are necessary to ensure a safe operation of the whole methanol fuel system including the bunker system.

2.2.13.1.5 It shall be possible to manually shut down the methanol fuel supply system from the the wheelhouse or a permanently manned location as applicable.

2.2.13.2 Methanol fuel tank and bunkering system

2.2.13.2.1 Each methanol fuel tank shall be fitted with:

a) at least one closed level gauging device, arranged to ensure a level reading is always obtainable;

b) an independent sensor (high-high level) triggering an optical and acoustic alarm and allowing to automatically stop the bunkering at 95 % full; and

c) an optical and acoustic high-level alarm. This shall be able to be functionally tested from the outside of the tank and can be common with the alarm of the level gauging device according to (a), configured as an alarm on the gauging transmitter, but shall be independent of the high-high level alarm according to (b).

2.2.13.2.2 A ship-shore link shall be fitted for automatic and manual transmission of the bunkering stop order to the bunkering source.

At least the signal of the high-high level sensor shall be transmitted to the bunkering station by means of a watertight connection plug meeting the requirements of International Standard IEC 60309-1 : 2012 for 40 to 50 V DC, housing colour white, earthing contact position ten o'clock.

2.2.13.2.3 Provisions shall be made that the bunkering can be supervised and stopped at any time. Overfill alarm and automatic shutdown shall be indicated.

2.2.13.2.4 If a leakage into the interbarrier space of the bunkering line is detected, an optical and acoustic alarm and automatic shutdown of the bunkering shall be initiated.

2.2.13.2.5 Each shore connection for liquids and vapours shall be provided with at least one local pressure indicator. The permissible maximum pressure or vacuum value shall be indicated on each indicator.

2.2.13.2.6 For inerted tanks, means shall be provided that the tanks cannot be overpressurised by the inert gas system.

2.2.13.3 Gas and leakage warning equipment

2.2.13.3.1 Spaces where methanol fuel vapours may accumulate shall be equipped with permanently installed means of fuel leakage detection.

The number, type and redundancy of detectors in each space shall correspond to the size, layout and ventilation of the space.

The effectiveness of leakage detection shall be demonstrated. For gas detectors, this is deemed fulfilled when a gas dispersal analysis or a physical smoke test is used to find the best arrangement.

2.2.13.3.2 Permanently installed gas detection shall be provided for:

a) enclosed or semi-enclosed rooms,
   aa) where fuel vapours may accumulate, and
   bb) which contain a source of ignition.
b) air locks, and
c) air outlets of ventilated spaces where a fuel leakage could remain undetected in the space.

2.2.13.3.3 Gas warning equipment shall be designed, installed and tested in accordance with a Standard recognized by one of the Member States, such as European Standard EN 60079-29-1 : 2020.

2.2.13.3.4 In the event of a fuel vapour concentration above 20 % of the lower explosion limit (LEL), an optical and acoustic alarm shall be triggered in the wheelhouse or at any other permanently manned location.

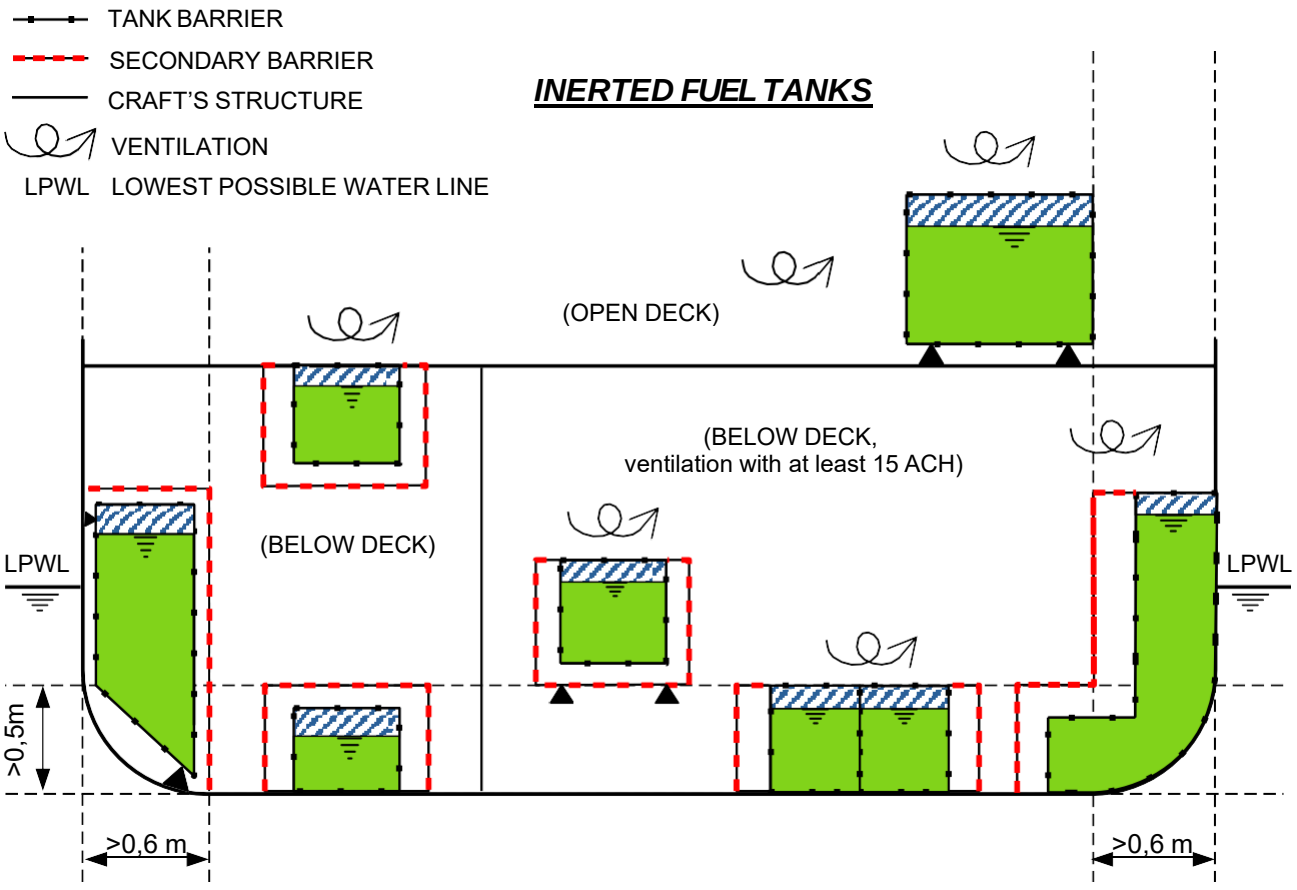
The automatic shutdown required by 2.2.13.1.2 shall be activated at the latest at a fuel vapour concentration of 40 % of the lower explosion limit (LEL).

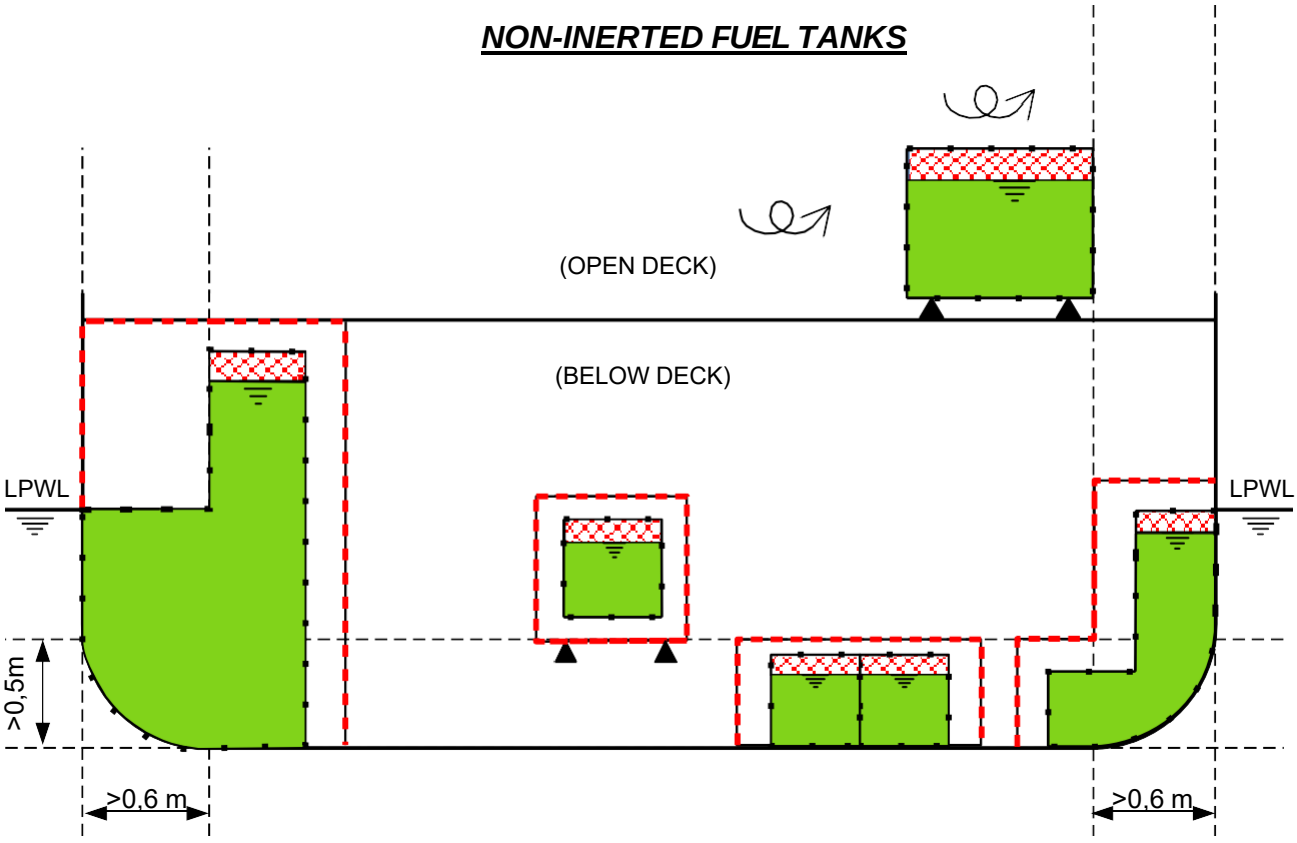
2.2.13.4 Provisions on safety functions of fuel supply systems

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

ARRANGEMENT OF METHANOL FUEL TANKS

Illustration of typical tank arrangements in accordance with ES-TRIN, Annex 8, 2.2.3 and 2.2.4; other configurations are possible.





ARRANGEMENT OF PIPES CONTAINING LIQUID METHANOL OR METHANOL VAPOURS

Illustration of typical pipe arrangements in accordance with ES-TRIN, Annex 8, 2.2.5 and 2.2.6; other configurations are possible.

SECONDARY BARRIER

CRAFT'S STRUCTURE

(*) SEPARATE STRUCTURAL SPACE

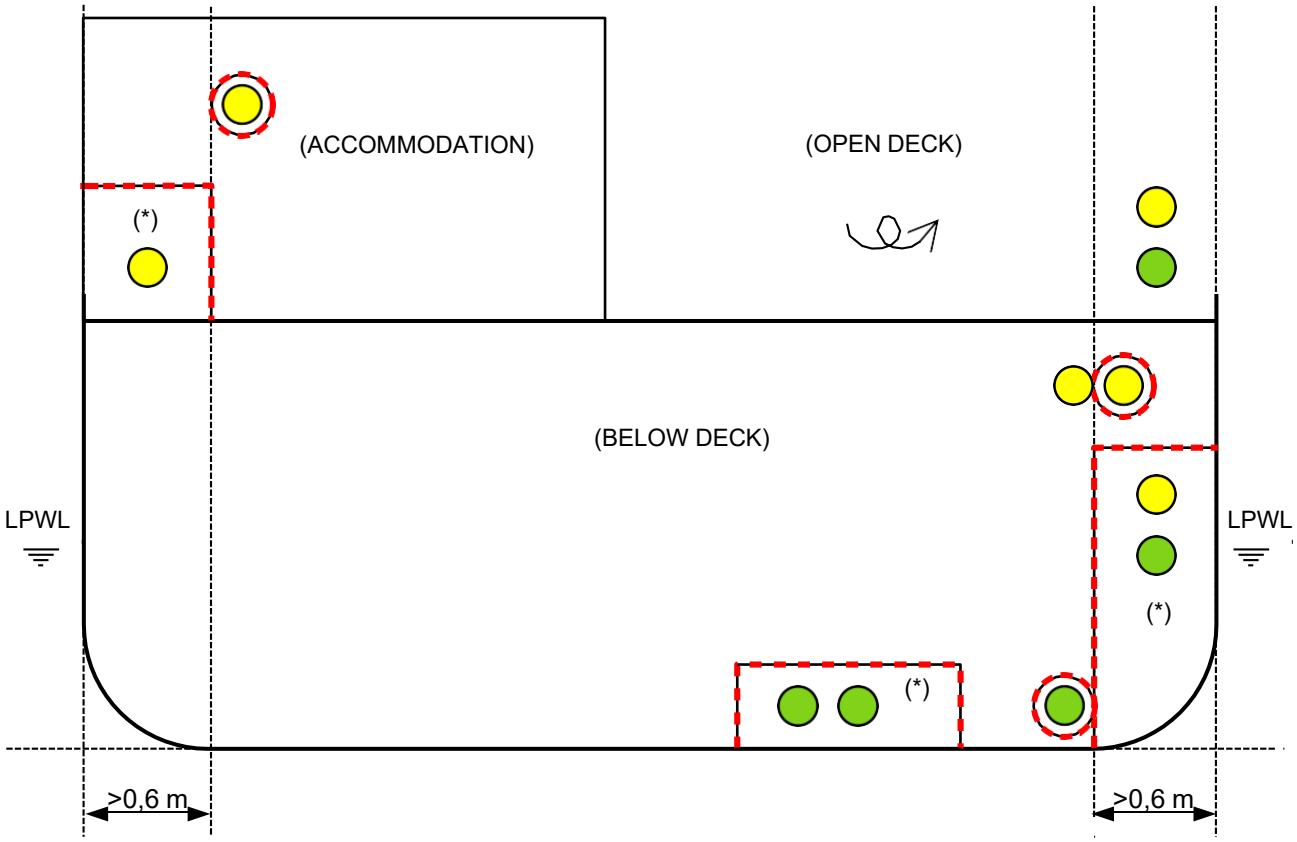
LPWL LOWEST POSSIBLE WATER LINE

VENTILATION

LIQUID PIPE (single walled)

VAPOUR PIPE (single walled)

PIPE (double walled)



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