RUSSIAN MARITIME REGISTER OF SHIPPING

CIRCULAR LETTER	**No. 312-09-1760c**	dated 18.05.2022

Re:

amendments to the Rules for the Classification and Construction of Sea-Going Ships, 2022, ND No. 2-020101-152-E

Item(s) of supervision:

ships under construction and technical documentation

Entry-into-force date:
01.07.2022

~~Cancels/amends/adds Circular Letter No.~~ ~~dated~~

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Appendices:

Appendix 1: information on amendments introduced by the Circular Letter

Appendix 2: text of amendments to Part I "Classification" and Part XVII "Distinguishing Marks and Descriptive Notations in the Class Notation Specifying Structural and Operational Particulars of Ships"

Director General Konstantin G. Palnikov

Text of CL:

We hereby inform that the Rules for the Classification and Construction of Sea-Going Ships shall be amended as specified in the Appendices to the Circular Letter.

It is necessary to do the following:

1. Bring the content of the Circular Letter to the notice of the RS surveyors, interested organizations and persons in the area of the RS Branch Offices' activity.
2. Apply the provisions of the Circular Letter during review and approval of the technical documentation on ships (or equipment installed on board the ships, or products/machinery installed on board the ships) contracted for construction or conversion on or after 01.07.2022, in the absence of a contract, during review and approval of the technical documentation on ships requested for review on or after 01.07.2022.

List of amended and/or added paras/chapters/sections:

Part I: para 2.2.50 and Table 2.5

Part XVII: Section 23

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Appendix 1 to Circular Letter
No. 312-09-1760c dated 18.05.2022

Information on amendments introduced by the Circular Letter
(for inclusion in the Revision History to the RS Publication)

Nos.	Amended paras/chapters/ sections	Information on amendments	No. and date of the Circular Letter introducing the amendments	Entry-into-force date
1	Part I, para 2.2.50	New para has been introduced containing requirements for assignment of distinguishing marks **LFLFS (Me)** and **LFLFS (Et)** to ships equipped to use methanol and ethanol as fuel	312-09-1760c of 18.05.2022	01.07.2022
2	Part I, Table 2.5	New item 2.34 has been introduced containing requirements for assignment of distinguishing marks **LFLFS (Me)** and **LFLFS (Et)** to ships equipped to use methanol and ethanol as fuel	312-09-1760c of 18.05.2022	01.07.2022
3	Part XVII, Section 23	New Section has been introduced containing requirements for ships equipped to use methanol and ethanol as fuel	312-09-1760c of 18.05.2022	01.07.2022

Appendix 2 to Circular Letter
No. 312-09-1760c dated 18.05.2022

RULES FOR THE CLASSIFICATION AND CONSTRUCTION OF SEA-GOING SHIPS, 2022,

ND No. 2-020101-152-E

PART I. CLASSIFICATION

2 CLASS OF A SHIP

1 **New para 2.2.50** is introduced reading as follows:

"**2.2.50 Distinguishing mark for a ship equipped to use methanol and ethanol as fuel.**

Ships equipped to use methanol and ethanol as fuel in compliance with the requirements of Section 23 of Part XVII "Distinguishing Marks and Descriptive Notations in the Class Notation Specifying Structural and Operational Particulars of Ships", the distinguishing mark **LFLFS (Me)** or **LFLFS (Et)** (Low Flashpoint Liquid Fuelled Ship (Methanol) or (Ethanol)) may be added to the character of classification.".

2 **Table 2.5. New item 2.34** is introduced reading as follows:

"

2.34 Distinguishing mark for a ship equipped to use methanol and ethanol as fuel		
LFLFS (Me) (Low Flashpoint Liquid Fuelled Ship (Methanol)) **LFLFS (Et)** (Low Flashpoint Liquid Fuelled Ship (Ethanol))	The mark is assigned if a ship is equipped to use methanol and ethanol as fuel	**Rules for the Classification and Construction of Sea-Going Ships** Part I "Classification", 2.2.50 Part XVII "Distinguishing Marks and Descriptive Notations in the Class Notation Specifying Structural and Operational Particulars of Ships", Section 23

".

PART XVII. DISTINGUISHING MARKS AND DESCRIPTIVE NOTATIONS IN THE CLASS NOTATION SPECIFYING STRUCTURAL AND OPERATIONAL PARTICULARS OF SHIPS

3 **New Section 23** is introduced reading as follows:

"23 REQUIREMENTS FOR SHIPS EQUIPPED TO USE METHANOL/ETHANOL AS FUEL

23.1 GENERAL

23.1.1 Application.

The requirements of this Section apply to ships equipped to use methanol and ethanol as fuel. In addition to the requirements of this Section, the ship shall comply with requirements of the International Code of Safety for Ships Using Gases or Other Low-Flashpoint Fuels (IGF Code).

Where the ship is a chemical tanker and uses cargo as fuel, the requirements of this Section related to arrangement of fuel tanks on board the ship do not apply to cargo tanks which shall be located in compliance with the requirements of the International Code for the

Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) and the Rules for the Classification and Construction of Chemical Tankers.

For ships equipped to use methanol and ethanol as fuel in compliance with the requirements of this Section, the distinguishing mark **LFLFS (Me)** or **LFLFS (Et)** (Low Flashpoint Liquid Fuelled Ship, (Methanol) or (Ethanol)) is added to the character of classification.

23.1.2 Definitions.

In addition to the below mentioned, the definitions specified in 1.2 of Part VI "Fire Protection", 9.1.3 of this Part and in the IGF Code are applicable to the requirements of this Section.

Independent tanks are self-supporting tanks, do not form part of the ship's hull and are not essential to the hull strength.

Integral tanks are fuel-containment envelope tanks which form part of the ship's hull and which may be stressed in the same manner and by the same loads which stress the contiguous hull structure.

Single fuel engine means, for the purpose of this Section, a heat engine capable of operating only on methyl/ethyl alcohol, and not able to switch over to operation on any other type of fuel.

Dual fuel engine means, for the purpose of this Section, a heat engine designed to operate on methanol/ethanol and conventional fuel, either simultaneously or separately.

Conventional fuel means liquid petroleum-derived fuel which complies with the requirements specified in 1.1.2 of Part VII "Machinery Installations".

Pilot oil fuel means conventional fuel fed to the dual fuel engine cylinder for self-ignition as per conventional diesel cycle ensuring an ignition source for methanol/ethanol.

Tank connection space means a space surrounding all tank valves and connections required for methanol/ethanol tank with such connections in enclosed spaces.

Fuel storage hold space means the space where an independent methanol/ethanol tank is located. If tank connections are located in the fuel storage hold space, such fuel storage hold space shall also be considered as tank connection space.

Portable tank means an independent tank being able to be easily removed from ship and installed on board ship and easily connected and disconnected from ship systems.

23.1.3 Technical documentation.

In addition to the technical documentation specified in Section 3 of Part I "Classification", the technical documents and ship data specified in this Section shall be submitted. In case of review based on plan approval documentation and in case of conversion of ships, the technical documentation shall be submitted in full scope specified in 23.1.3.1 — 23.1.3.16.

In case of two-stage review, at the technical design stage the technical documentation shall be submitted as per 23.1.3.1 — 23.1.3.2, 23.1.3.8 — 23.1.3.9, 23.1.3.13 — 23.1.3.16. The technical documentation as per 23.1.3.4 — 23.1.3.5, 23.1.3.10 — 23.1.3.12 shall be submitted at the detailed design stage. As regards 23.1.3.3, 23.1.3.6 and 23.1.3.3.7, the diagrams shall be submitted during the technical design review, and the drawings shall be submitted at the stage of detailed design review.

The letter identification (A — Approved, AG — Agreed) in 23.1.3.1 — 23.1.3.16 means the documentation review results which are documented by stamping in compliance with 8.2 of Part II "Technical Documentation" of the Rules for Technical Supervision during Construction of Ships and Manufacture of Materials and Products for Ships.

.1 drawing of fuel tanks arrangement with indication of distance from bottom and side plating to methanol/ethanol fuel tanks (A);

.2 drawing of supports and other structures to ensure fastening and limiting shifting of methanol/ethanol fuel tanks (A);

.3 drawings and diagrams of systems and piping for methanol/ethanol specifying such assemblies as compensators, flange joints, stop and control valves and fittings, drawings of quick-closing arrangements of the fuel system, diagrams of fuel preparation systems (A);

.4 drawings of safety and vacuum valves of fuel tanks, where available (A);

.5 installation drawings of arrangements for measurement of fuel amount and characteristics, and for leakage detection (A);

.6 diagrams and calculations of gas-dangerous spaces ventilation (A);

.7 diagrams and calculations of gas-freeing system and inert gas system, drawings and calculations of bilge and ballast systems in cargo area, pump rooms, cofferdams, pipe tunnels and hold spaces (A);

.8 electrical diagrams for connection of drives and control systems for fuel preparation plants, ventilation of hazardous spaces and airlocks (A);

.9 electrical circuit diagrams for measurement and alarm systems for equipment related to the use of methanol/ethanol (A);

.10 arrangement drawings of electrical equipment related to the use of methanol/ethanol (A);

.11 drawings of cable laying in hazardous and gas-dangerous spaces and areas (A);

.12 drawings of earthing for electrical equipment, cables, piping located in gas-dangerous spaces (A);

.13 arrangement of hazardous areas diagram specifying the layout of methanol/ethanol storage tanks and any openings in them; spaces for fuel storage and preparation and any openings to them; doors, hatches and any other openings into hazardous spaces and areas; venting pipes and air inlet and outlet locations of a ventilation system of hazardous spaces and areas; doors, scuttles, companions, ventilation duct outlets locations and other openings in spaces adjacent to hazardous area (A);

.14 analysis of risks related to the use and storage of methanol/ethanol and possible consequences of its leakages. The analysis shall consider the risks of damage of hull structural members and failure of any equipment after accident related to the use of methanol/ethanol. The results of risk analysis shall be taken into account in the ship's operational documentation (AG);

.15 diagram of fire-protection water spray system, including piping, valves, nozzles and fittings, as well as diagram of dry powder fire extinguishing system and foam fire extinguishing system, their operating manuals and capacity calculation (A);

.16 description and plan of monitoring, control and alarm systems (A).

23.2 GENERAL REQUIREMENTS FOR SHIP STRUCTURE

23.2.1 Onboard location of fuel storage tanks.

23.2.1.1 Tanks containing methanol/ethanol shall not be located within accommodation spaces and machinery spaces of category A or be adjacent to them.

23.2.1.2 Fuel tanks containing methanol/ethanol shall be located abaft the collision bulkhead and forward of the afterpeak bulkhead and at the distance of at least 800 mm from the side shell. Storage of fuel in integral tanks bound by shell plating below the waterline is accepted.

23.2.1.3 Fuel tanks containing methyl/ethyl alcohol which are located on open decks shall be protected against mechanical damage.

23.2.1.4 Fuel tanks containing methyl/ethyl alcohol which are located on open decks shall be surrounded by coamings and spills shall be collected in a dedicated holding tank.

23.2.2 Drip trays.

23.2.2.1 Drip trays shall be fitted where leakage and spill may occur, in particular, in way of single wall pipe connections.

23.2.2.2 Each drip tray shall have sufficient capacity to ensure that the maximum amount of spill can be handled.

23.2.2.3 Each drip tray shall be provided with means to safely drain methanol/ethanol spills or transfer spills to a dedicated holding tank. Means for preventing backflow from the tank shall be provided.

23.2.2.4 Drip trays for leakage of less than 10 litres may be provided with means for manual emptying, other trays shall be self-drained by means of scupper pipes.

23.2.2.5 The holding tank shall be equipped with a level indicator and high level alarm. The tank shall be inerted at all times during normal operation.

23.2.3 Machinery spaces.

23.2.3.1 A single failure within the fuel system shall not lead to release of methanol/ethanol into the machinery space.

23.2.3.2 Methanol/ethanol piping within machinery space boundaries shall be enclosed in gas and liquid tight outer pipes or ducts in accordance with 23.5.4.3.

23.2.4 Requirements for bilge systems.

23.2.4.1 Bilge systems installed in areas where methyl/ethyl alcohol may be present shall be segregated from the bilge systems of spaces where methyl alcohol or ethyl alcohol cannot be present.

23.2.4.2 One or more holding tanks for collecting drainage and any possible leakage of methyl/ethyl alcohol from fuel pumps, valves or from double walled inner pipes located in enclosed spaces shall be provided. Means shall be provided for safely transferring contaminated liquids to onshore reception facilities.

23.2.5 Requirements for arrangement of entrances and other openings in enclosed spaces.

23.2.5.1 Direct access shall not be permitted from a non-hazardous area to a hazardous area. Where such openings are necessary for operational reasons, an airlock complying with the requirements of 23.2.6 shall be provided.

23.2.5.2 Fuel preparation spaces shall have independent access direct from open deck. Where a separate access from open deck is not practicable, an airlock complying with the requirements of 23.2.6 shall be provided.

23.2.5.3 Tanks for storage of methanol/ethanol and surrounding cofferdams shall normally have suitable access from the open deck, where practicable, for gas freeing, cleaning, maintenance and inspection. Where it is not possible to provide a separate access from the open deck for fuel tanks or cofferdams, an access from a space not connected with accommodations and service spaces, control stations or machinery spaces of category A in any way shall be provided and shall meet the following:

.1 be fitted with an independent extraction ventilation system, providing a minimum of 6 air changes per hour, a low oxygen alarm and a vapour detection alarm;

.2 have sufficient open area around the fuel tank hatch for efficient rescue operations and evacuation of injured persons.

23.2.5.4 The area around independent fuel tanks shall be sufficient to carry out maintenance, inspections, evacuation of injured persons and rescue operations.

23.2.6 Requirements for airlocks.

23.2.6.1 The airlocks shall comply with the requirements of 9.2.7.

23.2.7 Requirements for location and protection of fuel piping.

23.2.7.1 Fuel pipes shall not be located less than 800 mm from the ship's side.

23.2.7.2 Fuel piping shall not be led directly through accommodation spaces, service spaces, and control stations.

23.2.7.3 Fuel pipes led through ro-ro spaces, special category spaces and on open decks shall be protected against mechanical damage.

23.2.8 Methanol fuel piping shall comply with the following:

.1 methanol fuel piping that passes through enclosed spaces in the ship shall be enclosed in an outer pipe or duct that is gas and liquid tight towards the surrounding spaces with the fuel contained in the inner pipe. Such double walled piping is not required in cofferdams surrounding fuel tanks, fuel preparation spaces or spaces containing independent fuel tanks, however, electrical equipment located in such enclosed spaces shall be explosion-proof;

.2 pipes shall be self-draining to suitable fuel or collecting tanks in normal conditions of operation.

23.3 DESIGN OF TANKS FOR METHYL/ETHYL FUEL

23.3.1 Requirements for integral fuel storage tanks.

23.3.1.1 On ships other than tankers for the carriage of methanol/ethanol, fuel storage tanks shall be surrounded by protective cofferdams, except of those tanks with walls bound by other fuel tanks containing methanol/ethanol, pump room, fuel preparation space and shell plating below the waterline. On tankers carrying methanol/ethanol, methanol/ethanol tanks may be adjacent to the cargo tanks.

23.3.2 Requirements for independent tanks.

23.3.2.1 Independent tanks may be accepted on open decks or in a fuel storage space.

23.3.2.2 Independent tanks shall be fitted with:

.1 mechanical protection of the tanks depending on location and damage hazard during cargo operations;

.2 if located on an open deck, drip tray arrangements for leak containment and water spray systems for emergency cooling.

23.3.2.3 Independent fuel tanks shall be secured to the ship's structure. The arrangement for supporting and fixing the tanks shall be designed for the maximum expected static, dynamic and accidental loads as well as the maximum expected values of acceleration, taking into account the ship characteristics and the position of the tanks.

23.3.3 Requirements for portable tanks.

23.3.3.1 Portable methanol and ethanol tanks shall comply with the requirements of 9.3.4.

23.3.3.2 When a portable tank is connected to the ship's fuel piping system, the following shall be met:

.1 each portable tank shall be capable of being remotely isolated from fuel system at any time from a readily accessible position;

.2 isolation of one tank shall not impair the operability of the remaining portable tanks.

23.3.4 Venting and gas freeing systems for methanol/ethanol fuel tanks.

23.3.4.1 The methanol/ethanol fuel tanks shall be fitted with a controlled fixed tank venting system to enable safe gas freeing and fuel filling. The formation of gas pockets during the filling and gas freeing operations shall be avoided by considering the arrangement of tank structure and location of gas freeing inlets and outlets.

23.3.4.2 Pressure and vacuum relief valves shall be fitted to each fuel tank to limit the pressure or vacuum in the tank. The tank venting system may consist of individual vents from each fuel tank or the vents from each individual fuel tank may be connected to a common header. Design and arrangement shall prevent flame propagation into the fuel containment system. If pressure relief valves of the high velocity type are fitted to the end of the vent pipes, they shall comply with the requirements of IMO circular MSC/Circ.677, as amended. If pressure relief valves are fitted in the vent line, the vent outlet shall be fitted with a flame arrestor complying with the requirements of IMO circular MSC/Circ.677, as amended.

23.3.4.3 Shut-off valves shall not be arranged either upstream or downstream of the pressure relief valves. Bypass valves may be provided. For temporary tank segregation purposes (maintenance) shut-off valves in common vent lines may be accepted if a secondary independent over/underpressure protection is provided to all tanks as per 23.3.4.4.

23.3.4.4 The controlled venting system shall consist of the main (primary) and auxiliary (secondary) means allowing relief of fuel vapour to prevent overpressure or vacuum. Pressure sensors fitted in each fuel tank, and connected to an alarm system, may be accepted in lieu of the secondary redundancy requirement for pressure relief. The opening pressure of the pressure relief valves shall not be lower than 0,007 MPa below atmospheric pressure.

23.3.4.5 Pressure relief valves shall be of a type which allows the functioning of the valve to be easily checked. Piping of pressure relief valves shall vent to a safe location on open deck.

23.3.4.6 The fuel tank vent system shall be sized to permit bunkering at a design loading rate without over-pressurizing the fuel tank.

23.3.4.7 The fuel tank vent system shall be connected to the highest point of each tank and vent lines shall be self-draining under all normal operating conditions.

23.3.4.8 Fuel tank vent outlets shall be situated:

.1 not less than 3 m above the open deck or gangway if located within 4 m from such gangways;

.2 at a horizontal distance of at least 10 m from the nearest air intake or opening to accommodation, service and machinery spaces and ignition sources. The vapour discharge shall be directed upwards in the form of unimpeded jets.

23.3.4.9 Outlets from fuel tank vent pipes shall be provided with flame arrestors of a type approved by the Register. Due attention shall be paid in the design and position of the pressure relief valves of vent pipes to preclude blocking due to icing. Provision for inspection and cleaning shall be arranged.

23.4 FUEL CONSUMERS ON BOARD SHIP

23.4.1 General requirements for internal combustion engines.

23.4.1.1 Engine components containing methyl/ethyl alcohol fuel shall be effectively sealed. A single failure in the fuel supply system shall not lead to a leakage of fuel into the non-hazardous area of the machinery space.

23.4.1.2 Means shall be provided to monitor and detect poor combustion or misfiring. In the event that it is detected, continued operation may be allowed, provided that the fuel supply to the concerned cylinder is shut off and provided that the operation of the engine with one cylinder cut-off is acceptable with respect to torsional vibrations.

23.4.1.3 For engines where the space below the piston is in direct communication with the crankcase, a detailed evaluation regarding the hazard potential of methanol/ethanol accumulation in the crankcase shall be carried out and operational documents shall indicate the procedure for such a situation.

23.4.2 Dual fuel engines.

23.4.2.1 In case of shutoff of the methyl/ethyl alcohol supply, the engines shall be capable of continuous operation by conventional fuel only, without interruption.

23.4.2.2 An automatic system shall be fitted to change over from methyl/ethyl alcohol fuel operation to conventional fuel operation and vice versa with minimum deviations of the engine power from the mean value. Acceptable reliability shall be demonstrated through testing. In case of unstable operation on engines when methyl/ethyl alcohol firing, the engine shall automatically change to conventional fuel mode. There shall always be the possibility for manual changeover.

23.4.2.3 In case of a normal stop or an emergency stop, the methanol/ethanol supply shall be shut off not later than the pilot oil fuel. It shall not be possible to shut off the pilot oil fuel without first or simultaneously closing the methanol supply to each cylinder or to the complete engine.

23.4.3 Single-fuel engines for operation on methanol only.

23.4.3.1 In case of a normal stop or an emergency shutdown, the fuel supply shall be shut off not later than the ignition source. It shall not be possible to shut off the ignition source without first or simultaneously closing the fuel supply to each cylinder or to the complete engine.

23.4.3.2 Power installations with one engine operating only on methanol may be accepted, when the risk assessment results are submitted which demonstrate the equivalent level of reliability as compared with the conventional oil fuel engine.

23.5 FUEL SYSTEM

23.5.1 General requirements for fuel piping.

23.5.1.1 The walls thickness of pipes in the cargo piping system shall be in accordance with the requirements in 2.3 of Part VIII "Systems and Piping".

23.5.1.2 All fuel piping and independent fuel tanks shall be electrically continuous and earthed to the ship's hull. Electrical earthing shall be maintained across all gasketed pipe joints and hose connections. Electrical resistance between any piping section and the hull shall be maximum 1 MOhm.

23.5.1.3 Filling lines to fuel tanks shall be arranged to minimize the possibility for static electricity by reducing the free fall into the fuel tank to a minimum during tank filling.

23.5.1.4 The arrangement and installation of fuel piping shall provide the necessary flexibility to maintain the integrity of the piping system in the actual service situations, taking potential for fatigue into account. Expansion bellows shall not be used.

23.5.1.5 Due consideration shall be taken with respect to the corrosive nature of fuel when selecting materials.

23.5.2 Piping fabrication and joining details.

23.5.2.1 In addition to the requirements of this Section, during fabrication of fuel system pipelines and selection of connections, requirements specified in 1.3 of Part VI "Systems and

Piping" of the Rules for the Classification and Construction of Chemical Tankers shall be complied with.

The inner piping, where an outer pipe or a duct is required, shall be butt-welded. Welded joints shall be 100 % radiographed. Flange connections in this piping may only be permitted within the tank connection space and fuel preparation spaces.

23.5.2.2 The annular space in the double walled fuel piping shall be segregated at the engine-room bulkhead; this implies that there shall be no common ducting between the engine-room and other spaces.

23.5.2.3 Heat expansion of pipes shall normally be allowed for by the provision of expansion loops or bends in the piping systems.

23.5.3 Methanol/ethanol bunkering station.

23.5.3.1 The bunkering station shall be located on open deck so that sufficient natural ventilation is provided. Closed or semi-enclosed bunkering stations shall be subject to special consideration within the risk assessment.

23.5.3.2 Closed or semi-enclosed bunkering stations shall be surrounded by gas- and liquid-tight boundaries against adjacent enclosed spaces.

23.5.3.3 Bunkering lines shall not be led directly through accommodation, control stations or service spaces. Bunkering lines passing through non-hazardous areas shall be double walled or located in ventilated gastight ducts.

23.5.3.4 Arrangements shall be made for safe management of fuel spills. Coamings and/or drip trays shall be provided below the bunkering connections together with a means of safely collecting and storing spills of methanol. This could be a drain to a dedicated holding tank equipped with a level indicator and alarm. Where coamings or drip trays are subject to rainwater, provision shall be made to drain rainwater overboard.

23.5.3.5 Showers and eye wash stations for emergency usage shall be located in close proximity to areas where the possibility for accidental contact with fuel exists. The emergency showers and eye wash stations shall be operable under all ambient conditions.

23.5.3.6 Bunkering hoses carried permanently on board the ship shall comply with the requirements specified in 1.8 of Part VI "Systems and Piping" of the Rules for the Classification and Construction of Chemical Tankers.

23.5.3.7 Means shall be provided for draining any fuel from the bunkering hoses upon completion of operation. Means shall be provided for safe storage of hoses carried on board the ship. Hoses shall be stored on the open deck or in a storage room with an independent extraction ventilation system, providing a minimum of six air changes per hour.

23.5.3.8 The bunkering manifold shall be designed to withstand the external loads during bunkering. The connections at the bunkering station shall be of dry-disconnect type equipped with additional safety dry break-away coupling/self-sealing quick release.

23.5.3.9 Means shall be provided for draining any fuel from the bunkering pipes upon completion of operation.

23.5.3.10 Bunkering lines shall be arranged for inerting and gas freeing. When not engaged in bunkering, the bunkering lines shall be free of gas, unless the decision of not gas freeing is approved and the consequences are evaluated by a person in charge.

23.5.3.11 A ship-shore link (SSL) or an equivalent means for automatic and manual ESD communication to the bunkering source shall be fitted.

23.5.3.12 In the bunkering line, as close to the connection point as possible, there shall be a manually operated stop valve and a remotely operated shutdown valve arranged in series. Alternatively, a combined manually operated and remote valve may be provided. It shall be possible to operate this remotely operated valve from the bunkering control station and/or from another safe location.

23.5.3.13 The bunkering control station shall not be used for any other purpose. Where bunkering lines are arranged with a cross-over, suitable isolation arrangements shall be provided to ensure that fuel cannot be transferred inadvertently to the ship side not in use for bunkering.

23.5.3.14 Risk assessment of bunkering shall be carried out, and the results thereof shall be stated in a document "Risk assessment related to use and storage of methanol/ethanol and potential consequences of leakage". Such assessment shall be aimed at the review of bunkering equipment and operating procedures thereof in order to:

.1 identify causes and effects for safety of potential fuel emissions at connection, preparation and disconnection of bunkering equipment, as well as during the fuel transfer;

.2 establish safety precautions to ensure safe bunkering to minimize the causes and effects of failures.

The study shall be performed in accordance with a recognized standard (e.g. ISO 31010 "Risk management. Risk assessment techniques") which is based on risk assessment, considering the applicable appendices thereto.

23.5.3.15 Bunkering shall be controlled from a safe location, where, as a minimum, the information showing instrument readings, such as fuel level in the tanks and methanol pressure in supply piping, as well as overfill alarms and automatic shutdown of methanol/ethanol supply shall be indicated at this location.

23.5.3.16 If the pressure in the annular spaces of the double walled bunkering lines or air pressure in the ventilated air ducts is decreased, the alarm system shall activate audible and visual alarm at the bunkering control stations.

23.5.3.17 The ship shall be fitted with an emergency shutdown of bunkering (ESD) capable of operating both from the ship and control station of the facility.

Quick and safe shutdown of both bunkering supply and ship methanol/ethanol supply system shall be provided without liquid spill or vapour emission.

23.5.3.18 Fuel tanks shall be filled up to maximum 98 % of the total capacity.

23.5.4 Methanol/ethanol supply to consumers.

23.5.4.1 The methanol/ethanol fuel piping system shall be separate from all other piping systems of the ship.

For chemical tankers carrying methanol/ethanol and using cargo as fuel, the fuel system shall be separate from cargo piping system.

For single fuel installations the fuel supply system shall be arranged with full redundancy all the way from the fuel tanks to the fuel consumers.

23.5.4.2 The piping and their joints shall be so arranged that any damage of fuel piping cannot lead to an uncontrolled release of fuel. The number of fuel piping joints shall be kept to a minimum necessary for mounting of valves and equipment of the fuel system.

23.5.4.3 All methanol/ethanol supply piping in the enclosed spaces including the machinery spaces shall be enclosed within gas and liquid tight outer pipes or ducts complying with one of the following requirements:

.1 the annular space between inner and outer pipe shall have mechanical ventilation of underpressure type with a capacity of minimum 30 air changes per hour and be ventilated to open air. Appropriate means for detecting leakage of methanol/ethanol into the annular space shall be provided. The double wall enclosure shall be connected to a suitable draining tank allowing the collection and the detection of any possible leakage;

.2 the annular space shall be inerted. Appropriate means of detecting leakage of methanol/ethanol into the annular space shall be provided. Suitable alarms shall be provided to indicate a loss of inert gas pressure between the pipes.

23.5.4.4 The outer pipe in the double walled fuel pipes shall be dimensioned for a design pressure not less than the maximum working pressure of the fuel pipes. As an alternative the calculated maximum built-up pressure in the duct in the case of an inner pipe rupture may be used for dimensioning of the duct.

23.5.4.5 Fuel piping to every consumer shall be provided with the means of purging the piping after the master fuel valve. Purging shall be conducted automatically in the methanol supply system at closing of the master fuel valve.

23.5.4.6 For installations with a single engine for transfer of power to the propeller, the arrangements shall be such that in case of fuel supply stop a standby fuel supply system is provided. Dual fuel engines shall be capable of continuous operation on conventional fuel without using methanol/ethanol.

23.5.5 Safety of fuel supply systems.

23.5.5.1 All fuel piping shall be arranged for gas freeing and inerting.

23.5.5.2 Fuel storage tank inlets and outlets shall be provided with valves located as close to the tank as possible. Valves required to be operated during normal operation and bunkering which are not readily accessible shall be remotely operated.

23.5.5.3 The main fuel supply line to each consumer or set of consumers shall be equipped with a manually operated shut-off valve and an automatically operated master fuel valve for methanol/ethanol supply. The valves shall be situated in the part of the piping that is outside the machinery space containing methanol/ethanol consumers. The master methanol/ethanol supply

valve shall automatically shut off the fuel supply when the safety system as required in Table 23.9.1.1.2 is activated.

23.5.5.4 Means of manual emergency shutdown of fuel supply to the consumers or set of consumers shall be provided on the primary and secondary escape routes from the compartment where methanol/ethanol consumers are located, at a location outside consumer space, outside the fuel preparation space and at the bridge. The activation device shall be arranged as a physical button, duly marked and protected against inadvertent operation and operable under emergency lighting.

The fuel supply line to each consumer shall be provided with a remotely operated shut-off valve.

23.5.5.5 There shall be one manually operated shut-off valve in the fuel line to each consumer to ensure safe isolation during maintenance.

23.5.5.6 When pipes penetrate the fuel tank below the top of the tank a remotely operated shut-off valve shall be fitted to the fuel tank bulkhead. When the fuel tank is adjacent to a fuel preparation space, the valve may be fitted on the tank bulkhead on the fuel preparation space side.

23.5.6 Requirements for fuel preparation spaces and pumps.

23.5.6.1 All equipment containing fuel intended for its preparation and supply to consumers shall be located in a particular space which shall comply with the following requirements:

.1 fuel preparation spaces shall be located outside ship's machinery spaces of category A or other spaces of high fire hazard;

.2 fuel preparation space shall be gas and liquid tight to surrounding enclosed spaces.

23.5.6.2 Hydraulically powered pumps that are submerged in fuel tanks shall be arranged with double barriers preventing the hydraulic system serving the pumps from being directly exposed to fuel. The double barrier shall be arranged for detection and drainage of eventual fuel leakage.

23.5.6.3 All pumps in the fuel system shall be protected against running dry.

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

23.6 REQUIREMENTS FOR FIRE PROTECTION

23.6.1 General.

23.6.1.1 Fire protection shall comply with the requirements of this Section in addition to Part VI "Fire Protection" depending on the purpose of the ship.

23.6.2 Structural fire protection.

23.6.2.1 Any boundary of accommodation spaces, service spaces, control stations, escape routes, machinery spaces facing methyl/ethyl fuel storage tanks on the open deck, shall have A-60 fire integrity and shall be extended to the lower boundary of the wheelhouse deck. Methyl/ethyl fuel storage tanks shall be isolated from the cargo and be located in accordance with the requirements of the International Maritime Dangerous Goods Code (IMDG Code) for the class 3 package.

23.6.2.2 For the purposes of fire protection, fuel preparation spaces shall be regarded as machinery space of category A. Should the space have boundaries towards other machinery spaces of category A, accommodation, control station or cargo areas, these boundaries shall not be less than A-60.

23.6.2.3 The boundaries of spaces for storage of methyl/ethyl alcohol tanks shall be separated from the machinery spaces of category A and other rooms with high fire risks by a cofferdam of at least 600 mm, with insulation of not less than A-60 class. They may be separated from other spaces with low fire risks by A-0 fire structures.

23.6.2.4 Methyl/ethyl fuel pipes led through open ro-ro spaces on open deck shall be provided with special guards to prevent vehicle collision damage. Fire insulation of such pipelines shall be considered by the Register in each particular case.

23.6.2.5 Where more than one machinery space is arranged on board the ship, they shall be separated by class A-60 divisions.

23.6.2.6 Any space containing equipment for the fuel preparation shall be regarded as a machinery space of category A and provided with a fixed fire extinguishing system complying with the requirements set out in 3.1.2 of Part VI "Fire Protection" taking into account necessary concentrations/application rate of fire extinguishing substance required for extinguishing gas fires.

23.6.2.7 The bunkering station shall be separated by A-60 class divisions towards machinery spaces of category A, accommodation, control stations and high fire risk spaces, except for spaces such as tanks, voids, auxiliary machinery spaces of little or no fire risk, sanitary and similar spaces where the insulation standard may be reduced to class A-0.

23.6.2.8 Fuel hold space shall not be used for arrangement and storage of other equipment.

23.6.2.9 The bunkering space shall be separated from the machinery spaces of category A, accommodation, control stations and high fire risk spaces by A-60 class divisions. Fire resistance of structures separating this space from tanks, voids, auxiliary machinery spaces of little or no fire risk, sanitary and similar spaces may be reduced to class A-0.

23.6.3 Water fire main system.

23.6.3.1 The water fire main system shall comply with the requirements set out in 3.2 of Part VI "Fire Protection" with due regard to the purpose of the ship.

23.6.3.2 Where fire main pumps are used for the water spray system, the required pump capacity shall be determined for the case of both the water fire main system and the water spray system being in operation.

23.6.3.3 Where methyl/ethyl alcohol storage tanks are located on open deck, the fire water mains shall be provided with a shut-off valve to isolate the damaged pipe section with the system remaining operable all the time.

23.6.4 Water spray system.

23.6.4.1 A water spray system shall be installed for cooling and fire prevention to cover exposed parts of FSTs located on open deck. The water spray system shall also provide coverage for exposed structures of superstructures, compressor rooms and pump rooms, CCRs, bunkering stations and any other normally occupied spaces that face the FST on the open decks if the distance between them does not exceed 10 m.

23.6.4.2 The system shall be designed to cover all areas specified in 23.6.4.1 with an application rate as follows:

.1 10 l/min per 1 m^2 for horizontal surfaces;

.2 4 l/min per 1 m^2 for vertical surfaces.

23.6.4.3 Stop valves shall be fitted in the water spray application main supply line, at intervals not exceeding 40 m for the purpose of isolating damaged sections.

Alternatively, the system may be divided into two or more sections that may be operated independently, provided the necessary controls are located together in a readily accessible position not likely to be inaccessible in case of fire in the areas protected.

23.6.4.4 Connection of the water fire main system to the water spray system shall be provided through a stop valve fitted on the exposed deck area in a safe position outside the bunkering station area.

23.6.4.5 Remote start of pumps supplying the water spray system and remote operation of valves shall be located in a readily accessible safe position which is not likely to be cut off in case of fire.

23.6.4.6 The nozzles of the water spray system shall be of a full bore type and ensure an effective distribution of water throughout the areas being protected.

23.6.5 Foam fire extinguishing system and special provisions of fire protection.

23.6.5.1 Where a fuel storage tanks is located on open deck, there shall be a fixed fire-fighting system of alcohol-resistant foam type (AR/AFFF), as set out in Chapter 17 of the IBC Code and the applicable requirements of Chapter 14 of the International Code for Fire Safety Systems (FSS Code).

23.6.5.2 The alcohol-resistant foam type fire-fighting system shall cover the area below the fuel storage tank where a spill of fuel could be expected to spread.

23.6.5.3 The bunker station shall have a fixed fire extinguishing system of alcohol resistant foam type and a portable dry chemical powder extinguisher, located near the entrance of the bunkering station.

23.6.5.4 Where FSTs are located on open deck, there shall be a fixed water spray system for diluting eventual spills and fire prevention. The system shall cover exposed parts of FST.

23.6.5.5 A fixed fire detection and fire alarm system complying with FSS Code shall be provided for all compartments containing the alcohol fuel system.

23.6.5.6 Suitable detectors shall be selected based on the fire characteristics of the fuel. Smoke detectors shall be used in combination with detectors which can more effectively detect methyl/ethyl alcohol fires.

23.6.6 Provision for fire extinguishing of machinery space and fuel preparation space.

23.6.6.1 Machinery space and fuel preparation space where methyl/ethyl alcohol-fuelled engines or fuel pumps are arranged shall be protected by an approved fixed fire extinguishing system in accordance with regulation II-2/10 of SOLAS-74, as amended, and the FSS Code. In addition, the fire extinguishing medium used shall be suitable for the extinguishing of methyl alcohol fires.

23.6.6.2 An alcohol-resistant foam system covering the whole space area, the FST top and area under the floor plates shall be arranged for machinery space of category A and fuel preparation space.

23.6.7 Fire-fighting outfit.

23.6.7.1 Two portable dry chemical powder fire extinguishers, each of at least 5 kg capacity shall be provided, one of which shall be located in the vicinity of the bunkering station.

23.6.7.2 The machinery space where alcohol (methanol/ethanol) is used as fuel shall be provided with two portable dry chemical powder extinguishers of at least 5 kg capacity each, located at the entrance.

23.7 VENTILATION

23.7.1 General.

23.7.1.1 Ventilation inlets and outlets for spaces required to be fitted with mechanical ventilation in compliance with this Section, shall be located such that according to the International Convention on Load Lines they will not be required to have closing appliances.

23.7.1.2 Any ducting used for the ventilation of hazardous spaces shall be separate from that used for the ventilation of non-hazardous spaces. The ventilation shall be operable at all temperatures and environmental conditions the ship will be operating in.

23.7.1.3 Electric motors for ventilation fans shall not be located in ventilation ducts for hazardous spaces unless the motors are certified for the same hazard zone as the space served.

23.7.1.4 Design of ventilation fans serving spaces containing fuel vapours shall comply with the requirements of 9.8.1.3.

23.7.1.5 Ventilation system shall be of a mechanical exhaust type with inlets located such as to avoid accumulation of vapour from leaked methyl/ethyl alcohol leak in the space.

23.7.1.6 Air inlets for hazardous enclosed spaces shall be taken from areas that, in the absence of the considered inlet, would be non-hazardous. Air inlets for non-hazardous enclosed spaces shall be taken from non-hazardous areas at least 1,5 m away from the boundaries of any hazardous area. Where the inlet duct passes through a more hazardous space, the duct shall be gastight and have overpressure relative to this space.

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

23.7.1.8 Air outlets from hazardous enclosed spaces shall be located in an open area that, in the absence of the considered outlet, would be of the same or lesser hazard than the ventilated space.

23.7.1.9 The required capacity of the ventilation plant is normally based on the total volume of the room. An increase in required ventilation capacity may be necessary for rooms having a complicated form.

23.7.1.10 Non-hazardous spaces with entry openings to a hazardous area shall be arranged with an airlock and be maintained at overpressure relative to the external hazardous area. The overpressure ventilation shall be arranged according to the following:

.1 during initial start-up or after loss of overpressure ventilation, before energizing any electrical installations not certified safe for the space in the absence of pressurization, it shall be required to:

.1.1 proceed with purging (at least 5 air changes) or confirm by measurements that the space is non-hazardous; and

.1.2 pressurize the space;

.2 operation of the overpressure ventilation shall be monitored and in the event of failure of the overpressure ventilation the following shall be performed:

.2.1 an audible and visual alarm shall be given at a manned location; and

.2.2 if overpressure cannot be immediately restored, automatic or programmed disconnection of electrical installations shall be required.

23.7.1.11 Double bottoms, cofferdams, duct keels, pipe tunnels, hold spaces and other spaces where methyl/ethyl fuel may accumulate shall be capable of being ventilated to ensure a safe environment when entry into the spaces is necessary.

23.7.2 Ventilation of fuel preparation spaces.

23.7.2.1 Fuel preparation spaces shall be provided with an effective mechanical forced ventilation system of extraction type. During normal operation the ventilation shall be at least 30 air changes per hour.

23.7.2.2 The number and power of the ventilation fans shall be such that the capacity is not reduced by more than 50 %, if a fan with a separate circuit from the main switchboard or emergency switchboard or a group of fans with common circuit from the main switchboard or emergency switchboard, is inoperable.

23.7.2.3 Ventilation systems for fuel preparation rooms shall be in operation when pumps or any other equipment for fuel treatment are working.

23.7.3 Requirements for ventilation of bunkering stations.

23.7.3.1 Ventilation of bunkering stations shall be provided as specified in 9.8.5.

23.7.4 Requirements for ventilation of ducts and double pipes.

23.7.4.1 Ducts and double pipes containing fuel piping shall be fitted with effective mechanical ventilation system of the extraction type providing a ventilation capacity of at least 30 air changes per hour.

23.7.4.2 The ventilation system for double wall piping and ducts shall be independent of all other ventilation systems.

23.7.4.3 The ventilation inlet for the double wall piping or duct shall always be located in a non-hazardous area away from ignition sources. The inlet opening shall be fitted with a suitable wire mesh guard and protected from ingress of water.

23.7.4.4 Ventilation inlets shall be so located that to be arranged at least at the height of 3 m above the main deck and at the distance of at least 3 m from the nearest air inlets, openings for the enclosed spaces and possible ignition sources.

23.7.4.5 Ventilation shall be so arranged that it shall be operated each time when methyl/ethyl fuel is available in the piping.

23.7.4.6 Continuous vapour detection shall be arranged in the ventilation system, and fuel supply to the machinery space shall be shut-off in case of methanol/ethanol vapour leak is detected.

23.7.4.7 When the required air flow is not maintained by the exhaust ventilation system, the master fuel valve shall be automatically closed.

23.7.4.8 Materials, design and strength of outer protective pipes or air ducts and mechanical ventilation systems shall be capable of withstanding an instantaneous outburst and expansion of methanol under pressure in case of a failure of methanol/ethanol piping internal structure.

23.7.4.9 The number of flange connections of outer protective pipes or air ducts shall be kept to a minimum.

23.7.4.10 Outer protective pipes or air ducts shall be tested by the maximum working pressure of the internal pipe.

23.7.4.11 Ventilation system shall be operable at all expected ambient temperatures.

23.8 INERTING AND ATMOSPHERE CONTROL

23.8.1 General requirements for inert gas system.

23.8.1.1 All fuel tanks shall be inerted during normal operation. The system shall be so designed that to eliminate the possibility of a flammable mixture atmosphere existing in the fuel tank during any operations and gas freeing utilizing an inerting medium.

23.8.1.2 Cofferdams shall be arranged either for purging or filling with water through a non-permanent connection. Emptying the cofferdams shall be done by a separate drainage system.

23.8.1.3 To prevent the return of flammable liquid and vapour to the inert gas system, the inert gas supply line shall be fitted with two shutoff valves in series with a venting valve in between (double block and bleed valves). In addition, a closable non-return valve shall be installed between the double block and bleed arrangement and the fuel system. These valves shall be located inside hazardous spaces.

23.8.1.4 Where the connections of the inert gas piping systems to fuel tanks are non-permanent, two non-return valves may substitute the valves required in 23.8.1.3.

23.8.1.5 Blanking arrangements shall be fitted in the inert gas supply line to individual tanks. The position of the blanking arrangements shall be immediately obvious to personnel entering the tank. Blanking shall be via removable spool piece.

23.8.1.6 The arrangements for gas freeing and ventilation of fuel tanks shall be such as to minimize the hazards of the dispersal of flammable vapours to the atmosphere and ignition of gas mixture in the tank. The ventilation system for fuel tanks shall be exclusively for ventilating and gas freeing purposes. Connection between fuel tank ventilation system and fuel preparation space will not be accepted.

23.8.1.7 Gas freeing operations shall be carried out such that vapour is initially discharged in one of the following ways:

.1 through outlets at least 3 m above the deck level with a vertical efflux velocity of at least 30 m/s maintained during the gas freeing operation;

.2 through outlets at least 3 m above the deck level with a vertical efflux velocity of at least 20 m/s which are protected by suitable devices to prevent the passage of flame; or

.3 through outlets underwater.

23.8.2 Inert gas production and storage on board.

23.8.2.1 Inert gas shall be available permanently on board in order to achieve at least one trip from port to port considering maximum consumption of fuel expected and maximum length of trip expected, and to keep tanks inerted during two weeks in harbour with minimum port consumption of fuel.

23.8.2.2 An inert gas production plant and/or adequate inert gas storage capacities capable of being filled externally to the ship shall be used to achieve the availability target defined in 23.8.2.1.

23.8.2.3 Fluid used for inerting shall not modify the characteristics of the fuel.

23.8.2.4 Inert gas generation plant shall be capable of producing inert gas with at no time greater than 5 % oxygen content by volume. A continuous-reading oxygen content meter shall be provided at the inert gas generator output and shall be fitted with an alarm set at a maximum of 5 % oxygen content by volume.

The system shall be designed to ensure that if the oxygen content exceeds 5 % by volume at the generator output the inert gas shall be automatically vented to atmosphere.

23.8.2.5 The system shall be able to maintain an atmosphere with an oxygen content not exceeding 8 % by volume in any part of any fuel tank.

23.8.2.6 The inert gas generator or inert gas storage facilities may be installed in a separate space outside of the engine room. This space shall be fitted with an independent extraction ventilation system, providing a minimum of 6 air changes per hour. If the oxygen content is below 19 % in the separate space, an alarm shall be given. A minimum of two oxygen sensors shall be provided in each space. Visual and audible alarms shall be placed at each entrance to the inert gas room.

23.8.2.7 Inert gas pipelines shall only be laid through well ventilated spaces. Pipelines in enclosed spaces shall:

.1 have only a minimum of flange connections as needed for fitting of valves;

.2 be as short as possible.

23.8.2.8 Inert gas utilized for gas freeing of fuel tanks may be provided externally to the ship.

23.9 MONITORING, CONTROL AND SAFETY SYSTEMS

23.9.1 General.

23.9.1.1 The control, monitoring and safety systems shall be so arranged that to meet the following functional requirements in order to ensure safe and effective use of methyl/ethyl alcohol as fuel on board ships:

.1 there is not an unacceptable loss of power in the event of a single failure of monitoring, control and safety systems;

.2 a fuel safety system shall be arranged to close down the fuel supply system automatically, upon failure in systems as described in Table 23.9.1.1.2;

.3 the safety functions shall be arranged in a dedicated fuel safety system that is independent of the fuel control system in order to avoid possible common cause failures; this includes power supplies and input and output signal;

.4 the safety systems including the field instrumentation shall be arranged to avoid spurious shutdown, e.g. as a result of a faulty vapour detector or a wire break in a sensor loop;

.5 where two independent fuel supply systems are required to meet the provisions, each system shall be fitted with its own set of independent fuel control and safety systems.

23.9.1.2 Suitable instrumentation devices shall be fitted to allow a local and a remote reading of essential parameters to ensure safe management of the whole fuel equipment including bunkering.

23.9.1.3 Liquid leakage detection shall be installed in the protective cofferdams surrounding the fuel tanks, in ducts around fuel pipes, in fuel preparation spaces, and in other enclosed spaces containing single walled fuel piping or other fuel equipment.

23.9.1.4 The annular space in a double walled piping system shall be monitored for leakages and the monitoring system shall be connected to an alarm system. Any leakage detected shall lead to shutdown of the affected fuel supply line in accordance with Table 23.9.1.1.2.

23.9.1.5 At least one bilge well with a level indicator shall be provided for each enclosed space, where independent storage tanks are located. A high-level bilge alarm shall be provided. The leakage detection system shall trigger an alarm and the safety functions in accordance with Table 23.9.1.1.2.

23.9.1.6 A monitoring system, equivalent to that intended for permanently installed tanks, shall be provided for portable fuel tanks.

23.9.2 Bunkering and fuel tank monitoring systems.

23.9.2.1 Level indicators.

Each fuel tank shall be fitted with closed level gauging devices enabling continuous level reading. Where it is not possible to arrange the required maintenance of such device while the fuel tank is in service, two level gauging devices shall be installed.

23.9.2.2 Overflow control.

.1 each fuel tank shall be fitted with a visual and audible high-level alarm. This shall be able to be function tested from the outside of the tank and can be common with the level gauging system (configured as an alarm on the gauging transmitter), but shall be independent of the high-high-level alarm;

.2 an additional sensor (high-high-level) operating independently of the high liquid level alarm shall automatically actuate a shut-off valve to avoid excessive liquid pressure in the bunkering line and prevent the tank from becoming liquid full;

.3 the high and high-high-level alarm for the fuel tanks shall be visual and audible at the location at which gas freeing by water filling of the fuel tanks is controlled, given that water filling is the preferred method for gas freeing.

23.9.2.3 Bunkering control.

23.9.2.3.1 Bunkering control shall be from a safe remote location. At this safe remote location:

.1 tank level shall be capable of being monitored;

.2 the remote-control valves shall be capable of being operated from this location, as required by 23.5.3.12. Closing of the bunkering shutdown valves shall be possible from the control location for bunkering and from another safe location;

.3 overfill alarms and automatic shutdown shall also be indicated at this location.

23.9.2.3.2 If the ventilation in the ducting enclosure or annular spaces of the double walled bunkering lines stops, an audible and visual alarm shall be activated at the bunkering control location.

23.9.2.3.3 If fuel leakage is detected in ducting enclosure or the annular spaces of the double walled bunkering lines, an audible and visual alarm and emergency shutdown of the bunkering valve shall automatically be activated.

23.9.3 Engine monitoring.

23.9.3.1 In addition to the instrumentation provided in accordance with Part XV "Automation", indicators for operating condition of engines operated on methanol/ethanol shall be fitted on the navigation bridge and the engine control room.

23.9.4 Methanol/ethanol vapour detection.

23.9.4.1 Permanently installed methanol/ethanol vapour detectors shall be fitted in:

.1 ventilated annular spaces of the double walled fuel pipes;

.2 machinery spaces containing methyl/ethyl fuel consumers or fuel equipment;

.3 methyl/ethyl fuel preparation spaces;

.4 enclosed or semi-enclosed spaces containing methyl/ethyl fuel piping or other fuel equipment without outer pipes or ducting;

.5 enclosed or semi-enclosed spaces where methyl/ethyl alcohol vapours may accumulate;

.6 closed fuel storage hold spaces and cofferdams surrounding fuel tanks;

.7 airlocks;

.8 ventilation inlets to accommodation and machinery spaces, if required, based on the risk assessment.

23.9.4.2 Methanol/ethanol vapour detection system shall be designed, installed and tested in accordance with the requirements of current national or international standards, e.g. IEC 60079-29-1:2016.

23.9.4.3 The number and placement of methanol/ethanol vapour detectors in each space shall be specially considered in each case taking into account the size, layout and ventilation of the space. Gas dispersal analysis or a physical smoke test shall be used to find the best arrangement.

23.9.4.4 An audible and visible alarm shall be activated at a fuel vapour concentration of 20 % of the lower explosion limit (LEL). The safety system shall be activated at 40 % of LEL at two detectors.

23.9.4.5 For ventilated ducts and annular spaces around double walled fuel pipes in the machinery spaces containing methyl/ethyl alcohol consumers, the alarm limit shall be set to 20 % of LEL. The safety system shall be activated at 40 % of LEL at two detectors.

23.9.4.6 Audible and visible alarms from the fuel vapour detection equipment shall be located on the navigation bridge, in the continuously manned central control station, at the control location for bunkering or in safety centre.

23.9.5 Fire detection.

23.9.5.1 Fire detection in machinery space containing methyl/ethyl alcohol engines and fuel storage hold spaces shall give audible and visual alarms on the navigation bridge and in a continuously manned central control station or safety centre.

23.9.6 Ventilation performance.

23.9.6.1 Any loss of the required ventilating capacity shall give an audible and visual alarm on the navigation bridge, and in a continuously manned central control station or safety centre.

23.9.7 Safety functions of fuel supply systems.

23.9.7.1 If the fuel supply is shut off due to activation of an automatic shut-off valve, the fuel supply shall not be opened until the reason for the disconnection is ascertained and the necessary precautions taken. A readily visible notice giving instruction to this effect shall be placed at the operating station for the shut-off valves in the fuel supply lines.

23.9.7.2 If a fuel leak leading to a fuel supply shutdown occurs, the fuel supply shall not be operated until the leak has been found and dealt with. Instructions to this effect shall be placed in a prominent position in the machinery space.

23.9.7.3 A caution placard or signboard shall be permanently fitted in the machinery space containing methyl/ethyl-fuelled engines stating that heavy lifting, implying danger of damage to the fuel pipes, shall not be done when the engine is running on methyl/ethyl fuel.

23.9.7.4 Pumps and methyl/ethyl fuel supply shall be arranged for manual remote emergency stop from the following locations as applicable:

.1 navigation bridge;
.2 cargo control room;
.3 onboard safety centre;
.4 central control station;
.5 fire control station;
.6 adjacent to the exit of fuel preparation space.

Table 23.9.1.1.2

Safety system of methyl/ethyl alcohol supply to engines

Monitored parameter	Alarm	Automatic closure of master fuel valve of tank required by 23.5.5.2	Automatic shutdown of fuel supply to consumers in machinery space (refer to 23.5.5.3)	Automatic shut-down of valve required by 23.5.3.12	Notes
High level in tank (95 %)	X			X	Refer to 23.9.2.2.1
High-high level in tank (98 %)	X			X	Refer to 23.9.2.2.1 and 23.9.2.3.1
Loss of ventilation in the annular space of the double walled bunkering lines	X			X	Refer to 23.9.2.3.2
Vapour detection in the annular space of the double walled bunkering lines	X			X	Refer to 23.9.2.3.3
Loss of ventilation in ventilated areas	X				Refer to 23.9.6
Manual shutdown				X	Refer to 23.9.2.3.1
Methyl/ethyl alcohol leakage detection in the annular space of the double walled bunkering lines	X			X	Refer to 23.9.2.3.3
Vapour detection in ducts around fuel pipes	X				Refer to 23.9.4.1.1
Vapour detection in cofferdams surrounding fuel tanks. One detector giving above 20 % of LEL	X				Refer to 23.9.4.5
Vapour detection in airlock	X				Refer to 23.9.4.1.7
Vapour detection in cofferdams surrounding fuel tanks. Two detectors giving above 40 % of LEL	X	X		X	Refer to 23.9.4.1.6
Vapour detection in ducts around double walled pipes, 20 % of LEL	X				Refer to 23.9.4.5
Vapour detection in ducts around double walled pipes, 40 % of LEL	X	X	X		Refer to 23.9.4.4. Two detectors giving 40 % of LEL prior to valve shut-down.
Liquid leak detection in annular space of double walled pipes	X	X	X		Refer to 23.9.1.4
Liquid leak detection in engine room	X	X			Refer to 23.9.1.3
Liquid leak detection in fuel preparation space	X	X			Refer to 23.9.1.3
Liquid leakage detection in protective cofferdams surrounding fuel tanks	X				Refer to 23.9.1.3

23.10 ELECTRICAL EQUIPMENT

23.10.1 General.

23.10.1.1 Electrical equipment shall comply with the applicable requirements of IEC 60092:2018 series or other equivalent standards.

23.10.1.2 Electrical equipment or wiring shall not be installed in gas-dangerous spaces or zones unless essential for operational purposes or safety enhancement.

23.10.1.3 Where electrical equipment is installed in gas-dangerous spaces, it shall be selected, installed and maintained in accordance with the applicable IEC standards or other equivalent standards.

23.10.1.4 The lighting system in gas-dangerous spaces and areas shall be divided between at least two branch circuits and be supplied from different switchboards. Switches and protective devices of the lighting system in gas-dangerous spaces and areas shall interrupt all phases and shall be located in a non-hazardous space or area.

23.10.1.5 All onboard electrical equipment shall be safely earthed to the ship's hull.

23.10.2 Classification of hazardous zones, spaces and areas.

23.10.2.1 Classification of hazardous zones is given in 23.10.2.2 — 23.10.2.4. In cases where the prescriptive provisions in 23.10.2.2 — 23.10.2.4 are deemed to be inappropriate, area classification according to IEC 60079-10 and IEC 60092-502 shall be applied.

23.10.2.2 Zone 0: the internal areas of methanol/ethanol storage tanks, fuel pipelines, pipelines from safety valves of fuel storage tanks and any venting pipelines from equipment containing methanol/ethanol.

23.10.2.3 Zone 1:

.1 cofferdams and other spaces surrounding the fuel tanks;

.2 fuel preparation spaces;

.3 areas on open deck, or semi-enclosed spaces on deck, within 3 m of any methyl/ethyl fuel tank outlet, vapour outlet, bunker manifold valve, other methyl/ethyl fuel valve, any methyl/ethyl fuel pipe flange, methyl/ethyl fuel preparation space ventilation outlets;

.4 areas on open deck or semi-enclosed spaces on deck in the vicinity of the fuel tank outlets, within a vertical cylinder of unlimited height and 6 m radius centred upon the centre of the outlet and within a hemisphere of 6 m radius below the outlet;

.5 areas on open deck or semi-enclosed spaces on deck, within 1,5 m of fuel preparation space entrances, fuel preparation space ventilation openings and other openings into zone 1 spaces;

.6 areas on the open deck within coamings surrounding methyl/ethyl fuel bunker manifold valves and 3 m beyond these, up to a height of 2,4 m above the deck;

.7 enclosed or semi-enclosed spaces in which pipes containing methyl/ethyl fuel are located, e.g. ducts around methyl/ethyl fuel pipes, semi-enclosed bunkering stations; and

.8 a space protected by an airlock is considered as a non-hazardous area during normal operation, but will require equipment to operate following loss of differential pressure between the protected space and the hazardous area to be certified as suitable for zone 1.

23.10.2.4 Zone 2:

.1 areas 4 m beyond the cylinder and beyond the sphere defined in 23.10.2.3.4;

.2 areas within 1,5 m surrounding other open or semi-enclosed spaces of zone 1 defined in 23.10.2.3; and

.3 airlocks.

23.11 PERSONNEL PROTECTION

23.11.1 Protective equipment.

23.11.1.1 For the protection of crew members who are engaged in bunkering operations, the ship shall have on board protective clothing and outfit consisting of the following:

.1 large aprons;

.2 special gloves with long sleeves;

.3 protective footwear;

.4 coveralls made of chemically resistant material;

.5 tight-fitting goggles or face shields.

23.11.1.2 Protective clothing and outfit shall cover and protect all skin and all body parts. For each crew member engaged in bunkering operations, 1 set of protective clothing and outfit shall be provided (there shall be at least 6 sets in total).

23.11.1.3 Work clothes and protective equipment shall be kept in easily accessible places in special lockers.

Such equipment shall not be located in the accommodation area, except for new, unused equipment and equipment that was not in use after relocation and arrangement. Used protective clothes and equipment shall be kept in a stowage space located away from accommodation spaces.

23.11.1.4 Protective equipment shall be used in any operation, which may entail danger to personnel.

23.11.2 Safety equipment for methanol operations.

23.11.2.1 On ships using methanol as fuel, there shall be available at least two complete sets of equipment to ensure safety of the crew members while entering a compartment with fuel vapour and operating in it for 20 minutes.

23.11.2.2 One complete set of safety equipment shall consist of the following:

.1 one self-contained air-breathing apparatus;

.2 protective clothing, boots, gloves and tight-fitting goggles;

.3 fire-proof lifeline with a belt resistant to methanol;

.4 explosion-proof lamp.".