ANNEX 17

DRAFT AMENDMENTS TO SOLAS REGULATIONS II-2/4 AND II-2/16

Part B
Prevention of fire and explosion

Regulation 4 – Probability of ignition

1 The existing paragraph 5.5 is replaced ~~by~~ with the following:

"**5.5 Inert gas systems**

5.5.1 Application

5.5.1.1 For tankers of 20,000 tonnes deadweight and upwards constructed on or after 1 July 2002 but before [*date of entry into force*], the protection of the cargo tanks shall be achieved by a fixed inert gas system in accordance with the requirements of the Fire Safety Systems Code, as adopted by resolution MSC.98(73), except that the Administration may accept other equivalent systems or arrangements, as described in paragraph 5.5.4.

5.5.1.2 For tankers of 8,000 tonnes deadweight and upwards constructed on or after [*date of entry into force*] when carrying cargoes described in regulation 1.6.1 or 1.6.2, the protection of the cargo tanks shall be achieved by a fixed inert gas system in accordance with the requirements of the Fire Safety Systems Code, except that the Administration may accept other equivalent systems or arrangements, as described in paragraph 5.5.4.

5.5.1.3 Tankers operating with a cargo tank cleaning procedure using crude oil washing shall be fitted with an inert gas system complying with the Fire Safety Systems Code and with fixed tank washing machines. However, inert gas systems fitted on tankers constructed on or after 1 July 2002 but before [*date of entry into force*] shall comply with the Fire Safety Systems Code, as adopted by resolution MSC.98(73).

5.5.1.4 Tankers required to be fitted with inert gas systems shall comply with the following provisions:

.1 double-hull spaces shall be fitted with suitable connections for the supply of inert gas;

.2 where hull spaces are connected to a permanently fitted inert gas distribution system, means shall be provided to prevent hydrocarbon gases from the cargo tanks entering the double hull spaces through the system; and

.3 where such spaces are not permanently connected to an inert gas distribution system, appropriate means shall be provided to allow connection to the inert gas main.

5.5.2 Inert gas systems of chemical tankers and gas carriers

5.5.2.1 The requirements for inert gas systems contained in the Fire Safety Systems Code need not be applied to chemical tankers and gas carriers constructed before [*date of entry into force*]:

.1 when carrying cargoes described in regulation 1.6.1, provided that they comply with the requirements for inert gas systems on chemical tankers established by the Administration, based on the guidelines developed by the Organization*; or

* Refer to the *Regulation for inert gas systems on chemical tankers*, adopted by the Organization by resolution A.567(14), and Corr.1.

.2 when carrying flammable cargoes other than crude oil or petroleum products such as cargoes listed in chapters 17 and 18 of the International Bulk Chemical Code, provided that the capacity of tanks used for their carriage does not exceed 3,000 m^3 and the individual nozzle capacities of tank washing machines do not exceed 17.5 m^3/h and the total combined throughput from the number of machines in use in a cargo tank at any one time does not exceed 110 m^3/h.

5.5.3 General requirements for inert gas systems

5.5.3.1 The inert gas system shall be capable of inerting, purging and gas-freeing empty tanks and maintaining the atmosphere in cargo tanks with the required oxygen content.

[5.5.3.2 The inert gas system referred to in paragraph 5.5.3.1 shall be designed, constructed and tested in accordance with the Fire Safety Systems Code.]

5.5.3.4 Tankers fitted with a fixed inert gas system shall be provided with a closed ullage system.

5.5.4 Requirements for equivalent systems

5.5.4.1 The Administration may, after having given consideration to the ship's arrangement and equipment, accept other fixed installations, in accordance with regulation I/5 and paragraph 5.5.4.3.

5.5.4.2 For tankers of 8,000 tonnes deadweight and upwards but less than 20,000 tonnes deadweight constructed on or after [*date of entry into force*], the Administration may accept other equivalent arrangements or means of protection in lieu of fixed installations, in accordance with regulation I/5 and paragraph 5.5.4.3.

5.5.4.3 Equivalent systems or arrangements shall:

.1 be capable of preventing dangerous accumulations of explosive mixtures in intact cargo tanks during normal service throughout the ballast voyage and necessary in-tank operations; and

.2 be so designed as to minimize the risk of ignition from the generation of static electricity by the system itself."

Part E
Operational requirements

Regulation 16 – Operations

2 Insert a new paragraph 16.3.3 after the existing paragraph 16.3.2 as follows:

"**16.3.3 Operation of inert gas system**

16.3.3.1 The inert gas system for tankers required in accordance with regulation 4.5.5.1 shall be so operated as to render and maintain the atmosphere of the cargo tanks non-flammable, except when such tanks are required to be gas-free.

16.3.3.2 Notwithstanding the above, for chemical tankers ~~constructed on or after [*date of entry into force*]~~, the application of inert gas, may take place after the cargo tank has been loaded, but before commencement of unloading and shall continue to be applied until that cargo tank has been purged of all flammable vapours before gas-freeing. Only nitrogen is acceptable as inert gas under this provision.

16.3.3.3 If the oxygen content of the inert gas exceeds 5 per cent by volume, immediate action shall be taken to improve the gas quality. Unless the quality of the gas improves, all operations in those cargo tanks to which inert gas is being supplied shall be suspended so as to avoid air being drawn into the cargo tanks, the gas regulating valve, if fitted, shall be closed and the off-specification gas shall be vented to atmosphere.

16.3.3.4 In the event that the inert gas system is unable to meet the requirement in paragraph 16.3.3.1 and it has been assessed that it is impracticable to effect a repair, then cargo discharge and cleaning of those cargo tanks requiring inerting shall only be resumed when suitable emergency procedures have been followed, taking into account guidelines developed by the Organization*.

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* Refer to the Clarification of inert gas system requirements under the Convention (MSC/Circ.485) and to the *Revised Guidelines for inert gas systems* (MSC/Circ.353), as amended by MSC/Circ.387."

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ANNEX 18

DRAFT AMENDMENTS TO THE FSS CODE

The existing chapter 15 is replaced ~~by~~ with the following:

"**CHAPTER 15**
INERT GAS SYSTEMS

1 Application

This chapter details the specifications for inert gas systems as required by chapter II-2 of the Convention.

~~This chapter details the specifications for inert gas systems installed on ships constructed on or after [*date of entry into force*] as required by chapter II-2 of the Convention. Detailed specifications for inert gas systems installed on ships constructed before [*date of entry into force*] are given in chapter 15 of the Code adopted by resolution MSC.98(73).~~

2 Engineering specifications

2.1 Definitions

For the purposes of this chapter:

2.1.1 *Cargo tanks* means those cargo tanks, including slop tanks, which carry cargoes, or cargo residues, having a flashpoint not exceeding 60ºC.

2.1.2 *Inert gas system* includes inert gas systems using flue gas, inert gas generators, and nitrogen generators and means the inert gas plant and inert gas distribution together with means for preventing backflow of cargo gases to machinery spaces, fixed and portable measuring instruments and control devices.

2.1.3 *Gas-safe space* is a space in which the entry of gases would produce hazards with regard to flammability or toxicity.

2.1.4 *Gas-free* is a condition in a tank where the content of hydrocarbon or other flammable vapour is less than 1 per cent of the lower flammable limit (LFL), the oxygen content is at least 21 per cent, and no toxic gases are present*.

* Refer to the *Revised Recommendations for entering enclosed spaces aboard ships* (resolution A.1050(27)).

2.2 Requirements for all systems

2.2.1 General

2.2.1.1 The inert gas system referred to in chapter II-2 of the Convention shall be designed, constructed and tested to the satisfaction of the Administration. It shall be designed to be capable of rendering and maintaining the atmosphere of the relevant cargo tanks non-flammable*.

* Refer to the *Revised Standards for the design, testing and locating of devices to prevent the passage of flame into cargo tanks in tankers* (MSC/Circ.677, as amended by MSC/Circ.1009 and MSC.1/Circ.1324) and the *Revised Factors to be taken into consideration when designing cargo tank venting and gas-freeing arrangements* (MSC/Circ.731).

2.2.1.2 The system shall be capable of:

.1 inerting empty cargo tanks and maintaining the atmosphere in any part of the tank with an oxygen content not exceeding 8 per cent by volume and at a positive pressure in port and at sea except when it is necessary for such a tank to be gas-free;

.2 eliminating the need for air to enter a tank during normal operations except when it is necessary for such a tank to be gas-free;

.3 purging empty cargo tanks of hydrocarbon or other flammable vapours, so that subsequent gas-freeing operations will at no time create a flammable atmosphere within the tank;

.4 delivering inert gas to the cargo tanks at a rate of at least 125 per cent of the maximum rate of discharge capacity of the ship expressed as a volume. For chemical tankers and chemical/product tankers, the Administration may accept inert gas systems having a lower delivery capacity provided that the maximum rate of discharge of cargoes from cargo tanks being protected by the system is restricted to not more than 80 per cent of the inert gas capacity; and

.5 delivering inert gas with an oxygen content of not more than 5 per cent by volume to the cargo tanks at any required rate of flow.

2.2.1.3 Materials used in inert gas systems shall be suitable for their intended purpose. In particular, those components which may be subjected to corrosive action of the gases and/or liquids are to be either constructed of corrosion-resistant material or lined with rubber, glass fibre epoxy resin or other equivalent coating material.

2.2.1.4 The inert gas supply may be:

.1 treated flue gas from main or auxiliary boilers, or

.2 gas from an oil or gas-fired gas generator, or

.3 gas from nitrogen generators.

The Administration may accept systems using inert gases from one or more separate gas generators or other sources or any combination thereof, provided that an equivalent level of safety is achieved. Such systems shall, as far as practicable, comply with the requirements of this chapter. Systems using stored carbon dioxide shall not be permitted unless the Administration is satisfied that the risk of ignition from generation of static electricity by the system itself is minimized.

2.2.2 Safety measures

2.2.2.1 The inert gas system shall be so designed that the maximum pressure which it can exert on any cargo tank will not exceed the test pressure of any cargo tank.

2.2.2.2 Automatic shutdown of the inert gas system and its components parts shall be arranged on predetermined limits being reached, taking into account the provisions of paragraphs 2.2.4, 2.3.2 and 2.4.2.

2.2.2.3 Suitable shutoff arrangements shall be provided on the discharge outlet of each generator plant.

2.2.2.4 The system shall be designed to ensure that if the oxygen content exceeds 5 per cent by volume, the inert gas shall be automatically vented to atmosphere.

2.2.2.5 Arrangements shall be provided to enable the functioning of the inert gas plant to be stabilized before commencing cargo discharge. If blowers are to be used for gas-freeing, their air inlets shall be provided with blanking arrangements.

2.2.2.6 Where a double block and bleed valve is installed, the system shall ensure upon of loss of power, the block valves are automatically closed and the bleed valve is automatically open.

2.2.3 System components

2.2.3.1 Non-return devices

2.2.3.1.1 At least two non-return devices shall be fitted in order to prevent the return of vapour and liquid to the inert gas plant, or to any gas-safe spaces.

2.2.3.1.2 The first non-return device shall be a deck seal of the wet, semi-wet, or dry type or a double-block and bleed arrangement. Two shut-off valves in series with a venting valve in between, may be accepted provided:

.1 the operation of the valve is automatically executed. Signal(s) for opening/closing is (are) to be taken from the process directly, e.g. inert gas flow or differential pressure; and

.2 alarm for faulty operation of the valves is provided, e.g. the operation status of "blower stop" and "supply valve(s) open" is an alarm condition.

2.2.3.1.3 The second non-return device shall be a non-return valve or equivalent capable of preventing the return of vapours and liquids and fitted between the deck water seal (or equivalent device) and the first connection from the inert gas main to a cargo tank. It shall be provided with positive means of closure. As an alternative to positive means of closure, an additional valve having such means of closure may be provided between the non-return valve and the first connection to the cargo tanks to isolate the deck water seal, or equivalent device, from the inert gas main to the cargo tanks.

2.2.3.1.4 A water seal, if fitted, shall be capable of being supplied by two separate pumps, each of which shall be capable of maintaining an adequate supply at all

times. The audible and visual alarm on the low level of water in the water seal shall operate at all times.

2.2.3.1.5 The arrangement of the water seal, or equivalent devices, and its associated fittings shall be such that it will prevent backflow of vapours and liquids and will ensure the proper functioning of the seal under operating conditions.

2.2.3.1.6 Provision shall be made to ensure that the water seal is protected against freezing, in such a way that the integrity of seal is not impaired by overheating.

2.2.3.1.7 A water loop or other approved arrangement shall also be fitted to each associated water supply and drain pipe and each venting or pressure-sensing pipe leading to gas-safe spaces. Means shall be provided to prevent such loops from being emptied by vacuum.

2.2.3.1.8 Any water seal, or equivalent device, and loop arrangements shall be capable of preventing return of vapours and liquids to an inert gas plant at a pressure equal to the test pressure of the cargo tanks.

2.2.3.1.9 The non-return devices shall be located in the cargo area on deck.

2.2.3.2 Inert gas lines

2.2.3.2.1 The inert gas main may be divided into two or more branches forward of the non-return devices required by paragraph 2.2.3.1.

2.2.3.2.2 The inert gas main shall be fitted with branch piping leading to the cargo tank. Branch piping for inert gas shall be fitted with either stop valves or equivalent means of control for isolating each tank. Where stop valves are fitted, they shall be provided with locking arrangements. The control system shall provide unambiguous information of the operational status of such valves to at least the control panel required in paragraph 2.2.4.

2.2.3.2.3 Each cargo tank not being inerted shall be capable of being separated from the inert gas main by:

.1 removing spool-pieces, valves or other pipe sections, and blanking the pipe ends; or

.2 arrangement of two spectacle flanges in series with provisions for detecting leakage into the pipe between the two spectacle flanges; or

.3 equivalent arrangements to the satisfaction of the Administration, providing at least the same level of protection.

2.2.3.2.4 Means shall be provided to protect cargo tanks against the effect of overpressure or vacuum caused by thermal variations and/or cargo operations when the cargo tanks are isolated from the inert gas mains.

2.2.3.2.5 Piping systems shall be so designed as to prevent the accumulation of cargo or water in the pipelines under all normal conditions.

2.2.3.2.6 Arrangements shall be provided to enable the inert gas main to be connected to an external supply of inert gas. The arrangements shall consist of a 250 mm nominal pipe size bolted flange, isolated from the inert gas main by a valve and located forward of the non-return valve. The design of the flange should conform to the appropriate class in the standards adopted for the design of other external connections in the ship's cargo piping system.

2.2.3.2.7 If a connection is fitted between the inert gas main and the cargo piping system, arrangements shall be made to ensure an effective isolation having regard to the large pressure difference which may exist between the systems. This shall consist of two shutoff valves with an arrangement to vent the space between the valves in a safe manner or an arrangement consisting of a spool-piece with associated blanks.

2.2.3.2.8 The valve separating the inert gas main from the cargo main and which is on the cargo main side shall be a non-return valve with a positive means of closure.

2.2.3.2.9 Inert gas piping systems shall not pass through accommodation, service and control station spaces.

2.2.3.2.10 In combination carriers, the arrangement to isolate the slop tanks containing oil or oil residues from other tanks shall consist of blank flanges which will remain in position at all times when cargoes other than oil are being carried except as provided for in the relevant section of the guidelines developed by the Organization*.

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* Refer to the Revised Guidelines for inert gas systems (MSC/Circ.353), as amended by MSC/Circ.387.

2.2.4 Indicators and alarms

2.2.4.1 The operation status of the inert gas system shall be indicated in a control panel.

2.2.4.2 Instrumentation shall be fitted for continuously indicating and permanently recording, when inert gas is being supplied:

.1 the pressure of the inert gas mains forward of the non-return devices; and

.2 the oxygen content of the inert gas.

2.2.4.3 The indicating and recording devices shall be placed in the cargo control room where provided. But where no cargo control room is provided, they shall be placed in a position easily accessible to the officer in charge of cargo operations.

2.2.4.4 In addition, meters shall be fitted:

.1 in the navigating bridge to indicate at all times the pressure referred to in paragraph 2.2.4.2.1 and the pressure in the slop tanks of combination carriers, whenever those tanks are isolated from the inert gas main; and

.2 in the machinery control room or in the machinery space to indicate the oxygen content referred to in paragraph 2.2.4.2.2.

2.2.4.5 Audible and visual alarms

2.2.4.5.1 Audible and visual alarms shall be provided, based on the system designed, to indicate:

.1 oxygen content in excess of 5 per cent by volume;
.2 failure of the power supply to the indicating devices as referred to in paragraph 2.2.4.2;

.3 gas pressure less than 100 mm water gauge. The alarm arrangement shall be such as to ensure that the pressure in slop tanks in combination carriers can be monitored at all times;

.4 high-gas pressure; and

.5 failure of the power supply to the automatic control system.

2.2.4.5.2 The alarms required in paragraphs 2.2.4.5.1.1, 2.2.4.5.1.3 and 2.2.4.5.1.5 shall be fitted in the machinery space and cargo control room, where provided, but in each case in such a position that they are immediately received by responsible members of the crew.

2.2.4.5.3 An audible alarm system independent of that required in paragraph 2.2.4.5.1.3 or automatic shutdown of cargo pumps shall be provided to operate on predetermined limits of low pressure in the inert gas main being reached.

2.2.4.5.4 Two oxygen sensors shall be positioned at appropriate locations in the space or spaces containing the inert gas system. If the oxygen level falls below 19 per cent, these sensors shall trigger alarms, which shall be both visible and audible inside and outside the space or spaces and shall be placed in such a position that they are immediately received by responsible members of the crew.

2.2.5 Instruction manuals

Detailed instruction manuals shall be provided on board, covering the operations, safety and maintenance requirements and occupational health hazards relevant to the inert gas system and its application to the cargo tank system.* The manuals shall include guidance on procedures to be followed in the event of a fault or failure of the inert gas system.

* Refer to the Revised Guidelines for inert gas systems (MSC/Circ.353), as amended by MSC/Circ.387.

2.3 Requirements for flue gas and inert gas generator systems

In addition to the provisions in paragraph 2.2, for inert gas systems using flue gas or inert gas generators, the provisions of this section shall apply.

2.3.1 System requirements

2.3.1.1 Inert gas generators

2.3.1.1.1 Two fuel oil pumps shall be fitted to the inert gas generator. Suitable fuel in sufficient quantity shall be provided for the inert gas generators.

2.3.1.1.2 The inert gas generators shall be located outside the cargo tank area. Spaces containing inert gas generators shall have no direct access to accommodation service or control station spaces, but may be located in machinery spaces. If they are not located in machinery spaces, such a compartment shall be separated by a gastight steel bulkhead and/or deck from accommodation, service and control station spaces. Adequate positive-pressure-type mechanical ventilation shall be provided for such a compartment.

2.3.1.2 Gas regulating valves

2.3.1.2.1 A gas regulating valve shall be fitted in the inert gas main. This valve shall be automatically controlled to close, as required in paragraph 2.2.2.2. It shall also be capable of automatically regulating the flow of inert gas to the cargo tanks unless means are provided to automatically control the inert gas flow rate.

2.3.1.2.2 The gas regulating valve shall be located at the forward bulkhead of the forward most gas-safe space through which the inert gas main passes.

2.3.1.3 Cooling and scrubbing arrangement

2.3.1.3.1 Means shall be fitted which will effectively cool the volume of gas specified in paragraph 2.2.1.2 and remove solids and sulphur combustion products. The cooling water arrangements shall be such that an adequate supply of water will always be available without interfering with any essential services on the ship. Provision shall also be made for an alternative supply of cooling water.

2.3.1.3.2 Filters or equivalent devices shall be fitted to minimize the amount of water carried over to the inert gas blowers.

2.3.1.4 Blowers

2.3.1.4.1 At least two inert gas blowers shall be fitted and be capable of delivering to the cargo tanks at least the volume of gas required by paragraph 2.2.1.2. For systems fitted with inert gas generators the Administration may permit only one blower if that system is capable of delivering the total volume of gas required by paragraph 2.2.1.2 to the cargo tanks, provided that sufficient spares for the blower and its prime mover are carried on board to enable any failure of the blower and its prime mover to be rectified by the ship's crew.

2.3.1.4.2 Where inert gas generators are served by positive displacement blowers, a pressure relief device shall be provided to prevent excess pressure being developed on the discharge side of the blower.

2.3.1.4.3 When two blowers are provided, the total required capacity of the inert gas system shall be divided evenly between the two and in no case is one blower to have a capacity less than 1/3 of the total required.

2.3.1.5 Inert gas isolating valves

For systems using flue gas, flue gas isolating valves shall be fitted in the inert gas mains between the boiler uptakes and the flue gas scrubber. These valves shall be provided with indicators to show whether they are open or shut, and precautions shall be taken to maintain them gas-tight and keep the seatings clear of soot. Arrangements shall be

made to ensure that boiler soot blowers cannot be operated when the corresponding flue gas valve is open.

2.3.1.6 Prevention of flue gas leakage

2.3.1.6.1 Special consideration shall be given to the design and location of scrubber and blowers with relevant piping and fittings in order to prevent flue gas leakages into enclosed spaces.

2.3.1.6.2 To permit safe maintenance, an additional water seal or other effective means of preventing flue gas leakage shall be fitted between the flue gas isolating valves and scrubber or incorporated in the gas entry to the scrubber.

2.3.2 Indicators and alarms

2.3.2.1 In addition to the requirements in paragraph 2.2.4.2, means shall be provided for continuously indicating the temperature of the inert gas at the discharge side of the system, whenever it is operating.

2.3.2.2 In addition to the requirements of paragraph 2.2.4.5, audible and visual alarms shall be provided to indicate:

.1 insufficient fuel oil supply to the oil-fired inert gas generator;

.2 failure of the power supply to the generator;

.3 low water pressure or low water flow rate to the cooling and scrubbing arrangement;

.4 high water level in the cooling and scrubbing arrangement;

.5 high gas temperature;

.6 failure of the inert gas blowers; and

.7 low water level in the water seal.

2.4 Requirements for nitrogen generator systems

In addition to the provisions in paragraph 2.2, for inert gas systems using nitrogen generators, the provisions of this section shall apply.

2.4.1 System requirements

2.4.1.1 The system shall be provided with one or more compressors to generate enough positive pressure to be capable of delivering the total volume of gas required by paragraph 2.2.1.2.

2.4.1.2 A feed air treatment system shall be fitted to remove free water, particles and traces of oil from the compressed air.

2.4.1.3 The air compressor and nitrogen generator may be installed in the engine-room or in a separate compartment. A separate compartment and any installed equipment shall be treated as an "Other machinery space" with respect to

fire protection. Where a separate compartment is provided for the nitrogen generator, the compartment shall be fitted with an independent mechanical extraction ventilation system providing six air changes per hour. The compartment is to have no direct access to accommodation spaces, service spaces and control stations.

2.4.1.4 Where a nitrogen receiver or a buffer tank is installed, it may be installed in a dedicated compartment, in a separate compartment containing the air compressor and the generator, in the engine room, or in the cargo area. Where the nitrogen receiver or a buffer tank is installed in an enclosed space, the access shall be arranged only from the open deck and the access door shall open outwards. Adequate, independent mechanical ventilation, of the extraction type, shall be provided for such a compartment.

2.4.2 Indicators and alarms

2.4.2.1 In addition to the requirements in paragraph 2.2.4.2, instrumentation is to be provided for continuously indicating the temperature and pressure of air at the suction side of the nitrogen generator.

2.4.2.2 In addition to the requirements in paragraph 2.2.4.5, audible and visual alarms shall be provided to include:

.1 failure of the electric heater, if fitted;

.2 low feed-air pressure or flow from the compressor;

.3 high air temperature; and

.4 high condensate level at automatic drain of water separator."