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To: relevant departments of the Headquarters, Shanghai Rules & Research Institute, plan approval centers, branches (offices), relevant shipyards, product manufacturers, designers, ship management companies and shipowners

Notice on Implementation of Resolution MSC.367(93) on Amendments to FSS Code

1 Foreword

1.1 The Maritime Safety Committee of International Maritime Organization, at its ninety-third session, adopted on 22 May 2014 resolution MSC.367(93) on Amendments to Chapter 15 "Inert Gas Systems" of FSS Code, which will enter into force on 1 January 2016.

1.2 The Circular provides explanation on revision of Annex of resolution MSC.367(93) and survey and certification requirements to be followed during implementation of the amendments.

1.3 The original English version and Chinese translation of resolution MSC.367(93) and its annex are given respectively in Annexes 1 and 2 of the Circular.

2 Main revisions

2.1 Application

2.1.1 Inert gas systems required to be provided by SOLAS Reg.II-2/4.5.5 amended by resolution MSC.365(93), i.e. Chapter 15 "Inert Gas Systems" of FSS Code amended by resolution MSC.367(93).

2.1.2 Resolution MSC.367(93) provides requirements for relevant performance standards for inert gas systems, mainly involving following three types of inert gas systems:

(1) treated flue gas from main or auxiliary boilers;

(2) gas from an oil or gas-fired gas generator; or

(3) gas from nitrogen generators.

2.1.3 Resolution MSC.367(93) combines Chapter 15 of existing FSS Code and resolution A.567(14) "Regulation for inert gas systems on chemical tankers" into one document, and refers to part of the requirements of IACS UR F20 "Inert Gas". Therefore, in addition to tankers carrying crude oil or petroleum products having a flashpoint not exceeding 60℃ (closed cup test, as determined by an approved flashpoint apparatus) and a Reid vapour pressure which is below the atmospheric pressure or other liquid products having a similar fire hazard referred to in SOLAS Reg.II-2/1.6.1, the resolution also applies to chemical tankers carrying products which introduce

additional fire hazards referred to in SOLAS Reg.II-2/1.6.2.

2.2 Main revisions

2.2.1 The whole chapter includes four parts, including:

(1) relevant definitions;

(2) general requirements for all systems, such as functional requirements, source of inert gas, safety measures, requirements for system components, indicators and alarms and instruction manuals;

(3) additional requirements for flue and gas or oil type systems, such as requirements for system and arrangement, indicators and alarms;

(4) additional requirements for nitrogen generators, such as requirements for system and arrangement, indicators and alarms.

2.2.2 Comparison of newly revised Chapter 15 of FSS Code with existing text is shown in Annex 3.

3 Explanation on implementation

3.1 Date of entry into force and application

3.1.1 According to the requirements of resolution MSC.367(93), amendments to Chapter 15 of FSS Code will enter into force on 1 January 2016, i.e. ships constructed on or after that day and engaged on international voyages, including relevant products and systems, shall meet the requirements of amendments.

3.2 Product survey

3.2.1 Since the date of entry into force of the Circular, when product survey review is carried out to inert gas systems, the applicant shall be required to define the date on which the ship's keels are laid. For inert gas systems on ships constructed on or after 1 January 2016, plan approval, approval and survey shall be carried out according to new requirements of resolution MSC.367(93). Type approval certificates and product certificates shall be issued, and the resolution No. shall be marked out in the applicative standard column of the corresponding certificates.

3.3 Ship plan approval, survey of newbuildings and ships in service

3.3.1 When carrying out plan approval to oil tankers and chemical tankers constructed on or after 1 January 2016, the surveyor shall pay attention to the fact that inert gas systems installed on board ship shall meet the new requirements of resolution MSC.367(93), especially applicable scope and different type.

3.3.2 When surveyor for survey of newbuildings carries out survey to above-mentioned equipment and system on ships constructed on or after 1 January 2016, there shall be product certificate meeting resolution MSC.367(93), and the surveyor shall check according to the requirements of this resolution.

3.3.3 Surveyor for survey of ships in service shall pay attention to the fact that:

(1) For tankers constructed before 1 January 2016 but after 1 July 2002 and carrying crude oil or petroleum products having a flashpoint not exceeding 60℃ (closed cup test, as determined by an approved flashpoint apparatus) and a Reid vapour pressure which is below the atmospheric pressure or other liquid products having a similar fire hazard referred to in SOLAS Reg.II-2/1.6.1, inert gas systems installed on board ship shall meet the requirements of Chapter 15 of FSS Code adopted by resolution MSC.98(73).

(2) For chemical tankers constructed before 1 January 2016 but after 1 July 2002 and carrying products which introduce additional fire hazards referred to in SOLAS Reg.II-2/1.6.2, inert gas systems installed on board ship shall meet IBC Code and the requirements adopted by resolution A.567(14).

4 Entry into force

The Circular enters into force on the date of issuance. Before the revision of instructions for survey of products and newbuildings is changed, such surveys are carried out according to the provisions of the Circular.

5 Other hints

The Circular is made public on CCS website (www.ccs.org.cn), and be transmitted to the relevant shipyards, marine product manufacturers, ship owners and designers by the survey units and plan approval centers of CCS within their responsible area.

Please contact Technical Management Department of the Headquarters for any inquiry in the implementation (email: rt@ccs.org.cn).

6 Annexes

Annex 1: Resolution MSC.367(93) and Annex

Annex 2: Chinese translation of resolution MSC.367(93) “Amendments to the International Code for Fire Safety Systems (FSS Code)” and its Annex

(Note: the original English version shall prevail in case of any doubt over the Chinese translation contained in the annex of the Circular).

Annex 3: The revision content comparison list to Chapter 15 of FSS Code

Annex 1:

RESOLUTION MSC.367(93)
(adopted on 22 May 2014)

AMENDMENTS TO THE INTERNATIONAL CODE FOR FIRE SAFETY SYSTEMS (FSS CODE)

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

NOTING resolution MSC.98(73), by which it adopted the International Code for Fire Safety Systems (hereinafter referred to as "the FSS Code"), which has become mandatory under chapter II-2 of the International Convention for the Safety of Life at Sea (SOLAS), 1974 (hereinafter referred to as "the Convention"),

NOTING ALSO article VIII(b) and regulation II-2/3.22 of the Convention concerning the procedure for amending the FSS Code,

HAVING CONSIDERED, at its ninety-third session, amendments to the FSS Code proposed and circulated in accordance with article VIII(b)(i) of the Convention,

1 **ADOPTS**, in accordance with article VIII(b)(iv) of the Convention, amendments to the FSS Code, the text of which is set out in the annex to the present resolution;

2 **DETERMINES**, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the amendments shall be deemed to have been accepted on 1 July 2015 unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have notified their objections to the amendments;

3 **INVITES** Contracting Governments to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2016 upon their acceptance in accordance with paragraph 2 above;

4 **REQUESTS** the Secretary-General, in conformity with article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Contracting Governments to the Convention;

5 **ALSO REQUESTS** the Secretary-General to transmit copies of this resolution and its annex to Members of the Organization, which are not Contracting Governments to the Convention.

ANNEX

AMENDMENTS TO THE INTERNATIONAL CODE FOR FIRE SAFETY SYSTEMS (FSS CODE)

CHAPTER 15
INERT GAS SYSTEMS

The text of existing chapter 15 is replaced by the following:

"1 Application

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

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% of the lower flammable limit (LFL), the oxygen content is at least 21%, and no toxic gases are present[*].

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

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

cargo tanks non-flammable[*].

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% 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% 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% of the inert gas capacity; and

.5 delivering inert gas with an oxygen content of not more than 5% 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

[*] 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).

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% 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[*].

[*] 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% 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%, 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.

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

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

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 gastight 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."

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Annex 3:

The revision content comparison list to Chapter 15 of FSS Code

Resolution MSC.367(93)	Existing text		Contrast of revised Chapter 15 of FSS Code with existing text
Chapter 15 of FSS Code (revised)	**Chapter 15 of FSS Code (existing)**	**ResolutionA.567(14)**	
1 Application This chapter details the specifications for inert gas systems as required by chapter II-2 of the Convention.	**1 Application** This chapter details the specifications for inert gas systems as required by chapter II-2 of the Convention.		
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.	**2.1.1** Throughout this chapter the term cargo tank includes also slop tanks.	Footnote of regulation 1: Throughout this Regulation the term "cargo tank" includes also "slop tanks containing oil residues".	Newly added according the contents of this Chapter.
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.		Footnote of regulation 1: "Inert gas generator system" means the machinery dedicated to the production and supply of inert gas and includes the air blowers, combustion chambers, oil fuel pumps and burners, gas coolers / scrubbers and automatic combustion control and supervision equipment, e. g. flame failure devices.	Newly added according the contents of this Chapter.
2.1.3 *Gas-safe space* is a space in which the entry of gases would produce hazards with regard to flammability or toxicity.	Footnote of 2.3.1.3.2: A gas-safe space is a space in which the entry of hydrocarbon gases would produce hazards with regard to flammability or toxicity.	Footnote of regulation 9: Gas-safe space is a space in which the entry of hydrocarbon 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% of the lower flammable limit (LFL), the oxygen content is at least 21%, and no toxic gases are present[1].			Newly added
2.2 Requirements for all systems ***2.2.1 General***			

[1] Refer to the *Revised recommendations for entering enclosed spaces aboard ships* (resolution A.1050(27)).

Resolution MSC.367(93)	Existing text		Contrast of revised Chapter 15 of FSS Code with existing text
Chapter 15 of FSS Code (revised)	**Chapter 15 of FSS Code (existing)**	**ResolutionA.567(14)**	
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[2].	**2.1.2** 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 so designed[3] and operated as to render and maintain the atmosphere of the cargo tanks non-flammable at all times, except when such tanks are required to be gas-free. In the event that the inert gas system is unable to meet the operational requirement set out above and it has been assessed that it is impracticable to effect a repair, then cargo discharge, deballasting and necessary tank cleaning shall only be resumed when the "emergency conditions" specified in the Guidelines[4] on inert gas systems are complied with.	1 Inert gas generator systems shall be designed, constructed and tested to the satisfaction of the Administration. They shall be designed and operated so as to render and maintain the atmosphere of cargo tanks non-flammable at all times except when such tanks are required to be maintained empty and gas-free.	
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% 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;		2 The systems shall be capable of: .1 inerting empty cargo tanks by reducing the oxygen content of the atmosphere in each tank	Because sources of various inert gas required by 2.2.1.4 are covered, in 2.2.1.2.3, in addition to hydrocarbon, other flammable vapour are included. In 2.2.1.2.4, the second sentence is added, which

[2] 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).

[3] 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) and the Revised factors to be taking into consideration when designing cargo tank venting and gas-freeing arrangements (MSC/Circ.450/Rev.1).

[4] 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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.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% 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% of the inert gas capacity; and .5 delivering inert gas with an oxygen content of not more than 5% by volume to the cargo tanks at any required rate of flow.	**2.1.3 Required functions** The system shall be capable of: **.1** inerting empty cargo tanks by reducing the oxygen content of the atmosphere in each tank to a level at which combustion cannot be supported; **.2** maintaining the atmosphere in any part of any cargo tank with an oxygen content not exceeding 8% by volume and at a positive pressure at all times in port and at sea except when it is necessary for such a tank to be gas-free; **.3** 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; and **.4** purging empty cargo tanks of a hydrocarbon gas, so that subsequent gas-freeing operations will at no time create a flammable atmosphere within the tank. **2.2.1.2** The system shall be capable of delivering inert gas to the cargo tanks at a rate of at least 125% of the maximum rate of discharge capacity of the ship expressed as a volume. **2.2.1.3** The system shall be capable of delivering inert gas with an oxygen content of not more than 5 % by volume in the inert gas supply main to the cargo tanks at any required rate of flow.	to a level at which combustion cannot be supported; .2 maintaining the atmosphere, in all parts of each cargo tank designated to carry flammable products requiring protection by an inert gas system, with an oxygen content not exceeding 8 % by volume and at a positive pressure at all times in port and at sea except when it is necessary for such a tank to be gas-free; .3 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; .4 purging empty cargo tanks of flammable vapour, so that subsequent gas-freeing operations will at no time create a flammable atmosphere within the tank. 3.1 The system shall be capable of delivering inert gas to the cargo tanks at a rate of at least 125 % of the maximum rate of discharge capacity of the ship expressed as a volume. An 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 80 % of the inert gas capacity. 3.2 The systems shall be capable of delivering inert gas with an oxygen content of not more than 5 % by volume in the inert gas supply main to the cargo tanks at any required rate of flow.	is from resolution A.567(14).
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.			Newly added, from IACS UR F20.1.1.3 and F20.2.3.2 (see 4.1.1.2(2) and 4.2.1.3（2）, PART SIX of CCS Rules for Classification of Seagoing

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			Steel Ships), with some revision.
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.	**2.2.1.1** The inert gas supply may be treated flue gas from main or auxiliary boilers. The Administration may accept systems using flue gases from one or more separate gas generators or other sources or any combination thereof, provided that an equivalent standard 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.	1 Inert gas systems supplied by one or more oil-fired inert gas generators may be accepted. An Administration may accept systems using inert gas from other sources provided that an equivalent standard of safety is achieved.	
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.	**2.2.3.2** 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.	6.2 The inert gas system shall be so designed that the maximum pressure which they 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.	**2.3.1.5.1** Automatic shutdown of the inert gas blowers and gas regulating valve shall be arranged on predetermined limits being reached in respect of paragraphs 2.4.3.1.1, 2.4.3.1.2 and 2.4.3.1.3**.** **2.3.1.5.2** Automatic shutdown of the gas regulating valve shall be arranged in respect of paragraph 2.4.3.1.4.	17.2 Automatic shutdown of the gas regulating valve and of the fuel oil supply to the inert gas generator shall be arranged on predetermined limits being reached in respect of paragraphs 17.1.1 and 17.1.3. 17.3 Automatic shutdown of the gas regulating valve shall be arranged in respect of paragraph 17.1.4.	With some revision and adjustment on predetermined limits for automatic shutdown, the existing words “blowers and gas regulating valve” are revised to “inert gas system and its components parts”.
2.2.2.3 Suitable shutoff arrangements shall be provided on the discharge outlet of each generator plant.		6.3 Where more than one inert gas generator is provided, suitable shutoff arrangements shall be provided on the discharge outlet of each generator plant.	Newly added, from resolution A.567(14).

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2.2.2.4 The system shall be designed to ensure that if the oxygen content exceeds 5% by volume, the inert gas shall be automatically vented to atmosphere.	**2.3.1.6 Oxygen rich gas** In respect of paragraph 2.4.3.1.5, when the oxygen content of the inert gas exceeds 8% by volume, immediate action shall be taken to improve the gas quality. Unless the quality of the gas improves, all cargo tank operations shall be suspended so as to avoid air being drawn into the tanks and the isolation valve referred to in paragraph 2.3.1.4.3 shall be closed.	6.4 Arrangements shall be made to vent the inert gas to the atmosphere in case the inert gas produced is off-specification, e. g. during starting-up or in case of equipment failure. 17.4 In respect of paragraph 17.1.5, when the oxygen content of the inert gas exceeds 8 % by volume, immediate action shall be taken to improve the gas quality. Unless the quality of the inert gas improves, all operations in those tanks to which inert gas is being supplied shall be suspended so as to avoid air being drawn into the tanks. The deck isolation valve referred to in paragraph 9.8 shall be closed and the off-specification gas shall be vented to atmosphere.	With some revision, the existing requirements, i.e. when the oxygen content of the inert gas exceeds 8% by volume, immediate action shall be taken to improve the gas quality, are revised to that the system shall be designed to ensure that if the oxygen content exceeds 5% 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.	2.2.3.2 Suitable shutoff arrangements shall be provided on the suction and discharge connections of each blower. Arrangements shall be provided to enable the functioning of the inert gas plant to be stabilized before commencing cargo discharge. If the 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.	**2.3.2.7** If a connection is fitted between the inert gas supply 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.		Newly added, from IACS UR F20.3.3 (see 4.2.2.3, PART SIX of CCS Rules for Classification of Seagoing Steel Ships), with some revision.
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	**2.3.1.4.1** At least two non-return devices, one of which shall be a water seal, shall be fitted in the inert gas supply main, in order to prevent the return of hydrocarbon vapour to the machinery space uptakes or	9.1 At least two nonreturn devices, one of which shall be a water seal, shall be fitted in the inert gas supply main in order to prevent the return of flammable vapour to the inert gas generator and to	2.2.3.1.1 is revised, i.e. in addition to vapour (including hydrocarbon gas and flammable

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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.	to any gas-safe spaces under all normal conditions of trim, list and motion of the ship. They shall be located between the automatic valve required by paragraph 2.3.1.3.1 and the aftermost connection to any cargo tank or cargo pipeline.	any gas-safe space under all normal conditions of trim, list and motion of the ship. They shall be located between the automatic valve required by paragraph 8 and the first connection to any cargo tank or cargo pipeline. An Administration may permit an alternative arrangement or device providing a measure of safety equivalent to that of a water seal.	vapour), it shall prevent the return of liquid to "inert gas plant" rather than to existing "machinery space uptakes or to any gas-safe spaces". 2.2.3.1.2 is newly added, which is from IACS UR F20.3.3 (see 4.2.2.3, PART SIX of CCS Rules for Classification of Seagoing Steel Ships).
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.	**2.3.1.4.3** The second device shall be a non-return valve or equivalent capable of preventing the return of vapours or liquids and fitted forward of the deck water seal required in paragraph 2.3.1.4.1. 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 forward of the non-return valve to isolate the deck water seal from the inert gas main to the cargo tanks.	9.8 The second device shall be a nonreturn valve or equivalent capable of preventing the return of vapours or liquids or both and fitted between the water seal (or the equivalent device) required in paragraph 9.1 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 nonreturn valve and the first connection to the cargo tanks to isolate the water seal (or equivalent device).	With some revision, from resolution A.567(14).
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.	**2.2.4.1** The water seal referred to in paragraph 2.3.1.4.1 shall be capable of being supplied by two separate pumps, each of which shall be capable of maintaining an adequate supply at all times. **2.2.4.6** In respect of paragraph 2.4.3.1.7, the Administration shall be satisfied as to the maintenance of an adequate reserve of water at all times and the integrity of the arrangements to permit the automatic formation of the water seal when the gas flow ceases. The audible and	9.3 The water seal referred to in paragraph 9.1 shall be capable of being supplied by two separate pumps, each of which shall be capable of maintaining an adequate supply at all times. 17.6 In respect of paragraph 17.1.7 the Administration shall be satisfied as to the maintenance of an adequate reserve of water at all times and the integrity of the arrangements to permit the automatic formation of the water seal when the gas flow ceases. The audible and visual alarm on the low level of water in the water	With some revision, requiring that the audible and visual alarm on the low level of water in the water seal shall operate at all times rather than when inert gas is not provided.

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	visual alarm on the low level of water in the water seal shall operate when the inert gas is not being supplied.	seal shall operate when the inert gas is not being supplied.	
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.	**2.2.4.2** The arrangement of the seal and its associated fittings shall be such that it will prevent backflow of hydrocarbon vapours and will ensure the proper functioning of the seal under operating conditions.	9.4 The arrangement of the water seal and its associated provisions shall be such that it will prevent backflow of flammable vapours and will ensure the proper functioning of the water seal under operation conditions.	With some revision, i.e. in addition to vapour (including hydrocarbon gas and flammable vapour), it shall prevent the return of liquid.
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.	**2.2.4.3** 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.	9.5 Provisions shall be made to ensure that any water seal is protected against freezing, in such a way that the integrity of water 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.	**2.2.4.4** 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.	9.6 A water loop or other approved arrangement shall also be fitted to all associated water supply and drain piping and to all venting or pressure sensing piping 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.	**2.2.4.5** The deck water seal and loop arrangements shall be capable of preventing return of hydrocarbon vapours at a pressure equal to the test pressure of the cargo tanks.	9.7 Any water seal or equivalent device and all loop arrangements shall be capable of preventing the return of flammable vapours to an inert gas generator at a pressure equal to the test pressure of the cargo tanks.	With some revision, i.e. in addition to vapour (including hydrocarbon gas and flammable vapour), it shall prevent the return of liquid to "inert gas plant".
2.2.3.1.9 The non-return devices shall be located in the cargo area on deck.	**2.3.1.4.2** The devices referred to in paragraph 2.3.1.4.1 shall be located in the cargo area on deck.	9.2 The devices referred to in paragraph 9.1 shall be located in the cargo tank 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.	**2.3.2.1** The inert gas main may be divided into two or more branches forward of the non-return devices required by paragraphs 2.2.4 and 2.3.1.4.	10.1 The inert gas main may be divided into two or more branches between the nonreturn devices required by paragraph 9 and the cargo tanks.	
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,	**2.3.2.2** The inert gas supply main shall be fitted with branch piping leading to each cargo tank. Branch piping for inert gas shall be fitted with either stop valves or equivalent means of control for isolating each tank.	10.2 Inert gas supply mains shall be fitted with branch piping leading to each cargo tank designated for the carriage of flammable products required to be inerted by this Regulation.	With some revision, i.e. the operational status of stop valves shall be provided to the control

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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.	Where stop valves are fitted, they shall be provided with locking arrangements, which shall be under the control of a responsible ship's officer. The control system operated shall provide unambiguous information of the operational status of such valves.		panel.
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.		10.2 Each cargo tank containing or loading products not required to be inerted shall be 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.	Newly added, from resolution A.567(14).
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.	**2.3.2.4** Means shall be provided to protect cargo tanks against the effect of overpressure or vacuum caused by thermal variations when the cargo tanks are isolated from the inert gas mains.	10.3 Means shall be provided to protect cargo tanks against the effect of overpressure or vacuum caused by thermal variations when the cargo tanks are isolated from the inert gas mains.	With some revision
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.	**2.3.2.5** Piping systems shall be so designed as to prevent the accumulation of cargo or water in the pipelines under all normal conditions.	10.4 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.	**2.3.2.6** 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 referred to in paragraph 2.3.1.4.3. 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.	10.5 Suitable arrangements shall be provided to enable the inert gas main to be connected to an external supply of inert gas.	
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	**2.3.2.7** If a connection is fitted between the inert gas supply main and the cargo piping system, arrangements shall be made to ensure an effective isolation having		

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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.	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.	**2.3.2.8** The valve separating the inert gas supply 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.		4.3 Inert gas piping systems shall not pass through accommodation, service and control station spaces.	Newly added, from resolution A.567(14).
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[5].	**2.3.2.3** 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 on inert gas systems.		
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.			Newly added, requiring that 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.	**2.4.2.1** Instrumentation shall be fitted for continuously indicating and permanently recording, when inert gas is being supplied: **.1** the pressure of the inert gas supply mains forward of the non-return devices required by paragraph 2.3.1.4.1; and **.2** the oxygen content of the inert gas in the inert gas supply mains on the discharge side of the gas blowers.	14.1 Instrumentation shall be fitted for continuously indicating and permanently recording, when the inert gas is being supplied: .1 the pressure of the inert gas supply mains between the nonreturn devices required by paragraph 9.1 and the cargo tanks; and .2 the oxygen content of the inert gas supply main.	

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

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Chapter 15 of FSS Code (revised)	**Chapter 15 of FSS Code (existing)**	**ResolutionA.567(14)**	
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.	**2.4.2.2** The devices referred to in paragraph 2.4.2.1 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.	14.2 The devices referred to in paragraph 14.1 shall be placed in the cargo control room where provided. 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.	**2.4.2.3** In addition, meters shall be fitted: **.1** in the navigating bridge to indicate at all times the pressure referred to in paragraph 2.4.2.1.1 and the pressure in the slop tanks of combination carriers, whenever those tanks are isolated from the inert gas supply main; and **.2** in the machinery control room or in the machinery space to indicate the oxygen content referred to in paragraph 2.4.2.1.2.	14.3 In addition, meters shall be fitted: .1 in the navigating bridge to indicate at all times the pressure referred to in paragraph 14.1.1; and .2 in the machinery control room or in the machinery space to indicate the oxygen content referred to in paragraph 14.1.2.	
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% 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.	**2.4.3.1** For inert gas systems of both the flue, gas type and the inert gas generator type, audible and visual alarms shall be provided to indicate: **.1** low water pressure or low water flow rate to the flue gas scrubber as referred to in paragraph 2.2.2.1; **.2** high water level in the flue gas scrubber as referred to in paragraph 2.2.2.1; **.3** high gas temperature as referred to in paragraph 2.4.1; **.4** failure of the inert gas blowers referred to in paragraph 2.2.3; **.5** oxygen content in excess of 8% by volume as referred to in paragraph 2.4.2.1.2**;** **.6** failure of the power supply to the automatic control system for the gas regulating valve and to the indicating devices as referred to in paragraphs 2.3.1.3 and 2.4.2.1; **.7** low water level in the water seal as referred to in paragraph 2.3.1.4.1;	17.1 Audible and visual alarms shall be provided to indicate: .1 low water pressure or low water flow rate to the cooling and scrubbing arrangement referred to in paragraph 5.1; .2 low fuel supply; .3 high gas temperature as referred to in paragraph 13; .4 failure of the power supply to the inert gas generators; .5 oxygen content in excess of 8 per cent by volume as referred to in paragraph 14.1.2; .6 failure of the power supply to the indicating devices as referred to in paragraph 14.1 and to the automatic control systems for the gas regulating valve referred to in paragraph 8 and the inert gas generator; .7 low water level in the water seal as referred to in paragraph 9.1; .8 gas pressure less than 100 mm water gauge as	With some revision, i.e. oxygen content of inert gas generated by inert gas system shall not exceed 5% by volume.

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	.8 gas pressure less than 100 mm water gauge as referred to in paragraph 2.4.2.1.1. The alarm arrangement shall be such as to ensure that the pressure in slop tanks in combination carriers can be monitored at all times; and **.9** high gas pressure as referred to in paragraph 2.4.2.1.1.	referred to in paragraph 14.1; .9 high gas pressure as referred to in paragraph 14.1.1.	
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.	**2.4.3.3** The alarms required in paragraphs 2.4.3.1.5, 2.4.3.1.6 and 2.4.3.1.8 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.	17.5 The alarms required in paragraphs 17.1.5, 17.1.6 and 17.1.8 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 either as individual alarms or as a group alarm.	
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.	**2.4.3.4** An audible alarm system independent of that required in paragraph 2.4.3.1.8 or automatic shutdown of cargo pumps shall be provided to operate on predetermined limits of low pressure in the inert gas main being reached.	17.7 An audible alarm system independent of that required in paragraph 17.1.8 or automatic shutdown of cargo pumps shall be provided to operate on predetermined limits of low pressure in the inert gas mains 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%, 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.			Newly added
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.	**2.4.4 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.	18 Detailed instruction manuals shall be provided on board, covering the operations, safety and maintenance requirements and occupational 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.	
2.3 Requirements for flue gas and inert gas generator			

Resolution MSC.367(93)	Existing text		Contrast of revised Chapter 15 of FSS Code with existing text
Chapter 15 of FSS Code (revised)	**Chapter 15 of FSS Code (existing)**	**ResolutionA.567(14)**	
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.	**2.2.1.4** Two fuel oil pumps shall be fitted to the inert gas generator. The Administration may permit only one fuel oil pump on condition that sufficient spares for the fuel oil pump and its prime mover are carried on board to enable any failure of the fuel oil pump and its prime mover to be rectified by the ship's crew.	7 Two fuel oil pumps shall be fitted to each inert gas generator. An Administration may permit only one fuel oil pump on condition that sufficient spares for the fuel oil pump and its prime mover are carried on board to enable any failure on the fuel oil pump and its prime mover to be rectified by the ship's crew. 4.1 Suitable fuel in sufficient quantity shall be provided for the inert gas generators.	The second sentence is newly added, which is from resolution A.567(14).
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.		4.2 The inert gas generators shall be located outside the cargo tank area as defined in the Bulk Chemical Code and the International Bulk Chemical Code. Spaces containing inert gas generators should 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 they shall be located in a compartment reserved solely for their use. Such a compartment shall be separated by a gastight steel bulkhead and/or deck from accommodation, service and control station spaces as defined in the Bulk Chemical Code and the International Bulk Chemical Code. Adequate positive-pressure type mechanical ventilation shall be provided for such a compartment. Access to such compartments located aft shall be only from an open deck outside the cargo tank area. Access shall be located on the end bulkhead not facing the cargo area and/or on the outboard side of the superstructure or deckhouse at a distance of at least 25 % of the length of the ship but not less than 5 m from the end of the superstructure or deckhouse facing the cargo area. In	Newly added, from resolution A.567(14).

Resolution MSC.367(93)	Existing text		Contrast of revised Chapter 15 of FSS Code with existing text
Chapter 15 of FSS Code (revised)	**Chapter 15 of FSS Code (existing)**	**ResolutionA.567(14)**	
		the case of such a compartment being located in the forecastle, access shall be through the deckhouse forward of the cargo area.	
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.	**2.3.1.3 Gas regulation valves** **2.3.1.3.1** A gas regulating valve shall be fitted in the inert gas supply main. This valve shall be automatically controlled to close as required in paragraphs 2.3.1.5**.** 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 speed of the inert gas blowers required in paragraph 2.2.3.	8 A gas regulating valve shall be fitted in the inert gas supply main. This valve shall be automatically controlled to close as required in paragraphs 17.2 and 17.3. It shall also be capable of automatically regulating the flow of inert gas to the cargo tanks unless other means are provided to automatically control the inert gas flow rate.	With some revision, i.e. blower speed is changed to 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.	**2.3.1.3.2** The valve referred to in paragraph 2.3.1.3.1 shall be located at the forward bulkhead of the forward most gas-safe space[6] through which the inert gas supply 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.	**2.2.2.1** A flue gas scrubber shall be fitted which will effectively cool the volume of gas specified in paragraphs 2.2.1.2 and 2.2.1.3 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.	5.1 Means shall be provided which will effectively cool the volume of gas specified in paragraph 3 and remove solids and sulphur combustion products. The cooling water arrangements shall be such that an adequate supply of water will always 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.	**2.2.2.2** Filters or equivalent devices shall be fitted to minimize the amount of water carried over to the inert gas blowers.	5.2 Filters or equivalent devices shall be fitted to minimize the amount of water carried over to the inert gas main.	
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	**2.2.3.1** At least two blowers shall be fitted and be capable of delivering to the cargo tanks at least the volume of gas required by paragraphs 2.2.1.2 and 2.2.1.3. For systems with gas generators the Administration may permit only one blower if that	6.1 Two air blowers shall be fitted to each inert gas generator, which together shall be capable of delivering to the cargo tanks, required to be protected by the system, at least the volume of gas required by paragraph 3. An Administration may permit only one	

[6] A gas-safe space is a space in which the entry of hydrocarbon gases would produce hazards with regard to flammability or toxicity.

Resolution MSC.367(93)	Existing text		Contrast of revised Chapter 15 of FSS Code with existing text
Chapter 15 of FSS Code (revised)	**Chapter 15 of FSS Code (existing)**	**ResolutionA.567(14)**	
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.	system is capable of delivering the total volume of gas required by paragraphs 2.2.1.2 and 2.2.1.3 to the protected 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.	blower if it is capable of delivering to the projected cargo tanks the total volume of gas required by paragraph 3, provided that sufficient spares for the air blower and its prime mover are carried on board to enable any failure of the air blower and its prime mover to be rectified.	
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.		6.5 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.	Newly added, from resolution A.567(14).
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.			Newly added, from UR F20.2.3.1 (see 4.2.1.3(1), PART SIX of CCS Rules for Classification of Seagoing Steel Ships).
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 gastight 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.	2.3.1.1 Flue gas isolating valves Flue gas isolating valves shall be fitted in the inert gas supply 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.	**2.3.1.2 Prevention of flue gas leakage** **2.3.1.2.1** 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.	**2.3.1.2.2** 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.		

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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.	**2.4.1 Indication devices** Means shall be provided for continuously indicating the temperature and pressure of the inert gas at the discharge side of the gas blowers, whenever the gas blowers are operating.	13 Means shall be provided for continuously indicating the temperature and pressure of the inert gas at the discharge side of the system, whenever it is operating.	With some revision, i.e. the existing "blower" is changed to "system", only requiring to indicate the temperature of the inert gas at the discharge side of the system.
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.	**2.4.3.1** For inert gas systems of both the flue, gas type and the inert gas generator type, audible and visual alarms shall be provided to indicate: **.1** low water pressure or low water flow rate to the flue gas scrubber as referred to in paragraph 2.2.2.1; **.2** high water level in the flue gas scrubber as referred to in paragraph 2.2.2.1; **.3** high gas temperature as referred to in paragraph 2.4.1; **.4** failure of the inert gas blowers referred to in paragraph 2.2.3; **.5** oxygen content in excess of 8% by volume as referred to in paragraph 2.4.2.1.2**;** **.6** failure of the power supply to the automatic control system for the gas regulating valve and to the indicating devices as referred to in paragraphs 2.3.1.3 and 2.4.2.1; **.7** low water level in the water seal as referred to in paragraph 2.3.1.4.1; **.8** gas pressure less than 100 mm water gauge as referred to in paragraph 2.4.2.1.1.The alarm arrangement shall be such as to ensure that the pressure in slop tanks in combination carriers can be monitored at all times; and **.9** high gas pressure as referred to in paragraph 2.4.2.1.1.	17.1 Audible and visual alarms shall be provided to indicate: .1 low water pressure or low water flow rate to the cooling and scrubbing arrangement referred to in paragraph 5.1; .2 low fuel supply; .3 high gas temperature as referred to in paragraph 13; .4 failure of the power supply to the inert gas generators; .5 oxygen content in excess of 8 per cent by volume as referred to in paragraph 14.1.2; .6 failure of the power supply to the indicating devices as referred to in paragraph 14.1 and to the automatic control systems for the gas regulating valve referred to in paragraph 8 and the inert gas generator; .7 low water level in the water seal as referred to in paragraph 9.1; .8 gas pressure less than 100 mm water gauge as referred to in paragraph 14.1; .9 high gas pressure as referred to in paragraph 14.1.1.	

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	2.4.3.2 For inert gas systems of the inert gas generator type, additional audible and visual alarms shall be provided to indicate: **.1** insufficient fuel oil supply; **.2** failure of the power supply to the generator; and **.3** failure of the power supply to the automatic control system for the generator.		
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.			Newly added, from IACS UR F20.4 (see 4.2.3, PART SIX of CCS Rules for Classification of Seagoing Steel Ships).
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.			Newly added, from IACS UR F20.4.7, F20.4.8, F20.4.4 and F20.4.9 (see 4.2.3.7, 4.2.3.8, 4.2.3.4 and 4.2.3.9, PART SIX of CCS Rules for Classification of Seagoing Steel Ships).

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Chapter 15 of FSS Code (revised)	**Chapter 15 of FSS Code (existing)**	**ResolutionA.567(14)**	
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.			Newly added, from IACS UR F20.4.13 (see 4.2.3.1.6, PART SIX of CCS Rules for Classification of Seagoing Steel Ships).

Note: Underlined words in the first column are revised contents.