RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part R Fire Protection, Detection and Extinction

Rules for the Survey and Construction of Steel Ships
Part R 2015 AMENDMENT NO.2
Guidance for the Survey and Construction of Steel Ships
Part R 2015 AMENDMENT NO.2

Rule No.63 / Notice No.82 25th December 2015
Resolved by Technical Committee on 28th July 2015
Approved by Board of Directors on 14th September 2015

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RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

RULES

Part R Fire Protection, Detection and Extinction

2015 AMENDMENT NO.2

Rule No.63 25th December 2015
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Rule No.63 25th December 2015
AMENDMENT TO THE RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

"Rules for the survey and construction of steel ships" has been partly amended as follows:

Amendment 2-1

Part R FIRE PROTECTION, DETECTION AND EXTINCTION

Chapter 3 DEFINITIONS

3.2 Definitions

Paragraph 3.2.54 has been added as follows.

3.2.54 Vehicle carrier

Vehicle carrier is a cargo ship with multi deck ro-ro spaces designed for the carriage of empty cars and trucks as cargo.

Chapter 20A has been added as follows.

Chapter 20A REQUIREMENTS FOR VEHICLE CARRIERS FOR CARRIAGE OF MOTOR VEHICLES WITH COMPRESSED HYDROGEN OR COMPRESSED NATURAL GAS IN THEIR TANKS FOR THEIR OWN PROPULSION AS CARGO

20A.1 General

20A.1.1 Purpose

The purpose of this chapter is to provide additional safety measures in order to address the fire safety objectives of this part for vehicle carriers with vehicle and ro-ro spaces intended for carriage of motor vehicles with compressed hydrogen or compressed natural gas in their tanks for their own propulsion as cargo.

20A.2 General Requirements

20A.2.1 Application

In addition to complying with the requirements of **chapter 20**, as appropriate, vehicle and ro-ro spaces of vehicle carriers intended for the carriage of motor vehicles with compressed hydrogen or compressed natural gas in their tanks for their own propulsion as cargo are to comply with the requirements in **20A.3** to **20A.5**.

20A.3 Requirements for Spaces Intended for Carriage of Motor Vehicles with Compressed Natural Gas in Their Tanks for Their Own Propulsion as Cargo

20A.3.1 Electrical Equipment and Wiring

All electrical equipment and wiring are to be of a certified safe type for use in an explosive methane and air mixture.

20A.3.2 Ventilation Arrangement

1 Electrical equipment and wiring, if installed in any ventilation duct, are to be of a certified safe type for use in explosive methane and air mixtures.

2 The fans are to be such as to avoid the possibility of ignition of methane and air mixtures. Suitable wire mesh guards are to be fitted over inlet and outlet ventilation openings.

20A.3.3 Other Ignition Sources

Other equipment which may constitute a source of ignition of methane and air mixtures is not to be permitted.

20A.4 Requirements for Spaces Intended for Carriage of Motor Vehicles with Compressed Hydrogen in Their Tanks for Their Own Propulsion as Cargo

20A.4.1 Electrical Equipment and Wiring

All electrical equipment and wiring are to be of a certified safe type for use in an explosive hydrogen and air mixture.

20A.4.2 Ventilation Arrangement

1 Electrical equipment and wiring, if installed in any ventilation duct, are to be of a certified safe type for use in explosive hydrogen and air mixtures and the outlet from any exhaust duct is to be sited in a safe position, having regard to other possible sources of ignition.

2 The fans are to be designed such as to avoid the possibility of ignition of hydrogen and air mixtures. Suitable wire mesh guards are to be fitted over inlet and outlet ventilation openings.

20A.4.3 Other Ignition Sources

Other equipment which may constitute a source of ignition of hydrogen and air mixtures is not to be permitted.

20A.5 Detection

20A.5.1 Portable Gas Detectors

When a vehicle carrier carries as cargo one or more motor vehicles with either compressed hydrogen or compressed natural gas in their tanks for their own propulsion, at least two portable gas detectors are to be provided. Such detectors are to be suitable for the detection of the gas fuel and be of a certified safe type for use in the explosive gas and air mixture.

EFFECTIVE DATE AND APPLICATION (Amendment 2-1)

1. The effective date of the amendments is 1 January 2016.

2. Notwithstanding the amendments to the Rules, the current requirements may apply to ships the keels of which were laid or which were at *a similar stage of construction* before the effective date except for in cases where the amendments are to be retroactively applied.

(Note) The term "*a similar stage of construction*" means the stage at which the construction identifiable with a specific ship begins and the assembly of that ship has commenced comprising at least 50 *tonnes* or 1% of the estimated mass of all structural material, whichever is the less.

Amendment 2-2

Chapter 4 PROBABILITY OF IGNITION

4.5 Cargo Areas of Tankers

Paragraph 4.5.5 has been amended as follows.

4.5.5 Inert Gas Systems

1 For tankers of ~~20,000~~8,000 *tonnes deadweight* and upwards when carrying cargoes described in **1.2.1** or **1.2.2**, the protection of the cargo tanks (including slop tanks) is to be achieved by a fixed inert gas system in accordance with the requirements of **Chapter 35**, except that~~, in lieu of the above, the Society, after having given consideration to the ship's arrangement and equipment, may accept other fixed installations if they afford protection equivalent to the above, in accordance with **1.1.2**. The requirements for alternative fixed installations are to comply with the requirements in **-6** below.~~ the Society may accept other equivalent systems or arrangements, as described in **-6** through **-8**.

2 Tankers operating with a cargo tank cleaning procedure using crude oil washing are to be fitted with an inert gas system complying with the requirements of **Chapter 35** and with fixed tank washing machines. ~~However, such system need not be fitted in addition to the systems required in **-1** above.~~

3 Tankers required to be fitted with inert gas systems are to comply with the following provisions:

(1) double hull spaces are to 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 are to 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 are to be provided to allow connection to the inert gas main.

4 The requirements for inert gas systems of **Chapter 35** need not be applied to all gas carriers:

(1) ~~chemical tankers and gas carriers when carrying cargoes described in **1.2.1**, provided that they comply with the requirements for inert gas systems on chemical tankers~~when carrying cargoes described in regulation **1.2.1**, provided that they comply with the requirements for inert gas systems on chemical tankers established by the Society, based on the guidelines deemed appropriate by the Society; or

(2) ~~chemical tankers and gas carriers~~ when carrying flammable cargoes other than crude oil or petroleum products such as cargoes listed in **Chapters 17** and **18** of **Part S**, 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 The inert gas systems are to comply with the followings:

(1) The inert gas system is to be capable of inerting, purging and gas-freeing empty tanks and maintaining the atmosphere in cargo tanks with the required oxygen content

~~(2) The inert gas system referred to in **(1)** above is to be designed, constructed and tested in accordance with **Chapter 35**.~~

(~~3~~2) Tankers fitted with a fixed inert gas system are to be provided with a closed ullage system.

6 The Society may, after having given consideration to the ship's arrangement and equipment, accept other fixed installations, in accordance with **1.1.2** and **-8**.

7 For tankers of 8,000 *tonnes deadweight* and upwards but less than 20,000 *tonnes deadweight*, in lieu of fixed installations as required by **-6** above, the Society may accept other equivalent arrangements or means of protection in accordance with **1.1.2** and **-8**.

6~~8~~ ~~Where an installation equivalent to a fixed inert gas system is installed, it is~~ Equivalent systems or arrangements are to:

(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.

9 Inert gas systems, which are installed in ships that **-1** or **-2** above does not apply to, are to be the satisfaction of the Society.

Chapter 35 has been amended as follows.

Chapter 35 INERT GAS SYSTEMS

35.1 General

35.1.1 Application

This chapter details the specifications for inert gas systems as required by this Part.

35.2 Engineering Specifications

35.2.1 Definitions

For the purposes of this chapter,

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

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.

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

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.

35.2.2 Requirements for all systems

1 General

(1) The inert gas system referred to in this part is to be designed, constructed and tested to the satisfaction of the Society. It is to be designed to be capable of rendering and maintaining the atmosphere of the relevant cargo tanks non-flammable.

(2) The system is to be capable of the following **(a)** through **(e)**.

(a) 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

(b) 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

(c) 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

(d) 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 Society 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

(e) delivering inert gas with an oxygen content of not more than 5% by volume to the cargo tanks at any required rate of flow

(3) Materials used in inert gas systems are to 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.

(4) The inert gas supply may be the following **(a)**, **(b)** or **(c)**.

The Society 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 are to, as far as practicable, comply with the requirements of this Chapter. Systems using stored carbon dioxide are not to be permitted unless the Society is satisfied that the risk of ignition from generation of static electricity by the system itself is minimized.

(a) treated flue gas from main or auxiliary boilers

(b) gas from an oil or gas-fired gas generators

(c) gas from nitrogen generators

(5) An automatic control capable of producing suitable inert gas under all service conditions is to be fitted.

2 Safety measures

(1) The inert gas system is to 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) Automatic shutdown of the inert gas system and its components parts are to be arranged on predetermined limits being reached, taking into account the provisions of paragraphs **-4** below, **35.2.3(2)** and **35.2.4(2)**.

(3) Suitable shutoff arrangements are to be provided on the discharge outlet of each generator plant.

(4) The system is to be designed to ensure that if the oxygen content exceeds 5% by volume, the inert gas is to be automatically vented to atmosphere.

(5) Arrangements are to 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 are to be provided with blanking arrangements.

(6) Where a double block and bleed valve is installed, the system is to ensure upon of loss of power, the block valves are automatically closed and the bleed valve is automatically open.

3 System components

(1) Non-return devices

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

(b) The first non-return device is to 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 the following **i)** and **ii)** are complied with.

i) 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

ii) 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.

(c) The second non-return device is to 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 is to 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.

(d) A water seal, if fitted, is to be capable of being supplied by two separate pumps, each of which is to 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 is to operate at all times.

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

(f) Provision is to 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.

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

(h) Any water seal, or equivalent device, and loop arrangements are to 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.

(i) The non-return devices are to be located in the cargo area on deck.

(2) Inert gas lines

(a) The inert gas main may be divided into two or more branches forward of the non-return devices required by **(1)** above.

(b) The inert gas main is to be fitted with branch piping leading to the cargo tank. Branch piping for inert gas is to be fitted with either stop valves or equivalent means of control for isolating each tank. Where stop valves are fitted, they are to be provided with locking arrangements. The control system is to provide unambiguous information of the operational status of such valves to at least the control panel required in **-4** below.

(c) Each cargo tank not being inerted is to be capable of being separated from the inert gas main by the followings

i) removing spool-pieces, valves or other pipe sections, and blanking the pipe ends; or

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

iii) equivalent arrangements to the satisfaction of the Society, providing at least the same level of protection.

(d) Means are to 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.

(e) Piping systems are to be so designed as to prevent the accumulation of cargo or water in the pipelines under all normal conditions.

(f) Arrangements are to be provided to enable the inert gas main to be connected to an external supply of inert gas. The arrangements are to 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 is to conform to the appropriate class in the standards adopted for the design of other external connections in the ship's cargo piping system.

(g) If a connection is fitted between the inert gas main and the cargo piping system, arrangements are to be made to ensure an effective isolation having regard to the large pressure difference which may exist between the systems. This is to 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.

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

(i) Inert gas piping systems are not to pass through accommodation, service and control station spaces.

(j) In combination carriers, the arrangement to isolate the slop tanks containing oil or oil residues from other tanks is to consist of blank flanges which will remain in position at all times when cargoes other than oil are being carried except where deemed as appropriately by the Society.

4 Indicators and alarms

(1) The operation status of the inert gas system is to be indicated in a control panel.

(2) Instrumentation is to be fitted for continuously indicating and permanently recording, when inert gas is being supplied:

(a) the pressure of the inert gas mains forward of the non-return devices; and

(b) the oxygen content of the inert gas.

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

(4) In addition to **(1)** through **(3)** above, meters are to be fitted:

(a) in the navigating bridge to indicate at all times the pressure referred to in **(2)(a)** above and the pressure in the slop tanks of combination carriers, whenever those tanks are isolated from the inert gas main; and

(b) in the machinery control room or in the machinery space to indicate the oxygen content referred to in **(2)(b)** above.

(5) Audible and visual alarms

(a) Audible and visual alarms are to be provided, based on the system designed, to indicate

i) oxygen content in excess of 5% by volume

ii) failure of the power supply to the indicating devices as referred to in **(2)** above.

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

iv) high-gas pressure

v) failure of the power supply to the automatic control system

(b) The alarms required in **(a)i)**, **iii)** and **v)** above are to 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.

(c) An audible alarm system independent of that required in **(a)iii)** above or automatic shutdown of cargo pumps are to be provided to operate on predetermined limits of low pressure in the inert gas main being reached.

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

(6) Portable instruments for measuring oxygen and flammable vapour concentrations

At least two portable gas detectors capable of measuring flammable vapour concentrations in air and at least two portable O_2 analysers are to be provided. These gas detectors are to be capable of measuring concentrations of flammable vapours in inerted atmosphere.

5 Instruction manuals

Detailed instruction manuals are to 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 are to include guidance on procedures to be followed in the event of a fault or failure of the inert gas system.

35.2.3 Requirements for flue gas and inert gas generator systems

In addition to the provisions in **35.2.2**, for inert gas systems using flue gas or inert gas generators, the following requirements **(1)** and **(2)** are to apply.

(1) System requirements

(a) Inert gas generators

i) Two fuel oil pumps are to be fitted to the inert gas generator. Suitable fuel in sufficient quantity is to be provided for the inert gas generators.

ii) The inert gas generators are to be located outside the cargo tank area. Spaces containing inert gas generators are to 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 is to be separated by a gastight steel bulkhead and/or deck from accommodation, service and control station spaces. Adequate positive-pressure-type mechanical ventilation is to be provided for such a compartment.

(b) Gas regulating valves

i) A gas regulating valve is to be fitted in the inert gas main. This valve is to be automatically controlled to close, as required in **35.2.2-2(2)**. It is also to 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.

ii) The gas regulating valve in **i)** above is to be located at the forward bulkhead of the forward most gas-safe space through which the inert gas main passes.

(c) Cooling and scrubbing arrangement

i) Means are to be fitted which will effectively cool the volume of gas specified in **35.2.2-1(2)** and remove solids and sulphur combustion products. The cooling water arrangements are to be such that an adequate supply of water will always be available without interfering with any essential services on the ship. Provision is also to be made for an alternative supply of cooling water.

ii) Filters or equivalent devices are to be fitted to minimize the amount of water carried over to the inert gas blowers.

(d) Blowers

i) At least two inert gas blowers are to be fitted and be capable of delivering to the cargo tanks at least the volume of gas required by **35.2.2-1(2)**. For systems fitted with inert gas generators the Society may permit only one blower if that system is capable of delivering the total volume of gas required by **35.2.2-1(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.

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

iii) When two blowers are provided, the total required capacity of the inert gas system is to 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.

(e) Inert gas isolating valves

For systems using flue gas, flue gas isolating valves are to be fitted in the inert gas mains between the boiler uptakes and the flue gas scrubber. These valves are to be provided with indicators to show whether they are open or shut, and precautions are to be taken to maintain them gastight and keep the seatings clear of soot. Arrangements are to be made to ensure that boiler soot blowers cannot be operated when the corresponding flue gas valve is open.

(f) Prevention of flue gas leakage

i) Special consideration is to 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.

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

(2) Indicators and alarms

(a) In addition to the requirements in **35.2.2-4(2)**, means are to be provided for continuously indicating the temperature of the inert gas at the discharge side of the system, whenever it is operating.

(b) In addition to the requirements of **35.2.2-4(5)**, audible and visual alarms are to be provided to indicate the following **i)** through **vii)**.

i) insufficient fuel oil supply to the oil-fired inert gas generator

ii) failure of the power supply to the generator

iii) low water pressure or low water flow rate to the cooling and scrubbing arrangement

iv) high water level in the cooling and scrubbing arrangement

v) high gas temperature

vi) failure of the inert gas blowers

vii) low water level in the water seal

35.2.4 Requirements for nitrogen generator systems

In addition to the provisions in paragraph **35.2.2**, for inert gas systems using nitrogen generators, **4.5.3-4(2)**, **4.5.6-3**, **11.6.3-4** and the following requirements **(1)** and **(2)** are to apply.

(1) System requirements

(a) The inert gas is to be produced by separating air into its component gases by passing compressed air through a bundle of hollow fibres, semi-permeable membranes or adsorber materials.

(b) A nitrogen generator is to consist of a feed air treatment system and any number of membrane or adsorber modules in parallel necessary to meet the requirements in **35.2.2-1(2)(d)**.

(c) The nitrogen generator is to be capable of delivering high purity nitrogen in accordance with **35.2.2-1(2)(e)**. In addition to **35.2.2-2(4)**, the system is to be fitted with automatic means to discharge "off-spec" gas to the atmosphere during start-up and abnormal operation.

(d) The system is to be provided with one or more compressors to generate enough positive pressure to be capable of delivering the total volume of gas required by **35.2.2-1(2)**.

(e) Where two compressors are provided, the total required capacity of the system is preferably to be divided equally between the two compressors, and in no case is one compressor to have a capacity less than 1/3 of the total capacity required.

(f) The feed air treatment system fitted to remove free water, particles and traces of oil from the compressed air is to preserve the specification temperature.

(g) 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 is to be treated as an "Other machinery space" with respect to fire protection. Where a separate compartment is provided for the nitrogen generator, the compartment is to 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.

(h) 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 is to be arranged only from the open deck and the access door is to open outwards. Adequate, independent mechanical ventilation, of the extraction type, is to be provided for such a compartment.

(i) The oxygen-enriched air from the nitrogen generator and the nitrogen-product enriched gas from the protective devices of the nitrogen receiver are to be discharged to a safe location on the open deck.

(j) In order to permit maintenance, means of isolation are to be fitted between the generator and the receiver.

(2) Indicators and alarms

(a) In addition to the requirements in **35.2.2-4(2)**, instrumentation is to be provided for continuously indicating the temperature and pressure of air at the suction side of the nitrogen generator.

(b) In addition to the requirements in **35.2.2-4(5)**, audible and visual alarms are to be provided to include:

i) Failure of the electric heater, if fitted;

ii) Low feed-air pressure or flow from the compressor;

iii) High-air temperature; and

iv) High condensate level at automatic drain of water separator.

~~**35.1 General**~~

~~**35.1.1 Application**~~

~~This chapter details the specifications for inert gas systems as required by this Part.~~

35.2 Engineering Specifications

35.2.1 General Requirements

1 Throughout this chapter the term cargo tank includes also slop tanks.

2 The inert gas system referred to in this Part is to be designed, constructed and tested under the provisions of this Chapter. It is to be so designed 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.

3 The system is to 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.

4 Materials used in inert gas systems are to be suitable for their intended purpose. In particular those parts or scrubbers, blowers, non-return devices, scrubber effluent and other drain pipes which may be subject 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.

35.2.2 Supply of Inert Gas

1 The inert gas supply may be treated flue gas from main or auxiliary boilers. The Society 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 are, as far as practicable, to comply with the requirements of this Chapter. Systems using stored carbon dioxide are not to be permitted unless the Society is satisfied that the risk of ignition from generation of static electricity by the system itself is minimized.

2 The system is to 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.

3 The system is to 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.

4 Two fuel oil pumps are to be fitted to the inert gas generator. The Society 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.

5 Arrangements are to be made to vent the inert gas from inert gas generators to the atmosphere when the inert gas produced is off-specification, e.g. during starting-up or in the event of equipment failure.

6 Automatic combustion control capable of producing suitable inert gas under all service conditions is to be fitted to the inert gas generators.

35.2.3 Scrubbers

1 A flue gas scrubber is to be fitted which will effectively cool the volume of gas specified in **-2** and **-3** of **35.2.2** and remove solids and sulphur combustion products. The cooling water arrangements are to be such that an adequate supply of water will always be available without

~~interfering with any essential services on the ship. Provision is also to be made for an alternative supply of cooling water.~~

~~**2** Filters or equivalent devices are to be fitted to minimize the amount of water carried over to the inert gas blowers.~~

~~**3** The scrubber is to be located aft of all cargo tanks, cargo pump-rooms and cofferdams separating these spaces from machinery spaces of category A.~~

~~35.2.4 Blowers~~

~~**1** At least two blowers are to be fitted which are together to be capable of delivering to the cargo tanks at least the volume of gas required by **-2** and **-3** of **35.2.2**. When two blowers are provided, the total required capacity of the inert gas system is preferably to be divided equally between the two blowers, and in no case is one blower to have a capacity less than 1/3 of the total capacity required by **35.2.2-2**. In the system with gas generator the Society may permit only one blower if that system is capable of delivering the total volume of gas required by **-2** and **-3** of **35.2.2** 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.~~

~~**2** The inert gas system is to 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. Suitable shutoff arrangements are to be provided on the suction and discharge connections of each blower. Arrangements are to 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 are to be provided with blanking arrangements.~~

~~**3** The blowers are to be located aft of all cargo tanks, cargo pump-rooms and cofferdams separating these spaces from machinery spaces of category A.~~

~~35.2.5 Water Seals~~

~~**1** The water seal referred to in **35.2.6-4(1)** is to be capable of being supplied by two separate pumps, each of which is to be capable of maintaining an adequate supply at all times.~~

~~**2** The arrangement of the seal and its associated fittings is to be such that it will prevent backflow of hydrocarbon vapours and will ensure the proper functioning of the seal under operating conditions.~~

~~**3** Provision is to 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.~~

~~**4** A water loop or other approved arrangement is also to be fitted to each associated water supply and drain pipe and each venting or pressure-sensing pipe leading to gas safe spaces. (Gas safe space means a space in which the entry of hydrocarbon vapours would produce hazards with regard to flammability or toxicity. The same is referred hereinafter in this Chapter.) Means are to be provided to prevent such loops from being emptied by vacuum.~~

~~**5** The deck water seal and loop arrangements are to be capable of preventing return of hydrocarbon vapours at a pressure equal to the test pressure of the cargo tanks.~~

~~**6** In respect of **35.2.10-1(7)**, safety measures are to be taken for 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 seal is to operate when the inert gas is not being supplied.~~

~~35.2.6 Safety Measures in the System~~

~~**1** Flue gas isolating valves~~

~~(1) Flue gas isolating valves are to be fitted in the inert gas supply mains between the boiler uptakes and the flue gas scrubber.~~

(2) These valves are to be provided with indicators to show whether they are open or shut, and precautions are to be taken to maintain them gas-tight and keep the seatings clear of soot.

(3) Arrangements are to be made to ensure that boiler soot blowers cannot be operated when the corresponding flue gas valve is open.

2 Prevention of flue gas leakage

(1) Special consideration is to 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) To permit safe maintenance, an additional water seal or other effective means of preventing flue gas leakage is to be fitted between the flue gas isolating valves and scrubber or incorporated in the gas entry to the scrubber.

3 Gas regulation valves

(1) A gas regulating valve is to be fitted in the inert gas supply main. This valve is to be automatically controlled to close as required in **-5** below. It is also to 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 **35.2.4.**

(2) The valve referred to in **(1)** above is to be located at the forward bulkhead of the forward most gas-safe space through which the inert gas supply main passes.

4 Non-return devices of flue gas

(1) At least two non-return devices, one of which is to be a water seal, are to be fitted in the inert gas supply main, in order to prevent the return of hydrocarbon vapour to the machinery space uptakes or to any gas-safe spaces under all normal conditions of trim, list and motion of the ship. They are to be located between the automatic valve required by **-3** above and the aftermost connection to any cargo tank or cargo pipeline.

(2) The devices referred to in **(1)** above are to be located in the cargo area on deck.

(3) The device referred to in **(1)** above as a device other than a water seal is to 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 **(1)** above. It is to 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.

(4) As an additional safeguard against the possible leakage of hydrocarbon liquids or vapours back from the deck main, means are to be provided to permit this section of the line between the valve having positive means of closure referred to in **(3)** above and the valve referred to in **-3** above to be vented in a safe manner when the first of these valves is closed.

5 Automatic shutdown

(1) Automatic shutdown of the inert gas blowers and gas regulating valve is to be arranged on predetermined limits being reached in respect of **(1)**, **(2)** and **(3)** of **35.2.10-1.**

(2) Automatic shutdown of the gas regulating valve is to be arranged in respect of **35.2.10-1(4).** In the system with a separate inert gas generator, automatic shutdown of the gas regulating valve is also to be arranged in respect of **35.2.10-2(2).**

(3) For a separate inert gas generator, automatic shutdown of the oil fuel supply is to be arranged on predetermined limits being reached in respect of **(1)** and **(3)** of **35.2.10-1.**

6 In respect of **35.2.10-1(5)**, when the oxygen content of the inert gas exceeds 8% by volume, immediate action is to be taken to improve the gas quality. Unless the quality of the gas improves, all cargo tank operations are to be suspended so as to avoid air being drawn into the tanks and the isolation valve referred to in **-4(3)** above is to be closed.

35.2.7 Inert Gas Lines

1 The inert gas main may be divided into two or more branches forward of the non-return devices required by **35.2.5** and **35.2.6-4**.

2 The inert gas supply main is to be fitted with branch piping leading to each cargo tank. Branch piping for inert gas is to be fitted with either stop valves or equivalent means of control for isolating each tank. Where stop valves are fitted, they are to be provided with locking arrangements, which is to be under the control of a responsible ship's officer. The control system operated is to provide unambiguous information of the operational status of such valves.

3 In combination carriers, the arrangement to isolate the slop tanks containing oil or oil residues from other tanks is to consist of blank flanges which will remain in position at all times when cargoes other than oil are being carried except where deemed as appropriately by the Society.

4 Means are to 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.

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

6 Arrangements are to be provided to enable the inert gas main to be connected to an external supply of inert gas. The arrangements are to 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 **35.2.6-4(3)**. The design of the flange is to conform to the appropriate class in the standards adopted for the design of other external connections in the ship's cargo piping system.

7 If a connection is fitted between the inert gas supply mains and the cargo piping system, arrangements are to be made to ensure an effective isolation having regard to the large pressure difference which may exist between the systems. This is to 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.

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

35.2.8 Indication Devices

Means are to 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.

35.2.9 Indicating and Recording Devices

1 Instrumentation is to be fitted for continuously indicating and permanently recording, when the inert gas is being supplied:

(1) the pressure of the inert gas supply mains forward of the non-return devices required by **35.2.6-4(1)**; and

(2) the oxygen content of the inert gas in the inert gas supply mains on the discharge side of the gas blowers.

2 The devices referred to in **-1** above are to be placed in the cargo control room where provided. But where no cargo control room is provided, they are to be placed in a position easily accessible to the officer in charge of cargo operations.

3 In addition, meters are to be fitted:

(1) in the navigating bridge to indicate at all times the pressure referred to in **-1(1)** above 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 **-1(2)** above.

4 At least each 2 sets of portable instruments for measuring oxygen and flammable vapour concentration are to be provided. The portable instruments for flammable vapour concentrations are to be capable of measurement in an inerted atmosphere. In addition, suitable arrangement is to be made on each cargo tank such that the condition of the tank atmosphere can be determined using these portable instruments.

5 Suitable means are to be provided for the zero and span calibration of both fixed and portable gas concentration measurement instruments, referred to in **-4** above.

35.2.10 Audible and Visual Alarms

1 For inert gas systems of both the flue gas type and the inert gas generator type, audible and visual alarms are to be provided to indicate:

(1) low water pressure or low water flow rate to the flue gas scrubber as referred to in **35.2.3-1**;

(2) high water level in the flue gas scrubber as referred to in **35.2.3-1**;

(3) high gas temperature as referred to in **35.2.8**;

(4) failure of the inert gas blowers referred to in **35.2.4**;

(5) oxygen content in excess of 8% by volume as referred to in **35.2.9-1(1)**;

(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 **35.2.6-3** and **35.2.9-1**;

(7) low water level in the water seal as referred to in **35.2.6-4(1)**;

(8) gas pressure less than 100 *mm* water gauge as referred to in **35.2.9-1(1)**. The alarm arrangement is to 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 **35.2.9-1(1)**.

2 For inert gas systems of the inert gas generator type, additional audible and visual alarms are to 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.

3 The alarms required in **(5)**, **(6)** and **(8)** of **-1** above are to 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.

4 An audible alarm system independent of that required in **-1(8)** above or automatic shutdown of cargo pumps is to be provided to operate on predetermined limits of low pressure in the inert gas main being reached.

5 Automatic stoppage of cooling water supply to the scrubber is to be arranged in respect of **-1(2)** above.

35.2.11 Instruction Manuals

Detailed instruction manuals are to 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 are to include guidance on procedures to be followed in the event of a fault or failure of the inert gas system.

EFFECTIVE DATE AND APPLICATION (Amendment 2-2)

1. The effective date of the amendments is 1 January 2016.

2. Notwithstanding the amendments to the Rules, the current requirements may apply to ships the keels of which were laid or which were at *a similar stage of construction* before the effective date.

(Note) The term "*a similar stage of construction*" means the stage at which the construction identifiable with a specific ship begins and the assembly of that ship has commenced comprising at least 50 *tonnes* or 1% of the estimated mass of all structural material, whichever is the less.

Amendment 2-3

Chapter 16 OPERATIONS

16.3 Additional Requirements for Tankers

Paragraph 16.3.3 has been added as follows.

16.3.3 Operation of inert gas system

1 The inert gas system for tankers required in accordance with **4.5.5-1** is to 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.

2 Notwithstanding the **-1** above, for chemical tankers, the application of inert gas, may take place after the cargo tank has been loaded, but before commencement of unloading and are to 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.

3 For ships constructed after 1 January 2016, if the oxygen content of the inert gas exceeds 5% by volume, immediate action is to 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 are to be suspended so as to avoid air being drawn into the cargo tanks, the gas regulating valve, if fitted, is to be closed and the off-specification gas is to be vented to atmosphere.

4 In the event that the inert gas system is unable to meet the requirement in **-1** above and it has been assessed that it is impractical to effect a repair, then cargo discharge and cleaning of those cargo tanks requiring inerting is to only be resumed when suitable emergency procedures have been followed, taking into account guidelines developed by the Society.

EFFECTIVE DATE AND APPLICATION (Amendment 2-3)

1. The effective date of the amendments is 1 January 2016.

Amendment 2-4

Chapter 10 FIRE FIGHTING

10.5 Fire-extinguishing Arrangements in Machinery Spaces

Title of Paragraph 10.5.2 has been amended as follows.

10.5.2 Machinery Spaces <u>of Category *A*</u> ~~e~~<u>C</u>ontaining Internal Combustion Machinery

1 Fixed fire-extinguishing systems

Machinery spaces of category *A* containing internal combustion machinery are to be provided with one of the fixed fire-extinguishing systems in **10.5.1**.

2 Additional fire-extinguishing arrangements

(1) There is to be at least one portable foam applicator unit complying with the provisions of **Chapter 24**.

(2) There are to be in each such space approved foam-type fire extinguishers, each of at least 45 *l* capacity or equivalent, sufficient in number to enable foam or its equivalent to be directed on to any part of the fuel and lubricating oil pressure systems, gearing and other fire hazards. In addition, there is to be provided a sufficient number of portable foam extinguishers or equivalent which are to be so located that no point in the space is more than 10 *m* walking distance from an extinguisher and that there are at least two such extinguishers in each such space. For smaller spaces of ships the Society may consider relaxing this requirement.

EFFECTIVE DATE AND APPLICATION (Amendment 2-4)

1. The effective date of the amendments is 1 July 2016.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE

Part R Fire Protection, Detection and Extinction

2015 AMENDMENT NO.2

Notice No.82 25th December 2015
Resolved by Technical Committee on 28th July 2015

Notice No.82 25th December 2015
AMENDMENT TO THE GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

"Guidance for the survey and construction of steel ships" has been partly amended as follows:

Amendment 2-1

Part R FIRE PROTECTION, DETECTION AND EXTINCTION

R9 CONTAINMENT OF FIRE

R9.2 Thermal and Structural Boundaries

R9.2.3 Bulkheads and Decks

Sub-paragraphs -15 and -16 have been added as follows.

15 With respect to **Tables R9.1** and **R9.2**, **Part R of the Rules**, bulkheads and decks separating open decks (category **(10)**) and ro-ro/vehicle spaces (category **(11)**) are to be insulated in accordance with the following requirements:

(1) "*A*-0" fire integrity does not apply to hatches fitted on open decks adjacent to ro-ro/vehicle spaces, provided that such hatches are constructed of steel;

(2) "*A*-0" fire integrity does not apply to access doors to ro-ro/vehicle spaces fitted on open decks, provided that such access doors are constructed of steel; and

(3) "*A*-0" fire integrity does not apply to ventilators constructed of steel fitted on open decks adjacent to ro-ro/vehicle spaces.

16 With respect to **Tables R9.1** and **R9.2**, **Part R of the Rules**, bulkheads and decks separating ro-ro/vehicle spaces are to be insulated in accordance with the following requirements:

(1) Decks and bulkheads to be insulated to "*A*-30" fire integrity are those boundaries of single spaces protected by their own fire-extinguishing system;

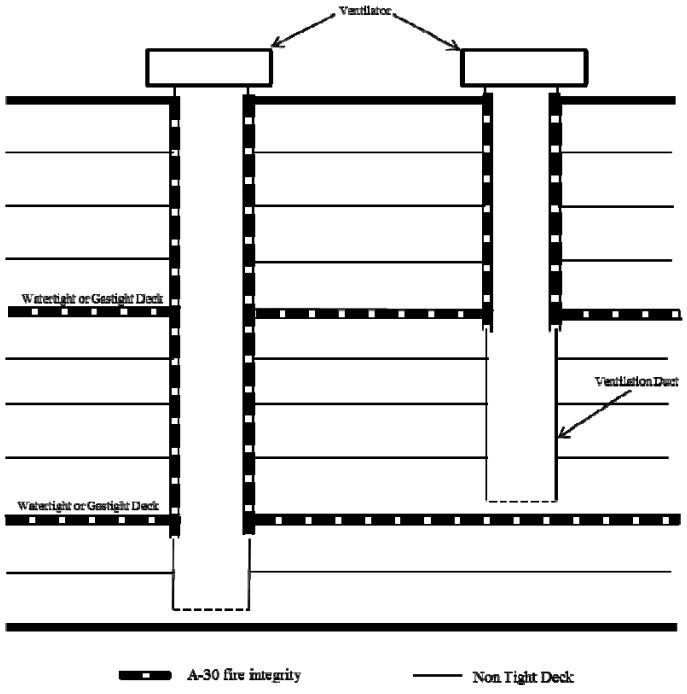
(2) "*A*-30" fire integrity does not apply to hatches fitted on decks separating ro-ro/vehicle spaces, provided that such hatches are constructed of steel;

(3) Movable ramps installed on decks referred to in **(1)** above which form boundaries of "*A*-30" fire integrity are to be constructed of steel and are to be insulated to "*A*-30" fire integrity, except for "working parts" of such movable ramps (e.g. hydraulic cylinders, associated pipes/accessories) and members supporting such fittings which do not contribute to the structural strength of the boundary. Such movable ramps need not be subject to fire test. This is applicable to non-watertight doors used for loading/unloading of vehicles; and

(4) Where ducts for a ro-ro/vehicle spaces pass through other ro-ro/vehicle spaces without serving those spaces, each duct is to be insulated all along itself to "*A*-30" fire integrity in ways of other ro-ro/vehicle spaces unless the sleeves and fire dampers in compliance with **9.7.3-1**, **Part R of the Rules** in order to prevent spread of fire through the ducts are fitted (See **Fig. R9.2.3-16**).

Fig. R9.2.3-16 has been added as follows.

Fig. R9.2.3-16



EFFECTIVE DATE AND APPLICATION (Amendment 2-1)

1. The effective date of the amendments is 25 December 2015.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to ships the keels of which were laid or which were at *a similar stage of construction* before the effective date.

(Note) The term "*a similar stage of construction*" means the stage at which the construction identifiable with a specific ship begins and the assembly of that ship has commenced comprising at least 50 *tonnes* or 1% of the estimated mass of all structural material, whichever is the less.

Amendment 2-2

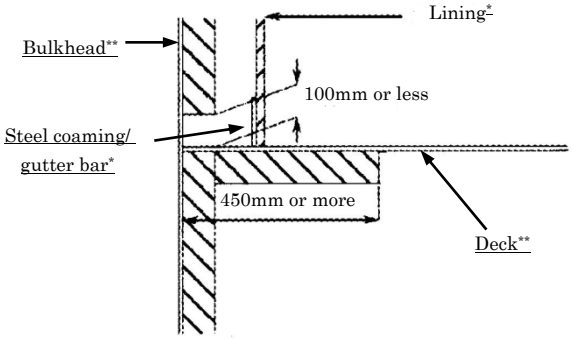
R9 CONTAINMENT OF FIRE

R9.3 Penetration in Fire-resisting Divisions and Prevention of Heat Transmission

R9.3.4 Prevention of Heat Transmission

Fig. R9.3.4-3 has been amended as follows.

Fig. R9.3.4-3



Notes:

*: Lining and steel coaming/gutter bar are for accommodation spaces only.

**: For the purpose of Fig. R9.3.4-3, bulkhead and deck are of steel construction only.

R10 FIRE FIGHTING

R10.7 Fire-extinguishing Arrangements in Cargo Spaces

R10.7.1 Fixed Fire-extinguishing Systems for General Cargo

Sub-paragraph -5 has been amended as follows.

5 Vegetable oil, latex and molasses are regarded as "cargoes which constitute a low fire risk" referred to in **10.7.1-2, Part R of the Rules**. For other cargoes carried in bulk, reference is to be made to the "*International Maritime Solid Bulk Cargoes (IMSBC) Code*, ~~as amended,~~ *appendix 1, entry for coal*" (as amended) and the "*Lists of solid bulk cargoes for which a fixed gas fire-extinguishing system may be exempted or for which a fixed gas fire-extinguishing system is ineffective* (~~*MSC.1/Circ.*1395/Rev.1~~*MSC.*1/*Circ.*1395/Rev.2)".

R10.7.2 Fixed Fire-extinguishing Systems for Dangerous Goods

Sub-paragraph -2 has been amended as follows.

2 With respect to the requirements of **10.7.2, Part R of the Rules**, ~~for cargoes listed in the Table 2 in the *MSC.*1/*Circ.*1395/Rev.1,~~a means of water ~~supplies~~supply complying with the requirements of **19.3.1-2, Part R of the Rules** may be considered as a "fire-extinguishing system which gives equivalent protection" specified in **10.7.2, Part R of the Rules** for the cargoes listed in Table 2 of *MSC.*1/*Circ.*1395/Rev.2.

R23 PERSONNEL PROTECTION

R23.2 Engineering Specifications

R23.2.1 Fire-fighter's Outfit

Sub-paragraph -5 has been added as follows.

5 With respect to the requirements of **23.2.1-2.(2), Part R of the Rules**, a pressure indicator, with which the user can read that the volume of remaining air in the cylinder has been reduced to no less than 200 *l*, regardless of the need for supplemental lighting, may be regarded as a "visual device".

EFFECTIVE DATE AND APPLICATION (Amendment 2-2)

1. The effective date of the amendments is 25 December 2015.

Amendment 2-3

R4 PROBABILITY OF IGNITION

R4.5 Cargo Areas of Tankers

Paragraph R4.5.1 has been amended as follows.

R4.5.1 Separation of Cargo Tanks

1 The wording "such pump rooms have the same safety standard as that required for cargo pump rooms" specified in **4.5.1-1, Part R of the Rules** means that the pump rooms are to comply with all requirements applied to cargo pump rooms in **this Part** (except the requirements for fixed fire fighting systems in **10.9, Part R of the Rules**).

2 With respect to the requriements specified in **4.5.1-1, Part R of the Rules**, pump rooms intended solely for ballast transfer need not comply with the requirements of **4.5.10, Part R of the Rules**.

3 ~~However,~~With respect to the requriements specified in **4.5.1-1, Part R of the Rules**, pump rooms ~~not~~ containing cargo pumps, stripping pumps, pumps for slop tanks, pumps for COW ~~nor~~ or similar pumps ~~need not~~ are to comply with the requirements of **4.5.10, Part R of the Rules** regardless of their location. For the purpose of this requirement, "similar pumps" includes pumps intended for transfer of fuel oil having a flashpoint of less than 60°C. Pump rooms intended for fuel oil transfer having a flashpoint of not less than 60°C~~also~~ need not comply with the requirements of **4.5.10, Part R of the Rules**.

~~2~~**4** (Omitted)
~~3~~**5** (Omitted)
~~4~~**6** (Omitted)
~~5~~**7** (Omitted)
~~6~~**8** (Omitted)
~~7~~**9** (Omitted)
~~8~~**10** (Omitted)
~~9~~**11** (Omitted)

Paragraph R4.5.5 has been amended as follows.

R4.5.5 Inert Gas Systems

1 The wording "means to prevent hydrocarbon gases from the cargo tanks entering the double hull spaces through the system" specified in **4.5.5-3(2), Part R of the Rules** means that the branch lines for the supply of inert gas into the double hull spaces are connected to the position between the inert gas regulating valves specified in **35.2.3(1)(b)i)~~6-3(1)~~, Part R of the Rules** and the ~~water seal~~ non-return devices specified in **35.2.2-3(1)(b)~~6-4(1)~~, Part R of the Rules** or equivalent measures, and are fitted with the ~~water seal~~ non-return devices in addition to the ~~water seal~~ non-return devices required in **35.2.2-3(1)(b)~~6-4(1)~~, Part R of the Rules** to prevent hydrocarbon gases from the polluted double hull spaces entering machinery spaces or other safety spaces.

2 The wording "appropriate means" specified in **4.5.5-3(3), Part R of the Rules** means the arrangement which consists of portable pipes or flexible hoses and blanking flanges. Portable pipes or flexible hoses are to be removed and kept on board and all openings of connections of the inert gas main and double hull spaces are to be fitted with blanking flanges except in the event of leakage of oil from cargo oil tanks entering double hull spaces.

3 The wording "the ~~requirements~~guidelines deemed appropriate by the Society" specified in **4.5.5-4(1), Part R of the Rules** means ~~the requirements of~~ the ~~**Annex S11.1.1-2(1)(a) "Inert Gas Systems using Oil Fired Inert Gas Generators on Ships Carrying Dangerous Chemicals in Bulk"**~~ "*Regulation for Inert Gas Systems on Chemical Tankers*"（*Res.A*.567(14)）, and Corr.1. With respect to this requirement, the following **(1)** and **(2)** are to be applied.

(1) An automatic control capable of producing suitable inert gas under all service conditions is to be fitted.

(2) Portable instruments for measuring oxygen and flammable vapour concentration required by Regulation 15 of *Res.A*.567(14) may be utilized as those required by **4.5.7(1), Part R of the Rules**, however, flammable vapour in an inerted atmosphere can be measured.

4 With respect to the wording "the satisfaction of the Society" specified in **4.5.5-9, Part R of the Rules**, the following **(1)** through **(4)** are to be complied with.

(1) Materials used in inert gas systems are to be suitable for their intended purpose.

(2) With respect to inert gas systems using nitrogen generators, the following **(a)** and **(b)** are to be complied with.

(a) **35.2.2-2(2), 35.2.2-2(4)**, **35.2.2-4(2)**, **35.2.2-4(3)**, **35.2.2-4(5)(a)** (except **(a)iii)** through **v)**), **35.2.2-4(5)(d)**, **35.2.4(1)(c)**, **35.2.4(1)(d)**, **35.2.4(1)(f)**, **35.2.4(1)(g)**, **35.2.4(1)(h)**, **35.2.4(1)(i)**, **35.2.4(1)(j) and 35.2.4(2), Part R of the Rules** are to be complied with.

(b) The two non-return devices as required by **35.2.2-3(1)(a), Part R of the Rules** are to be fitted in the inert gas main. The non-return devices are to comply with **35.2.2-3(1)(b)** and **35.2.2-3(1)(c), Part R of the Rules**, however, where the connections to the cargo tanks, to the hold spaces or to cargo piping are not permanent, the non-return devices required by **35.2.2-3(1)(a), Part R of the Rules** may be substituted by two non-return valves.

(3) Inert gas systems using flue gases are to comply with the requirements of **Chapter 35, Part R of the Rules** except the provisions of **35.2.2-1(2)(d)**, **35.2.3(1)(a)i), 35.2.3(1)(c)i), 35.2.3(1)(d)i)** and **35.2.3(1)(d)iii), Part R of the Rules**.

(4) Inert gas systems using boiler exhaust gas are to comply with the requirements of **Chapter 35, Part R of the Rules** except the provisions of **35.2.2-1(2)(d)**, **35.2.3(1)(a)i), 35.2.3(1)(c)i), 35.2.3(1)(d)i)** and **35.2.3(1)(d)iii), Part R of the Rules**.

Paragraph R4.5.6 has been amended as follows.

R4.5.6 Inerting, Purging and Gas-freeing

~~For the g~~"Gas-free"~~ing~~ specified in **4.5.6-1, Part R of the Rules**~~, the systems are to be capable of introducing fresh air into the tanks for increasing the oxygen content to 21% by volume.~~means 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.

R4.5.7 Gas Measurement

Sub-paragraph -1 has been amended as follows.

1 The portable instruments for measuring flammable vapour and oxygen concentrations required in **4.5.7(1), Part R of the Rules** may be utilized as portable instruments required in **4.5.7(2)(a)** and **35.2.2-4(6)~~9-4~~, Part R of the Rules**.

R13 MEANS OF ESCAPE

R13.4 Means of Escape from Machinery Spaces

Paragraphs R13.4.5 and R13.4.6 have been added as follows.

R13.4.5 Escape from Machinery Control Rooms in Machinery Spaces of Category *A*

1 With respect to the requirements of **13.4.5**, **Part R of the Rules**, a "machinery control room" means a space which serves for control and/or monitoring of machinery used for ship's main propulsion.

2 With respect to the requirements of **13.4.5**, **Part R of the Rules**, a "continuous fire shelter" means a route from a machinery control room, which allows safe escape, without entering the machinery space, to a location outside the machinery space. Such a continuous fire shelter need not be a protected enclosure as envisaged by **13.4.1(1)**, **Part R of the Rules**.

3 Continuous fire shelters as specified in **13.4.5**, **Part R of the Rules** are to comply with the following:

(1) The boundaries of the continuous fire shelter are to be at least "*A*-0" class divisions and be protected by self-closing "*A*-0" class doors; and

(2) The continuous fire shelter is to have minimum internal dimensions of at least 800 *mm* x 800 *mm* for vertical trunks and 600 *mm* in width for horizontal trunks, and is to have emergency lighting provisions.

4 Figures below from **Fig. R13.4.5-1** to **Fig. R13.4.5-6** represent typical arrangements of the continuous fire shelters through trunks or through spaces/rooms to a location outside the machinery space, which are be considered as effective.

R13.4.6 Escape from Main Workshops in Machinery Spaces of Category *A*

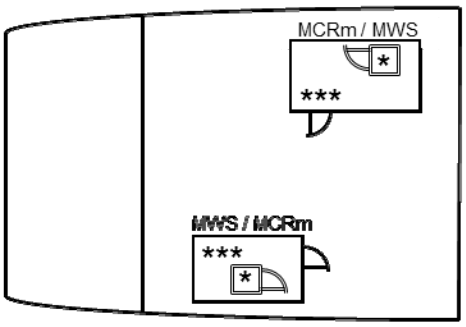
1 With respect to the requirements of **13.4.6**, **Part R of the Rules**, a "main workshop" means a compartment enclosed on at least three sides by bulkheads or gratings, usually containing welding equipment, metal working machinery and workbenches.

2 With respect to the requirements of **13.4.6**, **Part R of the Rules**, a "continuous fire shelter" means a route from a main workshop, which allows safe escape, without entering the machinery space, to a location outside the machinery space. Such a continuous fire shelter need not be a protected enclosure as envisaged by **13.4.1(1)**, **Part R of the Rules**.

3 Continuous fire shelters as specified in **13.4.6**, **Part R of the Rules** are to comply with **R13.4.5-3**.

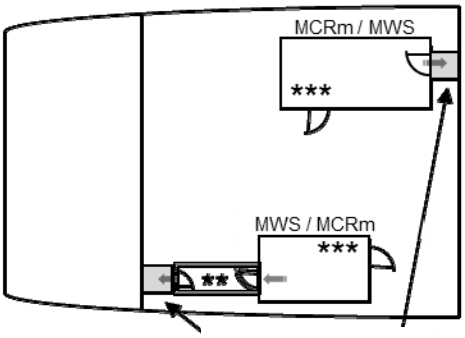
4 Figures below from **Fig. R13.4.5-1** to **Fig. R13.4.5-6** below represent typical arrangements of the continuous fire shelters through trunks or through spaces/rooms to a location outside the machinery space, which are considered as effective.

Fig.R13.4.5-1



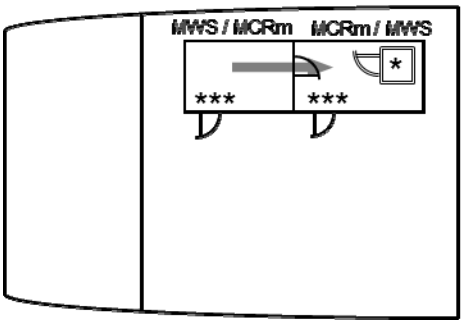
Single room escape via trunk

Fig.R13.4.5-2



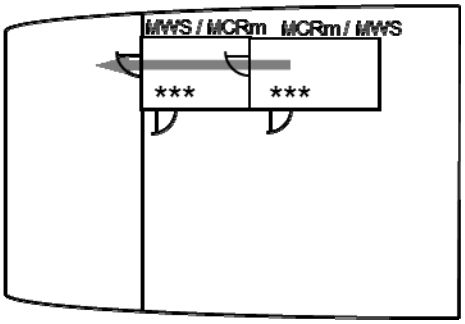
Single room escape via protected enclosure

Fig.R13.4.5-3



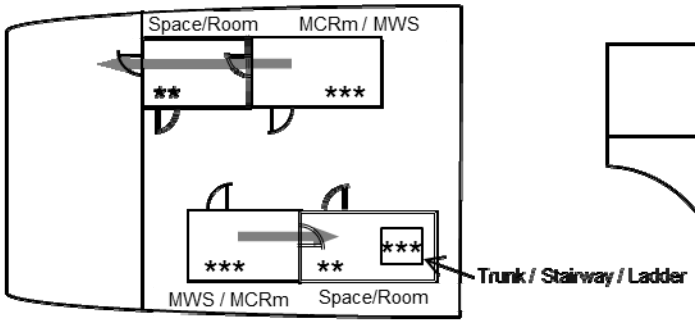
Room to room escape via trunk

Fig.R13.4.5-4



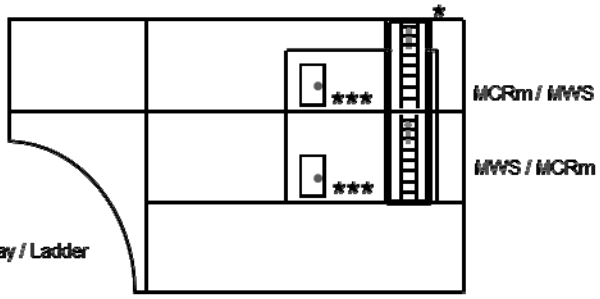
Room to room direct escape

Fig.R13.4.5-5



Room to room escape via other space/room

Fig.R13.4.5-6



Room to room escape via trunk (different decks)

MCRm: Machinery control room
MWS: Main workshop

Double lines in the figures represent "A-0" class fire integrity and self-closing "A-0" class doors

* Vertical trunk (minimum dimensions: 800 *mm* x 800 *mm*) enclosing ladders or stairways to be at least "*A*-0" class divisions and to be protected by self-closing "*A*-0" class doors (See **Fig.R13.4.1-2**)

** Horizontal trunk (minimum width: 600 *mm*) to be at least "*A*-0"class divisions and to be protected by self-closing "*A*-0" class doors

*** Fire integrity not required

R13.5 Means of Escape from Ro-Ro Spaces

Paragraph R13.5.1 has been amended as follows.

R13.5.1 Arrangement of Means of Escape

1 Means of escape required in **13.5.1**, **Part R of the Rules** are to be so arranged that there are adequate escape routes also during loading and unloading.

2 "Ro-ro spaces where the crew are normally employed" stipulated in **13.5.1**, **Part R of the Rules** is a place where the crew are present to carry out their routine work duties, e.g. during the loading and unloading of a ro-ro deck, or during their ro-ro deck inspections whilst the vessel is underway. Ro-ro deck inspections could for instance include fire patrols, inspection of the cargo, check of bilge wells and their alarms, sounding of tanks, cargo deck cleaning, different types of maintenance work (removing of rust, painting, greasing, etc.).

3 One of "at least two means of escape" required in **13.5.1**, **Part R of the Rules** is to be a stairway and the second escape is to be a trunk or a stairway.

4 "The fore and aft ends of the ro-ro spaces" stipulated in **13.5.1**, **Part R of the Rules** are considered as the areas being within the distance equal to the breadth of the ro-ro spaces, measured at its widest point, from its forward most and aftmost point.

5 With respect to the requirements of **13.5.1**, **Part R of the Rules**, suitable signs and markings are to be provided to indicate the route to the means of escape.

R18 HELICOPTER FACILITIES

Section R18.7 has been added as follows.

R18.7 Helicopter Refueling and Hanger Facilities

R18.7.1 Safety Measures for Refueling and Hanger Facilities

The ventilation fans which are of "non-sparking type" specified in **18.7.1(12), Part R of the Rules** mean those ventilation fans complying with the requirements of **R4.5.4-1(2)**. For the purpose of this requirement, protection screens of not more than 13*mm* square mesh are to be fitted in the inlet and outlet ventilation openings of the ducts fitted with such fans on the open deck.

R19 CARRIAGE OF DANGEROUS GOODS

R19.3 Special Requirements

R19.3.4 Ventilation

Sub-paragraph -2 has been amended as follows.

2 With respect to the requirements of **19.3.4-2, Part R of the Rules**, the following requirements **(1)** and **(2)** are to be complied with:

(1) (Omitted)

(2) Ventilating fans are to comply with the requirements of **R4.5.4-1(2)** and to be of non-sparking type~~., and protective wire gauze not exceeding~~ For the purpose of this requirement, protection screens of not more than 13 *mm* ~~× 13 *mm*~~ square mesh are to be ~~provided at openings of ventilation for cargo spaces located on the exposed deck~~ fitted in the inlet and outlet ventilation openings of the ducts fitted with such fans on the open deck.

R20 PROTECTION OF VEHICLE AND RO-RO SPACES

R20.3 Precaution against Ignition of Flammable Vapours in Closed Vehicle Spaces and Closed Ro-Ro Spaces

R20.3.2 Electrical Equipment and Wiring

Sub-paragraph -1 has been amended as follows.

1 The wording “electrical equipment of a type suitable for use in explosive petrol and air mixture” in **20.3.2-1, Part R of the Rules** means those generally meeting the requirements in **2.16, Part H of the Rules**, having an intrinsically safe, flameproof, pressurized, increased safety, encapsulation, powder filling or oil immersion construction ~~grouped into~~ certified as Apparatus Group II*A* and Temperature Class *T*3 or higher as specified in *IEC* Publication 60079 or Explosion Class *d*3 and Ignition Group *G*3 or higher as specified in ~~Technical Recommendation issued by, National Institute of Industrial Safety, Independent Administrative Institution in Japan~~ the Recommended Practices for Explosion-Protected Electrical Installations in General Industries (NIIS-TR-NO.39 (2006)) issued by National Institute of Industrial Safety in Japan, or equivalent thereto. Further, cables complying with the requirements in **4.2.4-5, Part H of the Rules** may generally be regarded as wiring of a type suitable for use in explosive petrol and air mixture ~~the wording “wiring of a type suitable for use in explosive petrol and air mixture” means generally cables which comply with the requirements in **4.2.4-5, Part H of the Rules**~~.

R20.3.4 Other Ignition Sources

Sub-paragraph -2 has been amended as follows.

2 Exhaust fans except <u>those ventilation fans which are of non-sparking type specified in **R4.5.4-1(2)**, unless protection screens of not more than 13*mm* square mesh are to be fitted in the inlet and outlet ventilation openings of the ducts fitted with such fans on the open deck,</u> ~~non-sparking construction type~~ are regarded as "facility which may become a source of ignition of flammable vapours" specified in **20.3.4-1, Part R of the Rules**.

Chapter R35 has been amended as follows.

R35 INERT GAS SYSTEMS

R35.2 Engineering Specifications

R35.2.2~~1~~ ~~General Requirements~~<u>Requirements for all systems</u>

<u>1</u> In case where plastic pipes are used for the drainage piping from the scrubber and blower fan casing specified in **35.2.<u>2-1(3)</u>~~1-4~~, Part R of the Rules**, the following requirements are to be complied with:

(1) The materials, design requirements, piping arrangements, connections of pipes, tests and inspections are to be as specified in **Annex D12.1.6-2 "GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF PLASTIC PIPES"**.

(2) In case where glass-fibre reinforced plastic pipes are provided inside the machinery space, the following requirements are to be complied with:

- (a) A valve operable from both inside and outside the machinery space either by pneumatic or hydraulic pressure led through steel piping is to be provided on a distance piece fitted to the shell plating. This valve is to be of automatic closing type in case of failure of the operating system.
- (b) The valve specified in **(a)** above is to be provided with an indicator showing the opening / closing condition.
- (c) The valve specified in **(a)** above is to be closed at all time when the inert gas system is not in operation as well as in the event of a fire in the machinery space.
- (d) For the valve specified in **(a)** above, a short piece of steel pipe or spool piece is to be fitted. Further, a swing type non-return valve is to be attached to the piece. The piece is to be provided with a drain pipe of an inside diameter of approximately 12.5 *mm* and a drain valve.
- (e) On the inboard side of the non-return valve specified in **(a)** above, a short piece of steel pipe or spool piece provided with a drain pipe with an inside diameter of approximately 12.5 *mm* and a drain valve is to be fitted.
- (f) The distance piece and valve specified in **(a)** above, and short piece of steel pipe or spool piece and swing type non-return valve specified in **(d)** and **(e)** above are to be of corrosion resistant materials or to be protected internally by rubber, glass fibers, epoxy

resins or equivalent coating materials.

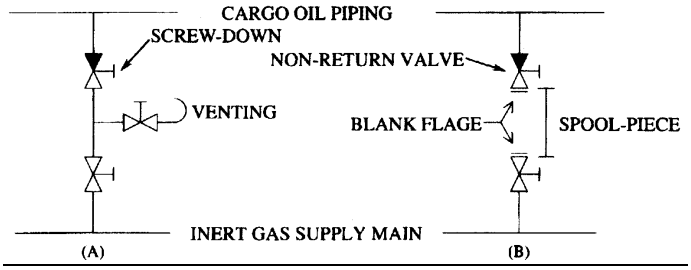
(g) Means for stopping the scrubber pump is to be provided outside the machinery space.

~~**R35.2.2 Supply of Inert Gas**~~

~~**1**~~**2** In the requirements of **35.2.2-1(4)** to **35.2.~~1~~14(2), Part R of the Rules**, the wording "separate inert gas generators" means the machinery dedicated to the production and supply of flue gas as the inert gas and includes the inert gas blowers, combustion chambers, oil fuel pumps and burners, gas coolers/scrubbers and automatic combustion control devices and monitoring, alarm and safety devices.

3 Arrangements to ensure an effective isolation specified in **35.2.2-3(2)(g), Part R of the Rules** is to be of such an arrangement shown in **Fig. R35.2.2-3(2)(g)** as an example.

Fig. R35.2.2-3(2)(g)



4 With respect to the requirements of **35.2.2-4(2)(b), Part R of the Rules**, where the system uses a separate inert gas generator, the oxygen content of the inert gas may be measured at the outlet side of the scrubber.

~~**2** For "other types of inert gas systems" in **35.2.2-1, Part R of the Rules**, inert gas systems using nitrogen generators are to comply with the **Annex R35.2.2-2 "Guidance for Inert Gas Systems Using Nitrogen Generators".**~~

~~**3** Where inert gas systems are installed on tankers of less than 20,000 *tonnes deadweight* not fitted with crude oil washing systems, the following requirements are to apply:~~

~~(1) Inert gas systems using flue gases are to comply with the requirements of **Chapter 35, Part R of the Rules** except the provisions of **35.2.2-2**, **35.2.2-4** and **35.2.3-1** and the provisions relating to measures for any failure for blowers in **35.2.4-1, Part R of the Rules**.~~

~~(2) Inert gas systems using nitrogen generators are to comply with the requirements of the **Annex R35.2.2-2 "Guidance for Inert Gas Systems Using Nitrogen Generators"** except **1.2.1-1** and **1.2.2-1**.~~

~~**R35.2.3 Scrubbers**~~

~~**1** With respect to the requirements of **35.2.3, Part R of the Rules**, the scrubber is generally to be installed on a suction side of the inert gas blowers except where a separate inert gas generator is provided.~~

~~**2** The wording "an alternative supply of cooling water" specified in **35.2.3-1, Part R of the Rules** means a stand-by cooling water. In this case, this pump may be used for other purposes.~~

~~**R35.2.4 Blowers**~~

~~With respect to the requirements of **35.2.4-2, Part R of the Rules**, where the system uses a separate inert gas generator whose blowers are installed before the generator, the shut-off valve on the suction side of the blower may be omitted.~~

R35.2.3 Requirements for flue gas and inert gas generator systems

~~**R35.2.6 Safety Measures in the System**~~

1 The gas regulating valve specified in **35.2.3(1)(b)i)~~6-3(1)~~, Part R of the Rules** is to be provided with an indicator to show whether it is open or closed.

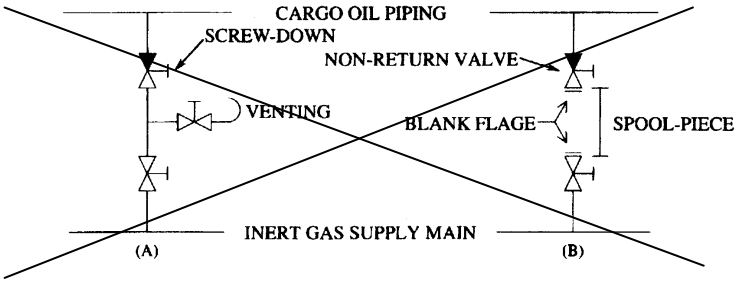
2 With respect to the requirements of **35.2.3(1)(c), Part R of the Rules**, the scrubber is generally to be installed on a suction side of the inert gas blowers except where a separate inert gas generator is provided.

3 The wording "an alternative supply of cooling water" specified in **35.2.3(1)(c)i), Part R of the Rules** means a stand-by cooling water. In this case, this pump may be used for other purposes.

~~**R35.2.7 Inert Gas Lines**~~

~~Arrangements to ensure an effective isolation specified in **35.2.7-7, Part R of the Rules** is to be of such an arrangement shown in **Fig. R35.2.7-1** as an example.~~

~~Fig. R35.2.7-1~~



~~**R35.2.8 Indication Devices**~~

4 With respect to the requirements of **35.2.3(2)(a)~~8~~, Part R of the Rules**, where the system uses a separate inert gas generator, the temperature and pressure of the inert gas may be measured at the outlet side of the scrubber.

~~**R35.2.9 Indicating and Recording Devices**~~

~~With respect to the requirements of **35.2.9, Part R of the Rules**, where the system uses a separate inert gas generator, the oxygen content of the inert gas may be measured at the outlet side of the scrubber.~~

R35.2.4 Requirements for nitrogen generator systems

The wording "safe location" specified in **35.2.4(1)(i), Part R of the Rules** means the following **(1)** and **(2)**.

(1) Oxygen-enriched air is to be discharged at the following **(a)** to **(c)**:
- (a) Locations outside of the hazardous areas specified in **1.1.5(1), Part H of the Rules**;
- (b) Locations which are not within 3 *m* of areas traversed by personnel; and
- (c) Locations which are not within 6 *m* of air intakes for machinery (engines and boilers) and all ventilation inlets

(2) Nitrogen-product enriched gas is to be discharged at the following **(a)** and **(b)**:
- (a) Locations which are not within 3 *m* of areas traversed by personnel; and
- (b) Locations which are not within 6 *m* of air intakes for machinery (engines and boilers) and all ventilation inlets and outlets.

Annex R35.2.2-2 has been deleted.

~~Annex R35.2.2-2 GUIDANCE FOR INERT GAS SYSTEMS USING NITROGEN GENERATORS~~

~~1.1 Scope~~

~~1.1.1 Scope~~

~~**1** The requirements in this Annex apply to inert gas systems using nitrogen generators (hereinafter referred to as "the inert gas systems" in this Annex).~~

~~**2** The inert gas systems are to comply with the following requirements in **other Part of the Rules** in addition to those in **this Annex**.~~

~~**2.1.2-1(1)(v)** and **2.1.3-1(10), Part B of the Rules**; and~~

~~**4.5.6-3**, **11.6.3-4**, **35.2.1-3**, **35.2.6-3**, **35.2.7**, **35.2.8**, **35.2.9** (except **-1(2)** and **-3(2)**), **(6)**, **(8)** and **(9)** of **35.2.10-1** and **35.2.10-4, Part R of the Rules.**~~

~~1.1.2 Definition~~

~~The wording "nitrogen generators" means gas generator systems where inert gas is produced by separating air into its component gases by passing compressed air through a bundle of hollow fibres, semi-permeable membranes or adsorbent materials and include feed air treatment systems.~~

~~1.2 Construction of Inert Gas Systems~~

~~1.2.1 General Requirements for Inert Gas Systems~~

~~**1** The inert gas system is to be capable of delivering inert gas to the cargo oil tanks at a rate of at least 125% of the maximum rate of discharge capacity of the ship expressed as a volume.~~

~~**2** The air compressor and the nitrogen generator may be installed in the engine room or in a separate compartment.~~

~~**3** Where a separate compartment is provided, the compartment is to comply with the following requirements. A separate compartment is to be treated as one of "other machinery spaces" with respect to fire protection.~~

~~(1) The compartment is to be positioned outside the cargo area and is to be fitted with an independent mechanical extraction ventilation system providing 6 *air changes per hour*. A low oxygen alarm is to be fitted as well.~~

~~(2) The compartment is to have no direct access to accommodation spaces, service spaces and control stations.~~

~~**4** The inert gas system is to be capable of delivering high purity nitrogen with an oxygen content not exceeding 5% by volume. The system is to be fitted with automatic means to discharge "off-spec" gas to the atmosphere during start-up and abnormal operation.~~

~~1.2.2 Air Compressors~~

~~**1** The inert gas system is to be provided with two air compressors. The total required capacity of the system is preferably to be divided equally between the two compressors, and in no case is one compressor to have a capacity less than 1/3 of the total capacity required. Only one air compressor may be accepted provided that sufficient spares for the air compressor and its prime mover are carried on board to enable their failure to be rectified by the ship's crew.~~

2 A feed air treatment system is to be fitted to remove free water, particles and traces of oil from the compressed air, and to preserve the specification temperature.

1.2.3 Nitrogen Receivers/Buffer Tanks

1 Where fitted, a nitrogen receiver/buffer tank may be installed in a dedicated compartment or in the separate compartment containing the air compressor and the generator or may be located in the cargo area. Where the nitrogen receiver/buffer tank is installed in an enclosed space, the following requirements are to apply.

(1) The access is to be arranged only from the open deck.

(2) The access door is to open outwards.

(3) Permanent ventilation and alarm are to be fitted as required by **1.2.1-3(1)**.

2 The oxygen-enriched air from the nitrogen generator and the nitrogen-product enriched gas from the protective devices of the nitrogen receiver are to be discharged to a safe location on the open deck. The expression "safe location" refers to the following **(1)** and **(2)**:

(1) Oxygen-enriched air is to be discharged at the following **(a)** to **(c)**:

(a) Locations outside of the hazardous areas specified in **1.1.5(1), Part II of the Rules**;

(b) Locations which are not within 3 *m* of areas traversed by personnel; and

(c) Locations which are not within 6 *m* of air intakes for machinery (engines and boilers) and all ventilation inlets

(2) Nitrogen-product enriched gas is to be discharged at the following **(a)** and **(b)**:

(a) Locations which are not within 3 *m* of areas traversed by personnel; and

(b) Locations which are not within 6 *m* of air intakes for machinery (engines and boilers) and all ventilation inlets and outlets.

3 In order to permit maintenance, means of isolation are to be fitted between the generator and the receiver.

1.2.4 Non-return Devices

At least two non-return devices are to be fitted in the inert gas supply main, one of which is to be of the double block and bleed arrangement consisting of two shut-off valves in series with a venting valve in between and to comply with the following **(1)** through **(3)**.

The second non-return device is to be equipped with positive means of closure.

(1) The operation of the valves is to be automatically executed.

(2) Signals for opening/closing are to be taken from the process directly, *e.g.* inert gas flow or differential pressure.

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

1.2.5 Measuring Devices

1 Instruments are to be provided for continuously indicating the temperature and pressure of air at the following positions.

(1) discharge side of the compressor,

(2) entrance side of the nitrogen generator.

2 Instruments are to be fitted for continuously indicating and permanently recording the oxygen content of the inert gas downstream of the nitrogen generator when inert gas is being supplied.

3 The instruments for indicating and recording the oxygen content of the inert gas referred to in **-2** is to be placed in the cargo control room, where provided. However, where no cargo control room is provided, they are to be placed in a position easily accessible to the officer in charge of cargo operation.

~~**1.2.6 Alarm Devices**~~

~~**1** Audible and visual alarms are to be provided to indicate the following conditions.~~

~~(1) low feed-air pressure from compressor as referred to in **1.2.5-1(1)**,~~

~~(2) high air temperature as referred to in **1.2.5-1(1)**,~~

~~(3) high condensate level at automatic drain of water separator as referred to in **1.2.2-2**,~~

~~(4) failure of electrical heater, if fitted,~~

~~(5) oxygen content in excess of that required in **1.2.1-4**,~~

~~(6) failure of power supply to the instruments as referred to in **1.2.5-2**.~~

~~**2** The alarms required by **-1(1)** to **(6)** are to 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.~~

~~**1.2.7 Safety Devices**~~

~~Automatic shut-down of the air compressors and the inert gas regulating valve is to be arranged upon alarm conditions as required by **1.2.6-1(1)** to **(5)**.~~

EFFECTIVE DATE AND APPLICATION (Amendment 2-3)

1. The effective date of the amendments is 1 January 2016.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to ships the keels of which were laid or which were at *a similar stage of construction* before the effective date.

(Note) The term "*a similar stage of construction*" means the stage at which the construction identifiable with a specific ship begins and the assembly of that ship has commenced comprising at least 50 *tonnes* or 1%* of the estimated mass of all structural material, whichever is the less.

* For high speed craft, "1%" is to be read as "3%".

Amendment 2-4

R10 FIRE FIGHTING

R10.2 Water Supply Systems

R10.2.2 Fire Pumps

Sub-paragraph -9 has been added as follows.

9 With respect to the requirements of **10.2.2-4(1), Part R of the Rules**, on board cargo ships designed to carry five or more tiers of containers on or above the weather deck, the total capacity of the main fire pumps need not exceed 180 m^3/h in cases where the mobile water monitors are supplied by separate pumps and piping system.

R26 FIXED FOAM FIRE-EXTINGUISHING SYSTEMS

R26.3 Fixed High-expansion Foam Fire-extinguishing Systems

Paragraph R26.3.2 has been amended as follows.

R26.3.2 Inside Air Foam Systems

1 With respect to the requirements of **26.3.2-1(2), Part R of the Rules**, where a machinery space of category *A* includes a casing, the volume of the largest protected space is to include that of the machinery space up to the following **(1)** or **(2),** whichever is higher: (See **Fig. R26.3.2-1**)

(1) the lowest part of the casing; or

(2) 1*m* above the highest point of the highest positioned fire risk objects within the machinery space. Such fire risk objects include~~, but may not be limited to,~~ those listed in **3.2.31, Part R of the Rules**, ~~and~~ those defined in **3.2.34, Part R of the Rules** as well as those having a similar fire risk such as exhaust gas boilers or oil fuel tanks.

2 With respect to the requirements of **26.3.2-1(2), Part R of the Rules**, where a machinery space of category *A* does not include a casing, the volume of the largest protected space is to be that of the space in its entirety, irrespective of the location of any fire risk object therein. (See **Fig. R26.3.2-2**)

Paragraph R26.3.3 has been amended as follows.

R26.3.3 Outside Air Foam Systems

1 With respect to the requirements of **26.3.3-1(2), Part R of the Rules**, where a machinery space of category *A* includes a casing, the volume of the largest protected space is to include that of the machinery space up to the following **(1)** or **(2),** whichever is higher: (See **Fig. R26.3.2-1**)

(1) the lowest part of the casing; or

(2) 1*m* above the highest point of the highest positioned fire risk objects within the machinery space. Such fire risk objects include~~, but may not be limited to,~~ those listed in **3.2.31, Part R of**

the Rules, and those defined in **3.2.34, Part R of the Rules** as well as those having a similar fire risk such as exhaust gas boilers or oil fuel tanks.

2 With respect to the requirements of **26.3.3-1(2), Part R of the Rules**, where a machinery space of category *A* does not include a casing, the volume of the largest protected space is to be that of the space in its entirety, irrespective of the location of any fire risk object therein. (See **Fig. R26.3.2-2**)

Fig. R26.3.2-1 has been added as follows.

Fig. R26.3.2-1 The largest protected space within a machinery space of category ***A*** including a casing

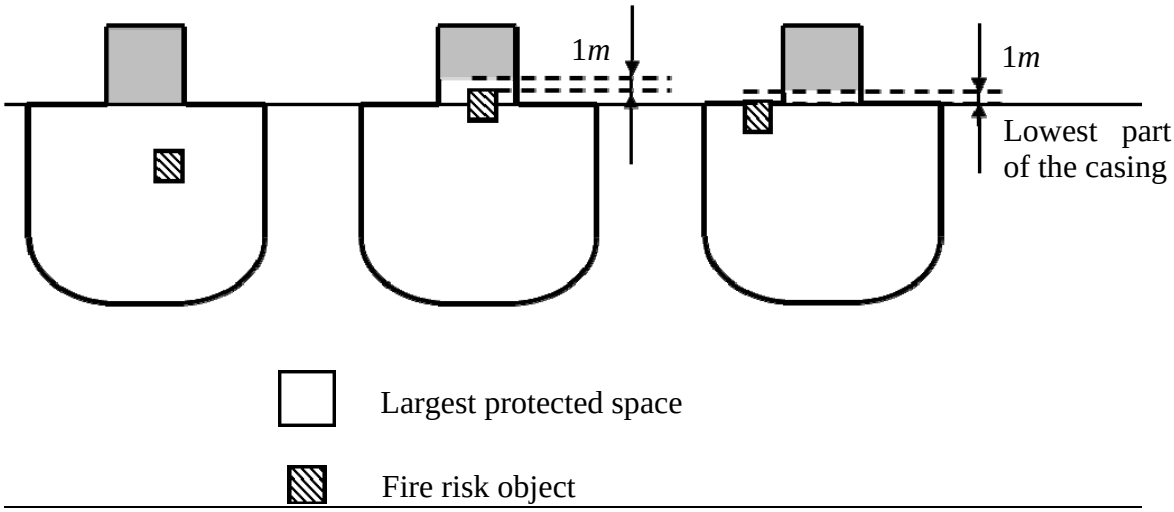
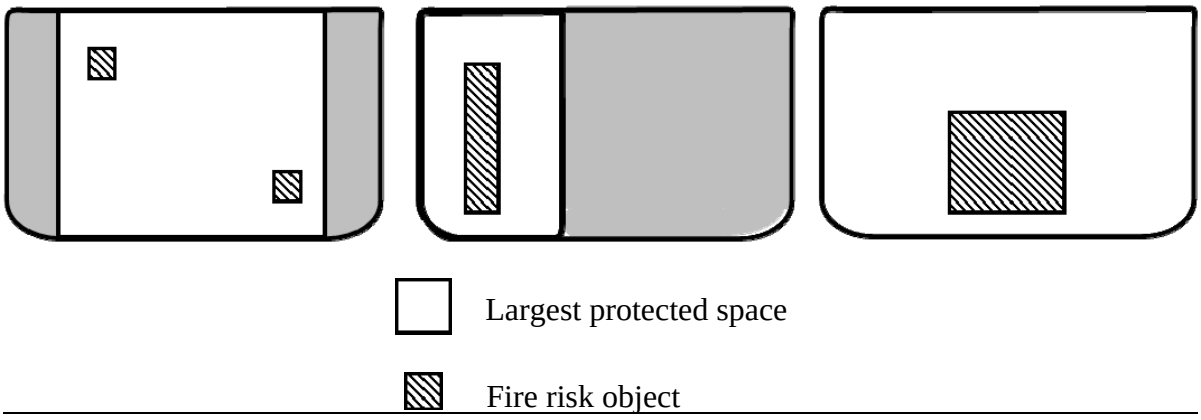


Fig. R26.3.2-2 has been added as follows.

Fig. R26.3.2-2 The largest protected space within a machinery space of category ***A*** not including a casing



R32 FIXED EMERGENCY FIRE PUMPS

R32.2 Engineering Specifications

R32.2.2 Component Requirements

Sub-paragraph -4 has been added as follows.

4 With respect to the requirements of **32.2.2-1, Part R of the Rules**, on board cargo ships designed to carry five or more tiers of containers on or above the weather deck, the total capacity of the emergency fire pump need not exceed 72 m^3/h.

EFFECTIVE DATE AND APPLICATION (Amendment 2-4)

1. The effective date of the amendments is 1 January 2016.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to ships for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

Amendment 2-5

R13 MEANS OF ESCAPE

R13.3 Means of Escape from Control Stations, Accommodation and Service Spaces

R13.3.2 Details of Means of Escape

Sub-paragraph -4 has been added as follows.

4 With respect to the requirements of **13.3.2-2** and **-3**, **Part R of the Rules**, the "lowest open deck" is an "open deck" as defined in **9.2.3-2(10)** and **9.2.4-2(10)**, **Part R of the Rules** at the lowest height from baseline in way of accommodation spaces.

R13.4 Means of Escape from Machinery Spaces

R13.4.1 Escape from Machinery Spaces of Category *A*

Sub-paragraph -5 has been amended as follows.

5 For the protected enclosure specified in **13.4.1(1), Part R of the Rules**, the following requirements are to be complied with:

(1) In case where doors are provided in midway of the protected enclosure in addition to the lower part door, these doors are to be of self-closing type and of the same fire integrity standards as the protected enclosure required in **9.2.3, Part R of the Rules**.

~~(2) In case where only one set of means of escape other than protected enclosure for machinery spaces of category *A* is provided, the self-closing door required at the lower part of the protected enclosure is to be provided at each deck level.~~

~~(3) For internal dimension of the protected enclosure, ladders in the protected enclosure need not be taken into account.~~

(~~4~~2) In principle, the protected enclosure is to be provided with insulation on the outside such that heat is not transferred into.

Sub-paragraphs -7 to -11 have been added as follows.

7 With respect to the requirements of **13.4.1, Part R of the Rules**, inclined ladders and stairways in machinery spaces being part of, or providing access to, escape routes but not located within a protected enclosure are not to have an inclination greater than 60° and are not to be less than 600 *mm* in clear width. Such requirement need not be applied to ladders and stairways not forming part of an escape route, only provided for access to equipment or components, or similar areas, from one of the main platforms or deck levels within such spaces.

8 A "safe position" specified in **13.4.1(1), Part R of the Rules** is any space, excluding cargo spaces, lockers and storerooms irrespective of their area, cargo pump-rooms and spaces where flammable liquids are stowed, but including vehicle and ro-ro spaces, from which access is provided and maintained clear of obstacles to the open deck.

9 With respect to the requirements of **13.4.1, Part R of the Rules**, machinery spaces of category

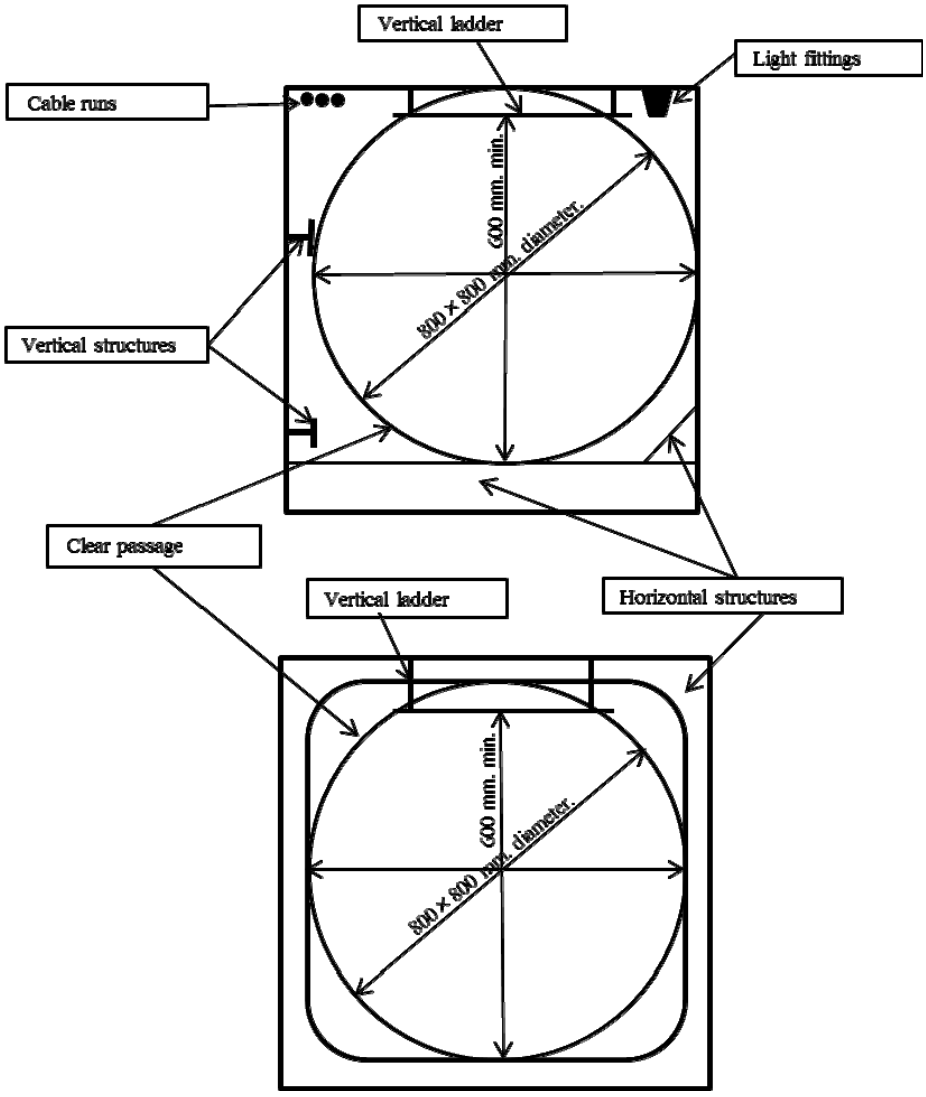
A may include working platforms and passageways, or intermediate decks at more than one deck level. In such case, the lower part of the space is to be regarded as the lowest deck level, platform or passageway within the space. At deck levels, other than the lowest one, where only one means of escape other than the protected enclosure is provided, self-closing fire doors are to be fitted in the protected enclosure at that deck level. Smaller working platforms in-between deck levels, or only for access to equipment or components, need not be provided with two means of escape**.**

10 A protected enclosure providing escape from machinery spaces of category *A* to an open deck may be fitted with a hatch as means of egress from the enclosure to the open deck. The hatch is to have minimum internal dimensions of 800 *mm* x 800 *mm*.

11 With respect to the requirements of **13.4.1(1), Part R of the Rules**, internal dimensions are to be interpreted as clear width, so that a passage having diameter of 800 *mm* is available throughout the vertical enclosure, as shown in the **Fig. R13.4.1-2**, clear of ship's structure, with insulation and equipment, if any. The ladder within the enclosure can be included in the internal dimensions of the enclosure. When protected enclosures include horizontal portions their clear width is not to be less than 600 *mm*.

Fig. R13.4.1-2 has been added as follows.

Fig. R13.4.1-2



R13.4.3 Escape from Machinery Spaces other than those of Category *A*

Sub-paragraph -4 has been added as follows.

4 With respect to the requirements of **13.4.3, Part R of the Rules**, in machinery spaces other than those of category *A*, which are not entered only occasionally, the travel distance is to be measured from any point normally accessible to the crew, taking into account machinery and equipment within the space.

EFFECTIVE DATE AND APPLICATION (Amendment 2-5)

1. The effective date of the amendments is 1 January 2016.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to ships for which the date of contract for construction is before the effective date.

Amendment 2-6

Chapter R16 has been added as follows.

R16 OPERATIONS

R16.3 Additional Requirements for Tankers

R16.3.3 Operation of inert gas system

1 The wording "guidelines developed by the Society" specified in **16.3.3-4, Part R of the Rules** means *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.

2 With respect to the requirements specified in **16.3.3-2 and -3, Part R of the Rules**, in case a product containing an oxygen dependent inhibitor is carried, *MSC.1/Circ.10*, as amended, is to be applied.

EFFECTIVE DATE AND APPLICATION (Amendment 2-6)

1. The effective date of the amendments is 1 January 2016.

Amendment 2-7

Chapter R20A has been added as follows.

R20A REQUIREMENTS FOR VEHICLE CARRIERS FOR CARRIAGE OF MOTOR VEHICLES WITH COMPRESSED HYDROGEN OR COMPRESSED NATURAL GAS IN THEIR TANKS FOR THEIR OWN PROPULSION AS CARGO

R20A.3 Requirements for Spaces Intended for Carriage of Motor Vehicles with Compressed Natural Gas in Their Tanks for Their Own Propulsion as Cargo

R20A.3.1 Electrical Equipment and Wiring

The wording "certified safe type for use in an explosive methane and air mixture" in **20A.3.1, Part R of the Rules** means those having an intrinsically safe, flameproof, pressurized, increased safety, encapsulation, powder filling or oil immersion construction grouped into Apparatus Group II*A* and Temperature Class *T*1 or higher as specified in *IEC* Publication 60079 or Explosion Class *d*1 and Ignition Group *G*1 or higher as specified in the Recommended Practices for Explosion-Protected Electrical Installations in General Industries (NIIS-TR-NO.39 (2006)) issued by National Institute of Industrial Safety in Japan, or equivalent thereto. Further, cables which comply with the requirements in **4.2.4-5, Part H of the Rules** may be regarded as a "certified safe type for use in an explosive methane and air mixture".

R20A.3.2 Ventilation Arrangement

1 Electrical equipment and wiring of a "certified safe type for use in explosive methane and air mixtures" in **20A.3.2-1, Part R of the Rules** are to be in accordance with **R20A.3.1**.

2 The fans "such as to avoid the possibility of ignition of methane and air mixtures" in **20A.3.2-2, Part R of the Rules** mean fans which comply with the requirements in **R4.5.4-1(2)**. For the purpose of this requirement, wire mesh guards with meshes not exceeding 13 *mm* × 13 *mm* are to be fitted over the ventilation openings above the open deck of the ducts in which such fans are fitted.

R20A.4 Requirements for Spaces Intended for Carriage of Motor Vehicles with Compressed Hydrogen in Their Tanks for Their Own Propulsion as Cargo

R20A.4.1 Electrical Equipment and Wiring

The wording "certified safe type for use in an explosive hydrogen and air mixture" in **20A.4.1, Part R of the Rules** means those having an intrinsically safe, flameproof, pressurized, increased safety, encapsulation, powder filling or oil immersion construction grouped into Apparatus Group II*C* and Temperature Class *T*1 or higher as specified in *IEC* Publication 60079 or Explosion Class *d*3 and Ignition Group *G*1 or higher as specified in Recommended Practices for Explosion-Protected Electrical Installations in General Industries (NIIS-TR-NO.39 (2006)) issued by National Institute of Industrial Safety in Japan, or equivalent thereto. Further, cables which comply with the requirements in **4.2.4-5, Part H of the Rules** may be regarded as a "certified safe type for use in an explosive hydrogen and air mixture".

R20A.4.2 Ventilation Arrangement

1 Electrical equipment and wiring of a "certified safe type for use in explosive hydrogen and air mixtures" in **20A.4.2-1, Part R of the Rules** are to be in accordance with **R20A.4.1**.

2 The fans "such as to avoid the possibility of ignition of methane and air mixtures" in **20A.4.2-2, Part R of the Rules** mean fans which comply with the requirements in **R4.5.4-1(2)**. For the purpose of this requirement, wire mesh guards with meshes not exceeding 13 *mm* × 13 *mm* are to be fitted over the ventilation openings above the open deck of the ducts in which such fans are fitted.

R20A.5 Detection

R20A.5.1 Portable Gas Detectors

Portable gas detectors of a "certified safe type for use in the explosive gas and air mixture" in **20A.5.1, Part R of the Rules** are to be in accordance with **R20A.3.1** and/or **R20A.4.1**.

EFFECTIVE DATE AND APPLICATION (Amendment 2-7)

1. The effective date of the amendments is 1 January 2016.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to ships the keels of which were laid or which were at *a similar stage of construction* before the effective date except for in cases where the amendments are to be retroactively applied.

(Note) The term "*a similar stage of construction*" means the stage at which the construction identifiable with a specific ship begins and the assembly of that ship has commenced comprising at least 50 *tonnes* or 1% of the estimated mass of all structural material, whichever is the less.

Amendment 2-8

R29 FIXED FIRE DETECTION AND FIRE ALARM SYSTEMS

R29.2 Engineering Specifications

R29.2.5 System Control Requirements

Sub-paragraph -3 has been added as follows.

3 With respect to the requirements of **29.2.5-1(3), Part R of the Rules**, a space in which a cargo control console is installed, but does not serve as a dedicated cargo control room (for example, office, machinery control room), is to be regarded as a cargo control room and is required to be provided with an additional indicating unit.

EFFECTIVE DATE AND APPLICATION (Amendment 2-8)

1. The effective date of the amendments is 1 January 2016.

2. Notwithstanding the amendments to the Guidance, the current requirements may apply to cargo ships for which the date of contract for construction* is before the effective date.

* "contract for construction" is defined in the latest version of IACS Procedural Requirement (PR) No.29.

IACS PR No.29 (Rev.0, July 2009)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Note:
This Procedural Requirement applies from 1 July 2009.

Amendment 2-9

R10 FIRE FIGHTING

R10.5 Fire-extinguishing Arrangements in Machinery Spaces

Title of Paragraph R10.5.2 has been amended as follows.

R10.5.2 Machinery spaces of Category *A* ~~c~~Containing Internal Combustion Machinery

1 With respect to the requirements of **10.5.2, Part R of the Rules**, the provisions of **-1** to **-5** of **R10.5.1** of this Guidance are to be applied.

2 For "each such space" specified in **10.5.2-2(2), Part R of the Rules**, spaces to which persons normally have no access may be excluded.

3 The wording "the fuel and lubricating oil pressure systems" specified in **10.5.2-2(2), Part R of the Rules** means, for example, valves, strainers, etc. of the internal combustion engines, fuel oil transfer pumps, oil burning pumps, lubricating oil coolers, oil purifiers, reversing gears, reduction gears and hydraulic piping.

EFFECTIVE DATE AND APPLICATION (Amendment 2-9)

1. The effective date of the amendments is 1 July 2016.