PARTE II RULES FOR THE CONSTRUCTION AND CLASSIFICATION OF VESSELS IDENTIFIED BY THEIR MISSION

TITLE 32 OIL TANKERS

SECTION 6 PIPING

CHAPTER

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A1. APPLICATION

100. Piping system

101. The requirements of the present Section 6 is additional to Part II, Title 11, Section 6 and apply to piping system, including pumps, valves and accessories, of vessels engaged in the transport of class 3 flammable liquids and petroleum products, of the following systems:

a) cargo safety;

b) safety of the vessel; and

c) operation of main propulsion system, its auxiliaries and equipment.

102. RBNA may, after special analysis allow changes of the rules when applied to smaller vessels.

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C1. CARGO PIPING

100. Interferences
– See Title 11

200. Protections

201. The pipes in cargo holds are to be protected against shocks by using reinforced ducts.

202 Effective protection of the piping against the corrosion, particularly in the more exposed stretches shall be provided.

203. Cargo loading piping shall be earthed to the hull.

204. Pipes of the Engine Room, passing through its bulkhead, will meet the following requirements:

a) where connecting to mechanical equipment from this room to their service location, shall be provided with closing devices, from the bulkhead of the Engine Room.

b) where starting from this room to across service locations or cofferdams to reach the external environment, shall be continuous, with reinforced walls and will have no taps or openings in the inside of their service space.

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200. Cargo loading

201. The cargo loading conditions will be specially analyzed by the RBNA

202. Depending of agreement with the Ship-owner, the RBNA may check the compliance with Regulations and Rules of the "Guidelines for Completing the Ship/Shore Safety Check List", of IMO, and of the ISGOT - International Safety Guide for Tankers and Terminals.

300. Cargo loading and unloading system

301. The piping system shall be permanently installed, be independent of any other pipe lines and be contained in "cargo area".

302. The piping system, as well as their conducts (pipes, hoses etc.) are installed in such a way that, at the end of operations, are drained without danger, draining the remaining liquid or the on-board tanks or shore tanks.

303. When the tanker is fitted with crude oil washing system ("Crude Oil Washing-COW") or segregated ballast tanks, the following requirements shall be met:

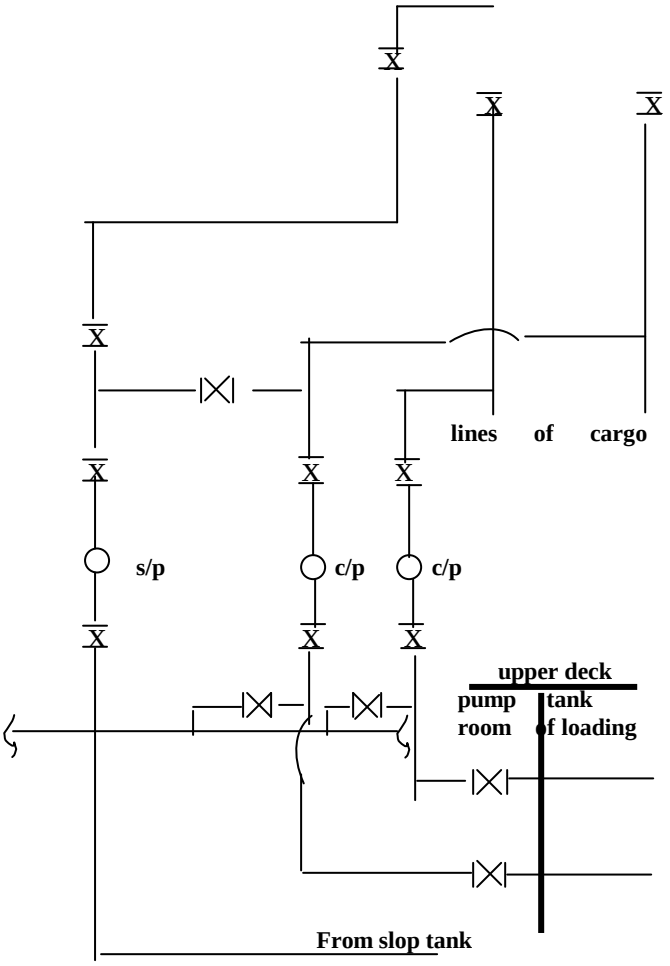
a) oil pipe designed and installed so as to minimize the oil retention within the lines;

b) means to drain all cargo pumps and oil lines to complete the discharge, if necessary by means of connection with stripping line;

c) drainage line and pump shall be such that they can be discharged as much to shore facilities as to a cargo or slop tank.

d) to discharge to shore facilities, a special line with reduced diameter with sectional area not exceeding 10% of the main discharge line, connected to the discharge side of the cargo deck manifold, both to port side and to starboard side, when the cargo is being discharged. See Figure F.E1.303.1.

FIGURE F.E1.303.1-LINE CONNECTION REDUCED DIAMETER TO MANIFOLD TO SHORE FACILITIES



Symbology:

X - VALVE
O s/p = stripping pump
c/p = cargo pump

304. For ships equipped with COW, refer to Part II, Title 32, Section 6, Chapter J3.

305. Each manifold of loading or discharge will have:

a) closing valve and blind flange, with indication of open-closed position;

b) means to discharge the residual quantities;

c) trays with a capacity not less than 200 litres, shall be connected to the cargo tank through the piping system, where a valve shall be installed.

306. The manifolds of loading shall be at a distance of at least 6 (six) metres of the entrances and openings of accommodations and service locations outside the cargo area.

307. The loading piping system can be installed under the deck, inside the cargo tanks, provided that valve closing operated from the deck are installed inside of the tanks that they supply. Additionally, within the pump room it shall be installed shut-off valves of all the piping system that lead to the cargo tanks.

308 All the elements of the loading piping system shall be electrically earthed to the hull. To avoid electrostatic effects loading piping system shall extend up as close as possible to the cargo tank bottom.

309. The piping system will be identified by colour code to distinguish it from any other systems.

310. The inside of cargo tanks, the pipes that are not of the loading / discharge pipeline shall be protected against impacts by means of reinforced ducts.

311. The flanges, gaskets and seals shall be provided with protection against water sprays.

312. Expansion curves or other approved means for expansion shall be installed where necessary.

313. The expansion joints shall be type-approved by RBNA. The joints constructed of non-metallic materials may be accepted only inside of the tanks and provided that they are of an approved type, designed to withstand the maximum internal and external pressure, and conductor of electricity.

314. Pressure gauges will be installed in the loading and unloading pipes at the inlet and outlet of the pump, taking into account the following:

a) range marked and at least 140 mm in diameter;

b) maximum permissible values of over-pressure or depression indicated by red marks; and

c) installed so that they can be read from the pump control station.

315. The piping will be protected against corrosion, particularly in the more exposed stretches.

316. The flow of loading and discharge shall be calculated. The calculations relating to the maximum flow of loading and discharge of a tank or group of tanks shall take into account the capacity of the vent pipe system.

317. The calculations shall take into account that, in the event of unexpected shutting-off of the return gas pipe or duct of equalization from ashore, the safety devices of the cargo tanks are capable of preventing the pressure inside to exceed the following values (does not apply to Rec-Oil vessels):

a) for over-pressure: 0.021 N/mm2 of high speed valve opening pressure; and

b) to a vacuum: no more than the nominal valve vacuum without it being exceeded the limit of 7kpa (0.007 N/ mm^2) of valve opening pressure.

318. The main factors to consider in the calculations are as follows:

a) dimensioning of the ventilation system of cargo tanks;

b) gas formation during loading: multiply the highest loading flow by a factor of at least 1.25;

c) the density of the vapour phase in the loading shall be based on a 50% volume ratio of vapour and 50% volume of air;

d) pressure drop in ventilation ducts, in the valves and hoods, considering the pressure drop in flame arrestors as 30%; and

e) adjustment of pressure safety valves.

319. The maximum allowable loading and discharge flow of a tank or group of tanks shall be included in the ship's instructions manual (does not apply to Rec-Oil vessels).

320. In case the vessel carries dangerous goods susceptible of dangerous inter-reaction provision shall be made for a pump for each type of cargo and the loading and unloading piping system shall be segregated. Such pipelines shall not pass across cargo tank containing dangerous goods with which the charge is subject to reaction.

400. Filling cargo tanks - safety devices

401. The cargo tanks shall be equipped as follows:

a) a level indicator;

b) a level alarm device triggering at the latest when the liquid reaches a level corresponding to 95% of capacity;

c) an overflow level alarm independent of the adjusted level alarm, so that there shall be enough time to allow the crew responsible for the operation stop the transfer pump before the tank from overflowing;

d) a device to withdraw samples closed and / or an opening to withdraw samples. See features in paragraphs that follow.

402. The maximum filling level shall be marked in the reading instruments (does not apply to supply vessels ("bunkers").

403. The tank filling rate (in %) shall be determined with an error less than 0.5%. It shall be calculated with reference to the total capacity of the cargo tank, including the expansion space.

404. The level meter shall have its indication displayed at the control station where is located the shut-off device of the corresponding cargo tank.

405. The level alarm device shall send audible and visual signal when activated. It shall be independent of the level meter, except when it is installed a system that:

a) at least be provided with contacts for the level meter, to the level alarm device and to indicate a flaw in the level meter;

b) be connected to the socket indicated in the following paragraph 408;

c) have permanent self-control; and

d) be able to shut-off, through the socket indicated in following paragraph 408, the loading operations or stopping the pump of the ship during discharging operations, in case of failure or malfunction of the system.

406. The alarm systems shall be:

a) self monitored or provided with test device;

b) equipped with alarm for failure of the sensors / circuit level sensors; and

c) equipped with alarm for power supply failure.

407. The audible and visual signals emitted by the level alarm device shall be readily distinguished from the overflow alarm signals.

408. visual alarm signal shall be perceived from each station of control of the shut-off valves of the cargo tanks.

409. The operation of the detectors shall be possible to easily check, and the electrical circuits shall be equipped with positive safety devices.

410. In addition, the overflow alarm signal shall be repeated on the area of the deck in such a way that they can be seen and heard from most locations.

411. On board oil-gathering vessels ("Oil Rec") the above shut-off device shall emit a signal visual and audible and shut down the pump used to suction water from the cargo hold inner bottom.

412. The supply vessels and other vessels likely to send the products necessary for the exploration shall be equipped with a transshipment installation compatible and with a quick closing device which makes it possible to interrupt the supply. This device shall be able to be triggered independently of the electrical signal and shall shoot a visual and audible alarm on board.

413. In case the control elements of cargo tank shut-off devices were located in a control station, it shall be possible to read the level meters from this control station and there shall be a luminous and audible alarm on the control station and on the deck, from the level alarm device, overflow alarm and under-pressure and overpressure measurement instruments of the gaseous phase of the cargo within the tank. Appropriate supervision of the loading zone shall be possible from the control station.

414. Measurement displays of under-pressure and overpressure in the vapour collector piping shall be fitted on each cargo transfer station.

415. In addition, an alarm emitting an audible and visual signal in the bridge and accommodation shall beinstalled to the following conditions:

a) for over-pressure, the alarm shall be activated before the pressure reaches 90% of the lowest regulation of overpressure of the PV valves of the air vent system;

b) for under-pressure in inertized tanks the alarm shall be activated before the vacuum reaches 0.01 bar; and

c) for under-pressure in non-inertized tanks, the alarm shall be activated before it is reached the lowest vacuum regulated of the PV valves of the air venting system.

416. In case the loading control devices were located in a control station, this control station shall be provided with:

a) shut-off device of the cargo pump;

b) level meter of the cargo tanks;

c) visual and audible alarm repeater at a high level in the cargo tanks; and

d) cargo pressure measuring instruments.

417. Closed sampling device shall be designed in such a way that there shall be no gas leakage or liquids during the taking of samples. It shall be type certified for this purpose by an accredited institution.

418. Opening for samples shall have a maximum diameter of 0.30 metres. It shall be fitted with flame-arrester and designed in such a way that the time it remains open is as short as possible and that the flame-arrester cannot remain open without external maneuver.

419. Opening for sounding shall be capable of measuring the rate of filling with the aid of a probe.

420. The level indicators mentioned in E1.401.a) and associated devices for remote reading shall be type approved.

421. Ullage openings and other sounding devices that release vapour into the atmosphere shall not be installed in enclosed spaces.

422. The level indicators shall be of the following types:

a) restricted: device that penetrates into the tank and that, when in use, allows small volume of liquid or vapour escape into the atmosphere, and when not in use, shall be completely closed; example: sounding pipes;

b) closed: separate device from the tank atmosphere and that prevents the tank content be released into the atmosphere; can penetrate into the tank such as buoys, magnetic probe or protected sight glass; or not penetrate in the tank, such as radar or ultrasonic probes.

c) indirect: device that determines the level of the liquid, for example, by means of weighing or of flow meter.

423. Tankers with inert gas system installed shall use closed level indicators. Tankers that are not equipped with inert gas system may employ level indicators of closed or restricted types.

424. The use of indirect level indicators may be analyzed particularly by RBNA. Measures shall be taken to prevent escape of liquid or vapour under pressure when in use and to relieve the pressure in the tank before the device is operated.

425. When sounding pipes were used, these shall be equipped with self-closing device.

426. Openings for ullage can be used only as a means of probing in stand-by, and shall be endowed with sealed cover.

500. Cargo pumping system

501. Loading pumps shall be certified by a laboratory recognized by the RBNA.

502. Each cargo tank shall be attended by at least two different means of unloading and drainage ("stripping"). For tanks fitted with individual submersible pump the second mean can be portable.

503. The loading pumps may be installed:

a) in a space dedicated to cargo pumps;

b) on the deck;

c) when specially designed for this end, inside the cargo tanks.

504. The cargo pumps on the deck are installed in the space extending from the aft to the forward cofferdam.

505. The cargo pumps under the deck are installed in pump rooms separated from other ship spaces by decks or gastight bulkheads. They may not be less than 6 metres from the openings of accommodation and service locations that are outside the cargo area.

506. Except where expressly permitted, cargo pumps shall be used exclusively for handling the liquid cargo and shall not have connections to other compartments other than the cargo tanks.

507. depending on their capacity, cargo pumps can be used to draining operations ("stripping").

508. Where necessary, the cargo pumps can be used of the cargo tank washing.

509. The cargo pumps (displacement pumps) will have overpressure protection device. The load flowing through such devices shall return to the cargo tank.

510. The cargo pumps shall have means of stopping from outside of the pump room.

511. The pump flow will be controlled from outside of the pump room.

512. The cargo pumps and filters positioned in pump rooms installed under the deck will be equipped with devices that permit safe drainage at any time.

513. The control panels of cargo pumps located on the deck shall have pressure indicators. The maximum permissible pressures shall be marked.

514. The prime movers of the cargo pumps shall not be located in the cargo area, except when they were:

a) steam propelled provided that the steam temperature shall not exceed 200°C;

b) hydraulic motors.

515. The pumps with submerged electric motors are not allowed inside the cargo tanks.

516. The cargo pumps shall be fitted with the following monitoring systems:

a) pressure of discharge of the pump:

-low pressure alarm located:

. in the pump;

. next to the prime mover in separated compartment;

. nest to the discharge control station;

Guidance

Items 516 b and 516 c do not apply for ships with notation K3.

End of Guidance

b) temperature of the pump casinsg (not required for tankers carrying products with flash point above 60° C, asphalt or other non-flammable substances):

-visual and audible alarm of high temperature in the compartment or control station of the cargo pump;

c) sealing of passages through the bulkhead

- visual and audible high temperature alarm in the pump room or control station of the cargo pump.

600. Pump room

601. The pump rooms and their entrances are located in the cargo area and shall not have accesses leading to the Engine Room or other spaces that contain sources of ignition.

602. The pump rooms under the deck will have flooding level alarm and gas alarm detectors.

603. Where audible alarms are fitted to warn of the release of fire extinguishing medium into pump rooms, they may be of the pneumatic type or electric type. **[IACS UR F5]**

(a) Pneumatically operated alarms In cases where the periodic testing of such alarms is required, CO2 operated alarms shall not be used owing to the possibility of the generation of static electricity in the CO2 cloud. Air operated alarms may be used provided the air supply is clean and dry.

(b) Electrically operated alarms When electrically operated alarms are used, the arrangements are to be such that the electric actuating mechanism is located outside the pump room except where the alarms are certified intrinsically safe.

(c) It was further agreed that the use of CO2 operated alarms shall be discouraged.

700. Canceled

800. Provisions for cargo loading or unloading in the stern or the bow

Guidance

Item 800. does not apply for ships with notation K3.

End of Guidance

801. Cargo piping system can be disposed in such a way as to allow loading and unloading in the stern or bow, subject to approval by the RBNA and to the requirements of this Chapter. These requirements may be waived for ships to carry products with flash point above 60°C, asphalt, or other non-flammable substances

802. In addition to the requirements of E1.300 above, the following requirements shall apply to the cargo piping system and associated equipment:

a) Piping system outside the cargo area shall run along the open deck and shall stay at least 760 mm from the edge, except for cross connections to earth. Such piping system shall be clearly identified and provided with a shut-off valve on the connection of load piping system within the cargo area. At this location, there shall also be capable of being isolated by means of a removable spool and blind flanges when not in use.

b) The earth connection shall have a shut-off valve and blind flange.

c) Pipe joints shall be of butt joint type with full penetration weld, and thoroughly x-rayed. Use of flange in the piping will be allowed only within the cargo area and in the connection to shore facilities.

d) Such piping system shall be equipped with shields against spray in the connections specified in a) above, and trays of sufficient capacity dispose of the drained liquid

e) The pipe shall be self-drained to the cargo area and preferably to a cargo tank. Alternative arrangements to drain the cargo may be accepted by the RBNA.

f) Means shall be provided to allow such piping be purged after use and kept safely gas-free when not in use. The vent pipes connected with purging shall be located in the cargo area. The relevant connections of the piping system shall be equipped with shut-off valve and blind flange.

803. The area enclosed in a radius of 3 metres around the cargo manifold will be considered as hazardous area.

CHAPTER F
HULL PIPING SYSTEM

CHAPTER CONTENTS

F1. HULL DRAINAGE SYSTEM – SEWAGE ARRANGEMENTS - DRAINAGE

100. – See Title 11

200. Arrangements

201. to 212. – See Title 11

213. Drainage piping and pumps of compartments of the “cargo area” shall be contained themselves.

214. Double bottom intended to storage of liquid fuel shall not be connected with the drainage piping system.

215. The vertical piping line for suction of ballast water and its on-board suction system, shall be located within the "cargo area", but outside the cargo tank area.

216. An area of cargo tanks shall be provided with separate drainage line independent of any other piping systems on the ship.

217. The hull drainage pipes shall be located outside the Cargo Pumps.

218. Cofferdam piping connection with any other hull fixed piping systems are not permitted.

300. Pumps located forward of the cargo tank area

301. to 308. See Title 11

309. At least one bilge pump shall be installed to drain the compartments located within the cargo area. Cargo or stripping pumps may be used for this purpose.

310. Hull drainage pumps serving compartments located within the cargo area shall be located in the cargo pumps or another appropriate compartment of the cargo area.

311. One or more ballast and bilge pumps shall be installed forward of the cargo tanks

400. Diameter of suction pipes

401. to 402. See Title 11

403. When the hull drainage pump is designed to drain the Engine Room only, the inner diameter d in mm, of the suction pipe may be less than that required in Part II, Title 11, Section 6, Chapter F1, item 401, but not less than

$$d = 35 + 3\sqrt{Lo\,(B+D)}$$

where:

Lo = length of the Engine Room, in metres;
B = Ship’s breadth, in metres;
D = Ship’s moulded depth up to the bulkhead deck, in metres.

500. – See Title 11

600. Drainage of the cargo pump room

601. A Pump room below decks shall be drained, in an emergency, by a system located in the "cargo area", independent of all other systems.

602. The cargo pump rooms shall be drained by drainage pumps or ejectors.

603. Cargo or stripping pumps may be used to drain the pump room provided that:

a) a threaded check valve is installed in the suctions of drainage;

b) a remote control valve is installed between the suction and the drainage manifold;

604. The drainage suction pipe diameter shall not be less than 50 mm.

605. The pump room drainage system shall be capable of being controlled from outside of the compartment.

606. The compartment shall be equipped with a high level alarm.

607. Tunnels and pump compartments other than cargo pump rooms shall be drained. Cargo pumps may be used for such purpose provided that they comply with the requirements of item F1.603 above.

700. Cofferdam drainage

701. The ship's double sides and double bottoms, the cofferdams and cargo tank areas which are not intended for ballast, will be drained by an independent piping line, located inside the "cargo area".

702. Cofferdams located at the ends of the cargo spaces:

a) Ship's double sides and double bottoms, the cofferdams and cargo tank areas which are not intended for ballast, will be drained by a proper piping system;

b) The aft cofferdams adjacent to cargo pump room may be drained by a pump.

703. Cofferdams located in the fore and aft ends of the cargo spaces that are intended for ballast water can be drained by a ballast pump located inside the machinery space or located forward as item F 1.309 above, provided that:

a) suction is connected directly to the pump and not to the piping system serving the machinery space;

b) are led directly to a discharge overboard.

F3. BALLAST SYSTEM

100. Application

101. The requirements covered by this Title 32 are complementary to the ones of the Part II, Section 6, Chapter F4.

200. Ballast pumps

201. The ballast pumps shall be endowed their manufacturer's certificate.

202. The ballast pumps shall be located in the cargo pump room or in other similar compartments within the cargo area and shall comply with the same requirements to cargo pumps in Part II, Title 32, Section 6, Chapter E1.500 above.

203. Tankers with a capacity equal to or greater than 5,000 deadweight tons shall not have ballast line passing through the inside of cargo tanks, including venting and sounding pipes for segregated ballast tanks.

However, short branches may be allowed provided that they are of reinforced material and all the connections are welded with reinforced flanges in number reduced to a minimum.

204. For vessels with a tonnage of less than 5,000 deadweight tons, ballast pipelines passing through cargo tanks shall comply with the specifications of Part II, Title 11, Section 6, Chapter F3. item 100. In addition, pipes referred to in item 203 above and this item shall have minimum thicknesses given by the table T. F3.204.1 below:

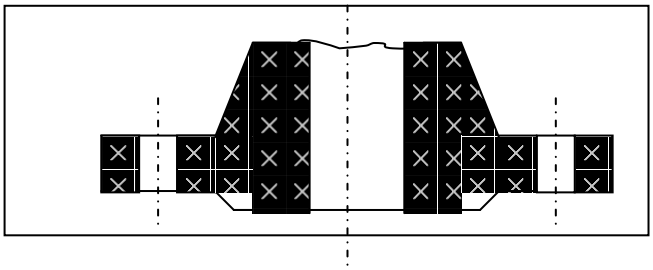
TABLE T.F3.204.1 – PIPE WALL MINIMUM THICKNESS

Nominal diameter (mm)	Minimum pipe wall (mm)
50	6,3
100	8,6
125	9,5
150	11,0
200 or plus	12,5

In the branches referred to in item 203 above and this item 204 expansion curves will be permitted; expansion joints will not be permitted.

All the connections shall be welded or have reinforced flanges and shall be maintained in a minimum number of flanged connections.

Neck welded flanges



205. Ballast pipes passing through the interior of cargo tanks, where allowed, or connected to ballast tanks adjacent to cargo tanks shall not be led at or through areas where there are ignition sources present.

206. The fire main line may be used to ballasting or deballasting with eductors provided that the branch of the fire main line used for this purpose is controlled from the upper deck and fitted with shut-off valve.

300. Ballast tank pumping in the cargo area

301. Ballast system attached to segregated ballast tanks in the cargo area shall be thoroughly located in the cargo area and shall not be connected to other systems.

302. Segregated ballast tanks located in the cargo area shall be operated by two different means. At least one of these means shall be a pump or eductor used exclusively to ballast.

400. Segregated ballast tanks emergency discharge

401. Arrangements shall be made for an emergency ballast discharge of segregated ballast by means of connection to a cargo pump through detachable spool provided that:

a) check valves are installed in the segregated ballast connections to prevent oil passage to the inside of the ballast tank; and

b) shut-off valves shall be installed to shut off the cargo and ballast lines before the detachable spool is removed.

500. Carriage of ballast water in cargo tanks

501. Wherever allowed, ballast water may be carried inside of cargo tanks, which shall be processed and discharged using the equipment as the chapter J of this Section.

502. The seawater intakes and discharges at the side shell attached to cargo tanks as the item F2.501 above shall not have any connections with the ballast system of segregated ballast tanks.

503. The cargo pumps may be used for pumping ballast water to or from cargo tanks provided that shut-off valves are installed to isolate the cargo oil pipe system of the inputs and discharges of ballast by the side shell.

504. Ballast pumps attached to segregated ballast tanks may be used for ballast water filling the cargo tanks provided that the connection is made at the top of the tanks and consist of a detachable and a threaded check valve to prevent siphoning action effects.

F4. VENTING, OVERFLOW, SOUNDING/ULLAGE AND LEVEL INDICATORS

100. Design principles

101. Cargo tank vents shall be thoroughly independent of the vent system of other ship compartment. The disposition and location of the openings existing in the deck of the cargo tank The disposition and location of openings on the deck of the cargo tank, where there may be flammable vapours outlet, shall be such as to minimise the likelihood that flammable vapours are allowed in closed compartments containing a source of ignition, or accumulate in the vicinity of deck machinery and equipment which may constitute an ignition hazard.

102. The vent system shall be designed and operated in order to ensure that neither overpressure nor vacuum exceed the design parameters and which are of such a nature as to ensure:

a) the flow of small volumes of vapour, air or inert gas mixtures caused by thermal variations in a cargo tank, always through a pressure/vacuum valve (PV);

b) the passage of large volumes of vapour, air or inert gas mixtures during the loading of cargo or ballast, or during the unloading;

c) there is a secondary means of allowing the total flow of vapour relief, air or inert gas mixtures to prevent overpressure or under pressure in the event of a failure of system in item b above;

d) alternatively pressure sensors may be installed in each tank protected by the arrangement required in (b) above, with a monitoring system in the cargo control station or on the position from which the cargo operations are controlled;

e) such monitoring equipment shall also provide an alarm which is activated when are detected conditions of overpressure or under pressure inside a tank;

f) a PV valve installed in inert gas system can be used as a secondary means of venting. When the arrangement of the vents would be of the free flowing type and valve of isolation of the mast were closed during discharge, the gas discharge system will function as the primary protection against under pressure with the valve PV functioning as the alternative system.

103. Vent outlets shall be designed on the basis of the maximum designed loading rate multiplied by a factor of at least 1.25 to take account of gas evolution, in order to prevent the pressure in any cargo tank from exceeding the design pressure.

104. The master shall be provided with information regarding the maximum permissible loading rate for each cargo tank and, in the case of combined venting system, for each group of cargo tanks.

200. Collective vent system

201. The existing venting devices in each cargo tank may be independent or be associated with other cargo tanks, and may be incorporated into the inert gas system.

202. Where the devices are associated with other cargo tanks, there shall be interception valves, or other acceptable means for isolating each tank.

203. When any interception valves were installed, they shall be equipped with locking devices, which shall be under the control of the ship's officer responsible.

204. There shall be a clear visual display or other acceptable means to indicate the operation of the valves

205. When the tanks have been isolated, there shall be assured that the isolation valves to be opened before the

starting of the reception of the cargo, ballast or unloading of those tanks.

206. Any insulation shall allow continuation of the flow caused by thermal variations within a cargo tank, according to the item F4.102 above.

207. If it is intended the loading and ballasting, or unloading a cargo tank or a group of cargo tanks that is isolated from a common vent system, that cargo tank or group of cargo tanks shall be provided with a means of protection against excess pressure, or against low pressure, as required in item F4.102 above.

300. Arrangement of the vent piping system

301. The vent piping devices shall be connected to the upper side of each cargo tank and their drainage shall be made automatically to the cargo tank in all normal conditions of the ship's trim and heeling.

302. Where it is not possible to install pipes which drain automatically, there shall be permanent device to drain the vent piping to a cargo tank.

303. Plugs or equivalent means shall be installed in the lines after the relief valves

400. Openings for pressure relief

401. Pressure relief openings required by F4.102 above shall comply with the following requirements:

a) being located at maximum practicable height above the cargo tank top in order to obtain the maximum dispersion of flammable vapours, but in no case closer than 2 metres above the tank top;

b) be located as much apart as possible, but no less than 5 metres of the nearest air intakes and openings to enclosed spaces containing a source of ignition and from machinery and deck equipment which may imply in risk of ignition.

402. The requirements of item 401 above shall not apply to PV valve installed on the inert gas system as long as its setting is above the required by item F4.102 a. and b.

403. The windlass and openings of the chain locker pose danger of ignition, and shall be located at the spacing prescribed by item 401. b. above.

500. Pressure / Vacuum (PV) and high speed valves

501. The openings on the tank top shall not be used for pressure equalisation. These openings shall be fitted with covers that shut-off automatically and perfectly sealed. It is not allowed the use of flame arresters and screens in these openings.

502. The PV valves shall be adjusted to a positive pressure not exceeding 0.021 N/mm^2, and a negative pressure not exceeding 0.007 N/mm^2.

503. Higher positive pressure adjustments may be accepted if the scantlings of the tanks are suitable.

504. PV Valves required by F4.102 may be equipped with a bypass when they are located in the main ventilation duct or at the mast top, and where such arrangement is installed, there shall be adequate indicators to show whether the derivation is open or closed.

505. The PV valves shall be of the type approved by the RBNA.

506. The PV valves shall be of easy access.

507. The PV valves shall be equipped with hand opening device such that they may be locked in the “open” position. The devices for locking in the position “closed” are not allowed.

508. High speed valves shall be easily accessible.

509. High speed valves not provided with flame arresters device shall not be locked in the open position.

600. Exhausting of the vents

601. Vent exhausting for cargo loading, discharging and ballasting required shall:

a) permit the free flow of mixtures of vapours or permit the throttling of the discharge of the vapour mixtures to achieve a speed of not less than 30 m/s;

b) be arranged so that the vapour mixture is exhausted vertically upwards;

c) where the method is by free flow of vapour mixtures, be such that the outlet shall be not less than 6 m above the cargo tank deck or fore and aft gangway if situated within 4 m of the gangway and located not less than 10 m measured horizontally from the nearest air intakes and openings to enclosed spaces containing a source of ignition and from deck machinery, which may include anchor windlass and chain locker openings, and equipment which may constitute an ignition hazard;

d) where the method is by high-speed exhausting, be located at a height not less than 2 m above the cargo tank deck and not less than 10 m measured horizontally from the nearest air intakes and openings to enclosed spaces containing a source of ignition and from deck machinery, which may include anchor windlass and chain locker openings, and equipment which may constitute an ignition hazard. These exhausts shall be provided with high-speed devices of an approved type.

700. Prevention of the passage of flames through inside the tanks and the climbing of the liquids in the venting system

701. The venting system shall be provided with flame arrester devices to prevent the passage of flames into the cargo tanks.

702. The design, testing and locating such devices shall meet the requirements of section F8. below.

703. The requirements of item 701. above shall not apply to the PV valve installed on the inert gas system since its adjustment is above the required by item F4.102 a. and b.

704. A flame arrester device integral to the venting system may be accepted.

705. Flame screens and flame arrester devices shall be designed so as to allow easy maintenance and cleaning.

706. Measures shall be taken to prevent the liquid of climbing up in the venting system.

707. The venting system shall not be used as an overflow system.

708. Spill valves shall not be considered as equivalent to an overflow system.

Guidance

Item 800 does not apply for ships with notation K3.

End of Guidance

800. Venting and sounding tubes within compartments other than cargo tanks

801. Such venting and sounding tubes of the following spaces shall be led into the atmosphere:

a) cofferdams located in the ends of forward aft the cargo area; and

b) tanks and cofferdams located within the cargo area and no used for cargo

802. In ships of capacity equal to or greater than 600 DWT deadweight tons the pipes of overflow and sounding shall not pass through the inside of cargo tanks, except in the following cases:

a) short section of vents of ballast tanks

b) double bottom tank lines serving lines located in the cargo area, except in the case of tankers of capacity equal to or greater than 5000 DWT deadweight tons.

900. Additional requirements for ships equipped with inert gas system

901. Ships fitted with inert gas system shall be equipped with pressure/vacuum devices to prevent the cargo tanks from being subject to:

a) a positive pressure, in excess of the test pressure of the cargo tank, if the cargo were to be loaded tat the maximum rated capacity and all other discharges are left shut; and

b) a negative pressure in excess of 700 mm water gauge if the cargo was to be discharged at the maximum rated capacity of the cargo pumps and the inert gas blowers were to fail.

902. Such devices shall be installed on the inert gas main unless they are installed in the venting system required by item 100 above.

903. The location and design of such devices referred to in 901 above shall comply with the requirements of 100 to 800 of this Chapter.

F6. VENTILATION OF COMPARTMENTS

Guidance

Item 300.to 900 does not apply for ships with notation K3.

End of Guidance

100. 5.3 Cargo tank venting [SLOAS II-2/B/4]

101. **General requirements:** The venting systems of cargo tanks are to be entirely distinct from the air pipes of the other compartments of the ship. The arrangements and position of openings in the cargo tank deck from which emission of flammable vapours can occur shall be such as to minimize the possibility of flammable vapours being admitted to enclosed spaces containing a source of ignition, or collecting in the vicinity of deck machinery and equipment which may constitute an ignition hazard. In accordance with this general principle, the criteria in paragraphs

102. **Venting arrangements**

a. The venting arrangements in each cargo tank may be independent or combined with other cargo tanks and may be incorporated into the inert gas piping.

b. Where the arrangements are combined with other cargo tanks, either stop valves or other acceptable means shall be provided to isolate each cargo tank. Where stop valves are fitted, they shall be provided with locking arrangements which shall be under the control of the responsible ship's officer. There shall be a clear visual indication of the operational status of the valves

or other acceptable means. Where tanks have been isolated, it shall be ensured that relevant isolating valves are opened before cargo loading or ballasting or discharging of those tanks is commenced. Any isolation must continue to permit the flow caused by thermal variations in a cargo tank.

c. If cargo loading and ballasting or discharging of a cargo tank or cargo tank group is intended, which is isolated from a common venting system, that cargo tank or cargo tank group shall be fitted with a means for over-pressure or under-pressure.

d. The venting arrangements shall be connected to the top of each cargo tank and shall be self-draining to the cargo tanks under all normal conditions of trim and list of the ship. Where it may not be possible to provide self-draining lines, permanent arrangements shall be provided to drain the vent lines to a cargo tank.

103. **Safety devices in venting systems:** The venting system shall be provided with devices to prevent the passage of flame into the cargo tanks. The design, testing and locating of these devices shall comply with the requirements established by the RBNA based on the guidelines developed by the Organization*. Ullage openings shall not be used for pressure equalization. They shall be provided with self-closing and tightly sealing covers. Flame arresters and screens are not permitted in these openings.

G*uideline*

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

End of guideline

300. Ventilation of spaces of the "cargo area" – lockers and service areas

301. and 302. – See Title 11

303. All the spaces of the "cargo area" shall be ventilated and equipped with means to verify that there is no presence of gas.

304. All service spaces situated in the cargo area, below deck, shall be equipped with a mechanical ventilation system sufficient to provide, at least, 20 (twenty) exchanges of air volume enclosed on the location, per hour. It shall be possible to verify that they do not contain gas.

305. The fans installed in the cargo area and in hazardous gas compartments shall be designed so as not to produce sparks by accidental contact between the propeller and the casing, or by electrostatic discharge:

306. Design requirement:

a) the minimum clearance between impeller and the casing shall be of 1/10 of the shaft diameter at the bearing, but in no case less than 2 mm, without however exceeding 13 mm; and

b) Protective screens with mesh no larger than 13 mm shall be installed at the entrance and exit of ventilation ducts to prevent objects from penetrating in the fan casing.

307. Material

a) The impeller and the casing in the region of the impeller shall be built of the materials of non-sparking type so recognised by means of appropriate tests to discretion of the RBNA.

b) Electrostatic charges, both in the rotating body like in the casing, shall be prevented by using antistatic materials. Additionally, the installation of the ventilation units in the ship shall be in such a way as to ensure secure connection to the hull.

c) The tests above may be dismissed in case of fans that have the following combinations of materials:

- Impellers and casings of non-metallic material, with due consideration to static electricity
- Impellers and casing of non-ferrous materials
- Impellers of aluminum alloy or magnesium alloy and a ferrous substrate, including stainless steel austenitic-co, in which a ring of suitable thickness of non-ferrous material to be installed in the casing around the impeller
- Any combination of ferrous impellers (including going austenitic stainless steel) and 13 mm minimum clearance between the impeller and the casing

d) The following combinations of impeller and casing are considered as spark-generating and are not allowed:

- Impeller of aluminum alloy or magnesium and ferrous casing, without taking into account the clearance between impeller and casing
- Casing of aluminum alloy or magnesium and ferrous impeller without taking into account the clearance between impeller and casing
- Any combination of ferrous impeller and casing with less than 13 mm of clearance between them

e) Fans assembled shall be tested according to the requirements of RBNA or national or international standards adopted by it.

308. The positions of the inlet and outlet of the ventilation ducts of the service spaces shall comply with the following requirements:

a) the extraction openings shall be located 50 mm above the lower part of the service location;

b) the air inlet openings shall be positioned in the higher part and shall not be:

- less than 2 m above the deck;
- less than 2 m from the discharges of cargo tanks;
- less than 6 metres from the exhaust ports of the safety valves.

c) output ducts, if necessary, may be of the articulated type.

309. In ships of the open type, are accepted natural ventilation devices without blowers.

310. Flame screens shall be installed in the ventilation of the following spaces:

a) ventilation openings of cofferdams;

b) openings of the cargo measuring devices;

c) collectors of cargo tank vents;

d) individual vents of cargo tanks;

e) slop tank valves.

400. Ventilation of accommodations

401. – See Title 11

402. The openings of ventilation at accommodations and service spaces opened towards the outside shall:

a) be located at least at 2 metres apart from the cargo area;

b) have means of indicating whether they are in the closed position;

c) be equipped with flame screens.

500. Ventilation of the machinery spaces

501. – See Title 11

502. The inlets for air suction of internal combustion engines shall be located at least at 2 metres apart from the cargo area.

503. The ventilation of machinery spaces shall be designed in such a way that at an ambient temperature of 32^{o} C, the inside temperature shall not exceed 40^{o} C, even with all hatches closed. It shall be prevented the accumulation of flammable, toxic or asphyxiating gases.

600. Ventilation of double hull

601. The side tanks of the double hull and the double bottom shall be equipped with a ventilation system, when they were not used for ballasting. It shall be equipped with connections for the provision of forced ventilation.

603. The openings for ventilation shall be identified by name plates, which also indicate the condition of "closed".

604. The area of openings, inlet or discharge, shall be sized one exchange of volume per 2(two) hours. In natural ventilation, consider the speed of 0.5 m/s.

700. Ventilation of Pump room

701. **Ventilation systems in cargo pump-rooms:** The ventilation of these rooms shall have sufficient capacity to minimize the possibility of accumulation of flammable vapours.

702. The number of air changes shall be at least 20 per hour, based upon the gross volume of the space.

703. The air ducts shall be arranged so that all of the space is effectively ventilated.

704. The ventilation shall be of the suction type using fans of the non-sparking type.

705. The ventilation ducts shall be installed so that its suction is immediately above the top of the floors or longitudinal in the vicinity of the dales.

706. An emergency air inlet located 2.20 m above the lower platform of the pump room equipped with a damper which can be opened or closed from the deck and the lower platform shall be installed. The ventilation through the emergency air inlet shall be effective when lower inlets are closed due to flooding of the bilges.

707. The exhaust system shall be associated with open grids on the floors to allow the free flow of air

708. Arrangements involving specific reasons of emergency openings for upper and lower to the fans that produce renewal of 20 exchanges per hour through the inlets below can be accepted without the use of dampers. When lower inlets are closed, the higher inlets shall allow a flow of at least 15 exchanges per hour.

709. The ventilation of the pump rooms shall be designed in such a way that at an ambient temperature of 32^{o} C the inside temperature shall not exceed 40^{o} C, even with all hatches closed.

800. Ventilation of holds containing independent cargo tanks

801. All the hold spaces containing independent tanks shall be fitted with two ventilation openings of adequate dimensions for an efficient ventilation of the compartment.

802. In the absence of these openings, the compartment shall be filled with inert gas or dry air.

900. Ventilation systems in combination carriers

901. In combination carriers, cargo spaces and any enclosed spaces adjacent to cargo spaces shall be capable of being mechanically ventilated.

902. The mechanical ventilation may be provided by portable fans. An approved fixed gas warning system capable of monitoring flammable vapours shall be provided in cargo pump-rooms, pipe ducts and cofferdams, adjacent to slop tanks. Suitable arrangements shall be made to facilitate measurement of flammable vapours in all other spaces within the cargo area. Such measurements shall be made possible from the open deck or easily accessible positions.

CHAPTER G
MACHINERY PIPING SYSTEM

CHAPTER CONTENTS

G1. ARRANGEMENTS FOR FUEL OIL AND OTHER FLAMMABLE OILS SOLAS II-2/B/5

100. Limitations in the use of oils as fuel

101. The following limitations shall apply to the use of oil as fuel:

a. except as otherwise permitted by this paragraph, no fuel oil with a flashpoint of less than 60°C shall be used;

Guidance

Refer to the Recommended procedures to prevent the illegal or accidental use of low flashpoint cargo oil as fuel adopted by the Organization by resolution A.565(14).

End of guidance

b. In emergency generators fuel oil with a flashpoint of not less than 43°C may be used;

c. the use of fuel oil having a flashpoint of less than 60°C but not less than 43°C may be permitted (e.g., for feeding the emergency fire pump' s engines and the auxiliary machines which are not located in the machinery spaces of category A) subject to the following:

i. fuel oil tanks except those arranged in double bottom compartments shall be located outside of machinery spaces of category A;

ii. provisions for the measurement of oil temperature are provided on the suction pipe of the fuel oil pump;

iii. stop valves and/or cocks are provided on the inlet side and outlet side of the fuel oil strainers; and

iv. pipe joints of welded construction or of circular cone type or spherical type union joint are applied as much as possible.

d. in cargo ships the use of fuel having a lower flashpoint than otherwise specified in paragraph 2.1, for example crude oil, may be permitted provided that such fuel is not stored in any machinery space and subject to the approval by the RBNA of the complete installation.

200. Arrangements for fuel oil

201. In a ship in which fuel oil is used, the arrangements for the storage, distribution and utilization of the fuel oil shall be such as to ensure the safety of the ship and persons on board and shall at least comply with the following provisions.

202. **Location of fuel oil systems:** As far as practicable, parts of the fuel oil system containing heated oil under pressure exceeding 0.18 N/mm² shall not be placed in a concealed position such that defects and leakage cannot readily be observed. The machinery spaces in way of such parts of the fuel oil system shall be adequately illuminated.

203. **Ventilation of machinery spaces:** The ventilation of machinery spaces shall be sufficient under normal conditions to prevent accumulation of oil vapour.

300. Fuel oil tanks

301. Fuel oil, lubrication oil and other flammable oils shall not be carried in forepeak tanks.

302. As far as practicable, fuel oil tanks shall be part of the ships structure and shall be located outside machinery spaces of category A.

a. Where fuel oil tanks, other than double bottom tanks, are necessarily located adjacent to or within machinery spaces of category A, at least one of their vertical sides shall be contiguous to the machinery space boundaries, and shall preferably have a common boundary with the double bottom tanks, and the area of the tank boundary common with the machinery spaces shall be kept to a minimum.

b. Where such tanks are situated within the boundaries of machinery spaces of category A they shall not contain fuel oil having a flashpoint of less than 60°C. In general, the use of free- standing fuel oil tanks shall be avoided.

c. When such tanks are employed their use shall be prohibited in category A machinery spaces on passenger ships.

d. Where permitted, they shall be placed in an oil- tight spill tray of ample size having a suitable drain pipe leading to a suitably sized spill oil tank.

Note: Refer to Unified interpretations of SOLAS chapter II-2 (MSC.1/Circ.1322).

303. No fuel oil tank shall be situated where spillage or leakage therefrom can constitute a fire or explosion hazard by falling on heated surfaces.

304. Fuel oil pipes, which, if damaged, would allow oil to escape from a storage, settling or daily service tank having a capacity of 500 l and above situated above the double bottom, shall be fitted with a cock or valve directly on the tank capable of being closed from a safe position outside the space concerned in the event of a fire occurring in the space in which such tanks are situated.

a. In the special case of deep tanks situated in any shaft or pipe tunnel or similar space, valves on the tank shall be fitted, but control in the event of fire may be effected by means of an additional valve on the pipe or pipes outside the tunnel or similar space.

b. If such an additional valve is fitted in the machinery space it shall be operated from a position outside this space. The controls for remote operation of the valve for the emergency generator fuel tank shall be in a separate location from the controls for remote operation of other valves for tanks located in machinery spaces.

305. Safe and efficient means of ascertaining the amount of fuel oil contained in any fuel oil tank shall be provided.

a. Where sounding pipes are used, they shall not terminate in any space where the risk of ignition of spillage from the sounding pipe might arise. In particular, they shall not terminate in passenger or crew spaces. As a general rule, they shall not terminate in machinery spaces. However, where the RBNA considers that these latter requirements are impracticable, it may permit termination of sounding pipes in machinery spaces on condition that all of the following requirements are met:

i. an oil-level gauge is provided meeting the requirements of paragraph G1.305.c;

ii. the sounding pipes terminate in locations remote from ignition hazards unless precautions are taken, such as the fitting of effective screens, to prevent the fuel oil in the case of spillage through the terminations of the sounding pipes from coming into contact with a source of ignition; and

iii. the termination of sounding pipes are fitted with self-closing blanking devices and with a small-diameter self- closing control cock located below the blanking device for the purpose of ascertaining before the blanking device is opened that fuel oil is not present. Provisions shall be made so as to ensure that any spillage of fuel oil through the control cock involves no ignition hazard.

c. Other oil-level gauges may be used in place of sounding pipes subject to the following conditions:

i. in passenger ships, such gauges shall not require penetration below the top of the tank and their failure or overfilling of the tanks shall not permit release of fuel; and

ii. in cargo ships, the failure of such gauges or overfilling of the tank shall not permit release of fuel into the space. The use of cylindrical gauge glasses is prohibited. The RBNA may permit the use of oil-level gauges with flat glasses and self-closing valves between the gauges and fuel tanks.

d. The means prescribed in paragraph G1.305.c which are acceptable to the RBNA shall be maintained in the proper condition to ensure their continued accurate functioning in service.

400. Prevention of overpressure

401. Provisions shall be made to prevent overpressure in any oil tank or in any part of the fuel oil system, including the filling pipes served by pumps on board.

402. Air and overflow pipes and relief valves shall discharge to a position where there is no risk of fire or explosion from the emergence of oils and vapour and shall not lead into crew spaces, passenger spaces nor into special category spaces, closed ro-ro cargo spaces, machinery spaces or similar spaces.

500. Fuel oil piping

501. Fuel oil pipes and their valves and fittings shall be of steel or other approved material, except that restricted use of flexible pipes shall be permissible in positions where the RBNA is satisfied that they are necessary. Such flexible pipes and end attachments shall be of approved fire-resisting materials of adequate strength and shall be constructed to the satisfaction of the RBNA. For valves, fitted to fuel oil tanks and which are under static pressure, steel or spheroidal-graphite cast iron may be accepted. However, ordinary cast iron valves may be used in piping systems where the design pressure is lower than 7 bar and the design temperature is below 60ºC

Note: Refer to recommendations published by the International Organization for Standardization, in particular, Publications ISO 15540:1999 on Test methods for fire resistance of hose assemblies and ISO 15541:1999 on Requirements for the test bench of fire resistance of hose assemblies.

502. External high-pressure fuel delivery lines between the high- pressure fuel pumps and fuel injectors shall be protected with a jacketed piping system capable of containing fuel from a high- pressure line failure. A jacketed pipe incorporates an outer pipe into which the high-pressure fuel pipe is placed, forming a permanent assembly. The jacketed piping system shall include a means for collection of leakages and arrangements shall be provided with an alarm in case of a fuel line failure.

503. Fuel oil lines shall not be located immediately above or near units of high temperature including boilers, steam pipelines, exhaust manifolds, silencers or other equipment required to be insulated by paragraph G1.601. As far as practicable, fuel oil lines shall be arranged far apart from hot surfaces, electrical installations or other sources of ignition and shall be screened or otherwise suitably protected to avoid oil spray or oil leakage onto the sources of ignition. The number of joints in such piping systems shall be kept to a minimum.

504. Components of a diesel engine fuel system shall be designed considering the maximum peak pressure which will be experienced in service, including any high pressure pulses which are generated and transmitted back into the fuel supply and spill lines by the action of fuel injection pumps. Connections within the fuel supply and spill lines shall be constructed having regard to their ability to prevent pressurized fuel oil leaks while in service and after maintenance.

505. In multi-engine installations which are supplied from the same fuel source, means of isolating the fuel supply and spill piping to individual engines, shall be provided. The means of isolation shall not affect the operation of the other engines and shall be operable from a position not rendered inaccessible by a fire on any of the engines.

506. Where the RBNA may permit the conveying of oil and combustible liquids through accommodation and service spaces, the pipes conveying oil or combustible liquids shall be of a material approved by the RBNA having regard to the fire risk.

600. Protection of high temperature surfaces

601. Surfaces with temperatures above 220ºC which may be impinged as a result of a fuel system failure shall be properly insulated.

602. Precautions shall be taken to prevent any oil that may escape under pressure from any pump, filter or heater from coming into contact with heated surfaces.

700. Arrangements for fuel oil in periodically unattended machinery spaces

701. In addition to the requirements of paragraphs G1.100 to G1.400, the fuel oil and lubricating oil systems in a periodically unattended machinery space shall comply with the following:

702. Where daily service fuel oil tanks are filled automatically, or by remote control, means shall be provided to prevent overflow spillages. Other equipment which treats flammable liquids automatically (e.g. fuel oil purifiers) which, whenever practicable, shall be installed in a special space reserved for purifiers and their heaters, shall have arrangements to prevent overflow spillages; and

703. Where daily service fuel oil tanks or settling tanks are fitted with heating arrangements, a high temperature alarm shall be provided if the flashpoint of the fuel oil can be exceeded.

800. Arrangements for other flammable oils

801. The arrangements for the storage, distribution and utilization of other flammable oils employed under pressure in power transmission systems, control and activating systems and heating systems shall be such as to ensure the safety of the ship and persons on board.

802. Suitable oil collecting arrangements for leaks shall be fitted below hydraulic valves and cylinders. In locations where means of ignition are present, such arrangements shall at least comply with the provisions of paragraphs G1.3033, G1.305, G1.5033 and G1.600 and with the provisions of paragraphs G1.400 and G1.501 in respect of strength and construction.

G2. ARRANGEMENTS FOR LUBRICATING OIL

100. Arrangements for the storage, distribution and utilization of lubricating oil

101. The arrangements for the storage, distribution and utilization of oil used in pressure lubrication systems shall be such as to ensure the safety of the ship and persons on board. The arrangements made in machinery spaces of category A, and whenever practicable in other machinery spaces, shall at least comply with the provisions of paragraphs G1.100, G1.303, G1.304, G1.305, G1.400, G1.501, G1.503 and G1.600 except that:

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a. this does not preclude the use of sight-flow glasses in lubricating systems provided that they are shown by testing to have a suitable degree of fire resistance; and

b. sounding pipes may be authorized in machinery spaces; however, the requirements of paragraphs G1.305.a.i and

c. G1.305.a.iii need not be applied on condition that the sounding pipes are fitted with appropriate means of closure.

102. The provisions of paragraph G1.400 shall also apply to lubricating oil tanks except those having a capacity less than 500 l, storage tanks on which valves are closed during the normal operation mode of the ship, or where it is determined that an unintended operation of a quick closing valve on the oil lubricating tank would endanger the safe operation of the main propulsion and essential auxiliary machinery.

G4. EXHAUST GAS

100. Arrangement

101. to 104. – See Title 11

105. The discharges of the engine or boiler exhaust gas system shall be located at:

a) further than 2 metres above the deck;

b) further than 2 metres from the cargo area; and

c) further than 3 metres of flammable vapour or gas source.

106. The discharge ducts shall be thermally insulated or water cooled.

200. Protection against fire

201. – See Title 11

202. The discharge ducts shall be provided, after the silencer, of spark suppressor device, such as flame screen, discharge turbines or unloading into water tank.

300. – See Title 11

400. – See Title 11

CHAPTER I
SPECIAL CARGO PROTECTION SYSTEM

CHAPTER CONTENTS

Guidance

Chapter I1 .to I2 does not apply for ships with notation K3.

End of Guidance

I1. INERT GAS SYSTEM

Note: This chapter I1 complies with and follows the requirements of the codes and standards listed below:

a) IMO "*Guidelines for Inert Gas Systems"* published by the Circulars of the IMO MSC/Circ. 282, 353 and 38;

b) Code FSS of the IMO, Chapter 15; and

c) IACS Unified Requirements UR_F.

There shall be detailed instruction manuals on board, containing the requirements relating to the operation, safety, maintenance and risks of work relevant to the inert gas system and its application to the cargo tank system. The manuals shall contain guidance on procedures to be followed in the event of a malfunction or a defect in the inert gas system.

100. Application

101. For tankers of 20,000 DWT deadweight tons or greater, the protection of the cargo tanks shall be obtained through a fixed inert gas system, in accordance with the requirements of this Chapter or an equivalent fixed system.

102. When there is an equivalent installation to an inert gas system, it shall:

a) be able to prevent a dangerous accumulation of explosive mixtures inside of intact cargo tanks during ordinary operation, along the voyage in ballast and the necessary operations carried out inside the tank; and

b) be designed so as to minimise the risk of ignition from generation of static electricity by the system itself

103. Every ship that is certified to carry cargoes that require inerting or blanketing its cargo shall be fitted with an inert gas system.

104. The tankers that use a procedure of cleaning of cargo tanks using crude oil washing shall be provided with an inert gas system that complies with the requirements of this Chapter. Such a system shall be fitted on each of the cargo tanks and slop tanks.

200. Basic principles for inert gas systems

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

In the event that the inert gas system is not able to meet the above operating condition and that a repair is impracticable, discharge, de-ballasting, and cleaning of tanks may only be carried out when the "emergency conditions" referred to in the publication IMO Guide of the IMO *"Guidelines for Inert Gas Systems*" published by the IMO Circular MSC Circ. 282, 353 and 387 were complied.'

202. The inert gas system shall be designed, built and tested left-in accordance with the requirements of this Chapter, and shall be able to:

a) inerting the cargo tanks by reducing the oxygen content in the atmosphere in each tank to a level at which it is not possible to sustain combustion..

b) keep the atmosphere in any part of any cargo tank with oxygen content not exceeding 8% by volume and positive pressure in every harbour and sea voyage conditions, except when it is necessary to the degassing of the tank.

c) eliminating the need for air to enter the tank during operations except when it is necessary to degas the tank.

d) purging empty tanks with hydrocarbon gases, so that subsequent operations of degassing does not create conditions for formation of flammable atmosphere within the tank.

203. The system shall be capable of supplying inert gas to the cargo tanks at a flow at least 125 percent of the maximum discharge of the vessel expressed by volume.

204. The system shall be capable of delivering inert gas with an oxygen content not greater than 5% by volume of flow on the main line of gas to the cargo tanks in any flow that may occur during operation.

205. The inert gas supply may be provided by means of combustion gases from the main or auxiliary boilers. The RBNA may accept systems using combustion gases of one or more separate gas generators or from other sources or a combination of these sources, as long as it is obtained an equivalent safety standard. These systems shall, to the

extent practicable, meet the requirements of this Chapter. There shall not be allowed systems that use carbon dioxide stored unless the RBNA is convinced that the risk of ignition from generation of static electricity by the system itself has been minimised.

206. The system shall be designed in such a way that the maximum pressure exerted on cargo tank does not exceed the test pressure of these tanks.

300. Design and arrangement of the inert gas systems

301. The inert gas distribution system shall meet the following requirements:

a) The inert gas generator shall be equipped with two fuel oil pumps. There shall be installed two fuel oil pumps in the inert gas generator. The RBNA may allow a single fuel pump, with the condition that there is sufficient spares onboard for the fuel pump and for its main prime movers, to allow that any malfunction in the fuel pump and is main prime mover can be remedied by the ship's crew;

b) There shall be interception valves of the combustion gases in the inert gas supply system between the smoke chambers of the boiler and combustion gas scrubber. These valves shall be fitted with indicators to show whether they are open or closed, and precautions shall be taken to keep them gas-tight to gases and to keep their seats free of soot. Measures shall be taken to ensure that the equipment of soot blowers system cannot work when the corresponding combustion gas valve is open; and

c) A gas regulating valve shall be fitted in the inert gas main line, automatically controlled to close as the requirements of Part II, Title 32, Section 6, Chapter I1, item 102.a and 102. b. It shall also be capable of automatically regulating the flow of inert gas to the cargo tanks unless means are provided to automatically control the speed of the inert gas blowers required. The valve in reference shall be located in the forward bulkhead of the most forward space safe to gas through which the inert gas main line is passing.

Note: *a space safe to gas is a compartment where the penetration of hydrocarbon gases may pose risk of flammability or toxicity.*

302. The devices intended to purging and / or degassing the tanks shall be such that minimise the risks due to dispersion of flammable vapours in the atmosphere and at the presence of flammable mixtures in a cargo tank there shall be installed a gas scrubber according to the following requirements:

a) be installed in a location where it is able to effectively cooling the volume of gas specified in Part II, Title 32, Section 6, Chapter I1. Items 202 and 203, to remove solids and sulphur combustion products;

b) the provision of the water cooler shall be in such a way to a suitable water supply is always available without interfering with any essential service of the ship. It shall also be an alternative system of cooling of the water;

c) filters or equivalent devices shall be installed to minimise the volume of water drawn to the inert gas blowers.

d) the scrubber shall be located abaft all cargo tanks, of the cargo pump rooms and of the cofferdams that separate these compartments from the machinery spaces of category A.

303. The blowers of the inert gas system shall meet the following requirements:

a) there shall be installed at least two inert gas blowers that together are able to supply to the cargo tanks the volumes required by Part II, Title 32, Section 6, Chapter I1, items 202 and 203. In a system with gas generator, the RBNA may permit a single bower if the system is capable of providing the required volume of gas, provided that there are sufficient spare parts on board to allow repairs to be made by the crew when any blower failure occurs;

b) adequate provision must be made for shut-off in the suction and discharge connections of each blower;

c) if the blowers were employed to degassing, their inlets shall be fitted with locking devices;

d) the blowers shall be located abaft all cargo tanks, the cargo pump rooms and the cofferdams that separate these compartments from the machinery spaces of category A.

304. The following means shall be provided to prevent gas leakage:

a) Special attention shall be given to the design and location of the scrubber and the blowers with relevant piping and fittings to prevent the leakage of combustion gases for enclosed spaces;

b) to allow the maintenance to be made with safety precautions, there shall be installed either other water seal, or another effective means of preventing the leakage of combustion gases between interception valves of combustion gases and the scrubber or incorporated into the gas inlet to the scrubber.

305. The means of preventing the return of hydrocarbons shall be designed and installed as follows:

a) There shall be installed at least two retaining devices, one of which shall be a water seal, in inert gas supply system, to prevent the return of hydrocarbon vapours for the discharge lines of the engine room, or for any free gas compartments, in all conditions of trim, healing and the ship's motion. They shall be located between the automatic valve required by paragraph Part II, Title 32, Section 6, Chapter I1. item 301.c and the connection further abaft to any cargo tank or for any cargo piping system;

b) The devices referred to in paragraph a. above shall be located in the cargo area on deck;

c) The water seal referred to in paragraph a. above shall be able to be powered by two separate pumps, one of which shall be capable of maintaining an adequate supply in all the conditions;
d) The arrangement of the seal and accessories shall be such as to prevent reverse flow of hydrocarbon vapours and will ensure the proper functioning of the seal under all conditions of operation;

e) There shall be adopted measures to ensure that the water seal is protected against freezing, in such a way that the integrity of the seal is not affected by excess heat;

f) There shall also be installed also a ring of water or another approved device in each water supply pipe and in each drainage pipes associated with the system, and each venting pipe or a pressure sensor that will lead to free gas compartments. There shall be means to prevent these rings be emptied by vacuum;

g) The seal of water on deck and all the arrangements of the ring (loop) shall be capaable to prevent the return of hydrocarbon vapours at a pressure equal to the test of cargo tanks;

h) The second device shall be a non-return valve, or an equivalent device that is capable of prevent the return of vapours or liquids, and shall be fitted at forward the deck water seal required by paragraph b1. It shall be equipped with a means of effective closure. As an alternative to using effective closure, there can be another valve that has such means of closure located forward of the non-return valve, to isolate the deck water seal from the inert gas system to the cargo tanks; and

i) As another safeguard against a possible leak of hydrocarbon liquids or vapours coming from the deck piping system, there shall be means to allow a venting that act in a safe way in this section of the piping between the valve which has the means of proper shut-off referred to in paragraph (h) above and the valve referred to in subparagraph Part II, Title 32, Section 6, Chapter I1, item 301.c.

306. The inert gas piping system shall meet the following requirements:

a) the inert gas supply piping system can be divided into two or more branches forward the devices of retention required by item 305 above;

b) the inert gas supply piping system may be endowed with a branch leading to each cargo tank. The branch piping for inert gas shall be equipped with interception valves, or of an equivalent control for isolating each tank. When interception valves are installed, they shall be fitted with locking devices, which shall be under the control of a ship's officer in charge. The control system operated shall provide clear information on the position of those valves, whether open or closed.

c) the piping system shall be designed to prevent the accumulation of cargo or water in the lines in all normal operating conditions;

e) the inert gas supply may be employed for the venting of vapours displaced from the cargo tanks along the ballast loading;

f) if there is a connection between the installed the piping system of inert gas supply and the ship's cargo system, measures shall be taken to ensure an effective isolation, taking into consideration the large pressure difference which may exist between the systems. These measures shall consist of two interception valves with a device to allow the discharge of gases in a safe way from the space between the two valves, or a device consisting of a spool with blind flanges. The valve separating the inert gas supply piping system from the cargo system, and that is on the side of the cargo piping, shall be a non-return valve with a means of effective shut-off.

307. In tankers for which required the inert gas system, the connection of this system to the double hull compartments shall meet the following requirements:

a) the double hull compartments shall be fitted with suitable connections for the supply of inert gas;

b) when the compartments were connected to a fixed system of distribution of inert gas, they shall be fitted with means to prevent hydrocarbon gases of cargo tanks penetrate into double hull compartments through the system;

c) when such compartments are not permanently connected to an inert gas distribution system adequate means shall be provided to enable the connection of these compartments to the inert gas supply main.

400. Instrumentation

401. Indicators – they shall be provided with means to indicate continuously the temperature and pressure of the inert gas at the discharge side of the blowers when they were in operation.

402. Indicators with recorder – there shall be provided instrumentation to indicate continuously and recording permanently while the gas is being supplied:

a) the pressure of supply of the main lines forward of inert gas check valves described in part II, Title 32, Chapter 6 Section I1, item 305;

b) the oxygen content of the inert gas main supply lines by the discharge side of the blowers.

403. The devices referred to in item I1.402 above shall be located in the cargo control station, where one exists.

When there is no control of the cargo control station they shall be installed in a position easily accessible to the officer in charge of loading operations.

404. Additionally meters shall be installed:

a) in the bridge to indicate at all times the pressure referred to in item 402 paragraph a. above and the pressure in the slop tanks whenever those tanks are isolated from the inert gas main line;
b) in the engine control station of machines or in the engine room to indicate the oxygen content referred to in paragraph b. of item 402 above.

405. Portable instruments for measuring the concentration of vapours and oxygen shall be provided. Additionally, appropriate provisions shall be laid down in each tank such that the condition of the tank atmosphere can be determined using these portable instruments.

406. There shall be adequate means for the measurement of the zero and the whole range of measuring instruments indication of gas concentration, both fixed as portable, mentioned in paragraphs 502 and 503 above.

500. Audible and visual alarms

501. For the inert gas system, both the type of combustion gases and the inert gas generator type, there shall be audible and visual alarms to indicate:

a) low pressure of water or low flow of water for the combustion gas scrubber referred to in paragraph 302;

b) high level of water in the gas scrubber mentioned in paragraph 302;

c) high gas temperature, as mentioned in paragraph 401;

d) failure in the inert gas blowers referred to in paragraph 303;

e) oxygen content exceeding 8% per unit volume, as mentioned in paragraph 402;

f) failure in power supply to the automatic control system of regulating valve and of the provisions mentioned in paragraphs 301.b and 4021;

g) low level of water in the water seal referred to in paragraph 305.a;

h) gas pressure lower than 100 mm of water in pressure gauge as mentioned in section 4021. The alarm device shall be such as to ensure that the pressure in the slop tank of the mixed tankers can be monitored all the time;

i) high pressure of gas, as mentioned in paragraph 402.

502. For the inert gas system of inert gas generator type, there shall be other audible and visual alarms to indicate:

a) deficient fuel oil supply;

b) power supply failure for the generator; and

c) power supply failure for the automatic system of the generator control.

503. The alarms required in paragraphs 501. e), 501. f) and 501 h) shall be installed in the machinery spaces and cargo control station, where being required, but, in each case, in such a location that they be immediately received by the crew members responsible.

504. With respect to paragraph 501. h above, it shall be demonstrated to the discretion of the RBNA that it is kept a proper reserve of water in all conditions and demonstrated 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 seal shall only operate when the inert gas is not being supplied.

505. There shall be a system of audible alarm indepen-dent of the required in paragraph 501. h, or an automatic shutoff device of the cargo pumps to trigger when predetermined thresholds are reached of low pressure in the inert gas system.

600. Automatic stop and shut-off

601. The automatic stop of the inert gas blowers and the automatic shut-off of the control valves shall be adjusted to trigger when re-determined limits are reached p, in compliance with provisions of paragraphs 501.a), 501 b) and 501 c).

602. The automatic shut-off of the valves of gas regulator shall be adjusted in accordance with the provisions of paragraph 2.303.

603. Oxygen-rich gas - with respect to paragraph 501. e), when the oxygen content of the inert gas exceeds 8% per unit volume immediate measures shall be taken to improve the quality of the gas. Unless the quality of the gas improves, all activities in cargo tanks shall be interrupted in order to prevent the air from being drawn into the tanks, and interception valves referred to in paragraph 305. h3) shall be closed.

I2. SYSTEM WITH NITROGEN GENERATOR

100. Application

101. This subchapter applies when the inert gas is produced by separation in its gas components by passing through pressed hollow fiber membranes, semi-permeable, or adsorbent materials.

Explanatory Note: adsorption

The adsorption is applied in separation and purification processes, presenting itself as an important and economically viable alternative in many cases. The most common examples of such processes are the so-called purification processes, where using a fixed bed column usually bundled with adsorbent to remove moisture from a gaseous stream, or even remove impurities from a liquid stream, e.g. from an industrial effluent. When the components to be adsorbed are present in low concentrations and have low added value usually are not recovered.

102. This subchapter applies in particular to ships carrying bulk alcohol or products which may be contaminated by inert gas generated by boiler exhaust gas or inert gas generators powered by fuel oil.

103. When such system are installed in location of the combustion gases of a boiler or inert gas generators fed by fuel oil, the previous requirements for inert gas systems for pipe arrangements, instrumentation and alarms shall apply from the discharge of the generator, as far as practicable.

200. Requirements for nitrogen generator system

201. A nitrogen generator consists of a power supply air treatment and a certain number of membranes or adsorption modules in parallel required to achieve at least the required minimum capacity of 125% of the discharge capacity of the ship expressed by volume.

202. The air compressor and the nitrogen generator may be installed in the engine room or in separate compartment. A separate compartment shall be classified as "Miscellaneous machinery compartment" with regard to fire protection requirements.

203. When a separate compartment is available, it shall be located outside the cargo area and shall be endowed with a system of ventilation and independent extraction with minimum capacity of 6 exchanges per hour. There shall also be installed an alarm of low oxygen level. The compartment shall not have direct access to accommodations, service spaces and control rooms.

204. The nitrogen generator shall be able to supply high purity nitrogen content not exceeding 5% by volume. The system shall be equipped with automatic means to discharge into the atmosphere gases "out of specification" during the start up and abnormal conditions of operation.

205. The system shall be equipped with two air compressors. The total capacity required for the system shall be preferably divided equally by the two compressors, but in no event the compressor capacity shall be less than 1/3 of total required capacity.

A single air compressor can be accepted provided that there is sufficient spare parts to allow repairs on voyage of the compressor and its prime mover.

206. There shall be installed a air supply treatment system to remove water, solid particles, residual oil of compressed air and to keep the specified temperature.

207. When there is a storage tank of nitrogen this shall be installed in separate dedicated compartment or in separate compartment containing the air compressors and the nitrogen generator, or may even be installed in the cargo area.

When the nitrogen storage tank is installed in an enclosed compartment, access can only be done from the open deck and the access door shall open outwards.

Permanent ventilation and alarm as required by item 203 above.

208. The air rich in oxygen of the nitrogen generator and the gas produced rich in nitrogen provided from protection devices of the nitrogen storage tank shall be discharged in suitable location on the open deck.

209. There isolation shall be installed between the generator and the tank to allow for maintenance.

210. At least two check valves shall be installed in the inert gas supply piping system, one of which shall be of type double block and draining. The second retention device shall have positive means of shutoff.

Explanatory Note: a block and drainage device consisting of two closing valves in series with a drainage valve between them can be accepted provided that:

a) The valve operation is performed automatically. Signals to open / close shall be derived directly from the process e.g. the inert gas flow or a pressure differential;

b) An alarm for misoperation of the valves shall be installed, for example, the condition of " blower shutoff " and "power valves open" is an alarm condition.

211. There shall be instrumentation to indicate continuously the air temperature and pressure:

a) on discharge side of the compressor

b) on admission side of nitrogen generator.

212. Instrumentation shall be installed to display and permanently record the content of oxygen in the inert gas discharge side of the nitrogen generator as the inert gas is being supplied.

213. The instrumentation referred to in 211 above shall be installed in the cargo control room.

214. Visual and audible alarms shall be fitted to indicate:

a) low pressure compressor feeder air referred to in item 210 above;

b) high air temperature as referred in item 210 above;

c) high level of condensate in the automatic drain of water separator referred to in item 206 above;

d) failure of the electrical heater, if any;

e) oxygen content greater than the required in item 204 above.

f) failure of the power supply to the instrumentation system as referred to in item 211 above.

215. Provision shall be made for automatic system shutoff under the conditions of alarm of the item 213.a up to 213.e above.

216. The alarms required by item 213.a up to 213.f above shall be installed in the engine room and in the control room, where one exists, but in each case in such a position to be immediately received by the crew member responsible for system operation.

300. Requirements for systems with nitrogen generator for tankers with less than 20,000 DWT deadweight tons and for which no inert gas system is required by the rules of the SOLAS

301. Inert gas systems by discharge gas or by nitrogen generator for ships below 20,000 tons of deadweight capacity not required by SOLAS shall comply with the following requirements:

a) the ship shall be in accordance with items I2.100 and I2.200 above, with exception of the items 101, 102, 201 and 205 above;

b) when the connections of the cargo tanks, of the bilges or piping system were not permanent, retention devices required by item 210 above may be replaced by two check valves.

I3. CARGO HEATING SYSTEM

100. Cargo heating system

101. The boilers used for heating the cargo shall use a liquid fuel having a flash point above 55° C.

102. The boilers shall be located either in the Engine Room or in special location situated under the deck outside the cargo area, accessible from the deck or Engine Room.

103. The cargo heating system shall be the designed so that the substance carried cannot return to the boiler in case of failure of tightness of the heating coils.

104. No part of the heating system shall exceed the temperature of 200° C.

105. Blind flanges or similar devices shall be installed in heating circuits in tanks carrying loads that shall not be heated.

106. The ventilation system of the Engine Room shall be dimensioned taking into account the volume of air required to feed the boilers.

107. If the cargo heating system is used during loading, unloading or degassing operations the service location in which is installed shall meet fully the requirements of Part II, Title 32 of these Rules.

This requirement does not apply to the suction openings of ventilation system, which shall be located at a minimum distance of 2.0 metres of height of the deck, 2.0 m from the cargo area and 6.0 metres from openings of:

a) cargo tanks,

b) cargo pumps on the deck,

c) outlet PV valves or of high speed

d) cargo piping valves on shore

108. The heating system shall be designed in such a way that the pressure maintained in the heating circuit is higher than the cargo oil. This requirement does not apply to circuits that are drained and isolated.

109. Isolation valves shall be installed at the inlets and exits of the heating circuits of the tanks.

110. Means shall be provided to allow the manual adjustment of the flow.

111. The heating coils inside the tanks shall be of suitable material for the heating of the fluid, and reinforced with welded connections only.

200. Steam heating system

201. In order to reduce the risk of gaseous or liquid cargo return to the machinery spaces or boilers, the cargo steam heating system shall meet the requirements of the items that follow.

202. There shall be independent from other on-board services with the exception of cargo heating or cooling system and load shall not penetrate in the machinery compartments.

203. Alternatively shall be endowed with observation tank in the return water system located within the cargo area. However, this tank may be located within the engine room in well ventilated location and away from boilers and other sources of ignition, being that the vent outlets shall be led into the atmosphere and equipped with flame screens.

300. Hot water heating system

301. Heating system of cargo tanks by hot water shall be independent from other systems.

302. They shall not penetrate in machinery spaces unless if the expansion tank were equipped with:

a) means of detecting flammable vapours; and

b) vent outlets led to exterior spaces and equipped with suppressor flame screens.

400. Thermal oil heating system

401. The oil heating system shall be provided through a separate secondary system, located completely within the cargo area.

402. A simple circuit can be accepted, however, provided that:

a) the system is disposed so to ensure positive pressure on the coils of at least 3 metres of water column above the static gauge height of the cargo when the circulation pump is not in operation;

b) means are provided in the expansion tank to the detection of flammable vapours of the cargo, being acceptable portable equipment;

c) the individual valves of each coil shall be fitted of locking device to ensure that the coils remain under static pressure all the time.

I4. SPRAY SYSTEM

– See Part II, Section 3, Title 11

I5. INERTING, PURGING, DEGASSING

100. Inerting, purging, degassing

101. The devices intended for purging and / or degassing the tanks shall be such be such to minimise the risks due to dispersion of flammable vapours in the atmosphere and to the presence of flammable mixtures in a cargo tank.

102. The procedure for purging and / or degassing of the cargo tanks shall be take into consideration the compliance with the following:

Guidance

SOLAS Chapter II-2, 2002
Part E - Operational requirements
Regulation 16. Operations

3.2 Procedures for cargo tank purging and/or gas-freeing
3.2.1 When the ship is provided with an inert gas system, the cargo tanks shall first be purged in accordance with the provisions of regulation 4.5.6 until the concentration of hydrocarbon vapours in the cargo tanks has been reduced to less than 2% by volume. Thereafter, gas-freeing may take place at the cargo tank deck level.
3.2.2 When the ship is not provided with an inert gas system, the operation shall be such that the flammable vapour is discharged initially through:
3.2.2.1 the vent outlets as specified in regulation 4.5.3.4;
3.2.2.2 outlets at least 2 m above the cargo tank deck level with a vertical efflux velocity of at least 30 m/s maintained during the gas-freeing operation; or
3.2.2.3 outlets at least 2 m above the cargo tank deck level with a vertical efflux velocity of at least 20 m/s and which are protected by suitable devices to prevent the passage of flame.
3.2.3 The above outlets shall be located not less than 10 m, measured horizontally, from the nearest air intakes and openings to enclosed spaces containing a source of ignition and from deck machinery, which may include anchor windlass and chain locker openings, and equipment which may constitute an ignition hazard.
3.2.4 When the flammable vapour concentration at the outlet has been reduced to 30% of the lower flammable limit, gas-freeing may be continued at cargo tank deck level.

End of Guidance

103. The devices intended to turn the empty tanks inerted, purged or degassed shall be approved by the RBNA and shall be such that is minimised the accumulation of hydro-

carbon vapours in pockets formed by the internal structural members in a tank and that:

a) in each cargo tank, the gas exhaust piping system, if any, shall be located as far away as possible from intake of inert gas / air. The intake of these exhaust pipelines may be located at the deck level, or at no more than 1 m above the tank bottom;

b) the cross-sectional area of these pipelines of gas discharge referred to in item a) above shall be such that may be maintained a speed of outlet of at least 20 m/s when any three tanks are being simultaneously supplied with inert gas. Their discharges shall extend for at least 2 m above the deck level; and

c) each gas outlet referred to in item (b) above) shall be equipped with suitable sealing devices.

I6. GAS MEASURING AND DETECTION

100. Portable instruments

101. The tankers shall be equipped with at least two portable instruments for measuring oxygen and two for measuring concentrations of flammable vapours, along with a sufficient quantity of spare assemblies. There shall be adequate means to carry out the calibration of these instruments. **[IACS UR F7]**

102. Dispositions for measurement of gases in double-hull spaces and double bottom.

a) There shall be adequate portable instruments for measuring oxygen and flammable vapour concentrations in spaces of the double hull and of the double bottom. When selecting these instruments, due attention shall be given to its use along with the fixed piping systems for withdrawal of gas samples mentioned in item b) below.

b) When the atmosphere inside the double-hull spaces cannot be measured in a reliable manner using flexible hoses for withdrawal of gas samples, these spaces shall be fitted with permanent pipelines for the removal of gas samples. The configuration of the pipelines for the removal of gas samples shall be adapted to the design of these spaces.

c) The materials for the confection and dimensioning of the pipelines for the withdrawal of the gas samples shall be such as to prevent restrictions on the flow of gas. When plastic materials were used, they shall be electric conductors.

200. Provisions for fixed systems of detection of hydrocarbon gases in double-hull spaces and double bottom of tankers

201. In addition to the requirements of items 701 and 702 the tankers with 20,000 tons of deadweight or more, built in January 1, 2012 or later, shall be fitted with a fixed system of detection of gas of hydrocarbons that meets to provision in the Fire Safety Systems Code, to measure the concentration of hydrocarbon gases in all ballast tanks and empty compartments of the double hull and double bottom, adjacent to cargo tanks, including the tank of forward collision and any other tanks of the bulkhead deck which are adjacent to the cargo tanks.

202. The tankers equipped with inerting systems for these spaces, which operate constantly, need not be equipped with fixed equipment of hydrocarbon gas protected.

203. Despite what has been said above, the compartments of cargo pumps subject to disposition in the items 902 to 905 shall not need to meet the requirements of this paragraph.

300. Installation requirements for analyzing units for continuous monitoring of flammable vapours

[IACS UR F43]

301. This item applies to gas analyzing units of the sampling type located outside gas dangerous zones and fitted on board gas carriers or on board oil/chemical tankers.

302. Gas analysing units with non-explosion proof measuring equipment may be located in areas outside cargo areas, e.g. in cargo control room, navigation bridge or engine room when mounted on the forward bulkhead provided the following requirements are observed:

a) Sampling lines shall not run through gas safe spaces, except where permitted under 5.

b) The gas sampling pipes shall be equipped with flame arresters. Sample gas is to be led to the atmosphere with outlets arranged in a safe location.

c) Bulkhead penetrations of sample pipes between safe and dangerous areas shall be of approved type and have same fire integrity as the division penetrated. A manual isolating valve shall be fitted in each of the sampling lines at the bulkhead on the gas safe side.

d) The gas detection equipment including sample piping, sample pumps, solenoids, analysing units etc. shall be located in a reasonably gas tight enclosure (e.g. a fully enclosed steel cabinet with a gasketed door) which is to be monitored by its own sampling point. At gas concentrations above 30% LFL inside the enclosure the entire gas analysing unit is to be automatically shut down.

e) Where the enclosure cannot be arranged directly on the bulkhead, sample pipes shall be of steel or other equivalent material and without detachable connections, except for the connection points for isolating valves at the bulkhead

and analysing units, and are to be routed on their shortest ways.

CHAPTER J
PREVENTION OF POLLUTION

CHAPTER CONTENTS

J1. RETENTION OF OIL ON BOARD: SLOP TANKS
[MARPOL ANNEX 1 CHAPTER 3]

Guidance
Applicable to ships having class notation K2 and K3 covered by the present item
End of guidance

100. Retention of oil on board: slop tanks

101. Oil tankers of 150 gross tonnage and above shall be provided with slop tank arrangements in accordance with the requirements of paragraphs E6.102 to E6.104 of this regulation.

102. Adequate means shall be provided for cleaning the cargo tanks and transferring the dirty ballast residue and tank washings from the cargo tanks into a slop tank approved by the RBNA.

103. In this system arrangements shall be provided to transfer the oily waste into a slop tank or combination of slop tanks in such a way that any effluent discharged into the sea will be such as to comply with the provisions of MARPOL Annex 1 regulation 34.

104. The arrangements of the slop tank or combination of slop tanks shall have a capacity necessary to retain the slop generated by tank washings, oil residues and dirty ballast residues. The total capacity of the slop tank or tanks shall not be less than 3% of the oil carrying capacity of the ship, except that the Administration may accept:

a. 2% for such oil tankers where the tank washing arrangement are such that once the slop tank or tanks are charged with washing water, this water is sufficient for tank washing and, where applicable, for providing the driving fluid for eductors, without the introduction of additional water into the system;

b. 2% where segregated ballast tanks or dedicated clean ballast tanks are provided in accordance with Subchapter J5 of this Section, or where a cargo tank cleaning system using crude oil washing is fitted in accordance with regulation 3 of this Annex. This capacity may be further reduced to 1.5% for such oil tankers where the tank washing arrangements are such that once the slop tank or tanks are charged with washing water, this water is sufficient for tank washing and, where applicable, for providing the driving fluid for eductors, without the introduction of additional water into the system; and

c. 1% for combination carriers where oil cargo is only carried in tanks with smooth walls. This capacity may be further reduced to 0.8% where the tank washing arrangements are such that once the slop tank or tanks are charged with washing water, this water is sufficient for tank washing and, where applicable, for providing the driving fluid for eductors, without the introduction of additional water into the system.

104. Slop tanks shall be so designed particularly in respect of the position of inlets, outlets, baffles or weirs where fitted, so as to avoid excessive turbulence and entrainment of oil or emulsion with the water.

105. Oil tankers of 70 000 tonnes deadweight and above shall be provided with at least two slop tanks.

J2. SEGREGATION OF OIL AND WATER BALLAST
[MARPOL ANNEX 1 REGULATION 18]

100. General

101. Oil tankers of 150 gross tonnage and above, no ballast water shall be carried in any oil fuel tank.

102. Every crude oil tanker of 20 000 tonnes deadweight and above and every product carrier of 30 000 tonnes deadweight and shall be provided with segregated ballast tanks and shall comply with Subchapters E5.200 and E5.300.

200. Capacity of the segregated ballast tanks

201. The capacity of the segregated ballast tanks shall be so determined that the ship may operate safely on ballast voyages without recourse to the use of cargo tanks for wa-

ter ballast except as provided for in paragraph 3 or 4 of this regulation. In all cases, however, the capacity of segregated ballast tanks shall be at least such that, in any ballast condition at any part of the voyage, including the conditions consisting of lightweight plus segregated ballast only, the ship's draughts and trim can meet the following requirements:

a. the moulded draught amidships (dm) in metres (without taking into account any ship's deformation) shall not be less than:

$d_m = 2.0 + 0.02L$

b. the draughts at the forward and after perpendiculars shall correspond to those determined by the draught amidships (d_m) as specified in paragraph 2.1 of this regulation, in association with the trim by the stern of not greater than $0.015L$; and

c. in any case the draught at the after perpendicular shall not be less than that which is necessary to obtain full immersion of the propeller(s).

300. Carriage of ballast water in cargo tanks

301. In no case shall ballast water be carried in cargo tanks, except:

a. on those rare voyages when weather conditions are so severe that, in the opinion of the master, it is necessary to carry additional ballast water in cargo tanks for the safety of the ship; and

b. in exceptional cases where the particular character of the operation of an oil tanker renders it necessary to carry ballast water in excess of the quantity required under paragraph 2 of this regulation, provided that such operation of the oil tanker falls under the category of exceptional cases as established by the Organization.

c. Such additional ballast water shall be processed and discharged in compliance with regulation 34 of Annex 1 of MARPOL 73/78 and an entry shall be made in the Oil Record Book Part II referred to in regulation 36 of that Annex.

d. In the case of crude oil tankers, the additional ballast permitted in paragraph 3 of this regulation shall be carried in cargo tanks only if such tanks have been crude oil washed in accordance with regulation 35 of this Annex before departure from an oil unloading port or terminal.

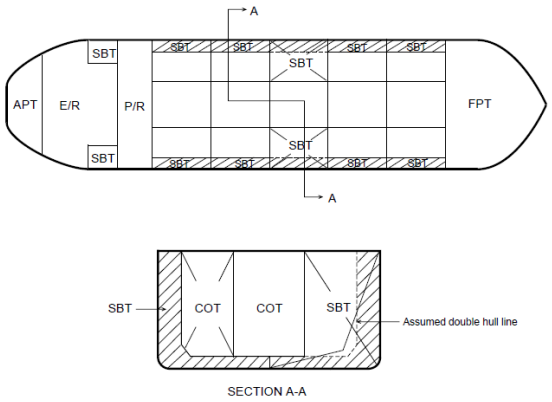
302. Notwithstanding the provisions of paragraph 2 of this regulation the segregated ballast conditions for oil tankers less than 150 metres in length shall be to the satisfaction of the RBNA.

400. Calculation of the aggregate capacity of SBT IACS MPC 6

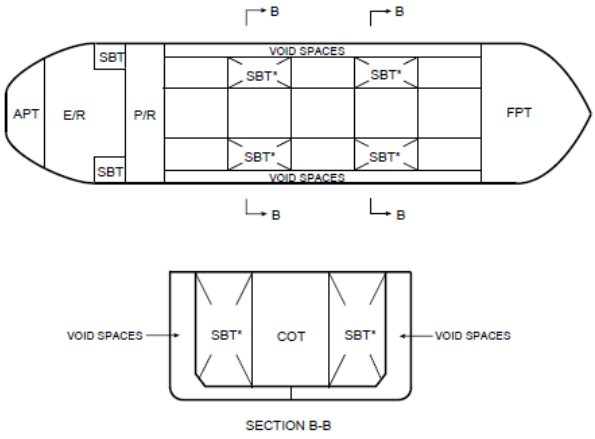
401. In calculating the aggregate capacity under regulation 13F (3) (d), the following shall be taken into account:

a. the capacity of engine-room ballast tanks shall be excluded from the aggregate capacity of ballast tanks;

b. the capacity of ballast tank located inboard of double hull shall be excluded from the aggregate capacity of ballast tanks (see figure 1).



a. spaces such as void spaces located in the double hull within the cargo tank length shall be included in the aggregate capacity of ballast tanks (see figure 2).



J3. CARGO TANK WASHING SYSTEM

100. General

101. The ships vessels covered by this Title shall be fitted with washing system for cargo tanks.

102. This Chapter J3 shall not apply to ships with less than 150 GT provided that the J1.100 requirements are met.

200. Tankers with 20,000 DWT deadweight tons and larger

201. All the tankers with a capacity of 20,000 DWT deadweight tons and larger shall be fitted with a tank washing system by crude oil (COW) in accordance with the these requirements.

202. All the tankers with a capacity of less than 20,000 DWT deadweight tons shall be in conformance to the present requirements in respect to safety.

Guidance

Item 300.to 800 does not apply for ships with notation K3.

End of Guidance

300. Operation and Equipment Manual

301. The Operation and Equipment Manual of COW washing system shall be subjected to the RBNA for information and shall contain the following information:

a. drawings of the oil washing pipeline showing the position of the pumps, lines and washing machines related to the COW system;

b. a system description and listing of procedures to verify if the equipment is operating correctly during washing operation of COW. There shall include a list of the system and the parameters of the equipment to be monitored, such as line pressure, oxygen level, the engine rotation, duration of cycles, etc. The set values for these parameters shall be included in the Manual. The result of the tests conducted in accordance with Part II, Title 32, Section 6, Chapter T. 6 and the values of all parameters monitored during such tests shall also be included in the Manual.

400. Design and installation of the COW lines

401. The COW system piping and all valves incorporated in the feeding piping system must be constructed of steel or other equivalent material of adequate strength in relation to the pressure that will be submitted, with connections and suitable support.

402. Grey cast iron may be allowed for the feeding line for COW system when in accordance with approved national standards.

403. The COW system piping shall consist of fixed pipings and shall be independent of the fire main or any systems other than the washing of tanks, except in sectors of the ship's cargo system that could be incorporated in the COW system provided they comply with the requirements applicable to the system.

404. Provisions shall made to prevent over-pressure in the feeding line of the tank washing system.

Any relief devices fitted to prevent over-pressure shall discharge to the suction line of the feeding pump.

Alternative means may be accepted at the discretion of the RBNA provided that an equivalent level of safety and environmental protection.

When the system is served solely by centrifugal pumps designed in such a way that the pressure shall not exceed that for which the system was designed a temperature sensor in the pump casing that shut-off the pump in case of overheating.

405. When there are installed fire hydrants to wash cargo the washing system with water, these shall have suitable strength, and shall be provided for the fitting of blind flanges when the lines are filled with oil.

406. All the connections to pressure gauges or other instools shall be fitted with isolation valves adjacent to the lines unless the accessory is of the type sealed.

407. No part of the tank washing system shall penetrate in machinery spaces. When the system is fitted with oil heater for use when washing with water, the heater shall be located outside the machinery spaces and effectively isolated during washing with oil by double shut-off valves or blind flanges clearly identified.

408. When be using combined system of washing by water-oil, the feeding line shall be designed so that it can be drained as far as possible of oil before washing by water start, and drained to designated compartments that can be slop tanks or other cargo spaces.

409. The pipeline system shall be of a diameter such that allows the largest possible number of washing machines of to operate simultaneously on pressure and flow of design. The arrangement of the piping shall allow the number of washing machines to each cargo compartment specified in the Operating Manual and Equipment can be operated simultaneously.

410. The COW system feeding pipe shall be strongly fixed to the structure of the ship at appropriate places, and shall be equipped with means to allow the fitting of thermal expansion and flexing of the ship.

The supports shall be such that any hydraulic shock can be absorbed without undue movement of the feeding pipe line.

The brackets shall normally be located in the furthest ends from the oil inlet in the feeding line.

In case the washing machines be used to withstand the ends of pipe branches special devices will be needed to anchor these sections when the machines need to be removed.

500. Tank washing machines

501. The washing machines for COW system shall be permanently installed and being to a type at discretion of the RBNA.

502. The characteristic performance of a tank washing machine is determined by the nozzle diameter, operating pressure and the pattern of movement and time.
Each washing machine installed shall be endowed of such features that the section of the cargo tank covered by this machine will be effectively washed within the time period specified in the Operation and Equipment Manual.

503. The washing machines shall be installed in each cargo tank and the method of support shall be to the discretion of the RBNA. When a machine is positioned significantly below the level of the deck to receive waste in the tank, it may be needed additional support for the machine and piping.

504. Each machine shall be capable of being isolated by means of lock valves on the line. If the deck of the washing machine need to be removed for any reason, measures shall be taken to empty the oil in the feeding line in the period in which the machine is removed. Similarly, measures shall be taken to close the opening of the tank with plating or equivalent means. When more than one underwater machine is connected to the same line, the isolation of a single shut-off valve on the line may be acceptable provided that the rotation of the underwater machine conforms to the item 510.

505. The number and location of oil washing machines shall be to the discretion of the RBNA.

506. The machine location depends on the characteristics described in item 502 and the dispositions of the internal structure of the tanks

507. the number and location of the machines in each tank shall be such that any vertical and horizontal area are washed by direct impact or effectively by deflection or jet splash impacting. In evaluating an acceptable degree of deflection and splash, one shall pay attention particularly to wash horizontal surfaces over the head, and the following parameters shall be used:

a) For horizontal areas of bottom tanks and surfaces above the stringers of the tanks and other large primary structural members, the total area protected from direct impact by transverse ribs of the deck or bottom, girders, stringers or similar large primary structural members shall not exceed 10% of the horizontal area of the tank bottom, surfaces above the stringers and other large primary structural members.

b) For vertical areas of the tank walls, the total area of the walls of the tank protected against direct impact by transverse deck and bottom stiffeners, girders, stringers or large primary structural members shall not exceed 15% of the total area of the tank walls.
In some installations, it may be necessary to consider the installation of more than one type of washing machine to perform an adequate coverage.
In considering the application of these requirements, the slop tank is considered as cargo tank.

508. In the design stage, the following minimum procedures shall be used to determine the area of the surface of the tank covered by direct impact:

a) Using appropriate structural plans, lines are exposed from the tips of each machine for parts of the tank within the range of the jets.

b) When the configuration of the tanks is considered complicated by the RBNA, there shall be used an indicator of light simulating the tip of the washing machine, on the tank scale.

509. The design of the washing machines installed on deck shall be such that provide external means for cargo tanks which, when in crude oil washing, indicate the rotation and arc of the movement of the machine. When the machine installed on deck is to the non-programmable type, double injection nozzle type, alternative methods to the discretion of the RBNA can be accepted with equivalent degree of verification.

510. Where underwater machines are required, they shall be non-programmable and, to meet the requirements described in item 507, there shall be possible to verify the rotation by one of the methods described below:

a) By information external to the tank;

b) By checking the pattern of sound characteristic of the machine, in each case of operation shall be checked for the end of each wash cycle. When two or more underwater machines are installed on the same line, there shall have valves arranged so that the operation of each machine can be verified independently of other machines on the same feeding line.

c) By degassing of tank and checking the operation of the machine with water during ballast voyages.

600. Pumps

601. Pumps that provide oil to tank washing machines shall be either tank loading pumps or specific pumps intended to this purpose.

602. The pump capacity shall be sufficient to provide the necessary production at the pressure required for a maximum number of tank cleaning machines required to operate simultaneously as specified in the Operations and Equipment Manual.

In addition to the above requirement, if a suction system by eductor is installed for stripping, the pumps shall be capable of supplying the eductor operating fluid in accordance with item 702.

603. The capacity of the pumps shall be such that the requirements of the previous item (602) can be found with any pump inoperative.

The arrangements of pumps and piping system shall be such that the COW can be effectively operated with any pump out of operation.

604. The carriage of more than one grade of cargo shall not prevent crude oil washing of tanks.

605. In order to allow the crude oil washing being effectively performed when the previous pressure presented by the shore terminal is below the pressure required for crude oil washing, precautions shall be taken so that a suitable pressure for washing machines can be sustained according to the item 602.

These requirements are to be found in any pump out of operation.

The minimum pressure of supply required for crude oil washing shall be specified in the Operations and Equipment Manual.

If this minimum pressure cannot be obtained, the crude oil washing operations shall not be performed.

700. Stripping system

701. The design of oil stripping system at the bottom of all the cargo tank shall be to the discretion of the RBNA.

702. The design and capacity of the tank stripping system shall be such that the bottom of the tank cleaned is kept free of oil and sediment accumulations of the tank washing process.

703. The stripping system shall be at least 1.25 times the total production of all the tank washing machines to be operated simultaneously along the bottom washing as described in the Ship's Operations and Equipment Manual.

704. Means shall be provided for verification that the bottom of all the cargo tanks to be dry after crude oil washing such as level indicators, hand probes, and performance indicators of the stripping system referred to in item 708.

There shall be appropriate arrangements for hand probing in the most forward cargo tank and in three other appropriate locations, unless other means deemed effective to check that the bottom of all the tanks is dry to be approved.

The bottom of the tank is considered dry if there isn't any oil more than a small quantity at the vicinity of the stripping system suction without accumulation of oil in another part of the tank.

705. There shall be means to drain all pumps and lines at the completion of the discharge where necessary for connecting to a device of stripping.

The drainage of the pump and pipeline shall be capable of discharging both to a cargo tank and ashore.

To discharge to ashore facilities, a line of special small diameter shall be provided for this purpose and shall be led to external of the valve of ship loading valves manifold..

The cross-sectional area of that line shall not exceed 10% of the unloading main line.

In oil tanks with a single loading pump for each tank, each pump with a single system of oil pipe, can be waived the provision of special line of small diameter in those cases where the combined quantity of oil was taken from the tank after the stripping, and the volume of oil in the drive system, from the manifold to the tank is less than 0.00085 times the volume of the cargo tank.

This consideration also applies if the drain well of the cargo pump system is provided with drying system for oil retained.

706. The means for stripping the oil of the cargo tanks shall be through positive displacement pumps, eductors or self-primed centrifugal pumps, or other methods to the discretion of the RBNA.

When the stripping line is connected to a number of tanks, means of isolation shall be provided for each tank not being stripped at that moment.

707. The loading of more than one type of cargo shall not prevent the crude oil washing of the tanks.

708. There shall equipment of monitoring of the efficiency of the stripping system.

All the equipments shall have remote reading device in the control room or somewhere else safe and convenient with easy access to the officer responsible for the operations of the washing of the cargo and the oil.

When stripping pumps are provided, the monitoring equipment shall include either a flow indicator, or stroke counter, or rotating counter, as adequate, and pressure gauges in the inlet connections and pump discharging or equivalent.

When educators are provided, the monitoring equipment shall include pressure gauges at the inlet of drive fluid, and discharge pressure gauge / vacuum in the suction inlet.

709. The internal structure of the tank shall be such that the suction in the drainage tank oil of the stripping system meets the requirements described in items 702 and 704.

800. Ballast lines

801. When there is no system of separation of ballast water for ballasting of cargo tanks, the arrangement shall be such that cargo pump, valve manifold and pipelines used for ballasting could have the oil drained effectively and safely before ballasting.

J4. PREVENTION OF POLLUTION BY OIL

100. Application

101. Unless non-specified, provisions described in subchapter J4 apply only to ships with notation Tankers or Tankers with flash point > 60° C, and ships with GT greater than or equal to 150.

200. Provisions for tankers with GT < 150

Guidance

Item 201.a does not apply for ships with notation K3.

End of Guidance

201. The discharge control for tankers or tankers with flash point > 60° C and GT < 150 shall be effected by oil retention on board with subsequent discharge of all contaminated washings for installation ashore unless suitable arrangements are made to ensure that the discharge of any effluent that is allowed to be discharged into the sea, be effectively monitored to ensure that the total quantity of oil discharged into the sea does not exceed 1/30000 of the total quantity particular cargo of which the residue was formed.

300. Exemptions

301. The provisions described in subchapter J5 below, may be waived in the cases described below:

a) tankers that carry out exclusively both voyages of 72 hours long or less, and within 50 miles from the nearest land, provided they are engaged exclusively on routes between ports or terminals within Member State of MARPOL 73/7 Convention.

Any exemption shall be subject to the requirements that the tanker shall retain on board all oily mixtures for subsequent discharge to the installation ashore and to determination by the RBNA that the onshore facility available to receive such oily mixtures is adequate.

b) tankers carrying products that by their physical properties inhibit the effective separation of the product of the water and are monitored, so that the control of discharge is effective by the retention of residues on board with discharge of all contaminated washings for installation ashore.

302. from the standpoint of the RBNA, where the equipment referred to in J5, 100 and 200 cannot be obtained for monitoring of discharge of oil refined products (light oils), as such requirements may be exempted provided that the discharge is carried out only in accordance with the applicable procedures.

400. Discharge of oil or oily mixtures into the sea

401. All discharge of oil or oily mixtures into the sea is prohibited except when all the following conditions are met:

a) the tanker is not within a special area (special area as defined in MARPOL Annex 1, regulation 9);

b) the tanker is more than 50 nautical miles from the nearest coast;

c) the tanker is proceeding en route;

d) instant rate of discharge of oil shall not exceed 30 litres per nautical mile;

e) the total quantity of oil discharged into the sea does not exceed 1/30000 of the total quantity particular load where the residue was formed;

f) the tanker has in operation a discharge and monitoring system in accordance with the requirements of Part II, Title 32, Section 6, Chapter J5 and a slop tank.

402. The provisions outlined above do not apply to discharge of segregated ballast.

403. The cargo oil residues which cannot be discharged into the sea in accordance with the provisions described in item 401 above, shall be retained on board or unload for installation ashore.

J5. OIL DISCHARGE MONITORING AND CONTROL SYSTEM

100. General

101. There shall be installed a monitoring and control system of oil discharge.

102. There shall be provided an alternative method of handling operation.

200. Design of the oil discharge monitoring and control system

Guidance

Item 201.a does not apply for ships with notation K3.

End of Guidance

201. The control and monitoring of the discharge system shall be of a type approved in accordance with the requirements of IMO Resolution A. 586 (14).

a. When are carried oil-like substances, specific tests shall be performed for demonstration that the system is able to monitor concentrations of such substances in accordance with IMO Resolution A. 586. If necessary adjust the monitor when the change of oil products for oil-like substances, shall be provided information on the adjustment.

202. The monitoring and control system shall be installed with a recording device to provide a continuous recording of the discharge in litres per nautical mile and the total quantity discharged, or oil content and discharge rate. This recording shall be identifiable respecting time and date.

203. the system of control and monitoring of the discharge of oil shall come into operation when there is discharge of effluent into the sea and shall be such as to ensure that all the discharge of oily mixture be automatically interrupted when the instant rate of oil discharge exceeds 30 litres per nautical mile.

204. Any failure in the system of monitoring and control shall stop the discharge.

300. Detectors of the oil/water ratio

301. Effective detectors approved by RBNA shall be provided for fast and accurate designation of the ratio oil/water in slop tanks and shall be available for use in other tanks where the separation of oil from water is made and of which is intended to discharge effluents directly into the sea.

400. Operational manuals for oil discharge monitoring and control systems

[IACS MPC2]

401. For compliance with Regulation 15(3) (a) and (c) of MARPOL 73/78 - Annex I and IMO Resolutions A 496 (XII) and MEPC 13 (19), the Oil Discharge Monitoring and Control System Operational Manual is to contain all the details necessary to operate and maintain the system and shall include at least the following information. The information may be grouped as indicated, or in an equivalent manner.

a. Introduction : Particulars of the ship, together with the date on which the system was/is to be installed and index to remainder of manual.

b. Section 1 : Manufacturer's equipment manuals for major components of the system. These may include installation, commissioning, operating and fault finding procedures for the oil content monitor.

c. Section 2 : Operations manual comprising a description of the ship's cargo ballast systems, designated overboard discharges with sampling points, normal operational procedures, automatic inputs, manual inputs (as applicable), starting interlock and discharge valve control (as applicable), override system, audible and visual alarms, outputs recorded and, where required for manual input, flow rate when discharging by gravity and when pumping ballast overboard. It shall also include instructions for the discharge of oily water following mal-function of the equipment. The above information is to be supported by copies of relevant approved diagrams. Reference may be made to Section 1, where applicable.

d. Section 3 : Technical manual comprising fault finding schedules, maintenance record and electrical, pneumatic and hydraulic schematic diagrams and descriptions of the complete system. Reference may be made to Section 1, where applicable.

e. Section 4 : Test and check-out procedures to include a functional test at installation and guidance notes for the Surveyors carrying out initial and in-service surveys. Reference may be made to Section 1, where applicable.

f. Appendix I : Technical installation specification including location and mounting of components, arrangements for maintaining integrity of 'safe' zones, safety requirements for electrical equipment installed in hazardous zones supported by copies of approved drawings, sample piping layout and sample delay calculations, design and arrangements of sampling probes, flushing arrangements and zero setting. Reference may be made to Section 1, where applicable.

g. Appendix II : Copy of Type Approval Certificate and Workshop Certificates for major components.

[IACS MPC3]

500. Machinery space oil discharge monitoring and control systems

501. As neither Regulation 16(5) nor Resolution A444 (XI) specifically require it, a Classification Society cannot insist on automatic recording of date and time in an oil discharge monitoring and control system provided for 100 ppm oily water separating equipment.

J6. ARRANGEMENTS FOR PUMPING, PIPING AND DISCHARGE

100. Manifold of discharge

101. In all the tankers, the discharge manifold for connection with installation ashore for discharge of sloppy ballast water or oil contaminated water shall be located on the open deck on both sides of the ship.

200. Discharge pipeline

201. In all the tankers, pipelines for discharging ballast water or oil contaminated water from cargo tank areas into the sea, where allowed, shall be led to the open deck or to the side shell above the waterline in the deepest ballast condition, except in:

a. segregated ballast and clean ballast may be discharged below the waterline into ports or offshore terminals, or into the sea by gravity, provided that the surface of the ballast water has been examined immediately before the discharge to ensure that they do not occur any contamination by oil.

b. in all tankers at sea, sloppy ballast water or oil contaminated water from tanks in the cargo area, except the slop tanks, may be discharged by gravity below the waterline, provided that sufficient time has elapsed to allow the separation oil/water and the ballast water has been examined immediately before the discharge with the oil/water ratio detector described in previous item J5,300, to ensure that the oil/water ratio is such that the discharge does not involve any increase in risk of harm to the marine environmental damage.

300. Discharge interruption

301. Interrupt means shall be provided of the discharge of the ballast water or oil contaminated water into the sea from cargo tank areas, except those discharges below the waterline allowed, described in item J6,200, the position on the upper deck or above located so that the manifold referred to in item J6,100, and discharge into the sea of pipes referred to in item J6,200, can be observed visually. Means of discharge interruption do not need to be provided in the position of the observation if a positive system of communication such as telephone or radio is provided between the observation position and position of the discharge control.

CHAPTER K
DESIGN OF INTEGRATED CARGO AND BALLAST SYSTEMS ON TANKERS

CHAPTER CONTENTS

K1. DESIGN OF INTEGRATED CARGO AND BALLAST SYSTEMS ON TANKERS
[IACS UR M64]

100. Application

101. These requirements are applicable to integrated cargo and ballast systems installed on tankers (i.e. cargo ships constructed or adapted for the carriage of liquid cargoes in bulk) contracted for construction on or after 1 January 2004, irrespective of the size or type of the tanker.

102. Within the scope of these requirements, integrated cargo and ballast system means any integrated hydraulic and/or electric system used to drive both cargo and ballast pumps (including active control and safety systems and excluding passive components, e.g. piping).

200. Functional Requirements

201. The operation of cargo and/or ballast systems may be necessary, under certain emergency circumstances or during the course of navigation, to enhance the safety of tankers.

As such, measures are to be taken to prevent cargo and ballast pumps becoming inoperative simultaneously due to a single failure in the integrated cargo and ballast system, including its control and safety systems.

300. Design features

301. The following design features are, inter alia, to be fitted:

a. the emergency stop circuits of the cargo and ballast systems are to be independent from the circuits for the control systems. A single failure in the control system circuits or the emergency stop circuits are not to render the integrated cargo and ballast system inoperative;

b. manual emergency stops of the cargo pumps are to be arranged in a way that they are not to cause the stop of the power pack making ballast pumps inoperable;

c. the control systems are to be provided with backup power supply, which may be satisfied by a duplicate power supply from the main switch board. The failure of any power supply is to provide audible and visible alarm activation at each location where the control panel is fitted.

d. in the event of failure of the automatic or remote control systems, a secondary means of control is to be made available for the operation of the integrated cargo and ballast system. This is to be achieved by manual overriding and/or redundant arrangements within the control systems.

CAPÍTULO T
TESTS

CHAPER CONTENTS

T5. SPECIAL TESTS OF LOADING AND UNLOADING PIPING SYSTEMS

100. Periodical tests

101. All the loading and unloading piping systems and their respective hoses shall be subjected to documented tests in periods not exceeding 12 months, with 1.5 times the normal working pressure but not less than 10 bar.

102. The last test date shall be painted in visible place of the piping.

200. Cargo pressure tests

– See Title 11

300. Inspections and tests in the manufacturers

301. See Table T.T5.301.1 in the next page

400. Tests of piping systems

401. When required by table T.T5.301.1, welded joints shall be inspected in accordance with this item.

402. The inspections of systems containing flammable liquids heated above the flash point or with flash point < 60°C shall be made with additional verifications to reduce the possibility of leaks and limit its consequences.

T6. SPECIALTESTS OF COW SYSTEM

100. Inspections and tests of cargo tank washing system

101. The initial survy shall include a thorough inspection of the equipment and arrangements of oil washing and, except in the cases specified in the following item 303, examination of the tanks after they have been washed and additional verification specified in the items 301 and 302 to ensure that the efficiency of the washing system is in the accordance with this chapter.

200. Piping system

201. The piping system shall be tested to 1.5 times the working pressure after it has been installed on the ship.

300. Washing machines

301. To confirm the cleaning of the tank and check the design in respect to the number and location of the tank washing machines, a visual inspection shall be made by entry in the tanks after crude oil washing, but before any rinse water that can be specified in the Operations and Equipment Manual.

The tank bottom to be inspected can be leveled with water and cleaned by stripping system to remove any liquid oil remains that stays in the tank bottom before the degassing.

This inspection aims to ensure that the tank is essentially oil tack free on the walls (clingage).

If the procedure of "flushing" is adopted, a similar tank, but that has not been subjected to "flushing" shall be used for the test specified in item 302 below.

302. To verify the effectiveness of the stripping and drainage arrangements, it shall be made a measurement of the volume of oil floating on the ballast

The ratio of the volume of oil on the ballast water of starting to the volume of the tanks containing that water shall not exceed 0.00085

This test shall be performed after the washing by oil and stripping in a tank similar in all respects relevant factors to the tank examined in accordance with item 301 above, that has not been subject to rinse water or water flushing permitted on item 301 above.

303. When it is demonstrated to the discretion of the RBNA that vessels are similar in all material respects, the provisions described in items 301 and 302 above need only be applied to one ship.

In addition, when a vessel has a series of tanks that are similar in all material respects, the requirements described in item 301 need be applied to only one tank of the series,

400. Stripping system

401. Care shall be taken to ensure that the longitudinal and transverse drainage is satisfactory

402. The drainage shall be checked during the inspection required on items 301, 302 and 303.

TABLE T.T5.301.1 – INSPECTIONS AND TESTS IN THE MANUFACTURERS

No.	Item	Test of materials		Inspections and testes of products			Reference
		Yes/No (1)	Type of the certificate of the material (2)	During the manufacture (1)	After manufactured (1) (3)	Type of the certificate of the product (2)	
1	Pipes, valves and accessories	Yes	C = ND>100 mm F = ND<100 mm	Yes (4)	Yes	C	
2	Expansion joints and cargo hoses	Yes (5)	F	No	Yes	C	
3	Loading pumps	Yes	C	Yes (6)	Yes	C	
4	Gas-tight seals for penetrations in bulkheads	No	N/A	No	Yes	C	
5	PV and high speed valves	Yes	C (7)	Yes	Yes	C	
6	Flame arrester devices	No	N/A	No	Yes	C	
7	Oil discharge monitoring system	No	N/A	N/A	Yes (8)	C	
8	Detector of interface oil / water	No	N/A	N/A	Yes (8)	C	

(1) Yes = required No = not required
(2) C = certificate of he RBNA F = manufacturer's certificate N/A = not applicable
(3) includes the verification of the characteristics of the drawings approved in accordance with the Rules of the RBNA
(4) only in the case of welded construction
(5) if they are metallic
(6) the inspections during manufacturing shall be in accordance with approved programme by the RBNA
(7) the adjustment of PV and high-speed valves shall be made by an accredited laboratory
(8) final inspections may be performed on board

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