PART II RULES FOR THE CONSTRUCTION AND CLASSIFICATION OF SHIPS IDENTIFIED BY THEIR MISSION

TITLE 33 CHEMICAL TANKERS

INTERNATIONAL CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS DANGEROUS CHEMICALS IN BULK, 2006, AS AMENDED

SECTION 6 PIPING

CHAPTERS

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CHAPTER A (4)
CARGO CONTAINMENT
For ships constructed from 1986-07-01

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A1. 4 CARGO CONTAINMENT

100. 4.1 Definitions

101. 4.1.1 Independent tank means a cargo-containment envelope, which is not contiguous with, or part of, the hull structure. An independent tank is built and installed so as to eliminate whenever possible (or in any event to minimize) its stressing as a result of stressing or motion of the adjacent hull structure. An independent tank is not essential to the structural completeness of the ship's hull.

102. 4.1.2 Integral tank means a cargo-containment envelope which forms part of the ship's hull and which may be stressed in the same manner and by the same loads which stress the contiguous hull structure and which is normally essential to the structural completeness of the ship's hull.

103. 4.1.3 Gravity tank means a tank having a design pressure not greater than 0.07 MPa gauge at the top of the tank. A gravity tank may be independent or integral. A gravity tank shall be constructed and tested according to recognized standards, taking account of the temperature of carriage and relative density of the cargo.

104. 4.1.4 Pressure tank means a tank having a design pressure greater than 0.07 MPa gauge. A pressure tank shall be an independent tank and shall be of a configuration permitting the application of pressure-vessel design criteria according to recognized standards.

200. 4.2 Tank requirements for individual products

201. Requirements for both installation and design of tank types for individual products are shown in column f in the table of ANNEX III (chapter 17).

CHAPTER B (5)
CARGO TRANSFER

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B1. 5 CARGO TRANSFER

100. 5.1 Piping scantlings

101. 5.1.1 Subject to the conditions stated in B1.104 (5.1.4) the wall thickness (t) of pipes shall not be less than:

$t = (to+b+c) / (1-a/100)$ (mm)

where:
to = theoretical thickness
$to = P \times D/(20K \times e+P)$ (mm)

with
P = design pressure (bar) referred to in B1.102 (5.1.2)

D = outside diameter (mm)

K = allowable stress (MPa) referred to in B1.105 (5.1.5)

e = efficiency factor equal to 1.0 for seamless pipes and for longitudinally or spirally welded pipes, delivered by approved manufacturers of welded pipes, which are considered equivalent to seamless pipes when non destructive testing on welds is carried out in accordance with recognized standards. In other cases, an efficiency factor of less than 1.0, in accordance with recognized standards, may be required depending on the manufacturing process.

b = allowance for bending (mm). The value of b shall be chosen so that the calculated stress in the bend, due to internal pressure only, does not exceed the allowable stress. Where such justification is not given, b shall be not less than:

$b = D\ to / 2.5r$ (mm)

with

r = mean radius of the bend (mm).

c = corrosion allowance (mm). If corrosion or erosion is expected, the wall thickness of piping shall be increased over that required by the other design requirements.

a = negative manufacturing tolerance for thickness (%).

102. 5.1.2 The design pressure P in the formula for to in 5.1.1 is the maximum gauge pressure to which the system

may be subjected in service, taking into account the highest set pressure on any relief valve on the system.

103. 5.1.3 Piping and piping-system components which are not protected by a relief valve, or which may be isolated from their relief valve, shall be designed for at least the greatest of:

a. .1 for piping systems or components, which may contain some liquid, the saturated vapour pressure at 45°C;

b. .2 the pressure setting of the associated pump discharge relief valve;

c. .3 the maximum possible total pressure head at the outlet of the associated pumps when a pump discharge relief valve is not installed.

104. 5.1.4 The design pressure shall not be less than 1 MPa gauge except for open-ended lines, where it shall be not less than 0.5 MPa gauge

105. 5.1.5 For pipes, the allowable stress K to be considered in the formula for to in 5.1.1 is the lower of the following values:

$$\frac{Rm}{A} \quad \text{or} \quad \frac{Re}{B}$$

where:

Rm = specified minimum tensile strength at ambient temperature (MPa)

Re = specified minimum yield stress at ambient temperature (MPa). If the stress strain curve does not show a defined yield stress, the 0.2% proof stress applies.

A and B shall have values of at least A = 2.7 and B = 1.8.

106. 5.1.6.1 The minimum wall thickness shall be in accordance with recognized standards.

107. 5.1.6.2 Where necessary for mechanical strength to prevent damage, collapse, excessive sag or buckling of pipes due to weight of pipes and content and to superimposed loads from supports, ship deflection or other causes, the wall thickness shall be increased over that required by 5.1.1 or, if this is impracticable or would cause excessive local stresses, these loads shall be reduced, protected against or eliminated by other design methods

108. 5.1.6.3 Flanges, valves and other fittings shall be in accordance with recognized standards, taking into account the design pressure defined under A1.102 (5.1.2).

109. 5.1.6.4 For flanges not complying with a standard, the dimensions for flanges and associated bolts shall be to the satisfaction of the Administration.

200. 5.2 Piping fabrication and joining details

201. 5.2.1 The requirements of this section apply to piping inside and outside the cargo tanks. However, relaxations from these requirements may be accepted in accordance with recognized standards for open-ended piping and for piping inside cargo tanks except for cargo piping serving

202. 5.2.2 Cargo piping shall be joined by welding except:

a. .1 for approved connections to shutoff valves and expansion joints; and

b. .2 for other exceptional cases specifically approved by the Administration.

203. 5.2.3 The following direct connections of pipe lengths without flanges may be considered:

a. .1 Butt-welded joints with complete penetration at the root may be used in all applications.

b. .2 Slip-on welded joints with sleeves and related welding having dimensions in accordance with recognized standards shall only be used for pipes with an external diameter of 50 mm or less. This type of joint shall not be used when crevice corrosion is expected to occur.

c. .3 Screwed connections, in accordance with recognized standards, shall only be used for accessory lines and instrumentation lines with external diameters of 25 mm or less.

204. 5.2.4 Expansion of piping shall normally be allowed for by the provision of expansion loops or bends in the piping system.

a. .1 Bellows, in accordance with recognized standards, may be specially considered.

b. .2 Slip joints shall not be used.

205. 5.2.5 Welding, post-weld heat treatment and non-destructive testing shall be performed in accordance with recognized standards.

300. 5.3 Flange connections

301. 5.3.1 Flanges shall be of the welded-neck, slip-on or socket-welded type. However, socket welded type flanges shall not be used in nominal size above 50 mm.

302. 5.3.2 Flanges shall comply with recognized standards as to their type, manufacture and test.

400. 5.4 Test requirements for piping

401. 5.4.1 The test requirements of this section apply to piping inside and outside cargo tanks. However, relaxations from these requirements may be accepted in accordance with recognized standards for piping inside tanks and open-ended piping.

402. 5.4.2 After assembly, each cargo piping system shall be subject to a hydrostatic test to at least 1.5 times the design pressure. When piping systems or parts of systems are completely manufactured and equipped with all fittings, the hydrostatic test may be conducted prior to installation aboard the ship. Joints welded on board shall be hydrostatically tested to at least 1.5 times the design pressure.

403. 5.4.3 After assembly on board, each cargo piping system shall be tested for leaks to a pressure depending on the method applied.

500. 5.5 Piping arrangements

501. 5.5.1 Cargo piping shall not be installed under deck between the out-board side of the cargo containment spaces and the skin of the ship unless clearances required for damage protection (see Section 1, B1.600) are maintained; but such distances may be reduced where damage to the pipe would not cause release of cargo provided that the clearance required for inspection purposes is maintained.

502. 5.5.2 Cargo piping located below the main deck may run from the tank it serves and penetrate tank bulkheads or boundaries common to longitudinally or transversally adjacent cargo tanks, ballast tanks, empty tanks, pump rooms or cargo pump rooms provided that inside the tank it serves it is fitted with a stop-valve operable from the weather deck and provided cargo compatibility is assured in the event of piping failure. As an exception, where a cargo tank is adjacent to a cargo pump room, the stop valve operable from the weather deck may be situated on the tank bulkhead on the cargo pump room side, provided an additional valve is fitted between the bulkhead valve and the cargo pump. A totally enclosed hydraulically operated valve located outside the cargo tank may, however, be accepted, provided that the valve is:

a. .1 designed to preclude the risk of leakage;

b. .2 fitted on the bulkhead of the cargo tank which it serves;

c. .3 suitably protected against mechanical damage;

d. .4 fitted at a distance from the shell as required for damage protection; and

e. .5 operable from the weather deck.

503. 5.5.3 In any cargo pump room where a pump serves more than one tank, a stop valve shall be fitted in the line to each tank.

504. 5.5.4 Cargo piping installed in pipe tunnels shall also comply with the requirements of A1.501 (5.5.1) and A1.502 (5.5.2). Pipe tunnels shall satisfy all tank requirements for construction, location and ventilation and electrical hazard requirements. Cargo compatibility shall be assured in the event of a piping failure. The tunnel shall not have any other openings except to the weather deck and cargo pump room or pump room.

505. 5.5.5 Cargo piping passing through bulkheads shall be so arranged as to preclude excessive stresses at the bulkhead and shall not utilize flanges bolted through the bulkhead.

600. 5.6 Cargo-transfer control systems

601. 5.6.1 For the purpose of adequately controlling the cargo, cargo-transfer systems shall be provided with:

a. .1 one stop-valve capable of being manually operated on each tank filling and discharge line, located near the tank penetration; if an individual deepwell pump is used to discharge the contents of a cargo tank, a stop-valve is not required on the discharge line of that tank;

b. .2 one stop valve at each cargo-hose connection;

c. .3 remote shutdown devices for all cargo pumps and similar equipment.

602. 5.6.2 The controls necessary during transfer or transport of cargoes covered by the Code other than in cargo pump rooms which have been dealt with elsewhere in the Code shall not be located below the weather deck

603. 5.6.3 For certain products, additional cargo-transfer control requirements are shown in column o in the table of ANNEX III (chapter 17).

700. 5.7 Ship's cargo hoses

701. 5.7.1 Liquid and vapour hoses used for cargo transfer shall be compatible with the cargo and suitable for the cargo temperature.

702. 5.7.2 Hoses subject to tank pressure or the discharge pressure of pumps shall be designed for a bursting pressure not less than 5 times the maximum pressure the hose will be subjected to during cargo transfer.

703. 5.7.3 For cargo hoses installed on board ships on or after 1 July 2002, each new type of cargo hose, complete with end- fittings, shall be prototype tested at a normal ambient temperature with 200 pressure cycles from zero to at least twice the specified maximum working pressure.

After this cycle pressure test has been carried out, the prototype test shall demonstrate a bursting pressure of at least 5 times its specified maximum working pressure at the extreme service temperature. Hoses used for prototype testing shall not be used for cargo service. Thereafter, before being placed in service, each new length of cargo hose produced shall be hydrostatically tested at ambient temperature to a pressure not less than 1.5 times its specified maximum working pressure but not more than two-fifths of its bursting pressure. The hose shall be stencilled or otherwise marked with the date of testing, its specified maximum working pressure and, if used in services other than the ambient temperature services, its maximum and minimum service temperature, as applicable. The specified maximum working pressure shall not be less than 10 bar gauge.

CHAPTER C (7)
CARGO TEMPERATURE CONTROL

CHATER CONTENTS

C1. 7 CARGO TEMPERATURE CONTROL

100. 7.1 General

101. 7.1.1 When provided, any cargo heating or cooling systems shall be constructed, fitted and tested to the satisfaction of the Administration. Materials used in the construction of temperature-control systems shall be suitable for use with the product intended to be carried.

102. 7.1.2 Heating or cooling media shall be of a type approved for use with the specific cargo. Consideration shall be given to the surface temperature of heating coils or ducts to avoid dangerous reactions from localized overheating or overcooling of cargo. (See also ANNEX I, A2.406)

103. 7.1.3 Heating or cooling systems shall be provided with valves to isolate the system for each tank and to allow manual regulation of flow.

104. 7.1.4 In any heating or cooling system, means shall be provided to ensure that, when in any condition other than empty, a higher pressure can be maintained within the system than the maximum pressure head that could be exerted by the cargo tank contents on the system.

105. 7.1.5 Means shall be provided for measuring the cargo temperature.

a. .1 The means for measuring the cargo temperature shall be of restricted or closed type, respectively, when a restricted or closed gauging device is required for individual substances, as shown in column j in the table of ANNEX III (chapter 17).

b. .2 A restricted temperature-measuring device is subject to the definition for a restricted gauging device in G1.101.b (13.1.1.2) (e.g. a portable thermometer lowered inside a gauge tube of the restricted type).

c. .3 A closed temperature-measuring device is subject to the definition for a closed gauging device in G1.101.c (13.1.1.3) (e.g. a remote-reading thermometer of which the sensor is installed in the tank).

d. .4 When overheating or overcooling could result in a dangerous condition, an alarm system which monitors the cargo temperature shall be provided. (See also operational requirements in ANNEX II, A1.600.)

106. 7.1.6 When products for which ANNEX I, A2.300, 301 or 303 (15.12, 15.12.1 or 15.12.3) are listed in column o in the table of chapter 17 are being heated or cooled, the heating or cooling medium shall operate in a circuit:

a. .1 which is independent of other ship' s services, except for another cargo heating or cooling system, and which does not enter the machinery space; or

b. .2 which is external to the tank carrying toxic products; or

c. .3 where the medium is sampled to check for the presence of cargo before it is recirculated to other services of the ship or into the machinery space. The sampling equipment shall be located within the cargo area and be capable of detecting the presence of any toxic cargo being heated or cooled. Where this method is used, the coil return shall be tested not only at the commencement of heating or cooling of a toxic product, but also on the first occasion the coil is used subsequent to having carried an unheated or uncooled toxic cargo.

200. 7.2 Additional requirements

201. For certain products, additional requirements contained in ANNEX I (chapter 15) are shown in column o in the table of chapter 17.

CHAPTER D (8)
CARGO TANK VENTING AND GAS FREEING ARRANGEMENT

CHAPTER CONTENTS

D1. 8 CARGO TANK VENTING AND GAS FREEING ARRANGEMENTS

100. 8.1 Application

101. 8.1.1 Unless expressly provided otherwise, this chapter applies to ships constructed on or after 1 January 1994.

102. 8.1.2 Ships constructed before 1 January 1994 shall comply with the requirements of chapter D which were in force prior to the said date.

103. 8.1.3 For the purpose of this regulation, the term "ship constructed" is as defined in SOLAS regulation II-1/1.3.1.

104. 8.1.4 Ships constructed on or after 1 July 1986 but before 1 January 1994 which fully comply with the requirements of the Code applicable at that time may be regarded as complying with the requirements of SOLAS regulations II-2/4.5.3, 4.5.6 to 4.5.8, 4.5.10 and 11.6.

105. 8.1.5 For ships to which the Code applies, the requirements of this chapter shall apply in lieu of SOLAS regulations II-2/4.5.3 and 4.5.6.

106. 8.1.6 Ships constructed on or after 1 July 1986, but before 1 July 2002 shall comply with the requirements of 8.3.3.

200. 8.2 Cargo tank venting

201. 8.2.1 All cargo tanks shall be provided with a venting system appropriate to the cargo being carried and these systems shall be independent of the air pipes and venting systems of all other compartments of the ship. Tank venting systems shall be designed so as to minimize the possibility of cargo vapour accumulating about the decks, entering accommodation, service and machinery spaces and control stations and, in the case of flammable vapours, entering or collecting in spaces or areas containing sources of ignition. Tank venting systems shall be arranged to prevent entrance of water into the cargo tanks and, at the same time, vent outlets shall direct the vapour discharge upwards in the form of unimpeded jets.

202. 8.2.2 The venting systems shall be connected to the top of each cargo tank and as far as practicable the cargo vent lines shall be self-draining back to the cargo tanks under all normal operational conditions of list and trim. Where it is necessary to drain venting systems above the level of any pressure/vacuum valve, capped or plugged drain cocks shall be provided.

203. 8.2.3 Provision shall be made to ensure that the liquid head in any tank does not exceed the design head of the tank. Suitable high-level alarms, overflow control systems or spill valves, together with gauging and tank filling procedures, may be accepted for this purpose. Where the means of limiting cargo tank overpressure includes an automatic closing valve, the valve shall comply with the appropriate provisions of ANNEX I, A2.900 (15.19).

204. 8.2.4 Tank venting systems shall be designed and operated so as to ensure that neither pressure nor vacuum created in the cargo tanks during loading or unloading exceeds tank design parameters. The main factors to be considered in the sizing of a tank venting system are as follows:

a. .1 design loading and unloading rate;

b. .2 gas evolution during loading: this shall be taken account of by multiplying the maximum loading rate by a factor of at least 1.25;

c. .3 density of the cargo vapour mixture;

d. .4 pressure loss in vent piping and across valves and fittings; and

e. .5 pressure/vacuum settings of relief devices.

205. 8.2.5 Tank vent piping connected to cargo tanks of corrosion-resistant material, or to tanks which are lined or coated to handle special cargoes as required by the Code, shall be similarly lined or coated or constructed of corrosion-resistant material.

206. 8.2.6 The master shall be provided with the maximum permissible loading and unloading rates for each tank or group of tanks consistent with the design of the venting systems.

300. 8.3 Types of tank venting systems

301. 8.3.1 An open tank venting system is a system which offers no restriction except for friction losses to the free flow of cargo vapours to and from the cargo tanks during normal operations. An open venting system may consist of individual vents from each tank, or such individual vents may be combined into a common header or headers, with due regard to cargo segregation. In no case shall shutoff valves be fitted either to the individual vents or to the header.

302. 8.3.2 A controlled tank venting system is a system in which pressure- and vacuum-relief valves or pressure/vacuum valves are fitted to each tank to limit the

pressure or vacuum in the tank. A controlled venting system may consist of individual vents from each tank or such individual vents on the pressure side only as may be combined into a common header or headers, with due regard to cargo segregation. In no case shall shut-off valves be fitted either above or below pressure- or vacuum-relief valves or pressure/vacuum valves. Provision may be made for bypassing a pressure- or vacuum-relief valve or pressure/vacuum valve under certain operating conditions provided that the requirement of D1.306 (8.3.6) is maintained and that there is suitable indication to show whether or not the valve is bypassed.

303. 8.3.3 Controlled tank venting systems shall consist of a primary and a secondary means of allowing full flow relief of vapour to prevent over-pressure or under-pressure in the event of failure of one means. Alternatively, the secondary means may consist of pressure sensors fitted in each tank with a monitoring system in the ship' s cargo control room or position from which cargo operations are normally carried out. Such monitoring equipment shall also provide an alarm facility which is activated by detection of over pressure or under pressure conditions within a tank.

304. 8.3.4 The position of vent outlets of a controlled tank venting system shall be arranged:

a. .1 at a height of not less than 6 m above the weather deck or above a raised walkway if fitted within 4 m of the raised walkway; and

b. .2 at a distance of at least 10 m measured horizontally from the nearest air intake or opening to accommodation, service and machinery spaces and ignition sources.

305. 8.3.5 The vent outlet height referred to in D1.304.a (8.3.4.1) may be reduced to 3 m above the deck or a raised walkway, as applicable, provided that high-velocity venting valves of an approved type, directing the vapour/air mixture upwards in an unimpeded jet with an exit velocity of at least 30 m/s, are fitted.

306. 8.3.6 Controlled tank venting systems fitted to tanks to be used for cargoes having a flashpoint not exceeding 60°C (closed-cup test) shall be provided with devices to prevent the passage of flame into the cargo tanks. The design, testing and locating of the devices shall comply with the requirements of the Administration, which shall contain at least the standards adopted by the Organization.

307. 8.3.7 In designing venting systems and in the selection of devices to prevent the passage of flame for incorporation into the tank venting system, due attention shall be paid to the possibility of the blockage of these systems and fittings by, for example, the freezing of cargo vapour, polymer build up, atmospheric dust or icing up in adverse weather conditions. In this context it shall be noted that flame arresters and flame screens are more susceptible to blockage. Provisions shall be made such that the system and fittings may be inspected, operationally checked, cleaned or renewed as applicable.

308. 8.3.8 Reference in D1.301 and 302 (8.3.1 and 8.3.2) to the use of shutoff valves in the venting lines shall be interpreted to extend to all other means of stoppage, including spectacle blanks and blank flanges.

400. 8.4 Venting requirements for individual products

401. Venting requirements for individual products are shown in column g, and additional requirements in column o in the table of ANNEX III (chapter 17).

500. 8.5 Cargo tank gas-freeing

501. 8.5.1 The arrangements for gas-freeing cargo tanks used for cargoes other than those for which open venting is permitted shall be such as to minimize the hazards due to the dispersal of flammable or toxic vapours in the atmosphere and to flammable or toxic vapour mixtures in a cargo tank. Accordingly, gas-freeing operations shall be carried out such that vapour is initially discharged:

a. .1 through the vent outlets specified in D1.304 or 305 (8.3.4 and 8.3.5); or

b. .2 through outlets at least 2 m above the cargo tank deck level with a vertical exit velocity of at least 30 m/s maintained during the gas-freeing operation; or

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

When the flammable vapour concentration at the outlets has been reduced to 30% of the lower flammable limit and, in the case of a toxic product, the vapour concentration does not present a significant health hazard, gas-freeing may thereafter be continued at cargo tank deck level.

502. 8.5.2 The outlets referred to in D1.501.b and c (8.5.1.2 and 8.5.1.3) may be fixed or portable pipes.

503. 8.5.3 In designing a gas-freeing system in conformity with D1.501 (8.5.1), particularly in order to achieve the required exit velocities of D1.501.b and c (8.5.1.2 and 8.5.1.3), due consideration shall be given to the following:

a. .1 materials of construction of system;

b. .2 time to gas-free;

c. .3 flow characteristics of fans to be used;

d. .4 the pressure losses created by ducting, piping, cargo tank inlets and outlets;

e. .5 the pressure achievable in the fan driving medium (e.g. water or compressed air); and

f. .6 the densities of the cargo vapour/air mixtures for the range of cargoes to be carried.

CHAPTER E (9)
ENVIRONMENTAL CONTROL

CHAPTER CONTENTS

E1. 9 ENVIRONMENTAL CONTROL

100. 9.1 General

101. 9.1.1 Vapour spaces within cargo tanks and, in some cases, spaces surrounding cargo tanks may require to have specially controlled atmospheres.

102. 9.1.2 There are four different types of control for cargo tanks, as follows:

a. .1 ***Inerting****:* by filling the cargo tank and associated piping systems and, where specified in ANNEX I (chapter 15), the spaces surrounding the cargo tanks, with a gas or vapour which will not support combustion and which will not react with the cargo, and maintaining that condition.

b. .2 *Padding*: by filling the cargo tank and associated piping systems with a liquid, gas or vapour which separates the cargo from the air, and maintaining that condition.

c. .3 *Drying*: by filling the cargo tank and associated piping systems with moisture-free gas or vapour with a dewpoint of -40°C or below at atmospheric pressure, and maintaining that condition.

d. .4 *Ventilation*: forced or natural.

103. 9.1.3 Where inerting or padding of cargo tanks is required:

a. .1 An adequate supply of inert gas for use in filling and discharging the cargo tanks shall be carried or shall be manufactured on board unless a shore supply is available. In addition, sufficient inert gas shall be available on the ship to compensate for normal losses during transportation.

b. .2 The inert gas system on board the ship shall be able to maintain a pressure of at least 0.007 MPa gauge within the containment system at all times. In addition, the inert gas system shall not raise the cargo tank pressure to more than the tank' s relief-valve setting.

c. .3 Where padding is used, similar arrangements for supply of the padding medium shall be made as required for inert gas in E1.103.a and b (9.1.3.1 and 9.1.3.2).

d. .4 Means shall be provided for monitoring ullage spaces containing a gas blanket to ensure that the correct atmosphere is being maintained.

e. .5 Inerting or padding arrangements or both, where used with flammable cargoes, shall be such as to minimize the creation of static electricity during the admission of the inerting medium.

104. 9.1.4 Where drying is used and dry nitrogen is used as the medium, similar arrangements for supply of the drying agent shall be made to those required in E1.103 (9.1.3). Where drying agents are used as the drying medium on all air inlets to the tank, sufficient medium shall be carried for the duration of the voyage, taking into consideration the diurnal temperature range and the expected humidity.

200. 9.2 Environmental control requirements for individual products

201. The required types of environmental control for certain products are shown in column h in the table of ANNEX III (chapter 17).

CHAPTER F (12)
MECHANICAL VENTILATION IN THE CARGO AREA

CHAPTER CONTENTS

F1. 12 MECHANICAL VENTILATION IN THE CARGO AREA

Note: For ships to which the Code applies, the requirements of this chapter replace the requirements of SOLAS regulations II-2/4.5.2.6 and 4.5.4.
However, for products addressed under paragraphs Section 3, A1.102 and 103 (11.1.2 and 11.1.3), except acids and products for which paragraph ANNEX I, A2.700 (15.17) applies, SOLAS regulations II-2/4.5.2.6 and 4.5.4 may apply in lieu of the provisions of this chapter.

100. 12.1 Spaces normally entered during cargo-handling operations

101. 12.1.1 Cargo pump-rooms and other enclosed spaces which contain cargo-handling equipment and similar spaces in which work is performed on the cargo shall be fitted with mechanical ventilation systems, capable of being controlled from outside such spaces.

102. 12.1.2 Provision shall be made to ventilate such spaces prior to entering the compartment and operating the equipment and a warning notice requiring the use of such ventilation shall be placed outside the compartment.

103. 12.1.3 Mechanical ventilation inlets and outlets shall be arranged to ensure sufficient air movement through the space to avoid the accumulation of toxic or flammable vapours or both (taking into account their vapour densities) and to ensure sufficient oxygen to provide a safe working environment, but in no case shall the ventilation system have a capacity of less than 30 changes of air per hour, based upon the total volume of the space. For certain products, increased ventilation rates for cargo pump-rooms are prescribed in ANNEX I, A2.700 (15.17).

104. 12.1.4 Ventilation systems shall be permanent and shall normally be of the extraction type. Extraction from above and below the floor plates shall be possible. In rooms housing motors driving cargo pumps, the ventilation shall be of the positive-pressure type.

105. 12.1.5 Ventilation exhaust ducts from spaces within the cargo area shall discharge upwards in locations at least 10 m in the horizontal direction from ventilation intakes and openings to accommodation, service and machinery spaces and control stations and other spaces outside the cargo area.

106. 12.1.6 Ventilation intakes shall be so arranged as to minimize the possibility of recycling hazardous vapours from any ventilation discharge opening.

107. 12.1.7 Ventilation ducts shall not be led through accommodation, service and machinery spaces or other similar spaces.

108. 12.1.8 Electric motors driving fans shall be placed outside the ventilation ducts if the carriage of flammable products is intended. Ventilation fans and fan ducts, in way of fans only, for hazardous locations referred to in chapter 10 shall be of non-sparking construction, defined as:

a. .1 impellers or housing of non-metallic construction, due regard being paid to the elimination of static electricity;

b. .2 impellers and housing of non-ferrous materials;

c. .3 impellers and housing of austenitic stainless steel; and

d. .4 ferrous impellers and housing with not less than 13 mm design tip clearance.

Any combination of an aluminium or a magnesium alloy fixed or rotating component and a ferrous fixed or rotating component, regardless of tip clearance, is considered a sparking hazard and shall not be used in these places.

109. 12.1.9 Sufficient spare parts shall be carried for each type of fan on board required by this chapter.

110. 12.1.10 Protection screens of not more than 13 mm square mesh shall be fitted in outside openings of ventilation ducts.

200. 12.2 Pump-rooms and other enclosed spaces normally entered

201. Pump-rooms and other enclosed spaces normally entered which are not covered by F1.101 (12.1.1) shall be fitted with mechanical ventilation systems, capable of being controlled from outside such spaces and complying with the requirements of F1.103 (12.1.3), except that the capacity shall not be less than 20 changes of air per hour, based upon the total volume of the space. Provision shall be made to ventilate such spaces prior to personnel entering.

300. 12.3 Spaces not normally entered

301. Double bottoms, cofferdams, duct keels, pipe tunnels, hold spaces and other spaces where cargo may accumulate shall be capable of being ventilated to ensure a safe environment when entry into the spaces is necessary. Where a permanent ventilation system is not provided for such spaces, approved means of portable mechanical ventilation shall be provided. Where necessary, owing to the arrangement of spaces, for instance hold spaces, essential ducting for ventilation shall be permanently installed. For permanent installations the capacity of eight air changes per hour shall be provided and for portable systems the capacity of 16 air changes per hour. Fans or blowers shall be clear of personnel access openings, and shall comply with F1.108 (12.1.8)

CHAPTER G(913)
INSTRUMENTATION

CHAPTER CONTENTS

G1. 13 INSTRUMENTATION

100. 13.1 Gauging

101. 13.1.1 Cargo tanks shall be fitted with one of the following types of gauging devices:

a. .1 *Open device:* which makes use of an opening in the tanks and may expose the gauger to the cargo or its vapour. An example of this is the ullage opening.

b. .2 *Restricted device:* which penetrates the tank and which, when in use, permits a small quantity of cargo vapour or liquid to be exposed to the atmosphere. When not in use, the device is completely closed. The design shall ensure that no dangerous escape of tank contents (liquid or spray) can take place in opening the device.

Guidance

IACS' unified interpretation CC1 Interpretation of sub-section 3.9(b), BCH Code (corresponds to paragraph 13.1.1.2 of the IBC Code) (1977) (Rev.2 Feb 2007):

A restricted device could be a sounding pipe with inside diameter not exceeding 200 mm, with vapour tight cover.

End of guidance

c. .3 *Closed device:* which penetrates the tank, but which is part of a closed system and keeps tank contents from being released. Examples are the float-type systems, electronic probe, magnetic probe and protected sight-glass. Alternatively, an indirect device which does not penetrate the tank shell and which is independent of the tank may be used. Examples are weighing of cargo, pipe flow meter.

102. 13.1.2 Gauging devices shall be independent of the equipment required under ANNEX I, A2.900 (15.19).

103. 13.1.3 Open gauging and restricted gauging shall be allowed only where:

a. .1 open venting is allowed by the Code; or

b. .2 means are provided for relieving tank pressure before the gauge is operated.

104. 13.1.4 Types of gauging for individual products are shown in column j in the table of ANNEX III (chapter 17).

200. 13.2 Vapour detection

201. 13.2.1 Ships carrying toxic or flammable products or both shall be equipped with at least two instruments designed and calibrated for testing for the specific vapours in question. If such instruments are not capable of testing for both toxic concentrations and flammable concentrations, then two separate sets of instruments shall be provided.

202. 13.2.2 Vapour-detection instruments may be portable or fixed. If a fixed system is installed, at least one portable instrument shall be provided.

203. 13.2.3 When toxic-vapour-detection equipment is not available for some products which require such detection, as indicated in column k in the table of chapter 17, the Administration may exempt the ship from the requirement, provided an appropriate entry is made on the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk. When granting such an exemption, the Administration shall recognize the necessity for additional breathing-air supply and an entry shall be made on the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk drawing attention to the provisions of Section 3, B1.204 (14.2.4) and ANNEX II, A1.402.b (16.4.2.2).

204. 13.2.4 Vapour-detection requirements for individual products are shown in column k in the table of ANNEX III (chapter 17).

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