

Subject :

1st set of Amendments to IGC Code

NKTECHNICAL INFORMATION

No. : 1 2 4

Date : 10 Decmber 1993

To : Owners and Shipbuilders concerned

1st set of Amendments to the IGC Code were adopted by the Marine Environment Protection Committee (MEPC) at its thirty-third session.

The adopted Amendments, after the authorized actions are taken as scheduled, come into force on 1st July, 1994 and apply to new ships as from 1st October, 1994.

The major items of the Amendments are as follows.

- (1) In case of large cargo pressure vessels of carbon or carbon-manganese steel, methods of mechanical stress relieving by pressurizing are added.
- (2) Requirements for fire extinguishing system for the cargo compressor room and the cargo pump room are modified.
- (3) Number of firemen's outfits of ships whose total cargo capacity is 5000m³ or less is modified.
- (4) Applicable rules of "Use of cargo as fuel" is fully changed.
- (5) Special requirements for Ammonia are fully changed.
- (6) Substances (Pentane and Pentene) are added to IGC Code, and MFAG * numbers are specified to each cargo in Table of minimum requirements.

(* MFAG : Medical First Aid Guide for Use in Accidents involving Dangerous Goods)

Should you have any question on this matter, please feel free to contact "Tanker section", Hull Department of the Head office.

A copy of text of the Amendments to IGC Code (Res.MSC28(61)) is attached for your reference.

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ANNEX 6

RESOLUTION MSC.30(61)
adopted on 11 December 1992

ADOPTION OF AMENDMENTS TO THE INTERNATIONAL CODE FOR
THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING
LIQUEFIED GASES IN BULK (IGC CODE)

THE MARITIME SAFETY COMMITTEE,

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

RECALLING ALSO resolution MSC.5(48), by which the Committee adopted the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code),

RECALLING FURTHER article VIII(b) and regulation VII/11.1 of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, concerning the procedure for amending the IGC Code,

BEING DESIROUS of keeping the IGC Code up to date,

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

1. ADOPTS, in accordance with article VIII(b)(iv) of the SOLAS Convention, amendments to the Code, the text of which is set out in annex to the present resolution;
2. DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the amendments shall be deemed to have been accepted on 1 January 1994 unless, prior to that date, more than one third of the Contracting Governments to the SOLAS Convention or Contracting Governments the combined merchant fleets of which constitute not less than fifty per cent of the gross tonnage of the world's merchant fleet, have notified their objections to the amendments;
3. INVITES Contracting Governments to note that, in accordance with article VIII(b)(vii)(2) of the SOLAS Convention, the amendments shall enter into force on 1 July 1994 upon their acceptance in accordance with paragraph 2 above;
4. REQUESTS the Secretary-General, in conformity with article VIII(b)(v) of the SOLAS Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Contracting Governments to the SOLAS Convention;
5. FURTHER REQUESTS the Secretary-General to transmit copies of the resolution and its annex to Members of the Organization, which are not Contracting Governments to the SOLAS Convention.

ANNEX

AMENDMENTS TO THE IGC CODE

(Paragraph numbers and amended text refer to the authentic text of the IGC Code in the English language)

- 1.1.2 Replace "1 July 1986" with "1 October 1994" and add the following:

"Ships constructed before 1 October 1994 are to comply with resolution MSC.5(48) adopted on 17 June 1983."

- 2.7.8.1 Amend reference to read 2.9.1.1.

- 2.7.8.2 Amend reference to read 2.9.2.1.

- 2.9.2.1 Fifth line, replace "m/rad." with "m.rad".

- 3.2.4 Second line, insert ", machinery spaces" between "spaces" and "and".

Fourth line, insert "(L)" between "length" and "of the ship".

Fourth and fifth lines, replace "house" with "superstructure or deckhouse".

Seventh line, replace "houses" with "superstructures or deckhouses".

- 3.2.5 Second line, replace "are to" with "or deckhouse should".

- 3.2.6 Third line, replace "are to" with "should".

- 3.8.4 Sixth line, replace "house" with "superstructure or deckhouse".

- 4.3.2 Replace " h_{eq} ", " h_{gd} " and " $(h_{gd})_{max}$ " by " P_{eq} ", " P_{gd} " and " $(P_{gd})_{max}$ ".

- 4.3.2.1 First line, delete "head"

- 4.3.2.2 Third line, insert "liquid" after "internal".

Fourth line, delete "head"

Last paragraph, second line, insert "components" between "acceleration" and "in"; replace "needs" with "need".

Replace the last sentence of the definition of $Z\beta$ with the following:

"Tank domes considered to be part of the accepted total tank volume should be taken into account when determining $Z\beta$ unless the total volume of tank domes V_d does not exceed the following value:

$$V_d = V_t \left(\frac{100 - FL}{FL} \right)$$

where:

V_t = tank volume without any domes

FL = filling limit according to chapter 15"

- 4.4.5.1 Last paragraph, replace "analyses" with "analysis" in three places.
- 4.4.5.6 Note C_w , delete " = ".
- 4.7.6.1 Last two lines, replace "in way of" with "adjacent to".
- 4.8.1 Third line, replace "service" with "design".
- 4.8.2 Fourth line, replace "service" with "design".
- 4.9.9 Last line, insert "cargo" between "the" and "containment".
- 4.10.9.1 Amend the second line to read "and workmanship such as out-of-roundness, local deviations from the".
- 4.10.9.2.1 Last line, replace "or" with "of".
- 4.10.18 Last line, replace "rises" with "raisers".
- 4.11.2 Replace paragraph 4.11.2 with the following:
- "4.11.2 In the case of large cargo pressure vessels of carbon or carbon-manganese steel for which it is difficult to perform the heat treatment, mechanical stress relieving by pressurizing may be carried out as an alternative to the heat treatment with the approval of the Administration and subject to the following conditions:
- .1 Complicated welded pressure vessel parts such as sumps or domes with nozzles, with adjacent shell plates should be heat treated before they are welded to larger parts of the pressure vessel.
 - .2 The mechanical stress relieving process should preferably be carried out during the hydrostatic pressure test required by paragraph 4.10.10.3, by applying a higher pressure than the test pressure required by 4.10.10.3.1. The pressurizing medium should be water.
 - .3 For the water temperature, paragraph 4.10.10.3.2 applies.
 - .4 Stress relieving should be performed while the tank is supported by its regular saddles or supporting structure or, when stress relieving cannot be carried out on board, in a manner which will give the same stresses and stress distribution as when supported by its regular saddles or supporting structure.

- .5 The maximum stress relieving pressure should be held for two hours per 25 mm of thickness but in no case less than two hours.
- .6 The upper limits placed on the calculated stress levels during stress relieving should be the following:
 - equivalent general primary membrane stress: $0.9 \cdot R_e$
 - equivalent stress composed of primary bending stress plus membrane stress: $1.35 \cdot R_e$

where R_e is the specific lower minimum yield stress or 0.2% proof stress at test temperature of the steel used for the tank.

- .7 Strain measurements will normally be required to prove these limits for at least the first tank of a series of identical tanks built consecutively. The location of strain gauges should be included in the mechanical stress relieving procedure to be submitted in accordance with 4.11.2.14.
- .8 The test procedure should demonstrate that a linear relationship between pressure and strain is achieved at the end of the stress relieving process when the pressure is raised again up to the design pressure.
- .9 High stress areas in way of geometrical discontinuities such as nozzles and other openings should be checked for cracks by dye penetrant or magnetic particle inspection after mechanical stress relieving. Particular attention in this respect should be given to plates exceeding 30 mm in thickness.
- .10 Steels which have a ratio of yield stress to ultimate tensile strength greater than 0.8 should generally not be mechanically stress relieved. If, however, the yield stress is raised by method giving high ductility of the steel, slightly higher rates may be accepted upon consideration in each case.
- .11 Mechanical stress relieving cannot be substituted for heat treatment of cold formed parts of tanks if the degree of cold forming exceeds the limit above which heat treatment is required.
- .12 The thickness of the shell and heads of the tank should not exceed 40 mm. Higher thicknesses may be accepted for parts which are thermally stress relieved.
- .13 Local buckling should be guarded against particularly when tori-spherical heads are used for tanks and domes.
- .14 The procedure for mechanical stress relieving should be submitted beforehand to the Administration for approval."

5.2.1.1 First line, replace "this section" with "sections 5.2 to 5.5".

5.2.3.2 Last line, replace "system" with "systems".

- 5.4.6 Heading, replace "treatments" with "treatment".
- 5.4.6.2 First line, replace "treatments" with "treatment".
- 5.4.6.3.1 Second line, replace "service" with "design".

Add the following to existing paragraph 5.4.6.3.1:

"When such butt welded joints of piping sections are made by automatic welding procedures in the pipe fabrication shop, upon special approval by the Administration, the extent of radiographic inspection may be progressively reduced but in no case to less than 10% of each joint. If defects are revealed the extent of examination should be increased to 100% and should include inspection of previously accepted welds. This special approval can only be granted if well-documented quality assurance procedures and records are available to enable the Administration to assess the ability of the manufacturer to produce satisfactory welds consistently."

- 5.4.6.3.2 First line, after "pipes" add "not covered by 5.4.6.3.1".
- Table 6.1 Line 16, replace "PLATE" with "PLATES".
- Table 6.2 Line 17, replace "SECTIONS" with "SECTIONS AND FORGINGS".
- 6.3.6.3 First line, amend the reference to read "6.3.6.2.1".
- 8.2.8.3 Last line, insert "spare" between "maintained" and "valve".
- 8.3.1.1 First line, correct the spelling of "pressure".
- 8.5.2 Definition of "D": replace "K" with "k".
- 9.5.3 Fourth line, delete "tank".
- 10.2.5.2 First and second lines: replace "cargo products" with "cargoes".
- 11.1.1.1 Amend reference to read "56.6".
- 11.3 Add the following new paragraph after 11.3.5:
- "11.3.6 Remote starting of pumps supplying the water spray system and remote operation of any normally closed valves in the system should be arranged in suitable locations outside the cargo area, adjacent to the accommodation spaces and readily accessible and operable in the event of fire in the areas protected".
- 11.5 Replace 11.5 with the following:
- "11.5 Cargo compressor and pump rooms
- 11.5.1 The cargo compressor and pump rooms of any ship should be provided with a carbon dioxide system as specified in regulation II-2/5.1 and .2 of the 1974 SOLAS Convention, as amended. A notice should be exhibited at the controls stating that the system is only to be used for fire-extinguishing and not for inerting purposes, due

to the electrostatic ignition hazard. The alarms referred to in regulation II-2/5.1.6 of the 1983 SOLAS amendments should be safe for use in a flammable cargo vapour-air mixture. For the purpose of this requirement, an extinguishing system should be provided which would be suitable for machinery spaces. However, the amount of carbon dioxide gas carried should be sufficient to provide a quantity of free gas equal to 45% of the gross volume of the cargo compressor and pump-rooms in all cases.

11.5.2 Cargo compressor and pump rooms of ships which are dedicated to the carriage of a restricted number of cargoes should be protected by an appropriate fire-extinguishing system approved by the Administration."

11.6.1 In the table, delete "below 2,000 m³ 2"
replace "between 2,000 m³ and 5,000 m³" with "5,000 m³ and below".

Chapter 12 Preamble, replace "replace" with "should be substituted for".

13.6.11 Sixth line, replace "sampling and detecting" with "monitoring".

14.2.3.1 First line, insert "spare" between "charged" and "air".

14.3.2 Replace the regulation number with "*** 14.3.2" and add a reference at the foot of the page as follows:

"

** Reference is made to the Medical First Aid Guide for Use in Accidents involving Dangerous Goods (MFAG) which includes the MFAG numbers of products covered by the Code and the emergency procedures to be applied in the event of an incident. MFAG numbers related to products covered by the IGC Code are given in the table of minimum requirements (chapter 19)".

14.4.2.1.1 Replace with the following:

".1.1 filter type respiratory protection is unacceptable".

15.1.2 First line, replace "should" with "may".

15.1.4.2 Penultimate line, replace "relief valve" with "relieving system".

15.2 First line, replace "tank filling" with "loading".

Chapter 16 The existing text of chapter 16 is replaced with the following:

"16.1 General

16.1.1 Methane (LNG) is the only cargo whose vapour or boil-off gas may be utilized in machinery spaces of category A and in such spaces may be utilized only in boilers, inert gas generators, combustion engines and gas turbines.

- 16.1.2 These provisions do not preclude the use of gas fuel for auxiliary services in other locations, provided that such other services and locations should be subject to special consideration by the Administration.
- 16.2 Arrangement of machinery spaces of category A
- 16.2.1 Spaces in which gas fuel is utilized should be fitted with a mechanical ventilation system and should be arranged in such a way as to prevent the formation of dead spaces. Such ventilation should be particularly effective in the vicinity of electrical equipment and machinery or of other equipment and machinery which may generate sparks. Such a ventilation system should be separated from those intended for other spaces.
- 16.2.2 Gas detectors should be fitted in these spaces, particularly in the zones where air circulation is reduced. The gas detection system should comply with the requirements of chapter 13.
- 16.2.3 Electrical equipment located in the double wall pipe or duct specified in 16.3.1 should be of the intrinsically safe type.
- 16.3 Gas fuel supply
- 16.3.1 Gas fuel piping should not pass through accommodation spaces, services spaces, or control stations. Gas fuel piping may pass through or extend into other spaces provided they fulfil one of the following:
- .1 the gas fuel piping should be a double wall piping system with the gas fuel contained in the inner pipe. The space between the concentric pipes should be pressurized with inert gas at a pressure greater than the gas fuel pressure. Suitable alarms should be provided to indicate a loss of inert gas pressure between the pipes; or
 - .2 the gas fuel piping should be installed within a ventilated pipe or duct. The air space between the gas fuel piping and inner wall of this pipe or duct should be equipped with mechanical exhaust ventilation having a capacity of at least 30 air changes per hour. The ventilation system should be arranged to maintain a pressure less than the atmospheric pressure. The fan motors should be placed outside the ventilated pipe or duct. The ventilation outlet should be placed in a position where no flammable gas-air mixture may be ignited. The ventilation should always be in operation when there is gas fuel in the piping. Continuous gas detection should be provided to indicate leaks and to shut down the gas fuel supply to the machinery space in accordance with 16.3.10. The master gas fuel valve required by 16.3.7 should close automatically, if the required air flow is not established and maintained by the exhaust ventilation system.
- 16.3.2 If a gas leak occurs, the gas fuel supply should not be restored until the leak has been found and repaired. Instructions to this effect should be placed in a prominent position in the machinery spaces.

- 16.3.3 The double wall piping system or the ventilated pipe or duct provided for the gas fuel piping should terminate at the ventilation hood or casing required by 16.3.4.
- 16.3.4 A ventilation hood or casing should be provided for the areas occupied by flanges, valves, etc., and for the gas fuel piping, at the gas fuel utilization units, such as boilers, diesel engines or gas turbines. If this ventilation hood or casing is not served by the exhaust ventilation fan serving the ventilated pipe or duct as specified in 16.3.1.2, then it should be equipped with an exhaust ventilation system and continuous gas detection should be provided to indicate leaks and to shut down the gas fuel supply to the machinery space in accordance with 16.3.10. The master gas fuel valve required by 16.3.7 should close automatically if the required air flow is not established and maintained by the exhaust ventilation system. The ventilation hood or casing should be installed or mounted to permit the ventilating air to sweep across the gas utilization unit and be exhausted at the top of the ventilation hood or casing.
- 16.3.5 The ventilation inlet and discharge for the required ventilation systems should be respectively from and to a safe location.
- 16.3.6 Each gas utilization unit should be provided with a set of three automatic valves. Two of these valves should be in series in the gas fuel pipe to the consuming equipment. The third valve should be in a pipe that vents, to a safe location in the open air, that portion of the gas fuel piping that is between the two valves in series. These valves should be arranged so that failure of the necessary forced draught, loss of flame on boiler burners, abnormal pressure in the gas fuel supply line, or failure of the valve control actuating medium will cause the two gas fuel valves which are in series to close automatically and the vent valve to open automatically. Alternatively, the function of one of the valves in series and the vent valve can be incorporated into one valve body so arranged that, when one of the above conditions occurs, flow to the gas utilization unit will be blocked and the vent opened. The three shut-off valves should be arranged for manual reset.
- 16.3.7 A master gas fuel valve that can be closed from within the machinery space should be provided within the cargo area. The valve should be arranged so as to close automatically if leakage of gas is detected, or loss of ventilation for the duct or casing or loss of pressurization of the double wall gas fuel piping occurs.
- 16.3.8 Gas fuel piping in machinery spaces should comply with sections 5.2-5.5 as far as found applicable. The piping should, as far as practicable, have welded joints. Those parts of the gas fuel piping, which are not enclosed in a ventilated pipe or duct according to 16.3.1 and are on the open deck outside the cargo area should have full penetration butt welded joints and should be fully radiographed.
- 16.3.9 Provision should be made for inerting and gas-freeing that portion of the gas fuel piping system located in the machinery space.

- 16.3.10 Gas detection systems provided in accordance with the requirements of 16.3.1 and 16.3.4 should comply with 13.6.2 and 13.6.4 through 13.6.8 as applicable; they should activate the alarm at 30% of the lower flammable limit and shut down the master gas fuel valve referred to in 16.3.7 before the gas concentration reaches 60% of the lower flammable limit.
- 16.4 Gas make-up plant and related storage tanks
- 16.4.1 All equipment (heaters, compressors, filters, etc.) for making up the gas for its use as fuel, and the related storage tanks should be located in the cargo area in accordance with paragraph 3.1.5.4. If the equipment is in an enclosed space, the space should be ventilated according to section 12.1 of the Code and be equipped with a fixed fire-extinguishing system according to section 11.5 and with a gas detection system according to section 13.6, as applicable.
- 16.4.2 The compressors should be capable of being remotely stopped from a position which is always and easily accessible, and also from the engine-room. In addition, the compressors should be capable of automatically stopping when the suction pressure reaches a certain value depending on the set pressure of the vacuum relief valves of the cargo tanks. The automatic shut-down device of the compressors should have a manual resetting. Volumetric compressors should be fitted with pressure relief valves discharging into the suction line of the compressor. The size of the pressure relief valves should be determined in such a way that, with the delivery valve kept closed, the maximum pressure does not exceed by more than 10% the maximum working pressure. The requirements of 5.6.1.3 apply to these compressors.
- 16.4.3 If the heating medium for the gas fuel evaporator or heater is returned to spaces outside the cargo area it should first go through a degassing tank. The degassing tank should be located in the cargo area. Provisions should be made to detect and alarm the presence of gas in the tank. The vent outlet should be in a safe position and fitted with a flame screen.
- 16.4.4 Piping and pressure vessels in the gas fuel conditioning system should comply with chapter 5.
- 16.5 Special requirements for main boilers
- 16.5.1 Each boiler should have a separate uptake.
- 16.5.2 A system suitable to ensure the forced draught in the boilers should be provided. The particulars of such a system should be to the satisfaction of the Administration.
- 16.5.3 Combustion chambers of boilers should be of suitable form such as not to present pockets where gas may accumulate.
- 16.5.4 The burner systems should be of dual type, suitable to burn either oil fuel or gas fuel alone or oil and gas fuel simultaneously. Only oil fuel should be used during manoeuvring and port operations unless automatic transfer from gas to oil burning is

- provided in which case the burning of a combination of oil and gas or gas alone may be permitted provided the system is demonstrated to the satisfaction of the Administration. It should be possible to change over easily and quickly from gas fuel operation to oil fuel operation. Gas nozzles should be fitted in such a way that gas fuel is ignited by the flame of the oil fuel burner. A flame scanner should be installed and arranged to assure that gas flow to the burner is cut off unless satisfactory ignition has been established and maintained. On the pipe of each gas burner a manually operated shut-off valve should be fitted. An installation should be provided for purging the gas supply piping to the burners by means of inert gas or steam, after the extinguishing of these burners.
- 16.5.5 Alarm devices should be fitted in order to monitor a possible decrease in liquid fuel oil pressure or a possible failure of the related pumps.
- 16.5.6 Arrangements should be made that, in case of flame failure of all operating burners for gas or oil or for a combination thereof, the combustion chambers of the boilers are automatically purged before relighting. Arrangements should also be made to enable the boilers to be manually purged and these arrangements should be to the satisfaction of the Administration.
- 16.6 Special requirements for gas-fired internal combustion engines and gas-fired turbines
- Special provisions for gas-fuelled internal combustion engines and for gas turbines will be considered by the Administration in each case".
- 17.1 Replace reference to column "h" by "i".
- 17.2 Replace reference to column "h" by "i".
- 17.3 Replace present section 17.13 of the IGC Code with the following:
- "17.13 Ammonia
- 17.13.1 Anhydrous ammonia may cause stress corrosion cracking in containment and process systems made of carbon manganese steel or nickel steel. To minimize the risk of this occurring, measures detailed in 17.13.2 to 17.13.8 should be taken as appropriate.
- 17.13.2 Where carbon manganese steel is used, cargo tanks, process pressure vessels and cargo piping should be made of fine grained steel with a specified minimum yield strength not exceeding 355 N/mm^2 and with an actual yield strength not exceeding 440 N/mm^2 . One of the following constructional or operational measures should also be taken:
- .1 lower strength material with a specified minimum tensile strength not exceeding 410 N/mm^2 should be used; or
 - .2 cargo tanks, etc., should be post weld stress relief heat treated; or

.3 carriage temperature should be maintained preferably at a temperature close to the product's boiling point of -33°C but in no case at a temperature above -20°C ; or

.4 the ammonia should contain not less than 0.1% w/w water.

- 17.13.3 If carbon manganese steels with higher yield properties are used other than those specified in 17.13.2, the completed cargo tanks, piping, etc. should be given a post weld stress relief heat treatment.
- 17.13.4 Process pressure vessels and piping of the condensate part of the refrigeration system should be given a post-weld stress relief heat treatment when made of materials mentioned in 17.13.1.
- 17.13.5 The tensile and yield properties of the welding consumables should exceed those of the tank or piping material by the smallest practical amount.
- 17.13.6 Nickel steel containing more than 5% nickel and carbon manganese steel not complying with the requirements of 17.13.2 and 17.13.3 are particularly susceptible to ammonia stress corrosion cracking and should not be used for containment and piping systems for the carriage of this product.
- 17.13.7 Nickel steel containing not more than 5% nickel may be used provided the carriage temperature complies with the requirements specified in 17.13.2.3.
- 17.13.8 In order to minimize the risk of ammonia stress corrosion cracking, it is advisable to keep the dissolved oxygen content below 2.5 ppm/w/w. This can best be achieved by reducing the average oxygen content in the tanks prior to the introduction of liquid ammonia to less than the values given as a function of the carriage temperature T in the table below:

T ($^{\circ}\text{C}$)	O ₂ (%v/v)
-30 and below	0.90
-20	0.50
-10	0.28
0	0.16
10	0.10
20	0.05
30	0.03

Oxygen percentages for intermediate temperatures may be obtained by direct interpolation".

- 17.14.3.1 First line, replace "are to" with "should".
- 17.14.4.3.1 Delete "cargo".
- 17.14.5.1 Fourth line, delete "remainder of the".
- 17.16.5 Replace "17.20.6.3" by "17.20.5.3".
- 17.20.4 Second line, delete "pit".
- 17.20.13.1 Fourth line, replace "the product" with "these products".
- 17.20.13.3 First line, amend to read "Before each initial loading of these products and before every subsequent return to such service, ...".
- 17.20.17 Eighth line, replace "atmospheric" with "ambient".
- Insert the following after the third sentence:
- "Remote manual operation should be arranged such that remote starting of pumps supplying water spray system and remote operation of any normally closed valves in the system can be carried out from a suitable location outside the cargo area, adjacent to the accommodation spaces and readily accessible and operable in the event of fire in the areas protected".
- 18.1.1.7 Insert "allowable" between "minimum" and "inner".
- 18.2.1 First line, replace "character" with "characteristics".
Last line, replace "if so" with "as".

Chapter 19 Summary of minimum requirements, revise the table of minimum requirements to include a new column "h" showing MFAG numbers, as follows:

a Product name	h MFAG table No.
Acetaldehyde	300
Ammonia, anhydrous	725
Butadiene	310
Butane	310
Butane-propane mixtures	310
Butylenes	310
Chlorine	740
Diethyl ether	330
Dimethylamine	320
Ethane	310
Ethyl chloride	340
Ethylene	310
Ethylene oxide	365
Ethylene oxide-propylene oxide mixtures with ethylene oxide content of not more than 30% by weight	365
Isoprene	310
Isopropylamine	320
Methane (LNG)	620
Methyl acetylene-propadiene mixtures	310
Methyl bromide	345
Methyl chloride	340
Monoethylamine	320
Nitrogen	620
Propane	310
Propylene	310
Propylene oxide	365
Refrigerant gases (see notes)	350
Sulphur dioxide	635
Vinyl chloride	340
Vinyl ethyl ether	330
Vinylidene chloride	340

Special requirements column becomes "i".

Add a new explanatory note:

"MFAG numbers are provided for information on the emergency procedures to be applied in the event of an incident with the products covered by the IGC Code. Where any of the products listed are carried at low temperature from which frostbite may occur MFAG No.620 is also applicable".

Chapter 19 Table of minimum requirements, insert an asterisk in column "a" for Ethylene oxide - propylene oxide mixtures with ethylene oxide content of not more than 30% by weight.

Add the following to the table of the summary of minimum requirements:

a	b	c	d	e	f	g	h	i
Pentanes (all isomers)*	1265	2G/2PG	-	-	F	R	310	14.4.4, 17.10, 17.12
Pentene (all isomers)*	1265	2G/2PG	-	-	F	R	310	14.4.4, 17.10, 17.12

Delete the reference to "Chapter 19" after paragraph 18.2.1 and at the top of page 13.

Appendix

Model form of certificate, footnote 5, third line, insert "or their compatible mixtures having physical proportions within the limitations of tank design" between "Code" and "should".
