BCH CODE

Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk

2008 Edition

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IMO INTERNATIONAL MARITIME ORGANIZATION

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CONTENTS

Page

Foreword ix

Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk

Preamble 1

CHAPTER I – GENERAL

1.1 Purpose 3
1.2 Scope 3
1.3 Hazards 4
1.4 Definitions 5
1.5 Equivalents 7
1.6 Survey and certification 7
1.7 Effective date 13
1.8 New products 14

CHAPTER II – CARGO CONTAINMENT

A – Physical protection (siting of cargo tanks; floatability and damage stability)

2.1 General 15
2.2 Ship types 16

B – Tank types

2.3 Installation 20
2.4 Design and construction 20
2.5 Requirements for individual substances 20

C – Ship arrangements

2.6 Cargo segregation 21
2.7 Accommodation spaces 21

Documents
Document Sharing Hub

Full document details: IMO IC772E 2009

Page

2.8 Cargo pump-rooms 22
2.9 Access to void spaces, cargo tanks and other spaces in the cargo-tank area..... 23

D – Cargo transfer

2.10 Piping arrangements 23
2.11 Cargo-transfer control systems 25
2.12 Ship's cargo hoses..... 25

E – Tank vent systems

2.13 General..... 26
2.14 Types of tank vent systems..... 27

F – Cargo temperature control

2.15 General..... 29
2.16 Additional requirements 30

G – Materials of construction

2.17 General..... 30
2.18 Additional requirements – *deleted*..... 31

H – Environmental control of vapour space in cargo tanks and void spaces surrounding such tanks

2.19 General..... 31
2.20 Environmental control requirements for individual substances.... 32
2.21 Ballast tank arrangements..... 33
2.22 Bilge pumping arrangements from spaces within the cargo-tank area..... 33
2.23 Pump and pipeline identification 33

CHAPTER III – SAFETY EQUIPMENT AND RELATED CONSIDERATIONS

A – Ventilation in cargo-handling spaces

3.1 Spaces normally entered during cargo-handling operations 34
3.2 Spaces not normally entered 35

Documents
Document Sharing Hub

Full document details: IMO IC772E 2009

Page

B – Electrical requirements in respect of flammable cargoes

3.3 General 35
3.4 Installations in spaces containing cargo tanks or pipes 36
3.5 Installations in enclosed spaces immediately aft of, forward of, or above the cargo-tank area 36
3.6 Installations on open decks 36
3.7 Bonding 37
3.8 Electrical requirements for individual substances 37

C – Gauging

3.9 General 37
3.10 Gauging for individual substances 38

D – Vapour detection

3.11 General 38
3.12 Requirements for individual substances 38

E – Fire protection

3.13 Fire safety arrangements 39
3.14 Fire-extinguishing arrangements for cargo-tank areas 40
3.15 Fire protection for ships built prior to 20 May 1980 42

F – Personnel protection

3.16 Requirements 43

G – Tank filling

3.17 General 46

CHAPTER IV – SPECIAL REQUIREMENTS

4.1 Carbon disulphide 47
4.2 Diethyl ether 50
4.3 Sulphur (molten) 51

Documents
Document Sharing Hub
Full document details: IMO IC772E 2009

Page

4.4 Acetone cyanohydrin and lactonitrile solution (80% or less) 51
4.5 Phosphorus, yellow or white 52
4.6 Motor fuel anti-knock compounds (containing lead alkyls) 53
4.7 Propylene oxide and mixtures of ethylene oxide/ propylene oxide with an ethylene oxide content of not more than 30% by weight 53
4.8 Acids 59
4.9 Toxic products 60
4.10 Cargoes protected by additives 61
4.11 Cargoes which have a vapour pressure greater than 1.033 kp/cm^2 at 37.8°C 62
4.12 Materials of construction – *deleted* 62
4.13 Cargo pump-rooms 62
4.14 Overflow control (Alternative 1) 63
4.14 Overflow control (Alternative 2) 64
4.15 Cargo contamination 65
4.16 Samples taken from chemical cargoes 66
4.17 Respiratory and eye protection 66
4.18 Cargoes not to be exposed to excessive heat 66
4.19 Ammonium nitrate solution, 93% or less 67
4.20 Hydrogen peroxide solutions 68
4.21 Sodium chlorate solution, 50% or less 72
4.22 Alkyl (C_7 – C_9) nitrates, all isomers 73
4.23 Temperature sensors 73

CHAPTER V – OPERATIONAL REQUIREMENTS

5.1 Maximum allowable quantity of cargo per tank 74
5.2 Cargo information 74
5.3 Personnel training 75
5.4 Tank entry 75
5.5 Openings in cargo tanks 76
5.6 Tank heating coil returns 76
5.7 Additional operational requirements 76

Documents
Document Sharing Hub

Full document details: IMO IC772E 2009

Page

CHAPTER VA – ADDITIONAL MEASURES FOR THE PROTECTION OF THE MARINE ENVIRONMENT

5A.1–5A.3 – *deleted* 77

CHAPTER VI – SUMMARY OF MINIMUM REQUIREMENTS 78

CHAPTER VII – LIST OF CHEMICALS TO WHICH THE CODE DOES NOT APPLY 81

CHAPTER VIII – TRANSPORT OF LIQUID CHEMICAL WASTES

8.1 Preamble 82
8.2 Definitions 82
8.3 Applicability 82
8.4 Permitted shipments 83
8.5 Documentation 83
8.6 Classification of liquid chemical wastes 83
8.7 Carriage and handling of liquid chemical wastes 83

APPENDIX

Model form of Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk 84

Decisions of the MSC

Recommendation on uniform interpretation of the application of 2.7.1 and 2.7.3 of the Bulk Chemical Code to existing chemical tankers 95

Guidelines for a uniform application of the survival requirements of the Bulk Chemical Code and the Gas Carrier Code 98

Documents
Document Sharing Hub

Full document details: IMO IC772E 2009

Page

Calculation of the capacity of the foam systems for chemical tankers 105

Resolution MSC.7(48) – Recommendation for chemical tankers and gas carriers constructed before 1 July 1986 108

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Document Sharing Hub

Full document details: IMO IC772E 2009

Foreword

This publication contains the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code) and information related to that Code. The Code was originally adopted in 1971 and was altered by a series of amendments between 1972 and 1983 before an amended version was adopted by the Marine Environment Protection Committee (MEPC) in 1985 and by the Maritime Safety Committee (MSC) in 1986. There have been further amendments, the most recent of which were adopted by the MEPC by resolution MEPC.144(54) in March 2006 and by the MSC by resolution MSC.212(81) in May 2006. These came into force on 1 August 2007.

This edition also includes amendments which were adopted by the MEPC by resolution MEPC.41(29) which became effective on 3 February 2000; by resolution MEPC.56(33) which became effective on 1 July 1994; by resolution MEPC.70(38) which became effective on 1 July 1998; by resolution MEPC.80(43) which became effective on 1 July 2002 and by resolution MEPC.91(45) which also became effective on 1 July 2002.

Chapters VI and VII of the BCH Code are now much shorter than in earlier editions because they refer the user to chapters 17 and 18 of the IBC Code.

Under the provisions of Annex II of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), chemical tankers constructed before 1 July 1986 must comply with this Code; those built on or after that date must comply with the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) for the purposes of MARPOL 73/78 and the International Convention for the Safety of Life at Sea (SOLAS 74).

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Preamble

1 The purpose of the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code) is to provide an international standard for the safe carriage of dangerous and noxious chemicals in bulk by prescribing the constructional features of ships, regardless of their tonnage, involved in such carriage and the equipment they should carry so as to minimize the risk to the ship, to its crew and to the environment, having regard to the nature of the products involved.

2 The basic philosophy is to assign to each chemical tanker one of the ship types according to the degree of the hazards of the products carried by such ship. Each of the products may have one or more hazard properties, which include flammability, toxicity and reactivity as well as the hazard they may present to the environment if accidentally released.

3 Throughout the development of the Code it was recognized that it must be based upon sound naval architectural and engineering principles and the best understanding available as to the hazards of the various products covered; furthermore that chemical tanker design technology is not only a complex technology but is rapidly evolving and that the Code should not remain static. Therefore the International Maritime Organization (IMO) will periodically review the Code, taking into account both experience and technical development.

4 Amendments to the Code involving requirements for new products and their conditions of carriage will be circulated from time to time as recommendations, on an interim basis, when adopted by the Maritime Safety Committee (MSC) and the Marine Environment Protection Committee (MEPC) of the Organization, in accordance with the provisions of article 16 of the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), pending the entry into force of these amendments.

5 The Code primarily deals with ship design and equipment. In order to ensure the safe transport of the products, the total system must, however, be appraised. Other important facets of the safe transport of the products, such as training, operation, traffic control and handling in port, are being or will be examined further by the Organization.

6 Chapter VI of the Code, dealing with operational requirements of chemical tankers, highlights the regulations in other chapters that are

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applicable and mentions those other important safety features that are peculiar to chemical tanker operation. The summary of minimum requirements of the products covered by the Code is set out in chapter 17 of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code). Cross-references to the IBC and BCH Codes are provided in chapter VI of this publication.

7 The Code has been revised to reflect the 2007 revision of MARPOL Annex II.

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Chapter I
General

1.1 Purpose

The purpose of the Code is to recommend suitable design criteria, construction standards and other safety measures for ships transporting dangerous and noxious chemical substances in bulk so as to minimize the risk to the ship, its crew and the environment. For the purposes of MARPOL 73/78, the Code applies only to chemical tankers which are engaged in the carriage of noxious liquid substances falling into category X, Y or Z and identified as such by an entry of X, Y or Z in *column c* of chapter 17 of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code).

1.2 Scope

1.2.1 Products: The Code applies to bulk cargoes of dangerous and noxious chemical substances, other than petroleum or similar flammable products, as follows:

(a) Products having significant fire hazards in excess of those of petroleum products and similar flammable products.

(b) Products having significant hazards in addition to or other than flammability.

(c) Products which may present a hazard to the environment, if accidentally released.

The Code is at present limited to the liquids shown in the summary of minimum requirements in chapter 17 of the IBC Code. Products that have been reviewed and determined not to present safety and pollution hazards to such an extent as to warrant application of the Code are found in chapter 18 of the IBC Code.

1.2.2 Ships: The Code is at present limited to tankships.

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1.3 Hazards

1.3.1 Hazards of chemicals and other substances relating to human life considered in this Code are:

(a) *Fire hazard* defined by flashpoint, boiling point, explosion limit range and auto-ignition temperature of the chemical.

(b) *Health hazard* defined by:

(i) irritant or toxic effect on the skin or on the mucous membranes of the eyes, nose, throat and lungs in the gas or vapour state combined with vapour pressure; or

(ii) irritational effects on the skin in the liquid state; or

(iii) toxic effect via skin absorption, taking into account values of LC_{50}, LD_{50} (oral), and LD_{50} (skin).

(c) *Water pollution hazard* defined by human toxicity, water solubility, volatility, odour or taste, and specific gravity.

(d) *Air pollution hazard* defined by:

(i) emergency exposure limit (EEL) or LC_{50};

(ii) vapour pressure;

(iii) solubility in water;

(iv) specific gravity of liquid;

(v) relative density of vapour.

(e) *Reactivity hazard* defined by reactivity with:

(i) other chemicals, or

(ii) water, or

(iii) the chemical itself (including polymerization).

1.3.2 Hazards of chemicals and other substances relating to the marine environment considered by this Code are:

(a) bioaccumulation with attendant risk to aquatic life or human health or causing tainting to seafood;

(b) damage to living resources;

(c) hazards to human health; and

(d) reduction of amenities.

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1.4 Definitions

1.4.1 *Liquids covered by this Code* are those having a vapour pressure not exceeding 2.8 kp/cm^2 at a temperature of 37.8°C.

1.4.2 *Vapour pressure* is equilibrium pressure of the saturated vapour above the liquid expressed in kp/cm^2 or mmHg absolute at a specified temperature.

1.4.3 *Flashpoint* is the temperature in degrees Celsius at which a liquid will give off enough flammable vapour to be ignited. Values given in this Code are both ''open-cup'' and ''closed-cup'', which indicate two different types of test equipment.

1.4.4 *Boiling point* is the temperature at which a liquid exhibits a vapour pressure equal to the atmospheric barometric pressure.

1.4.5 *Explosive range* is the range of gas or vapour concentrations (per cent by volume in air) which will burn or explode if an ignition source is present.

1.4.6 *Specific gravity* is the ratio of the weight of a certain volume of a substance to the weight of an equal volume of water. For liquids of limited solubility, the specific gravity will predict whether the product will sink or float in water.

1.4.7 *Vapour density* is the relative density or the ratio of the weight of a vapour or gas (with no air present) to the weight of an equal volume of air at the same pressure and temperature. Values less than 1 indicate that the vapour or gas is lighter than air, while values greater than 1 show that the gas is heavier than air.

1.4.8 *Viscosity* is the shearing resistance of a liquid film which separates two horizontal plates, one of which is being moved across the other. The absolute viscosity of a substance is the force in dynes which will move 1 cm^2 of a plane surface with a speed of 1 cm/s relative to another parallel plane surface from which it is separated by a layer of the substance 1 cm thick. The kinematic viscosity of a substance is the ratio of the absolute viscosity to the density of the substance at the temperature of measurement.

1.4.9 *Corrosive aggression* is the property of a substance having a destructive effect on the environment by entering into an electrochemical reaction with it.

1.4.10 *Cargo pump-rooms* are spaces containing pumps and their accessories for the handling of products covered by the Code.

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1.4.11 *Pump-rooms* are spaces, located in the cargo-tank area, containing pumps and their accessories for the handling of ballast and fuel oil.

1.4.12 *Cargo-tank area* is that part of the ship that contains cargo tanks and cargo pump-rooms and includes cofferdams, void spaces and deck spaces adjacent to and above all such spaces.

1.4.13 *Separate* means that a cargo piping system or cargo vent system, for example, is not connected to another cargo piping or cargo vent system. This separation may be achieved by the use of design or operational methods. Operational methods should not be used within a cargo tank and should consist of one of the following types:

(a) removing spool-pieces or valves and blanking the pipe ends;

(b) arrangement of two spectacle flanges in series, with provisions for detecting leakage into the pipe between the two spectacle flanges.

1.4.14 *Independent* means that a piping or venting system, for example, is in no way connected to another system and that there are no provisions available for the potential connection to other systems.

1.4.15 For the purpose of propylene oxide and ethylene oxide/propylene oxide mixtures with an ethylene oxide content of not more than 30% by weight (section 4.7), *reference temperature* means the temperature corresponding to the vapour pressure of the cargo at the set pressure of the pressure-relief valve.

1.4.16 *Toxicity limits*

(a) LD_{50} (oral): a dose which is lethal to 50% of the test subjects when administered orally;

(b) LD_{50} (skin): a dose which is lethal to 50% of the test subjects when administered to the skin;

(c) LC_{50}: the concentration which is lethal by inhalation to 50% of the test subjects.

1.4.16A *Noxious liquid substance* means any substance indicated in the pollution category column of chapter 17 or 18 of the International Bulk Chemical Code, or the current MEPC.2/Circular or provisionally assessed under the provisions of regulation 6.3 of the amendments to the Annex of the Protocol of 1978 relative to the International Convention for the Prevention of Pollution from Ships, 1973, as falling into Category X, Y or Z.

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1.4.16B *Deleted*

1.4.16C The *IBC Code* means the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk adopted by the Maritime Safety Committee and the Marine Environment Protection Committee of the Organization by resolutions MSC.4(48) and MEPC.19(22) respectively, as amended.

1.4.16D *Anniversary date* means the day and the month of each year which will correspond to the date of expiry of the Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk.

1.4.17 Where reference is made in the Code to a main paragraph, all the provisions of the subparagraphs of that designation should apply.

1.5 Equivalents

1.5.1 Where the Code requires that a particular fitting, material, appliance or apparatus, or type thereof, should be fitted or carried in a ship, or that any particular provision should be made, the Administration may allow any other fitting, material, appliance or apparatus, or type thereof, to be fitted or carried, or any other provision to be made in that ship, if it is satisfied by trial thereof or otherwise that such fitting, material, appliance or apparatus or type thereof, or provision, is at least as effective as that required by the Code.

1.5.2 When the Administration so allows any fitting, material, appliance, apparatus, item of equipment, or type thereof, or provision, procedure, or arrangement, or novel design or application to be substituted hereafter, it should communicate to IMO the particulars thereof together with a report on the evidence submitted so that the Organization may circulate the same to other Parties to MARPOL 73/78 and other participating Governments for the information of their officers

1.6 Survey and certification

1.6.1 Survey procedure

1.6.1.1 The survey of ships, so far as regards the enforcement of the provisions of the regulations and granting of exemptions therefrom, should be carried out by officers of the Administration. The Administration may, however, entrust the surveys either to surveyors nominated for the purpose or to organizations recognized by it.

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1.6.1.2 The Administration nominating surveyors or recognizing organizations to conduct surveys should, as a minimum, empower any nominated surveyor or recognized organization to:

.1 require repairs to a ship; and

.2 carry out surveys if requested by the appropriate authorities of a port State.

The Administration should notify the Organization of the specific responsibilities and conditions of the authority delegated to nominated surveyors or recognized organizations for circulation to the Contracting Governments.

1.6.1.3 When a nominated surveyor or recognized organization determines that the condition of the ship or its equipment does not correspond substantially with the particulars of the Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk, or is such that the ship is not fit to proceed to sea without danger to the ship, or persons on board, or without presenting unreasonable threat of harm to the marine environment, such surveyor or organization should immediately ensure that corrective action is taken and should in due course notify the Administration. If such corrective action is not taken the Certificate should be withdrawn and the Administration should be notified immediately; and, if the ship is in a port of another Contracting Government, the appropriate authorities of the port State should also be notified immediately. When an officer of the Administration, a nominated surveyor or a recognized organization has notified the appropriate authorities of the port State, the Government of the port State concerned should give such officer, surveyor or organization any necessary assistance to carry out their obligations under this paragraph. When applicable, the Government of the port State concerned should take such steps as will ensure that the ship does not sail until it can proceed to sea or leave the port for the purpose of proceeding to the nearest appropriate repair yard available without danger to the ship or persons on board or without presenting an unreasonable threat of harm to the marine environment.

1.6.1.4 In every case, the Administration should guarantee the completeness and efficiency of the survey, and should undertake to ensure the necessary arrangements to satisfy this obligation.

1.6.2 Survey requirements

1.6.2.1 The structure, equipment, fittings, arrangements and material (other than items in respect of which a Cargo Ship Safety Construction Certificate,

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Cargo Ship Safety Equipment Certificate and Cargo Ship Safety Radio Certificate or Cargo Ship Safety Certificate are issued) of a chemical tanker should be subjected to the following surveys:

.1 An initial survey before the ship is put in service or before the Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk is issued for the first time, which should include a complete examination of its structure, equipment, fittings, arrangements and material in so far as the ship is covered by the Code. This survey should be such as to ensure that the structure, equipment, fittings, arrangements and material fully comply with the applicable provisions of the Code.

. 2 A renewal survey at intervals specified by the Administration, but not exceeding five years, except where 1.6.6.2.2, 1.6.6.5, 1.6.6.6 or 1.6.6.7 is applicable. The renewal survey should be such as to ensure that the structure, equipment, fittings, arrangements and material fully comply with the applicable provisions of the Code .

. 3 An intermediate survey within three months before or after the second anniversary date or within three months before or after the third anniversary date of the Certificate which should take the place of one of the annual surveys specified in 1.6.2.1.4. The intermediate survey should be such as to ensure that the safety equipment and other equipment, and associated pump and piping systems fully comply with the applicable provisions of the Code and are in good working order. Such intermediate surveys should be endorsed on the Certificate issued under 1.6.4 or 1.6.5.

. 4 An annual survey within three months before or after each anniversary date of the Certificate, including a general inspection of the structure, equipment, fittings, arrangements and material referred to in 1.6.2.1.1 to ensure that they have been maintained in accordance with 1.6.3 and that they remain satisfactory for the service for which the ship is intended. Such annual surveys should be endorsed on the Certificate issued under 1.6.4 or 1.6.5.

.5 An additional survey, either general or partial according to the circumstances, should be made when required after an investigation prescribed in 1.6.3.3, or whenever any important repairs or renewals are made. Such a survey should ensure that the necessary repairs or renewals have been effectively made, that the material and workmanship of such repairs or renewals

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are satisfactory; and that the ship is fit to proceed to sea without danger to the ship or persons on board or without presenting unreasonable threat of harm to the marine environment.

1.6.3 Maintenance of conditions after survey

1.6.3.1 The condition of the ship and its equipment should be maintained to conform with the provisions of the Code to ensure that the ship will remain fit to proceed to sea without danger to the ship or persons on board or without presenting unreasonable threat of harm to the marine environment.

1.6.3.2 After any survey of the ship under 1.6.2 has been completed, no change should be made in the structure, equipment, fittings, arrangements and material covered by the survey, without the sanction of the Administration, except by direct replacement.

1.6.3.3 Whenever an accident occurs to a ship or a defect is discovered, either of which affects the safety of the ship or the efficiency or completeness of its life-saving appliances or other equipment covered by the Code, the master or owner of the ship should report at the earliest opportunity to the Administration, the nominated surveyor or recognized organization responsible for issuing the Certificate, who should cause investigations to be initiated to determine whether a survey, as required by 1.6.2.1.5, is necessary. If the ship is in a port of another Contracting Government, the master or owner should also report immediately to the appropriate authorities of the port State and the nominated surveyor or recognized organization should ascertain that such a report has been made.

1.6.4 Issue or endorsement of Certificate of Fitness

1.6.4.1 A certificate called a Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk, should be issued after an initial or renewal survey to a chemical tanker engaged in international voyages which complies with the relevant provisions of the Code.

1.6.4.2 The Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk should be drawn up in the form corresponding to the model given in the appendix. If the language is neither English nor French, the text should include the translation into one of these languages.

1.6.4.3 The Certificate issued under provisions of this section should be available on board for examination at all times.

1.6.4.4 Notwithstanding any other provisions of the amendments to this Code adopted by the Marine Environment Protection Committee (MEPC) by

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resolution MEPC.41(29) and the Maritime Safety Committee (MSC) by resolution MSC.7(58), any Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk, which is current when these amendments enter into force, should remain valid until it expires under the terms of this Code prior to the amendments entering into force.

1.6.5 Issue or endorsement of Certificate of Fitness by another Government

1.6.5.1 A Party to MARPOL 73/78 may, at the request of another Party, cause a ship entitled to fly the flag of the other State to be surveyed and, if satisfied that the provisions of the Code are complied with, issue or authorize the issue of the Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk to the ship, and, where appropriate, endorse or authorize the endorsement of the Certificate on board the ship in accordance with the Code. Any Certificate so issued should contain a statement to the effect that it has been issued at the request of the Government of the State whose flag the ship is entitled to fly.

1.6.6 Duration and validity of Certificate of Fitness

1.6.6.1 A Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk should be issued for a period specified by the Administration which should not exceed five years.

1.6.6.2.1 Notwithstanding the provisions of 1.6.6.1, when the renewal survey is completed within three months before the expiry date of the existing Certificate, the new Certificate should be valid from the date of completion of the renewal survey to a date not exceeding five years from the date of expiry of the existing Certificate.

1.6.6.2.2 When the renewal survey is completed after the expiry date of the existing Certificate, the new Certificate should be valid from the date of completion of the renewal survey to a date not exceeding five years from the date of expiry of the existing Certificate.

1.6.6.2.3 When the renewal survey is completed more than three months before the expiry date of the existing Certificate, the new Certificate should be valid from the date of completion of the renewal survey to a date not exceeding five years from the date of completion of the renewal survey.

1.6.6.3 If a Certificate is issued for a period of less than five years, the Administration may extend the validity of the Certificate beyond the expiry date to the maximum period specified in 1.6.6.1, provided that the surveys referred to in 1.6.2.1.3 and 1.6.2.1.4 applicable when a Certificate is issued for a period of five years are carried out as appropriate.

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1.6.6.4 If a renewal survey has been completed and a new Certificate cannot be issued or placed on board the ship before the expiry date of the existing Certificate, the person or organization authorized by the Administration may endorse the existing Certificate and such a Certificate should be accepted as valid for a further period which should not exceed five months from the expiry date.

1.6.6.5 If a ship at the time when a Certificate expires is not in a port in which it is to be surveyed, the Administration may extend the period of validity of the Certificate but this extension should be granted only for the purpose of allowing the ship to complete its voyage to the port in which it is to be surveyed, and then only in cases where it appears proper and reasonable to do so. No Certificate should be extended for a period longer than three months, and a ship to which an extension is granted should not, on its arrival in the port in which it is to be surveyed, be entitled by virtue of such extension to leave that port without having a new Certificate. When the renewal survey is completed, the new Certificate should be valid to a date not exceeding five years from the date of expiry of the existing Certificate before the extension was granted.

1.6.6.6 A Certificate issued to a ship engaged on short voyages which has not been extended under the foregoing provisions of this section may be extended by the Administration for a period of grace of up to one month from the date of expiry stated on it. When the renewal survey is completed, the new Certificate should be valid to a date not exceeding five years from the date of expiry of the existing Certificate before the extension was granted.

1.6.6.7 In special circumstances, as determined by the Administration, a new Certificate need not be dated from the date of expiry of the existing Certificate as required by 1.6.6.2.2, 1.6.6.5 or 1.6.6.6. In these special circumstances, the new Certificate should be valid to a date not exceeding five years from the date of completion of the renewal survey.

1.6.6.8 If an annual or intermediate survey is completed before the period specified in 1.6.2, then:

.1 the anniversary date shown on the Certificate should be amended by endorsement to a date which should not be more than three months later than the date on which the survey was completed;

.2 the subsequent annual or intermediate survey required by 1.6.2 should be completed at the intervals prescribed by that section using the new anniversary date;

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.3 the expiry date may remain unchanged provided one or more annual or intermediate surveys, as appropriate, are carried out so that the maximum intervals between the surveys prescribed by 1.6.2 are not exceeded.

1.6.6.9 A Certificate issued under 1.6.4 or 1.6.5 should cease to be valid in any of the following cases:

.1 if the relevant surveys are not completed within the periods specified under 1.6.2;

.2 if the Certificate is not endorsed in accordance with 1.6.2.1.3 or 1.6.2.1.4;

.3 upon transfer of the ship to the flag of another State. A new Certificate should only be issued when the Government issuing the new Certificate is fully satisfied that the ship is in compliance with the requirements of 1.6.3.1 and 1.6.3.2. In the case of a transfer between Parties, if requested within three months after the transfer has taken place, the Government of the Party whose flag the ship was formerly entitled to fly should, as soon as possible, transmit to the Administration copies of the Certificate carried by the ship before the transfer and, if available, copies of the relevant survey reports.

1.7 Effective date

1.7.1 The effective date of the Code is 12 April 1972 (six months after the Code was adopted by the IMO Assembly by resolution A.212(VII)).

1.7.2 The Code is applicable to vessels whose keel was laid or which were at a similar stage of construction or to vessels whose conversion was begun on or after the effective date. This conversion provision does not apply to the modification of a ship referred to in regulation 1(17) of Annex II of MARPOL 73/78.

1.7.3 The Code should also be applicable to existing ships carrying cargoes covered by the Code. Existing ships should comply with the provisions of the Code for the cargoes to be carried, except as follows:

(a) Tanks for cargoes required to be carried in type 1 ships should comply with 2.2.4(a)(iii); however, small departures from the distances specified in 2.2.2(a)(ii) and 2.2.2(b)(iii) may be accepted by the Administration.

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(b) Tanks for cargoes required to be carried in type 2 ships should be located outside the extent of minor side damage specified in 2.2.2(c), subject to such minor relaxation as may be acceptable by the Administration.

(c) Compliance with 2.2.4(b)(ii) and 2.2.4(c) would not be required.

(d) Compliance with the intent of 2.2.4(b)(iii) would be expected but relaxations from the required side and bottom distances may be allowed provided that cargo tanks on existing type 2 ships are located at least 760 mm above the bottom shell.

(e) When an existing chemical tanker is converted from a type 3 ship to a type 2 ship the full requirement of 2.2.4 should be met except that the ability to survive damage in the machinery space should be determined by the Administration.

(f) Full compliance with 2.7.1 would not be expected.

1.8 New products

Where it is proposed to carry in bulk dangerous liquid chemicals and noxious liquid substances of category X, Y or Z, any of which may be considered to come within the scope of the Code but are not at present designated in the summary of minimum requirements in chapter VI, the Administrations involved in such carriage should establish suitable conditions of carriage based on the principles of the Code and notify such conditions to the Organization. Criteria for assigning carriage requirements for products subject to the IBC Code should provide guidance. During the periodical review of the Code these submissions will be considered for inclusion.

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Chapter II
Cargo containment

A* — PHYSICAL PROTECTION (SITING OF CARGO TANKS; FLOATABILITY AND DAMAGE STABILITY)

2.1 General

The probability of damage resulting from collision, stranding or other circumstances to a ship carrying a dangerous chemical in bulk leading, sooner or later, to uncontrolled release of the cargo cannot be discounted. Therefore, the siting of the cargo tanks in relation to the ship's side and bottom (which would afford a degree of protection from external damage to the cargo containment) and the extent to which the ship should be capable of remaining afloat subsequent to such damage should be related to the extent to which escape of that cargo, taking into account the nature and severity of its hazard to the environment, could be tolerated.

2.1.1 Three degrees of physical protection are employed. The highest standard of such protection – type 1 – is required for the substances considered to have the greatest environmental hazard, with reduced standards – types 2 and 3 – for substances of progressively lesser hazard.

2.1.2 The required degrees of physical protection for the transport of individual substances are shown in *column* e of the summary of minimum requirements in chapter VI.

2.1.3 Where it is intended to transport more than one substance, the requirements for ship survival of damage should correspond to the most dangerous substance, but the cargo containment need only conform to the specified minimum requirements for the chemicals taken individually.

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* The provisions of chapter 2 of the IBC Code, if satisfied in their entirety, may be applied as an alternative to part A.

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2.2 Ship types

2.2.1 General: Ships subject to this Code may be assigned the minimum freeboard permitted by the International Convention on Load Lines, 1966. The additional requirements in 2.2.4, taking into account any empty or partially filled tank as well as the specific gravities of cargoes to be carried, however, should govern the allowed operating draught for any actual condition of loading. To this end, all ships engaged in the transport of chemicals in bulk should be supplied with loading and stability manuals for the information and guidance of the master. These manuals should contain details concerning the loaded conditions of full and empty or partially empty tanks, the position of these tanks in the ship, the specific gravities of the various parcels of cargoes carried, and any ballast arrangements in critical conditions of loading. Provisions for evaluating other conditions of loading should be contained in the manuals.

2.2.2 Damage assumption: In establishing criteria in regard to siting of cargo tanks and ship stability, it is necessary to define the assumed damages and to state the conditions of survival and of cargo containment. The following main assumed damage conditions will apply. In those cases where the machinery space is to be treated as a floodable compartment, a permeability of 0.85 is to be assumed therein. The permeability of other spaces subject to flooding should be so determined as to reflect the limitations of cargo, fuel or ballast loaded. Such limitations should be included in the information to be supplied to the master.

(a) *Collision damage*

(i) Longitudinal extent: $\frac{L^{2/3}}{3}$ or 14.5 m, whichever is less

(ii) Transverse extent (inboard from the ship's side at right angles to the centre-line at the level of the load line): $\frac{B}{5}$ or 11.5 m, whichever is less

(iii) Vertical extent: from the baseline upwards without limit

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(b) *Stranding*

		For 0.3*L* from the forward perpendicular of ship	Any other part of ship
(i)	Longitudinal extent:	$\frac{L}{10}$	$\frac{L}{10}$ or 5 m, whichever is less
(ii)	Transverse extent:	$\frac{B}{6}$ or 10.0 m, whichever is less	5 m
(iii)	Vertical extent from the baseline:	$\frac{B}{15}$ or 6 m, whichever is less	

where: *L* and *B*, in metres, for any part of the ship and perpendicular are as defined in regulation 3 of the International Convention on Load Lines, 1966

(c) *Minor side damage*
Damage from tugs, piers, etc., should be taken as:

Transverse extent (inboard from the ship's side at right angles to the centre-line at the level of the deepest load line):	760 mm

2.2.3 Survival assumption: The ship is considered to survive the conditions of damage specified for each ship type (see 2.2.4) if she remains afloat in a condition of stable equilibrium and satisfying the following stability criteria:

(a) The stability in the final condition of flooding may be regarded as sufficient if the righting lever curve has a minimum range of 20° beyond the position of equilibrium in association with a residual righting lever of at least 100 mm. The unflooded volume of the poop superstructure around the machinery-space casing, provided the machinery casing is watertight at this level, may be taken into consideration, in which case the damage waterline should not be above the after end of the top of the poop superstructure deck at the centreline.

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(b) The angle of heel in the final condition of flooding should not exceed 15°, except that, if no part of the deck is immersed, an angle of heel up to 17° may be accepted. For ships less than 150 m in length, the Administration may accept an angle of heel not exceeding 25° provided it is positively shown that a lesser limit is not reasonably obtainable, and that all other provisions stated in 2.2.3(a) are complied with.

2.2.4 Ship type requirements

(a) *Type 1 ship*

(i) *General*
A type 1 ship is designed to transport products which require maximum preventive measures to preclude escape of such cargo.

(ii) *Ship capability*
The ship should be capable of sustaining anywhere in her length collision damage (2.2.2(a)) or stranding damage (2.2.2(b)) and surviving as specified in 2.2.3.

(iii) *Cargo tank location*
Tanks intended for the carriage of cargoes which are required to be transported in a type 1 ship should be located outside the extent of the damage specified in 2.2.2(a)(ii) and 2.2.2(b)(iii) and should nowhere be closer to the ship's shell than 760 mm.

This requirement does not apply to tanks for diluted slops arising from the tank washing.

(b) *Type 2 ship*

(i) *General*
A type 2 ship is designed to transport products which require significant preventive measures to preclude the escape of such cargo.

(ii) *Ship capability*

(1) A ship of 150 m in length or less should be capable of sustaining collision damage (2.2.2(a)) or stranding damage (2.2.2(b)) anywhere in her length except involving either of the bulkheads bounding a machinery space located aft and surviving as specified in 2.2.3.

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(2) A ship of more than 150 m in length should be capable of sustaining collision damage (2.2.2(a)) or stranding damage (2.2.2(b)) anywhere in her length and surviving as specified in 2.2.3.

(iii) *Cargo tank location*

Tanks containing cargoes which are required to be transported in a type 2 ship should be located outside the extent of damage specified in 2.2.2(b)(iii) and 2.2.2(c) and should nowhere be closer to the ship's shell than 760 mm (30 inches). This requirement does not apply to the tanks for diluted slops arising from the tank washing.

(c) *Type 3 ship*

(i) *General*

A type 3 ship is designed to carry products of sufficient hazard to require a moderate degree of containment to increase survival capability in a damaged condition.

(ii) *Ship capability*

(1) A type 3 ship of 125 m in length and over should be capable of sustaining collision damage (2.2.2(a)) or stranding damage (2.2.2(b)) anywhere in her length except involving either of the bulkheads bounding a machinery space located aft and surviving as specified in 2.2.3.

(2) A type 3 ship below 125 m in length should be capable of sustaining collision damage (2.2.2(a)) or stranding damage (2.2.2(b)) anywhere in her length and surviving as specified in 2.2.3 with the exception of damage to the machinery space. In addition to the foregoing, the ability to survive flooding of the machinery space should be determined by the Administration.

(iii) *Cargo tank location*

No special requirements.

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2.2.5 Special considerations for small ships: In the case of small ships intended for the carriage of cargoes requiring type 1 or type 2 containment which do not comply in all respects with the requirements in 2.2.4(a)(ii) and 2.2.4(b)(ii) above, special dispensations may only be considered by the Administration where alternative measures can be taken which maintain the same degree of safety. In the approval of the design of a ship for which a dispensation has been granted, the nature of the alternative measures prescribed should be clearly stated and be available to the Administration in the countries the ship will visit and any such dispensation should be duly noted on the certificate (1.6).

B — TANK TYPES

2.3 Installation

2.3.1 Integral tank: A cargo-containment envelope which forms part of the ship's hull and may be stressed in the same manner and by the same loads which stress the contiguous hull structure. An integral tank is essential to the structural completeness of the ship's hull.

2.3.2 Independent tank: A cargo-containment envelope which is not a contiguous 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 completeness of its ship's hull.

2.4 Design and construction

Gravity tank: Tanks having a design pressure not greater than 0.7 kp/cm^2 at the top of the tank. Gravity tanks may be independent or integral. Gravity tanks should be constructed and tested according to the standards of the Administration.

2.5 Requirements for individual substances

Tank type requirements (covering both installation and design) for individual substances are shown in *column f* of the summary of minimum requirements in chapter VI.

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C — SHIP ARRANGEMENTS

2.6 Cargo segregation

2.6.1 A cargo subject to the provisions of the Code should be segregated from machinery and boiler spaces, accommodation and service spaces and drinking water and stores for human consumption by means of a cofferdam, void space, cargo pump-room, pump-room, empty tank, fuel tank or other similar space, except where otherwise excluded by the Code.

2.6.2 Cargoes, residues of cargoes or mixtures containing cargoes which react in a hazardous manner with other cargoes, residues or mixtures, should:

(a) be segregated from such other cargoes by means of a cofferdam, void space, cargo pump-room, pump-room, empty tank, or a mutually compatible cargo;

(b) have separate pumping and piping systems which should not pass through other cargo tanks containing such cargoes, unless encased in a tunnel; and

(c) have separate tank vent systems.

2.6.3 Cargo piping should not pass through any accommodation or machinery space, other than cargo pump-rooms or pump-rooms.

2.6.4 A cargo subject to the provisions of the Code should not be stowed either in the fore or aft peak tanks.

2.7 Accommodation spaces

2.7.1 No accommodation spaces should be located over cargo tanks or pump-rooms and no cargo tanks should be aft of the forward end of accommodation.*

2.7.2 In order to guard against the danger of hazardous vapours, due consideration should be given to the location of air intakes and openings into accommodation and machinery spaces in relation to cargo piping and tank vent systems.

* See the Recommendation on uniform interpretation of the application of 2.7.1 and 2.7.3 of the Bulk Chemical Code to existing chemical tankers (p.95).

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2.7.3 Doors and air ports in the accommodation should be located on the house sides at least $L/25$* and not less than 3 m aft of the forward end of the house and the cargo-tank area. This distance, however, need not exceed 5 m. Port lights located on the forward bulkhead or along the house sides within the limits specified above should be of the fixed type. Wheelhouse windows and wheelhouse doors may be located within the above limits; however, they are to be so designed that a rapid and efficient gas- and vapour-tightening of the wheelhouse can be ensured. Bolted plates for the removal of machinery may be fitted within the limits specified above.

2.8 Cargo pump-rooms

2.8.1 Cargo pump-rooms should be so arranged as to ensure unrestricted passage at all times from any ladder platform and from the floor.

2.8.2 Permanent arrangements should be fitted for hoisting an unconscious person with a rescue line whilst avoiding any projecting obstacles.

2.8.3 Cargo pump-rooms should be so arranged as to ensure unrestricted access to all valves necessary for cargo handling for a person wearing the required personnel protective equipment.

2.8.4 Guard railings should be installed on all ladders and platforms.

2.8.5 Normal access ladders should not be fitted vertically, and should incorporate platforms at suitable intervals.

2.8.6 Arrangements should be installed to deal with drainage and any possible leakage from cargo pumps and valves in cargo pump-rooms. The bilge system serving the cargo pump-room should be operable from outside the cargo pump-room. One or more slop tanks for storage of contaminated bilge water or tank washings should be provided. A shore connection with a standard coupling or other facilities should be provided for transferring contaminated water to onshore slop tanks.

2.8.7 Pump discharge pressure gauges should be provided outside the cargo pump-room.

2.8.8 For cargo pump requirements for certain products see *column m*† of the summary of minimum requirements in chapter VI.

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* L = length of the ship.

† See second paragraph of chapter VI on page 78.

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2.9 Access to void spaces, cargo tanks and other spaces in the cargo-tank area

2.9.1 Arrangements for void spaces, cargo tanks and other spaces in the cargo-tank area should be such as to ensure adequate access for complete inspection.

2.9.2 Access to the cargo tanks should be direct from the open deck.

2.9.3 For access through horizontal openings, hatches or manholes the dimensions should be sufficient to allow a person wearing a breathing apparatus to ascend or descend any ladder without obstruction and also to provide a clear opening to facilitate the hoisting of an injured person from the bottom of the space. The minimum clear opening should be not less than 600 mm × 600 mm.

2.9.4 For access through vertical openings, or manhole providing passage through the length and breadth of the space, the minimum clear opening should be not less than 600 mm × 800 mm at a height of not more than 600 mm from the bottom shell plating unless gratings or other footholds are provided.

2.9.5 Smaller dimensions may be approved by the Administration in special circumstances.

D — CARGO TRANSFER

2.10 Piping arrangements*

Cargo piping systems should be designed, arranged and fabricated in accordance with the standards of the Administration, taking into account the following provisions.

2.10.1 All piping systems components should have a pressure rating not less than the maximum pressure to which the system may be subjected. Piping which is not protected against overpressure by a pressure-relief valve, or which can be isolated from its relief valve, should be designed to withstand the greatest pressure the piping would experience in service, taking into consideration:

(a) cargo vapour pressure at 45°C;

* Where bow or stern loading and unloading arrangements are allowed by the Administration the provisions of section 3.7 of the IBC Code may be used for guidance.

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(b) pressure rating of the cargo tank;

(c) maximum discharge pressure of the associated pump and its relief-valve setting; and

(d) maximum hydrostatic pressure that could be generated in the piping during normal operations.

2.10.2 Piping connections to tanks should be protected against mechanical damage and tampering. Other than for approved connections to shutoff valves and expansion joints, cargo piping should be joined by welding.

2.10.3 Cargo piping should not be installed under deck between the outboard side of the cargo-containment spaces and the skin of the ship unless clearances required for damage protection (see 2.1 and 2.2) 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.

2.10.4 Runs of cargo piping located below the main deck may run from the tank they serve and penetrate tank bulkheads or boundaries common to adjacent (longitudinally or transversally) cargo tanks, ballast tanks, empty tanks, cargo pump-rooms or pump-rooms, provided that inside the tank they serve they are 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.

The Administration may, however, accept a totally enclosed hydraulically operated valve located outside the cargo tank, provided that the valve is:

(a) designed to preclude the risk of leakage;

(b) fitted on the bulkhead of the cargo tank which it serves;

(c) suitably protected against mechanical damage;

(d) fitted at a distance from the shell, as required for damage protection; and

(e) operable from the weather deck.

2.10.5 In any cargo pump-room where a pump serves more than one tank, a stop valve should be fitted in the line to each tank.

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