Focus on IMO

International Maritime Organization, 4 Albert Embankment, London SE1 7SR, United Kingdom
Tel: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210
E-mail: rkohn@imo.org or nbrown@imo.org Web site: www.imo.org

May 1996

IMO and dangerous goods at sea

The transport by sea of dangerous and harmful goods, including marine pollutants and wastes

It is estimated that more than 50% of packaged goods and bulk cargoes transported by sea today can be regarded as dangerous, hazardous or harmful to the environment according to IMO criteria. The cargoes concerned include products which are transported in bulk - such as solid or liquid chemicals and other materials, gases and products for and of the oil refinery industry, and wastes.

Some of these substances, materials and articles are dangerous or hazardous from a safety point of view, and are also harmful to the marine environment; others are only hazardous when carried in bulk and some may be considered as harmful to the marine environment. Between 10% to 15% of the cargoes transported in packaged form, including shipborne barges on barge-carrying ships, freight containers, bulk packagings, portable tanks, tank-containers, road-tankers, swap-bodies, vehicles, trailers, intermediate bulk containers (IBCs), unit loads and other cargo transport units, fall under these criteria.

As the world becomes increasingly industrialized and as industry itself becomes ever more complex, so the transport by sea of these cargoes will continue to rise and the lists of products will grow. It is essential, if shipping is to maintain and improve its safety record, that these cargoes are handled, transported and stored with the greatest possible care.

Background

Over the last four decades, the International Maritime Organization (IMO) has become recognized as the maritime community's forum for all matters affecting the safety of shipping. The transport of dangerous cargoes has been one of IMO's responsibilities since it came into being and the regulations and recommendations it has developed are observed by 153 Member States whose combined merchant fleets represent more than 98% of the world's gross tonnage.

More than one hundred years ago so few dangerous cargoes were transported by sea that no special regulations were considered necessary. It was not until 1894 that the first reference to dangerous goods was made in maritime law, when the British Merchant Shipping Act stated, under the heading "Dangerous Goods and Carriage of Cattle" that an emigrant ship shall not proceed to sea if she carried "an explosive or any vitriol, lucifer matches, guano or green hides or any article which, by reason of the nature, quantity and mode of stowage is likely to endanger the health or lives of the passengers or the safety of the ship". In this context, the safety of the ship might also be interpreted to include other cargoes on board, probably together in the same space (compartment or hold).

On 15 April 1912, the *Titanic*, on her maiden voyage to the United States, after a collision with an iceberg, sank in the North Atlantic and more than 1500 lives were lost. Governments agreed that a conference should be convened in 1914 to consider safety of life at sea matters.

In the first Convention for the Safety of Life at Sea (SOLAS 1914), "the carriage of goods which by reason of their nature, quantity and mode of stowage" were likely to endanger the lives of the passengers or the safety of the ship, was in principle forbidden. However, the decisions as to which goods were "dangerous" was left to the Contracting Governments, who were also requested to advise on the precautions which should be taken in the packing and mode of transport, e.g. stowage and segregation of such goods. The latter seems to imply that, if these precautions were followed, the transport of these goods was permitted and could be regarded as being safe.

Although SOLAS 1914 never entered into force, the principle of relying on national Administrations and competent authorities to decide on the definition and treatment of dangerous goods was established and, unfortunately, resulted in the development of many diversified regulations and practices which are still in force in some countries; they are, in particular, embedded in national, regional or individual out-of-date port regulations.

The same attitude was maintained in the SOLAS Conference of 1929, in article 24 of which "Dangerous Goods" are mentioned together with "Life-Saving Appliances". It was still forbidden to carry goods which by their nature, quantity and mode of stowage were liable to endanger the lives of the passengers or the safety of the ship. It was still left to each Administration to determine which goods were to be considered dangerous and to indicate the precautions which had to be taken in their packing and mode of stowage.

Thus, up to the time of the 1948 SOLAS Conference it was, in principle, forbidden to carry dangerous goods in ships.

In 1914 and even in 1929, the types and amounts of dangerous cargoes transported by sea were comparatively small. But by 1948, when the third SOLAS Conference was held, the traffic had grown considerably and more and more cargoes were being transported which could be considered dangerous.

This expansion led to a radical rethinking and, as a result, a new chapter VI was added to the 1948 SOLAS Convention, dealing specifically with the "Carriage of Grain and Dangerous Goods".

However, the Conference recognized that the provisions of the 1948 SOLAS Convention were inadequate. It therefore adopted recommendation 22 to stress the importance of international uniformity in the safety precautions applied to the transport of dangerous cargoes by sea and noted that certain countries with an extensive export trade in chemicals had already adopted detailed regulations.

In addition to stressing the need for international uniformity in safety precautions, the Conference also established that:

(1) goods should be considered dangerous on the basis of their properties and characteristics; and

(2) a labelling system should be developed using distinctive symbols indicating the kind of danger for each class of substances, materials or articles.

Recommendation 22 additionally urged that further study be undertaken with a view to developing uniform international regulations on the subject. However, despite these efforts, there was no common basis for the different modes of transport to work together to develop rules and regulations on dangerous goods.

This situation changed in 1956 when the United Nations Committee of Experts on the Transport of Dangerous Goods, established by UN's Economic and Social Council (ECOSOC), completed a report which established the minimum requirements applicable for the transport of dangerous goods by all modes. This report, the United Nations *Recommendations on the Transport of Dangerous Goods* (Orange Book), offered the general framework within which existing regulations could be adapted and developed, the ultimate aim being world-wide uniformity across all modes of transport. It was considered by ECOSOC in April 1957. The United Nations Recommendations have been amended and updated by succeeding sessions of the Committee of Experts and published in accordance with subsequent resolutions of the ECOSOC.

However, despite the publication of the United Nations Recommendations, as far as maritime transport was concerned, little was done in response to recommendation 22. This was largely because the Convention establishing IMO (then IMCO), adopted in 1948 at the United Nations Maritime Conference, did not enter into force until 1958 and the IMO Assembly did not meet for the first time until the following year. One of its first actions was to arrange for a new conference to be held, the main purpose of which was to revise the 1948 SOLAS Convention.

This conference took place in 1960. Chapter VII of the revised 1960 SOLAS Convention, which entered into force on 26 May 1965, dealt exclusively with the carriage of dangerous goods. With a few exceptions, SOLAS 1960 applied to all ships of 500 tons gross tonnage, or more, engaged on international voyages. Another conference, held in 1974, further revised the Convention and the 1974 SOLAS version entered into force on 25 May 1980. It has subsequently been substantially modified and amended.

Amendments to SOLAS 1974 concerning the carriage of dangerous goods, were adopted by IMO in 1981, 1983 and 1989. Revised chapter VII of the 1974 SOLAS Convention, as amended in 1994, applies now to all ships to which the SOLAS regulations generally apply and, in addition, to cargo ships of less than 500 tons gross tonnage.

The revised Chapter VII, as amended in 1994, now applies to all ships covered by SOLAS and also to cargo ships of less than 500 tons gross tonnage. The 1974 SOLAS Convention has been ratified by 128 countries and applies to some 98% of the world merchant gross tonnage.

Regulation 1 of part A of chapter VII prohibits the carriage of dangerous goods by sea except when they are carried in accordance with the provisions of the SOLAS Convention, and requires each Contracting Government to issue, or cause to be issued, detailed instructions on safe packing and stowage of dangerous goods which shall include the precautions necessary in relation to other cargo. In a footnote, reference is made to the more detailed provisions of the International Maritime Dangerous Goods (IMDG) Code.

Regulation 2 divides dangerous goods into nine classes which are described later in this paper. In the IMDG Code, classes 2, 3, 4, 5 and 6 are further divided into two or three sub-classes.

The other six regulations of part A (including new regulation 7-1) deal with the packing, identification, marking, labelling and placarding of dangerous goods, the documents which are to be provided, stowage and segregation requirements, the carriage of explosives on board passenger ships, and reporting of incidents involving dangerous goods.

Chapter VII contains mandatory requirements and thereby provides the necessary legal basis for international and national regulations for the transport of dangerous cargoes by sea.

The development of the IMDG Code

Resolution 56, adopted at the 1960 SOLAS Conference, recommended that Governments should adopt a uniform international code for the carriage of dangerous goods by sea which should supplement the SOLAS regulations and cover such matters as packing, container traffic and stowage, with particular reference to the segregation of incompatible substances. It further recommended that IMO, in co-operation with the United Nations Committee of Experts on the Transport of Dangerous Goods, should pursue its studies on such an international code, especially in respect of classification, description, labelling, a list of dangerous goods and shipping documents.

To carry out this mandate, in January 1961, IMO's Maritime Safety Committee (MSC) established a Working Group on the Carriage of Dangerous Goods (CDG). Governments with considerable experience in the carriage of dangerous goods were invited to nominate experts.

The Group met for the first time from 29 to 31 May 1961 and set about preparing the "unified international maritime code" as envisaged by the 1960 SOLAS Conference.

Preliminary drafts for each class were compiled by individual national delegations and then considered by the Group which took into account the practices and procedures of numerous maritime countries in order to make such a code as widely acceptable as possible. Close co-operation was established with the United Nations Committee of Experts on the Transport of Dangerous Goods, which had prepared its 1956 report in which it established the minimum requirements for the transport of dangerous goods by all modes of transport. The CDG Working Group met 10 times, the final meeting being held in November 1965, after which it became the Sub-Committee on the Carriage of Dangerous Goods, meeting 45 times. In May 1995 the sub-committee was combined with the Sub-Committee on Containers and Cargoes (BC), to become the Sub-Committee on Dangerous Goods, Solid Cargoes and Containers (DSC).

By November 1965, good progress had been made in preparing such a code and the resulting document became known as the International Maritime Dangerous Goods (IMDG) Code . It was adopted by the fourth IMO Assembly in 1965. Although designed primarily for mariners, the provisions of the IMDG Code affect a number of industries as well as storage, handling and transport services from manufacturers to consumers. Chemical and packaging manufacturers, packers, shippers, forwarders, carriers and terminal operators are guided by its provisions on classification, terminology, identification, packing and packagings, marking, labelling and placarding, documentation and marine pollution aspects. Feeder services, such as road, rail, harbour and inland water craft are guided by its provisions. Port authorities, terminal and warehousing companies consult the IMDG Code to segregate and separate dangerous cargoes in loading, discharge and storage areas. Although the Code only applies to ships covered by the SOLAS Convention, IMO considers it highly desirable that its provisions should be observed by all ships.

Since its introduction in 1965, the IMDG Code has undergone many changes, both in appearance and content to keep pace with the ever-changing needs of industry. Amendments which do not affect the principles upon which the Code is based may be adopted by the Maritime Safety Committee alone. Thus IMO can respond to transport developments in reasonable time.

Amendments to the IMDG Code originate from two sources; proposals submitted directly to IMO by Member Governemnts and amendments required to take account of changes to the United Nations Recommendations on the Transport of Dangerous Goods which sets the basic requirements for all the transport modes. Amendments to the provisions of the United Nations Recommendations are made by the Committee of Experts on a two-yearly cycle and approximately two years after their adoption, they are adopted by the authorities responsible for regulating the various transport modes. In that way a basic set of requirements applicable to all modes of transport is established and implemented, thus ensuring that difficulties are not encountered at inter-modal interfaces.

As a result of Assembly resolution A.717(17) adopted by IMO on 6 November 1991, amendments to the United Nations recommendations are incorporated into the IMDG Code to ensure that it remains harmonized with the requirements of the other transport modes.

The new DSC Sub-Committee meets, in principle, once a year and one of its main objectives is to keep the IMDG Code up to date. After a set of amendments has been agreed by the DSC Sub-Committee they are submitted to the MSC for adoption. It normally takes approximately up to a year to prepare them for publication. For reasons of uniformity, the Committee has agreed that the amendments to the IMDG Code should be implemented not earlier than six months after their publication in English, the exact date being established by the Committee.

The latest 1995 consolidated edition of the IMDG Code, incorporating Amendment 27-94, is published in four loose-leaf volumes so that amendments can be easily inserted. The Code is also published by the Organization in French and Spanish and has been translated into many other languages by national Governments.

The Maritime Safety Committee unanimously agreed that Amendment 27-94 to the IMDG Code, its Annex I (Packing Recommendations), the Emergency Procedures for Ships Carrying Dangerous Goods (EmS) and the Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG) should be implemented not later than 1 July 1995, on the understanding that Governments had the prerogative to implement an amendment in whole or in part at any earlier date following circulation of the adopted amendments by the Organization and that the Organization would be notified of any such early implementation. The Committee also agreed that this date would apply to both the safety-related and the marine pollution prevention provisions (MSC/Circ.659).

With regard to future amendments, the Committee agreed that:

(1) complete revisions of the Code resulting in new editions should normally be made at intervals of not less than ten years;

(2) substantial amendments to the provisions of the Code should normally be adopted at intervals of not less than four years;

(3) urgent substantial amendments and amendments to cover new, reclassified or regrouped substances and any necessary consequential amendments in the Annexes and Supplements to the Code should be made at intervals of not less than two years; and

(4) departures from these intervals could be considered on the basis of well justified proposals arising from new developments, experience or accidents (MSC/Circ.502 of 13 April 1989).

IMO Member Governments are periodically requested to provide information on the current status of implementation of the IMDG Code, its Annexes and Supplements, and information on the names, addresses, telephone, telex and telefax numbers of the offices of competent authorities and other appointed bodies within their Administration which deal with questions related to the carriage of dangerous cargoes (refer to MSC.2/Circ.34) or revisions thereof, and any additions thereto, and section 22 (and the appendix thereto) of the General Introduction to the Code.

So far some 51 Administrations, whose combined merchant fleets total 80% of the world's gross tonnage, have informed IMO that they are applying the IMDG Code (see Annex 1). The legal system of each country determines in detail whether the IMDG Code becomes mandatory or is applied as a recommendation. Application of the Code as a recommendation does not detract in any way from the obligations imposed by the 1974 SOLAS Convention, as amended, but merely provides a greater flexibility in the method of observance.

The contents of the IMDG Code

The IMDG Code is published in five volumes. Volume I contains a general introduction to the Code while volumes II, II and IV contain detailed technical information on specific dangerous goods which are divided up into nine different classes. Volume V is a Supplement to the Code.

Structure of the classes

Each class is preceded by an introduction which describes the properties, characteristics and definitions of the goods and gives detailed advice on handling and transport, e.g. stowage and segregation, that is the degree to which such goods should be kept separated from other dangerous cargoes, or other goods, transported in a ship, including separation from special spaces or areas in a ship. The class introductions also give information concerning procedures which should be followed during loading and unloading.

Marking/labelling/placarding

Each substance, material or article which is listed in the IMDG Code is referred to by a proper shipping name (correct technical name) together with a four-digit UN Number assigned to the goods by the United Nations Committee of Experts on the Transport of Dangerous Goods. Each package containing dangerous goods should be durably marked with the proper shipping name of the contents, and, when assigned, the corresponding UN Number preceded by the letters "UN".

Each class or category of goods is identified by a distinctive mark, label, placard or sign. Where appropriate, each individual schedule (page) in the Code refers to the required label and, if applicable, the marine pollutant mark and elevated temperature or fumigation warning sign. Some consignments of dangerous goods should have the UN Number of the goods displayed.

All placards, orange panels and other marks and/or signs should be removed from cargo transport units or masked as soon as both the goods or their residues which led to the application of those placards, orange panels and marks or signs, are discharged.

Each dangerous substance or category of substancs is listed on a schedule.The schedules of the IMDG Code follow a similar pattern. The proper shipping name of the substance, material or article, and any known and commonly used alternative names (synonyms) appear at the top left of the schedule. To the right of this, other relevant information or observations are given, such as the United Nations identification number (UN Number), its chemical formula, explosive limits, flashpoint and so on.

The other headings used in the individual schedules include properties or descriptions (such as state and appearance), special observations, packing, stowage, segregation and the marine pollution aspects. The schedule also indicates the label or labels/placards and, if applicable, the MARINE POLLUTANT and other signs required on the package or cargo transport unit. This is basically one of the labels shown in Annex 4, but a label or placard may also contain additional information. Those used for explosives, for example, also give the substance's division number and compatibility group. Class 3 labels or placards sometimes contain a reference to the flashpoint or flashpoint group. For class 7 labels or placards additional information on the contents, activity and transport index is required.

VOLUME I

The General Introduction describes the basic principles which apply to all classes of dangerous goods are established. The mandatory requirements of Part A of chapter VII of the 1974 SOLAS Convention, Annex III of MARPOL 73/78, both as amended, and resolution 56 of the 1960 SOLAS Conference are reproduced in sections 2 and 3.

The General Introduction goes on to describe such matters as classification, marking, identification and consignment procedures, labelling and placarding, documentation and packing of dangerous goods shipments.

The principle of dividing dangerous goods, other than those covered by classes 1, 2, 6.2 and 7, into three packaging groups according to the degree of danger they present is reflected in the classification of the goods and in their allocation to appropriate packagings. The three groups are:

Packaging group I: goods presenting great danger;

Packaging group II: goods presenting medium danger; and

Packaging group III: goods presenting minor danger,

The General Introduction includes sections containing special provisions for freight containers, portable tanks and road tank vehicles, stowage and segregation, fire prevention and fire fighting. The final sections deal with

the carriage of dangerous goods on roll-on roll-off ships, in limited quantities, in shipborne barges on barge-carrying ships, the chemical stability of dangerous substances and provisions for transport under controlled temperatures, competent authority approvals and a list of national competent authorities, marine pollution aspects of dangerous and harmful substances in packaged forms, transport in bulk in the cargo spaces of the ship or in bulk packagings, and intermediate bulk containers (IBCs). A section 27 on the transport of wastes was included with Amendment 26-91.

Volume I also contains the Alphabetical General Index of dangerous substances, materials and articles, and harmful substances (marine pollutants). This index is followed by the Numerical Index (the table of UN numbers with corresponding IMDG Code-Page numbers, EmS numbers and MFAG table numbers) and a list of definitions, including a list of common abbreviations.

Annex I to the IMDG Code follows the General Introduction in Volume I and contains recommendations on the packing of dangerous goods and the construction and testing of packagings. The text closely follows the United Nations *Recommendations on the Transport of Dangerous Goods* in respect of the packing of dangerous goods. Annex I was adopted by the Maritime Safety Committee in 1984.

The recommendations take into account the mandatory requirements on packing set forth in regulation 3 of chapter VII of SOLAS and regulation 2 of Annex III of MARPOL 73/78. These regulations require packages containing dangerous or harmful goods to be capable of withstanding the ordinary risks of handling and carriage by sea and lay down other specifications.

The principle of dividing dangerous goods, other than those covered by classes 1, 2, 6.2 and 7, into three packaging groups according to the degree of danger they present is reflected in the recommendations of Annex I and has an impact on the detailed provisions for the construction and performance testing of types of standard receptacles, packagings, and packages ready for shipment.

The recommendations of Annex I are intended for manufacturers of dangerous goods and of packagings for these goods, the shippers and carriers as well as competent authorities, and are to be used in conjunction with the IMDG Code.

All substances, materials and articles which appear in the IMDG Code are listed in the alphabetical order of their proper shipping name (correct technical name) in the General Index of the IMDG Code which also gives the product's UN (United Nations) Number, its Emergency Schedule Number (EmS No.), Medical First Aid Guide Table number (MFAG Table No.), the IMDG Code-Page number of the individual schedule, class, packaging group and subsidiary risk label(s).

Some dangerous goods are not listed by name in the Code and, therefore, will have to be shipped under a generic name/entry or a "Not Otherwise Specified (N.O.S.)" entry. These entries have also been included in the General Index. For some goods, abbreviated names, common names and synonyms are also listed as an aid to finding the correct proper shipping name.

Non-classified materials:
A list of "Materials Hazardous only in Bulk (MHB)" is included in the BC Code, Appendix B and also in section 24 of the General Introduction to the IMDG Code.

VOLUME II

This volume contains three classes, each of which contains several divisions.

Class 1 - Explosives

These are among the most dangerous of all goods carried by sea and the precautions outlined in this class of the Code are particularly stringent. The class is divided into five divisions which present different hazards, as follows:

Division 1.1	Substances and articles which have a mass explosion hazard [1]
Division 1.2	Substances and articles which have a projection hazard but not a mass explosion hazard.
Division 1.3	Substances and articles which have a fire hazard and either a minor blast hazard or minor projection hazard or both, but not a mass explosion hazard

[1] A mass explosion is one which affects almost the entire load virtually instantaneously.

Division 1.4[2] Substances and articles which present no significant hazard. This division comprises substances which present only a small hazard in the event of ignition during transport. The effects are largely confined to the package and no projection of fragments of appreciable size or range is to be expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package.

Division 1.5 Very insensitive substances which have a mass explosion hazard

This division comprises substances which have a mass explosion hazard but are so insensitive that there is very little probability of initiation or of transition from burning to detonation under normal conditions of transport.

NOTE: The probability of transition from burning to detonation is greater when large quantities are carried in a ship. As a consequence, the stowage requirements for explosive substances in division 1.1 and for those in division 1.5 are identical.

Division 1.6 Extremely insensitive articles which do not have a mass explosion hazard.

This division comprises articles which contain only extremely insensitive detonating substances and which demonstrate a negligible probability of accidental initiation or propagation.

NOTE: The risk from articles of division 1.6 is limited to the explosion of a single article.

Class 1 is unique in that the type of packaging and method of packing used frequently has a decisive effect on the hazard and, therefore, on the assignment of an explosive to a particular division and compatibility group.

For goods in this class for under deck stowage particular stowage arrangements have been agreed, such as ordinary stowage which covers goods which present relatively little hazard. Magazine stowage involves most goods in class 1 and is itself divided into three types (A to C). Special stowage is for items which are mainly goods which contain both explosive and chemical agents which e.g. can evolve tear-producing or toxic gases.

Although the safety of goods in class 1 can best be assured by stowing them separately, this can rarely be done in practice. To ensure that they are stowed as safely as possible, the goods in the class are arranged in twelve compatibility groups. These are lettered from A to N and S, omitting letterI. The thirteen compatibility groups and classification codes are shown below:

Description of substance and article to be classified	**Compatibility group**	**Classification code**
Primary explosive substance	A	1.1A
Article containing a primary explosive substance and not containing two or more effective protective features	B	1.1B 1.2B 1.4B
Propellant explosive substance or other deflagrating explosive substance or article containing such explosive substance	C	1.1C 1.2C 1.3C 1.4C
Secondary detonating explosive substance or black powder or article containing a	D	1.1D 1.2D

[2]Substances and articles in this division, so packaged or designed that any hazardous effects arising from accidental functioning are confined within the package unless the package has been degraded by fire, in which case all blast or projection effects are limited to the extent that they do not significantly hinder fire fighting or other emergency response efforts in the immediate vicinity of the package, are in compatibility group S (and are more or less treated as ordinary general cargo).

secondary detonating explosive substance, in each case without means of initiation and without a propelling charge, or article containing a primary explosive substance and containing two or more effective protective features		1.4D 1.5D
Article containing a secondary detonating explosive substance, without means of initiation, with a propelling charge (other than one containing a flammable liquid or gel or hypergolic liquids)	E	1.1E 1.2E 1.4E
Article containing a secondary detonating explosive substance with its own means of initiation, with a propelling charge (other than one containing a flammable liquid or gel or hypergolic liquids) or without a propelling charge	F	1.1F 1.2F 1.3F 1.4F
Pyrotechnic substance, or article containing a pyrotechnic substance, or article containing both an explosive substance and an illuminating, incendiary, tear- or smoke-producing substance (other than a water-activated article or one containing white phosphorus, phosphides, a pyrophoric substance, a flammable liquid or gel, or hypergolic liquids)	G	1.1G 1.2G 1.3G 1.4G
Article containing both an explosive substance and white phosphorus	H	1.2H 1.3H
Article containing both an explosive substance and a flammable liquid or gel	J	1.1J 1.2J 1.3J
Article containing both an explosive substance and a toxic chemical agent	K	1.2K 1.3K
Explosive substance or article containing an explosive substance and presenting a special risk (e.g. due to water-activation or presence of hypergolic liquids, phosphides or a pyrophoric substance) and needing isolation of each type[3]	L	1.1L 1.2L 1.3L
Articles containing only extremely insensitive detonating substances	N	1.6N
Substance or article so packaged or designed that any hazardous effects arising from accidental functioning are confined within the package unless the package has been degraded by fire, in which case all blast or projection effects are limited to the extent that they do not significantly hinder or prohibit fire fighting or other emergency response efforts in the immediate vicinity of the package	S	1.4S

In addition to the proper shipping name (correct technical name) and the UN number, the individual schedule for an explosive in class I also gives the substance's or article's division and compatibility group, which information

[3]Goods in Compatibility Group L should not be transported with goods in other compatibility groups (not even 1.4S).

must also be shown on the primary label or placard that goes on the package, unpackaged article or cargo transport unit.

Class 2 - Gases

Gases carried on board ships have varied chemical properties and come in different states. They may be compressed, liquefied at ambient temperature under high pressure, dissolved under pressure in a solvent which is then absorbed in a porous material, or liquefied by refrigeration. They may for example be non-flammable, non-poisonous, flammable, poisonous, corrosive, support combustion or be a combination of all or some of these. Some gases are lighter than air, some are heavier.

For the purposes of stowage and segregation, class 2 is further divided into 3 subclasses according to the hazards presented by gases during transport:

Class 2.1 - Flammable gases

Class 2.2 - Non-flammable, non-poisonous gases

Class 2.3 - Poisonous gases

To more accurately convey the hazards presented by gases, the classification required by regulations 2 and 5 of part A of chapter VII of SOLAS 1974, as amended, has to be supplemented by the additional description of the subclass.

The introduction to class 2 contains general information concerning the properties and characteristics of gases, packing, marking, stowage, segregation and fire precautions.

The schedules themselves include the UN number, the chemical formula of each gas and, where flammable, the range of its explosive limits (that is the percentage of gas required in a gas air atmosphere to make the mixture ignite). Thus, the schedule for acetylene, the first schedule in class 2 (IMDG Code - Page 2101), shows that a mixture of acetylene and air (used for cutting) has an explosion risk when it contains 2.1% to 80% of acetylene.

Class 3 - Flammable liquids

This class deals with liquids which give off flammable (ignitable) vapours at or below 61°C closed cup (c.c.)(141°F). Some flammable liquids are included in other classes (mainly classes 6.1 and 8) because of their other more predominant poisonous or corrosive properties.

Class 3 is divided by IMO into three subclasses according to the flashpoints of the liquids. Class 3.1 covers liquids with a low flashpoint (below -18°C c.c. (0°F)), such as acetone; class 3.2 covers liquids with an intermediate flashpoint (-18°C up to but not including 23°C c.c. (73°F)), such as benzene; and class 3.3 covers liquids with a high flashpoint (23°C and above up to 61°C c.c. (141°F)), such as certain alcoholic beverages.

The IMDG Code in section 6 of the General Introduction sets out the various methods which can be used to establish the flashpoint of a flammable liquid, a very important factor as far as safety at sea is concerned. Packing and stowage provisions for liquids with low flashpoints (classes 3.1 and 3.2) are stricter than for those with high flashpoints (class 3.3).

The information contained in the introduction to class 3 is very similar to that for class 2. The individual schedules are arranged in English alphabetical order in the three subclasses referred to above starting with class 3.1. Each schedule includes the substance's name, UN number, chemical formula, explosive limits and flashpoint or flashpoint range. For some liquids, in particular for those to be shipped under a generic or a not otherwise specified entry (N.O.S.), entries exist in all three subclasses depending on the flashpoint of the solution, mixtures or preparation.

Other relevant information is provided under the standard headings of properties, observations, packing, stowage and segregation etc. as in the other classes.

Generally speaking, water is unsuitable in fighting a fire involving flammable liquids.

Class 4 - Flammable solids or substances

This class is divided into the three subclasses which have very different properties. The classes include some commonly known products, many of which seem harmless enough but which can be very dangerous unless properly packaged, handled and transported.

Class 4.1 - Flammable solids

The substances and materials in this class are solids possessing the properties of being easily ignited by external sources, such as sparks and flames, and of being readily combustible, or being liable to cause or contribute to fire through friction. This class also covers substances which are self-reactive, i.e. liable to undergo at normal or elevated temperatures a strong exothermic decomposition caused by excessively high transport temperatures or by contamination, and desensitized explosives which may explode if not diluted sufficiently. Under certain conditions, an explosives subsidiary risk label is required for some substances.

This class comprises:

(1) readily combustible solids, and solids which may cause fire through friction;

(2) self-reactive (solids and liquids) and related substances; and

(3) desensitized explosives.

In the future energetic substances may also be covered by this class.

Some of these substances, when in a dry state, are classified as explosives. Where reference is made in the text to a substance which is wetted with water, alcohol or are diluted with some other liquid(s), to suppress its explosive properties, it should be permitted for transport as a class 4.1 substance only when in the wetted condition specified.

The wetting agent should be distributed uniformly throughout the substance in the state in which it is to be transported. Where transport under conditions of low temperature is anticipated for substances containing or wetted with water, a suitable and compatible solvent such as alcohol may have to be added to lower the freezing point of the liquid.

Some common products covered by this class are celluloid; camphor; dry vegetable fibres such as cotton, flax, jute, hemp, kapok; some metal powders; naphthalene; sisal; hay and straw; matches; rubber scrap and sulphur.

Class 4.2 - Substances liable to spontaneous combustion

Substances in this class are liable to self-heating and to ignite spontaneously. Some are more likely to do so when wetted with water or in contact with moist air. Some may also give off toxic gases if involved in a fire. Because of these properties, packing and stowage requirements are important. Although some general information is contained in the introduction to the class, more detailed information is given in the individual schedules.

Common products included in this class are charcoal, celluloid scrap, copra, wet or damp or oily fibres, some nitrocellulose based plastics, fishmeal and seed cakes.

Class 4.3 - Substances which, in contact with water, emit flammable gases

Because the substances in this class give off gases which are sometimes subject to spontaneous ignition and are also toxic, fire-fighting is a particular problem.

The use of water, steam or water-foam extinguishers may make matters worse and even the use of carbon dioxide (CO_2) can do more harm than good in some situations; for small fires neutralizing powders or sand is recommended.

Common products in this class include calcium carbide, metal powders, ferrosilicon, magnesium and magnesium-based products, potassium and potassium-based products, rubidium and sodium.

Class 5 - Oxidizing substances

This class is divided into two subclasses. Class 5.1 deals with oxidizing substances which, although not necessarily combustible in themselves, may increase the risk and intensity of a fire by giving off oxygen. Class 5.2 covers organic peroxides, most of which are combustible.

Class 5.1 - Oxidizing substances (agents)
The fact that all substances in this class give off oxygen when involved in a fire creates obvious fire-fighting difficulties, even though they are not necessarily combustible themselves. Some substances may also be sensitive to impact, friction or a rise in temperature, and some may react vigorously with moisture, so increasing the risk of fire.

Mixtures of these substances with organic and combustible materials are easily ignited and may burn with explosive force. There will also be a violent reaction between most oxidizing substances and strong liquid acids evolving highly toxic gases.

One fire-fighting problem is caused by the fact that some substances in this class give off oxygen when involved in a fire, the use of steam, carbon dioxide (CO_2) or other inert gas extinguishers may be ineffective.

This class includes ammonium nitrate fertilizers, chlorates, chlorites, and calcium and potassium permanganates.

Class 5.2 - Organic Peroxides
In addition to being oxidizing substances (agents), most substances in this class are also liable to violent or explosive decomposition. Most will burn rapidly and are sensitive to heat. Some are also sensitive to impact or friction. To reduce this sensitivity to a safe level they are carried in a solution, as a paste, wetted with water or with an inert solid.

Even so, some may react dangerously with other substances. Violent decomposition may be caused by traces of impurities such as acids, metallic oxides or amines. Decomposition may give rise to toxic or flammable gases.

Some organic peroxides can be particularly dangerous to the eyes, even after only momentary contact, and immediate irrigation of the eyes lasting at least 10 to 15 minutes is essential, followed by medical attention.

Some substances may begin to decompose, when a certain temperature is exceeded, and in some cases this may lead to an explosion. To prevent this, some organic peroxides have to be transported at a controlled temperature. The General Introduction to the IMDG Code, the introduction to class 5.2 and the individual schedules contain information on these aspects.

Fire is another problem and may result in an explosion. Packages containing organic peroxides should be moved away from the seat of any fire or jettisoned. If this is not possible, packages should be sprayed (cooled) with large quantities of water from as far away as possible and even when the fire has been extinguished packages should be treated with great care, since organic peroxides which have been exposed to high temperatures may start a violent decomposition at any time. Organic peroxides are carried by sea "on deck only" and are prohibited for carriage on most passenger ships.

In some cases, certain packages may be required to carry a subsidiary risk label in addition to the class 5.2 label, e.g. a special class 1 (explosives) label. Substances of class 5.2 are assigned to 20 generic entries.

VOLUME IV

Class 6 - Toxic and infectious substances

Class 6.1 - Toxic substances
Generally, substances in class 6.1 may cause serious injury or even death if swallowed, inhaled or absorbed by contact through the skin. They are arranged in three packaging groups (I, II and III), in descending order of risk. The introduction to class 6.1 lays down the criteria for such grouping.

Fire-fighting measures are basically the same as those given for class 3 (flammable liquids) but because of the high risk of poisoning through fumes, the IMDG Code provides that ships carrying poisonous substances should always carry protective clothing and self-contained breathing apparatus.

If leakage or spillage occurs involving toxic substances, such as pesticides, decontamination should be carried out by trained staff wearing suitable protective clothing and equipment.

This class covers mainly the pesticides and insecticides but also substances such as chloroform, cyanides, strychnine and tear gas.

Class 6.2 - Infectious substances
These are substances containing viable micro-organisms, including a bacterium, virus, rickettsia, parasite, fungus, or a recombinant, hybrid or mutant, that are known or reasonably believed to cause disease in animals or humans.

However, they are not subject to the provisions of this class if the spread of disease to humans or animals exposed to such substances is considered unlikely.

Infectious substances carry a special label (three crescents superimposed on a circle). In case of damage or leakage public health authorities have to be notified immediately.

Class 7 - Radioactive materials

The provisions of this class are based upon the principles of the International Atomic Energy Agency's (IAEA) Regulations for the Safe Transport of Radioactive Material (1985 Edition, as amended 1990). They offer guidance to those involved in handling and transport of radioactive materials in ports and on ships without necessarily consulting the IAEA Regulations Safety Series No. 6, although references to the IAEA Regulations have been included in the class 7 IMDG Code texts.

Packing, labelling and placarding, stowage, segregation and other requirements vary according to the radioactivity of the material. Radioactive materials are divided into three categories, depending upon radiation levels, category I (white) being the least dangerous. The labels for categories II and III (yellow) are printed in yellow and white for additional emphasis. For class 7, a special placard has been developed.

IMO has also developed a Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on board Ships (INF Code) which was adopted by the IMO Assembly at its eighteenth session by resolution A.748(18).

In adopting the INF Code, the Assembly urged governments to implement its provisions "at the earliest possible opportunity". The Assembly also requested the MSC and MEPC, in consultation with the IAEA to keep the Code under regular review and amend it as necessary.

Class 8 - Corrosives

Substances in this class are solids or liquids; they can damage living tissue and materials, in some cases very severely. Some of them give off irritating, poisonous or harmful vapours, others are also poisonous. Some are also flammable or give off flammable gases under certain conditions.

Substances in this class may be corrosive to metals such as aluminium, zinc and tin but not to iron or steel while others are corrosive to all metals. Some substances even corrode glass. Water can also affect some substances by making them more corrosive, by liberating gases, and in a few cases by generating heat.

In view of these different properties, packing, stowage and segregation are extremely important. The substances are also divided into three packaging groups (packaging group I being the most dangerous). The introduction to class 8 gives detailed information on the types of packagings to be used.

Most fires involving corrosive substances can be dealt with by any extinguishant, including water, although those which are also flammable should be dealt with in the same way as substances in class 3 of the IMDG Code. Care must also be taken in view of the high risk of poisoning through fumes. This class includes battery acid, formic acid, caustic soda and sulphuric acid.

Class 9 - Miscellaneous dangerous substances and articles

This class includes substances, materials and articles which, for various reasons, do not come within any of the other classes. Because their properties and characteristics are so varied, the individual schedules usually include detailed information on stowage and segregation, packing and further observations. Packages containing most of the substances in this class need not be labelled. An exception has been made for polychlorinated biphenyls (PCBs) and polyhalogenated biphenyls or plyhalogenated terphenyls, liquids and solids. Harmful substances, however, have to carry the MARINE POLLUTANT mark. Products of this class include aerosols, some ammonium nitrate fertilizers, asbestos, and substances which are harmful to the marine environment only and designated as MARINE POLLUTANT in the IMDG Code (environmentally hazardous substances, solid or liquid).

VOLUME V

The Supplement to the IMDG Code contains recommendations issued by IMO to provide extra guidance in the safe carriage of dangerous goods.

Emergency Procedures for Ships Carrying Dangerous Goods (EmS)

No matter how closely regulations are followed, there is always the danger that an incident may lead to an emergency. IMO's Sub-Committee on the Carriage of Dangerous Goods prepared group emergency schedules for all substances, materials and articles covered by the IMDG Code. These are contained in the IMO publication

Emergency Procedures for Ships Carrying Dangerous Goods (EmS), a supplement to the IMDG Code, and also to be used in conjunction with the Code.

The *Emergency Procedures for Ships Carrying Dangerous Goods* were adopted by the Maritime Safety Committee and first published by the Organization in 1981. Whenever an amendment to the IMDG Code is adopted, a new EmS or a supplement thereto, containing the consequential amendments, is published. The procedures are designed to protect the ship, the cargo, as well as those on board, taking into account that at sea the ship is its own emergency response organization.

The introductory part of the publication gives general advice on dealing with emergencies. Particular advice is given in the individual emergency schedules.

The emergency schedules divide the various substances, materials and articles contained in each IMDG Code class into groups. They advise on any special emergency equipment which should be carried and set out the procedures which should be followed in an emergency, including the action to be taken in case of spillages or fire. The remedial action may vary depending on whether the goods are stowed on deck or under deck. The emergency schedules include supplementary advice where necessary. The EmS number for a particular substance, material or article is given in the indices to the IMDG Code.

The IMO/WHO/ILO Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG)
The MFAG gives information on how injuries, which may arise from such accidents, should be dealt with. It is intended to supplement the information contained in the *International Medical Guide for Ships* (IMGS) published by the World Health Organization (WHO). The MFAG was developed in close co-operation with WHO and the International Labour Organisation (ILO). IMO is responsible for its preparation, publication and updating.

The advice given in the MFAG refers to the chemicals, substances and other dangerous goods covered by the IMDG Code, and to solid materials possessing chemical hazards covered by appendix B of the IMO *Code of Safe Practice for Solid Bulk Cargoes* (BC Code). It should, therefore, be used in conjunction with the information provided in the IMDG Code, the BC Code and the *Emergency Procedures for Ships Carrying Dangerous Goods* (EmS). It is also intended to provide advice necessary if chemical poisoning is to be diagnosed and treated within the limits of the facilities available on board ships.

The MFAG covers such matters as diagnosis of poisoning, first aid, the complications of poisoning, general toxic hazards, emergency treatment, chemical tables including indices, and a list of medicines. The Guide is currently under revision by the new DSC Sub-Committee.

Information on the treatment of illnesses of a general nature and not predominantly concerned with chemical poisoning may be found in the IMGS of the WHO.

Minor accidents involving chemicals do not usually cause severe effects provided the appropriate first aid measures described in the MFAG are taken. Although the number of reported serious accidents is small, accidents involving those chemicals which are toxic or corrosive may be dangerous and must be regarded as potentially serious until either the affected person has completely recovered, or medical advice to the contrary has been obtained. Any person suffering from chemical poisoning should be seen as soon as possible by a doctor at the next port of call. In some cases it may be necessary to radio for medical advice from a doctor ashore.

Within the MFAG, chemicals are grouped into tables according to their chemical properties. In the rare circumstances where a chemical could not be classified in an appropriate table according to its chemical properties, it has been assigned to a table which is consistent with the toxic medical effects to be expected from poisoning by that chemical. The tables themselves give general information about the particular group of chemicals and indicate the toxic effects likely to be encountered. The treatment recommended in the MFAG is specified in either the appropriate section or the appropriate table.

The recommended quantities of medicines to be carried on board ships transporting dangerous goods are listed in section 11 of the MFAG: they are based on an estimate of risks.

The master, officers and crew of a ship regularly carrying chemicals ought to have been trained in the general hazards involved in accordance with the provisions of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, and relevant resolutions of the International Conference on Training and Certification of Seafarers, 1978, and relevant resolutions of the IMO Assembly; and should be aware, therefore, of the necessary precautions to be observed. Equally, they should have been instructed about the safety rules and the first aid procedures to be used in case of an accident. In the case of other ships it is essential that before a chemical is handled, the officers and crew involved should be advised by the master of the hazards of the particular chemical and the action to be taken in the event of an accident. The dangers of smoking,

drinking, taking food or being under the influence of alcohol or drugs whilst handling chemicals should be emphasized.

Recommendations on the Safe Use of Pesticides in Ships

Pests such as rodents and insects have been a problem on board ships for thousands of years. The recommendations take into account new pesticides and techniques which have been developed as well as the increasing concern about the safety of pest control operations.

The recommendations deal with the prevention of infestation, chemical control of infestation, control of rodents, regulations for the use of pesticides and general safety precautions. They are intended as a guide to competent authorities, mariners, fumigators, pesticide and fumigant manufacturers, and others concerned.

IMO/ILO Guidelines for the Packing of Cargo in Freight Containers or Vehicles (Packing Cargo Transport Units)

Whilst the use of freight containers, vehicles and other cargo transport units substantially reduces the physical hazard to which goods are exposed, improper or careless packing of goods into a container or vehicle may be the cause of injury to personnel when such units are handled or transported. In addition, serious and costly damage may occur to the goods inside or to other equipment. The person who packs and secures goods in a unit for export may be the last person to look inside until it is opened at its final destination. Consequently, a great many persons will rely on his skill: shippers, forwarders, road vehicle drivers and other highway users when the unit is carried by road, railway personnel and others when the unit is carried on a railway wagon, dock workers when the unit is lifted on or off a ship, crew members of the ship which may be taking the unit through very difficult conditions, and the consignee at the final destination. All may be at risk from a poorly packed unit, in particular one which is packed with dangerous goods.

The Guidelines provide advice as to the essentials of the safe packing of freight containers and vehicles by those responsible for it and for the securing of cargo in them. They are not intended to cover the filling or emptying of tank-containers or the transport of solid cargo in bulk packagings, nor are they meant to replace or supersede any existing regulations which may be in effect concerning the transport of cargo in transport units, in particular those which may relate to the carriage of dangerous goods. The users of the Guidelines are advised to consult their Governments for more detailed advice at the national level concerning shipment. The user is recommended to consult also the transport operator/carrier concerning the packing and securing of particularly bulky or heavy goods and the use of special purpose containers or transport units (e.g. tank-containers, refrigerated containers, etc.).

IMO's MSC has been informed that members of the International Chamber of Shipping (ICS) have reported that, in a number of ports, some of which are located in countries which have advised the Organization that they have implemented the IMDG Code, it is difficult and often impossible to obtain container packing certificates. This creates great difficulties for ship operators and, where the flag State regulations require strict compliance with the IMDG Code, means that cargo has to be refused if the certificate cannot be obtained. However, the most serious threat facing all ship operators is the risk that dangerous goods may be loaded into a container which, because no packing certificate has been issued, may not be placarded to indicate the danger of its contents. Experience has shown that such containers can remain undetected during transport and may therefore be incorrectly stowed, thus creating a potential danger to ships. Such containers also pose a serious threat to the safety of inland transport, container terminals and ports.

The Organization has also been informed that in a number of accidents involving containers packed with dangerous goods, no information on their contents has been made available.

Where there is reason to suspect that a cargo transport unit in which dangerous goods are packed is not in compliance with the provisions of the IMDG Code, or where a container packing certificate/vehicle packing declaration is not available, the unit should not be accepted for shipment.

The Maritime Safety Committee adopted in 1991 amendments to regulation VII/5 of SOLAS which include the provision of container packing certificates/vehicle packing declarations and dangerous goods special lists, manifests or stowage plans.

Handling of dangerous cargoes in ports

IMO's chief concern as far as dangerous cargoes are concerned is to protect the lives of those on board ships and the ships themselves. But dangerous goods can still be dangerous in the maritime context when they are on shore. Accordingly, to mitigate the hazards involved in handling such goods in port areas, the IMO Assembly, in 1973, by resolution A.289(VIII), adopted a *Recommendation on Safe Practice on Dangerous Goods in Ports and Harbours*.

Subsequent development of new techniques in shore and ship operations, as well as the desirability of having more comprehensive recommendations to include dangerous goods in packaged form, liquid substances and

solid dangerous materials, and gases carried in bulk, made it necessary to revise the original recommendation. This was done by Recommendations on the Safe Transport of Dangerous Cargoes and related Activities in Port Areas (MSC/Circ.675).

The recommendations therefore deal with the duties of shore authorities, the master of a ship and the berth operators regarding such matters as fire precautions, ship handling, the reporting of incidents, etc.

For dangerous cargoes, the recommendations give guidance on various aspects concerned with goods in packaged form including those which may be carried in portable tanks or cargo transport units, outlines precautions to be followed in handling bulk dangerous substances, which include not only substances listed in the IMDG Code but also those mentioned in the *Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk* (IBC Code), and the *Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* (IGC Code), and deal also with solid bulk dangerous substances (materials) covered by appendix B of the *Code of Safe Practice for Solid Bulk Cargoes* (BC Code).

There are annexes and appendices to the recommendations which deal *inter alia* with advance notification, transport and handling of explosives and segregation of radioactive materials on shore.

Extending the IMDG Code to cover marine pollution

In 1985 IMO decided to extend the IMDG Code to marine pollutants. The reason was to assist the implementation of Annex III of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78) through the IMDG Code. Annex III contains the regulations for preventing pollution by harmful substances carried in packaged form. As with part A of chapter VII of SOLAS, the regulations themselves are very general.

Annex III does not list the substances and materials concerned, but defines "harmful substances" as those substances which are identified as marine pollutants in the IMDG Code and sets out the criteria for identifying and designating marine pollutants. In addition, Governments of Contracting parties shall issue or cause to be issued, detailed requirements on packing, marking and labelling, documentation, stowage, quantity limitations, exceptions and notifications, for preventing or minimizing pollution of the marine environment by harmful substances.

The MEPC decided that further guidance was required from IMO if the implementation of Annex III was to be internationally effective. The Committee decided that the best way of ensuring this was by extending the IMDG Code to include the marine pollution aspects. This was done by including a new section 23 in the General Introduction to the IMDG Code, which came into force on 1 January 1991.

Annex III (like Annexes IV and V) of MARPOL 73/78 is optional, meaning that Governments which ratify the MARPOL Convention as a whole can at the same time exercise their option **not** to accept one or all of these annexes. Although the 1973/78 MARPOL Convention as a whole entered into force in 1983, Annex III did not receive the required number of acceptances for its entry into force until 28 February 1994. It has now been ratified by 76 countries.

Other IMO instruments

The Code of Safe Practice for Solid Bulk Cargoes (BC Code)
The problems involved in the transport of solid bulk cargoes were recognized by the 1960 SOLAS Conference but at that time it was not possible to frame detailed requirements except for the transport of grain cargoes (chapter VI of SOLAS). However, it was agreed that an internationally acceptable "Code of Safe Practice for the Shipment of Bulk Cargoes" should be drawn up and in 1965 the first *Code of Safe Practice for Bulk Cargoes* was adopted by IMO.

The primary aim of the BC Code is to promote safe stowage and shipment by:

(1) highlighting the dangers associated with the shipment of certain types of bulk cargoes;

(2) giving guidance on the procedures to be adopted when the shipment of bulk cargoes is contemplated;

(3) listing typical materials currently shipped in bulk, together with advice on their properties, handling, etc.; and

(4) describing test procedures to be employed to determine various characteristics of the materials to be carried.

The BC Code is kept under continuous review by IMO's DSC Sub-Committee.

The practices contained in the BC Code are intended as recommendations to governments, ship operators and masters, and bring the attention of those concerned to internationally accepted methods of dealing with the hazards which may be encountered when carrying a cargo in bulk.

Before loading any bulk cargo it is essential to obtain - normally from the shipper - the physical and chemical properties of the cargo. The master has to be provided with loading information sufficiently comprehensive to enable him to arrange the loading of his ship so as not to overstress the structure and to calculate the stability of ship for the worst conditions anticipated during the voyage.

IMO's Maritime Safety Committee has developed a form for cargo information (MSC/Circ. 663), advice on duties of chief mates and officers of the watch (OOW) at loading and discharging ports (MSC/Circ. 665), a cargo operations form (MSC/Circ. 666) and advice on safe practices on board bulk carriers (MSC/Circ. 667).

The BC Code also lists certain general precautions such as the need to protect machinery and the interior of the ship from dust and to ensure that bilges and service lines are in good order and not damaged during loading.

Some bulk cargoes are liable to oxidize, which may result in the reduction of oxygen in a cargo space, the emission of toxic fumes and the generation of heat. Others may emit toxic fumes on becoming wet. The shipper has to inform the master of any chemical hazards which may exist and the BC Code gives details of precautionary measures which should be taken.

Health hazards can also arise because of dust inhalation. Some cargoes can create dust or emit fumes which may create a danger of explosion.

The BC Code deals with three basic types of cargoes:

- those cargoes which may liquefy (appendix A);

- materials possessing chemical hazards (appendix B); and

- other materials not falling within these two categories (appendix C).

Section 10 deals with the transport of solid wastes in bulk.

Entry into enclosed spaces - oxygen depletion - Appendix F of the BC Code

IMO is aware that several Governments and shipowners have for many years issued information and warnings to prevent accidents occurring to personnel entering enclosed spaces. However, fatal accidents continue to occur.

The MSC has, therefore, urged Governments to increase their efforts to alert personnel of the dangers of entering any enclosed space on board any ship and to stress not only the importance of checking the oxygen content or presence of dangerous gases prior to entry, but also the need for ships' crews to be properly prepared to carry out rescue operations. Further, Governments were requested to emphasize that this hazard is not necessarily associated with a particular cargo or type of space, but applies to a variety of cargoes and to any space that has been unventilated for some time.

Enclosed spaces include any tank, compartment or cargo space in which toxic, inert, asphyxiating, flammable or other dangerous gases may accumulate or in which oxygen may be deficient.

The hazards commonly encountered in an enclosed space are:

(1) toxic vapours in fatal concentrations which may emanate from a known material in the space, gradual release from sludge or scale, or be introduced by leakage from an adjacent space or from interconnected piping systems;

(2) flammable gases emanating from similar sources and creating a potential fire or explosion hazard;

(3) lack of oxygen in the enclosed space causing asphyxiation. Lack of oxygen may result from chemicals absorbing or replacing oxygen in the atmosphere or from the use of dry ice as a refrigerant or from inert gases to exclude oxygen and thus reduce the possibility of explosion. The atmosphere in a space that has remained closed for some time may become deficient in oxygen because of rusting steelwork. Improper or inadequate ventilation whilst work is in progress within a space may also result in a lack of oxygen;

(4) electric shock from portable lights, power tools or other electrical equipment; and

(5) bodily injury from direct contact with toxic, corrosive or irritating substances.

The dangers of enclosed spaces have been recognized in the latest version of the *Code of Safe Practice for Solid Bulk Cargoes*. Appendix F of the BC Code deals specifically with entering cargo spaces, tanks, pump-rooms, fuel tanks, cofferdams, duct keels, ballast tanks and similar enclosed spaces.

The introduction states that entry into such spaces should not take place "unless authorized by the master or a responsible officer and only after all appropriate safety checks have been carried out". These safety checks are listed and are also printed on a special maritime safety card which is published with the BC Code. It lists actions to be checked by the master or responsible officer and by the person who is to enter the space.

In order to publicize the problem further, IMO's Maritime Safety Committee issued an MSC circular (MSC/Circ.487 of 6 June 1988). It is hoped that it will be implemented at the national level and the poster displayed on board ships. A draft Assembly resolution on this subject has also been prepared and it is hoped that it will be adopted at the next session in 1997.

Guidelines to ensure the reporting to the Organization of incidents involving dangerous goods and marine pollutants in packaged form on board ships and in port areas
The MSC, at its 59th session, adopted a "Form for reporting incidents involving dangerous goods and marine pollutants in packaged form on board ships and in port areas." It was issued under MSC/Circ.559.

Dangerous Goods Declaration and Form for Cargo Information
The MSC adopted for inclusion in the IMDG Code a revised Dangerous Goods Declaration and also recommended a layout for a new form for Cargo Information. They were issued under MSC/Circ. 663.

International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code)
This Code applies to chemical tankers constructed on or after 1 July 1986 (the date of entry into force of part B of chapter VII of SOLAS 1974 contained in the 1983 amendments to the 1974 SOLAS Convention). Chemical tankers constructed before that date should comply with the requirements of the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk.

The purposes of each of these Codes is to provide an international standard for the safe transport by sea in bulk of liquid dangerous chemicals, by prescribing the design and construction standards of ships regardless of tonnage involved in such transport and the equipment they should carry so as to minimize the risks to the ship, its crew and to the environment, having regard to the nature of the products carried.

The basic philosophy is one of ship types related to the hazards of the products covered by the Codes. Each of the products may have one or more hazard properties which include flammability, toxicity, corrosivity and reactivity.

Throughout the development of the Codes it was recognized that they 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 IBC Code should not remain static. Therefore, IMO will periodically review the IBC Code taking into account both experience and technical development.

Both codes primarily deal with ship design and equipment. 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 IMO.

The layout of the IBC Code is in line with the *International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* (IGC Code). Gas carriers may also carry in bulk liquid chemicals covered by the IBC Code.

International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code)

This code applies to gas carriers constructed on or after the entry into force of part C of chapter VII of SOLAS 1974 contained in the 1983 amendments to the 1974 SOLAS Convention (1 July 1986). Gas carriers constructed before that date should comply with the requirements of the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk or the Code for Existing Ships Carrying Liquefied Gases in Bulk.

The purposes of these codes is to provide an international standard for the safe transport by sea in bulk of liquefied gases and certain other substances, by prescribing the design and construction standards of ships involved in such transport and the equipment they should carry so as to minimize the risk to the ship, its crew and to the environment, having regard to the nature of the products involved.

Again the basic philosophy is one of ship types related to the hazards of the products covered by these codes, each of which may have one or more hazard properties. A further possible hazard may arise owing to the products being transported under cryogenic (refrigerated) or pressure conditions.

Severe collisions or strandings could lead to cargo tank damage and uncontrolled release of the product. Such release could result in evaporation and dispersion of the product and, in some cases, could cause brittle fracture of the ship's hull. The requirements in the codes are intended to minimize these risks as far as is practicable, based upon present knowledge and technology.

IMO will periodically review the IGC Code taking into account both experience and future development. The layout of this code is in line with the *International Code for the Construction of Equipment of Ships Carrying Dangerous Chemicals in Bulk* (IBC Code).

Recommendations concerning ships not covered by the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk

This code was developed to provide international standards for the safe transport of liquefied gases in bulk by ships which are presently in service or otherwise fall outside the scope of the more extensive standards contained in the IGC Code.

The standards contained in this recommendation have been derived from those contained in the IGC Code and many of the standards are common to both.

This recommendation has been developed to provide a common basis for evaluating ships already in the trade which have been built to differing individual administrations' standards and operated with an excellent safety record. It is not meant to replace any controls which may already be in operation in certain countries; neither is it intended to degrade any administration's standards which were in existence when the ship was built.

The recommendation, because of the definition of the ships it covers, is interim in nature.

SOLAS Regulation 11-2/54

Chapter II-2 of SOLAS 74 deals with fire protection and Part C with fire safety measures for cargo ships. Regulation 54 contains special requirements for ships carrying dangerous goods.

The following ship types and cargo spaces are covered by regulation 54:

1. ships and cargo spaces not specifically designed for the carriage of freight containers but intended for the carriage of dangerous goods in packaged form including goods in freight containers and portable tanks;

2. purpose-built container ships and cargo spaces intended for the carriage of dangerous goods in freight containers and portable tanks (tank containers);

3. ro-ro ships and ro-ro cargo spaces intended for the carriage of dangerous goods;

4. ships and cargo spaces intended for the carriage of solid dangerous goods in bulk; and

5. ships and cargo spaces intended for carriage of dangerous goods other than liquids and gases in bulk in shipborne barges.

Cargo ships of less than 500 tons gross tonnage constructed on or after 1 February 1992 shall comply with regulation 54, but Administrations may reduce the requirements and such reduced requirements shall be recorded in the document of compliance.

The different requirements cover:

1. general application;
2. water supplies, in case of incidents such as fire;
3. sources of ignition;
4. fixed fire-detection and fire alarm systems;
5. ventilation arrangements;
6. bilge pumping arrangements;
7. personnel protection clothing;
8. portable fire extinguishers;
9. insulation of machinery space boundaries;
10. water spray systems; and
11. the ship's document of compliance.

The International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances (HNS) by sea, 1996

An international convention on liability and compensation for damage in connection with the carriage of hazardous and noxious substances (HNS) by sea was adopted on 3 May 1996 at a conference held at IMO headquarters.

It will make it possible for the equivalent of up to £250 million to be paid out in compensation to victims of accidents involving HNS, such as chemicals and other dangerous goods.

The HNS Convention defines its scope of application by reference to existing lists of substances, such as the IMDG Code and 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).

The Convention introduces strict liability for the shipowner, higher limits of liability than the present general limitation regimes and a system of compulsory insurance and insurance certificates.

It has generally been agreed that it would not be possible to provide sufficient cover by the shipowner liability alone for the damage that could be caused in connection with the carriage of HNS cargo. This liability, which creates a first tier of the convention, is therefore supplemented by a second tier, the HNS Fund, financed by cargo interests.

In principle, compensation will be paid from the HNS Fund when the shipowner's liability is insufficient to provide full compensation or when no liability arises under the first tier. Contributions to the second tier will be levied on persons in the Contracting Parties who receive a certain minimum quantity of HNS cargo during a calendar year. The tier will consist of one general account and three separate accounts for oil, liquefied natural gas (LNG) and liquefied petroleum gas (LPG). The system with separate accounts has been seen as a way to avoid cross-subsidization between different HNS substances.

The unity of account used in the Convention is the Special Drawing Right (SDR) of the International Monetary Fund (IMF). At present 1 SDR is roughly equivalent to £1 sterling. The liability limits contained in the first tier are based on the gross registered tonnage of the ship concerned and are as follows:

For ships not exceeding 2,000 grt	10 million SDRs
For ships between 2,001 and 50,000 grt	1,500 SDRs per ton, making a maximum of 82 million SDRs at 50,000 grt
For ships between 50,001 grt and 100,000 grt	360 SDRs per ton, making a maximum of 100 million SDRs at 100,000 grt
For ships exceeding 100,000 grt	100 million SDRs

Once these limits are reached, compensation would be paid from the second tier, the HNS Fund, which will be limited to 250 million SDRs. The Fund will be made up of contributions paid by the importers of HNS materials (primarily chemical companies).

The Convention will enter into force 18 months after the date when the following conditions have been fulfilled:

- 12 States have accepted the Convention, four of which have not less than two million units of gross tonnage

- Provided that persons in these States who would be responsible to pay contributions to the general account have received a total quantity of at least 40 million tonnes of contributing cargo in the preceding calendar year.

Technical assistance

IMO's technical assistance programme has grown considerably in recent years and is now one of the Organization's most important activities.

Although many developing countries have financial difficulties, probably the most important problem they face is the shortage of experienced and expert personnel. Although this is true for many maritime activities, it is particularly true in areas such as the transport of dangerous, hazardous and harmful cargoes, which are especially complex.

The improvement of maritime training has been one of IMO's priorities since its inception. IMO tackles the subject in two ways: firstly by adopting international standards and regulations in conventions, codes and recommendations which are designed to be implemented at the national, regional or international level and secondly by providing practical assistance and advice to countries, particularly developing countries, for the improvement of training programmes.

Few sectors of industry have seen such rapid progress as has been made in raising safety standards in the transport of dangerous goods. Nevertheless, much work remains to be done.

The opening of the World Maritime University (WMU) in July 1983 has led to major improvements in the implementation of IMO's safety standards. The purpose of the University, which is based in Malmö, Sweden, is to provide advanced training for senior experts and administrators, particularly from developing countries in various fields of maritime activities, including the safe transport of dangerous, hazardous and harmful cargoes by sea.

Training of this type is often lacking in developing countries themselves and the University is fully supported by IMO Member States and the maritime community as a whole.

The University offers two-year degree courses on general maritime administration and environment protection, maritime safety administration, maritime education and training, port management, and shipping management. For additional information contact WMU. The address is World Maritime University, P.O. Box 500, S-201-24 Malmö, Sweden.

The IMO model course programme

The model course programme was developed out of suggestions from a number of IMO Member Governments, following the adoption of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (STCW 1978). Assisted by the Government of Norway, IMO has designed a series of courses to help implement this Convention and, further, to facilitate access to the knowledge and skills demanded by an increasingly sophisticated maritime technology. The courses are flexible in application; maritime institutes and their teaching staff can use them in organizing and introducing new courses or in enhancing, updating or supplementing existing training material.

The aim of the model course programme is to make available to developing countries a number of model training courses in order to enhance current maritime training programmes or to develop additional, specialized maritime training.

The maritime courses reflect the requirements of the IMO international conventions governing ship safety and the prevention of pollution and will, therefore, contribute to the establishment of minimum global standards of training.

Many other model training courses will relate to "state of the art" maritime activities and will contribute to the increasing professional knowledge and expertise of ship operators ashore and afloat.

The development of a real and effective minimum standard of maritime training throughout the world will enhance ship operational safety and provide a much safer and cleaner environment. Such a development will also enable maritime standards to be improved periodically on a world-wide basis in a much more effective way.

The hazards of dangerous goods

During recent years there have been comparatively few major accidents at sea involving dangerous goods, with the exception of accidents involving oil tankers and bulk carriers. Nevertheless, dangerous cargoes have been involved in some of the worst disasters in shipping history, and small incidents still occur frequently. In virtually every case the disaster could have been avoided or its effects mitigated if the procedures now incorporated in the IMDG Code, its Annexes and Supplements and other IMO codes of safe practice had been observed. The following sections refer to a few incidents, involving mishandling or misuse of dangerous goods, ignorance of their potential hazards or inadequate training of the crews manning the ships involved, or the shore personnel where the accidents occurred.

Halifax, 1917

Explosives are normally treated with great care on board ships but by the end of 1917, with the world war at its height, the Allies' main concern was to get ammunition to the front as quickly as possible. As a result the 3,000 ton freighter *Mont Blanc* was heavily overloaded with more than 2,600 tons of explosives when she entered Halifax harbour on her way from the United States to Europe.

Following a series of navigational errors which have never been satisfactorily explained she collided with another ship, the *Imo,* and caught fire.

Shortly afterwards the ship exploded in the biggest man-made explosion until the advent of the atomic bomb. The blast devastated the centre of the port. As many as 3,000 people were killed, 9,000 were injured and 6,000 homes were completely destroyed.

LPG Tanker Yuyo Maru No.10, Japan, 1974

On 9 November 1974, in Tokyo Bay, Japan, the Japanese LPG Tanker *Yuyo Maru No.10*, carrying refrigerated LPC in her cargo tanks and Naphtha in her wing tanks and forward reserve cargo oil tank, was struck approximately at a right angle on her starboard bow by the bow of the Liberian cargo vessel *Pacific Ares.* As a result of the collision, the outer plating of the forward reserve cargo oil tank and the No.1 starboard wing tank (both containing Naphtha) was broken. This allowed a large amount of

Naphtha to flow out onto the *Pacific Ares* and onto the water. The Naphtha caught fire, killing five of the *Yuyo Maru* crew members and 28 on the *Pacific Ares.*

Fire-fighting efforts began about an hour after the collision. About two hours later, all external fires aboard the *Pacific Ares* were extinguished. The fire aboard the *Yuyo Maru* was attacked with fire-fighting foam but, in spite of these efforts, the fire continued to spread to more of the Naphtha tanks. The heat from the fire caused the LPG tanks to vent and reportedly melted one relief valve and gasket and packing materials at joints in several vent and gauge lines leading to the LPG tanks, resulting in a series of small fires where the LPG vented from the tanks. Eventually all Naphtha fires on the *Yuyo Maru* were extinguished; only the LPG venting from the relief valves and heat damaged piping continued to burn. For the most part, these were small, localized fires with an occasional larger flare-up.

Five days after the accident, the decision was made to tow the *Yuyo Maru* out of the bay. During the towing operation, Naphtha was spilled and fire again broke out. Towing was suspended at this time; the ship now being about 23 nautical miles from the shoreline. The ship was subsequently towed further out to sea and was then sunk by the Japanese Defense Agency.

Because this is the largest and the most dramatic incident involving fire aboard an LPG ship, it has often been cited as an example of the hazards posed by such ships. Since the collision did not damage any of the LPG cargo tanks, it is very likely that no fire would have occurred if the Naphtha tanks had been empty or were filled with ballast water. The fire was essentially a Naphtha fire. The only part of the LPG cargo that was involved was the portion that vented and fed the small fires around the cargo tank hatch areas. The Naphtha fire never breached the integrity of the cargo tanks but only damaged relief valves, packing, gaskets, etc. on the cargo piping system. And, as a final note, the relative integrity and stability of the LPG ship was demonstrated by the fact that the Japanese Defense Agency was able to sink the ship only with great difficulty using shells, bombs and torpedoes.

Port Kelang, 1980

Three people were killed and more than $12 million worth of damage was caused by a fire and series of explosions in this Malaysian port.

The fire began in a warehouse and although fire engines arrived within ten minutes of the alarm being given, the flames had taken such a firm grip on the building that the firemen were unable to control the blaze. Their efforts were hampered by the fact that cargo in the warehouse was piled right up to the roof: they could not, as a result, get to the root of the fire.

A series of explosions occurred about $1^1/_2$ hours later, the third of which was so great that burning debris led to fires starting elsewhere in the port - and at the same time knocked out most of the fire engines. It is believed that the explosion may have been caused by empty gas cylinders which were heated in the fire to such an extent that they finally blew up.

The fire raged for two days, destroyed four warehouses completely and severely damaged virtually every other building in the port.

Ariadne, 1985

On 24 August 1985, the Panamanian container ship *Ariadne* grounded in the port of Mogadishu, Somalia, causing fire. The ship was subsequently declared total loss. The ship carried 665 containers on board, some of which contained different dangerous goods, including tetraethyl lead. Serious sea and air pollution occurred, necessitating evacuation of some people in the port area.

Cason, 1987

On 5 December 1987, a 12,000 dwt Panamanian cargo ship *Cason* ran aground on the northwest of Spain near Cape Finisterre. Carrying over 1,000 tonnes of dangerous goods, including aniline oil, orthocreosol and dipheylmethane, the ship was proceeding from Antwerp to Shanghai, when sea water penetrated drums of sodium (there were 1,400 on board), causing them to explode. Although

rescue service were mobilized immediately, only 8 of the 31 crew members were saved. 20,000 residents of a nearby town were evacuated.

Masqusar, 1989

On 13 March 1989, the Liberian chemical tanker *Masqusar* had a massive engine room explosion and fire near the coast off central Japan. The tanker was carrying 25,700 tonnes of chemicals, including 7,000 tonnes of highly toxic acrylonitrile and various amounts of caustic soda, styrene and methanol. The explosion was of such a magnitude that the ship's crew was not able to send a distress signal. Fire and rescue teams could not board the ship due to toxic gases, fire and continuing explosions. The *Masqusar* burned for 5 days before sinking. All 23 crew were killed.

The incident caused a significant spill of chemicals carried on board, all of which drifted away toward the Pacific Ocean, and therefore no specific action was taken by Japan to combat pollution.

***

ANNEX 1

International Maritime Dangerous Goods (IMDG) Code

Implementation by IMO Member countries

No.	Member country	Date of implementation	Gross tonnage	Percentage World's tonnage
1	Algeria	-	935,812	0.20
2	Argentina	1981	715,747	0.15
3	Australia	20.03.68	3,012,177	0.63
4	Bahamas	1976	22,915,349	4.82
5	Belgium	20.07.73	233,390	0.05
6	Brazil	4.10.72	5,282,869	1.11
7	Bulgaria	1.01.83	1,294,941	0.27
8	Canada	1982	2,489,520	0.52
9	Chile	24.10.78	720,987	0.15
10	China	1.10.82	15,826,688	3.33
11	Denmark	1.02.72	5,798,908	1.22
12	Ecuador	-	269,640	0.06
13	Finland	1.01.81	1,403,711	0.29
14	France	8.08.68	4,347,617	0.91
15	Gambia	12.06.91	2,512	0.00
16	Germany	7.04.72	5,696,088	1.20
17	Greece	4.02.74	30,161,758	6.34
18	Iceland	20.09.82	174,508	0.04
19	India	4.11.78	6,485,374	1.36
20	Iran, Islamic Republic of	-	3,803,342	0.80
21	Ireland	1968	190,311	0.04
22	Israel	11.11.72	645,683	0.14
23	Italy	1968	6,818,178	1.43
24	Japan	1.10.79	22,101,606	4.64
25	Liberia	1.03.79	57,647,708	12.11
26	Malaysia	-	2,727,572	0.57
27	Morocco	1958	362,151	0.08
28	Netherlands	1.01.74	4,396,246	0.92
29	New Zealand	9.02.79	251,205	0.05
30	Norway	1971	22,387,936	4.70
31	Pakistan	1.09.73	374,949	0.08
32	Panama	March 1986	64,170,219	13.49
33	Papua New Guinea	-	46,528	0.01
34	Peru	1.01.70	321,460	0.07
35	Philippines	5.01.81	9,413,228	1.98
36	Poland	9.01.74	2,609,678	0.55
37	Portugal	1986	883,905	0.19
38	Republic of Korea	1.07.79	7,004,199	1.47
39	Russian Federation	1.01.69	16,503,871	3.47
40	Saudi Arabia	March 1985	1,064,052	0.22
41	Singapore	16.06.81	11,894,846	2.50
42	South Africa	21.11.75	330,725	0.07
43	Spain	27.11.88	1,560,101	0.33
44	Sweden	1.08.81	2,796,519	0.59
45	Switzerland	1.02.73	336,174	0.07
46	Thailand	-	1,373,501	0.29
47	United Kingdom	29.12.78	4,433,128	0.93

48	United States	10.11.80	13,655,438	2.87
49	Uruguay	25.04.85	125,053	0.03
50	Vanuatu	28.10.82	1,998,017	0.42
	Associate member			
51	Hong Kong	29.12.78	7,703,410	1.62
				79.38

ANNEX 2

List of IMO publications related to dangerous, hazardous and harmful cargoes

1. International Maritime Dangerous Goods (IMDG) Code
(1994 consolidated edition)
Four loose-leaf volumes
Sales No. English edition IMO-200E

2. IMDG Code - Supplement (1994 edition)
The publications listed below relate to the Code and have, for ease of reference, been consolidated in the Supplement to the IMDG Code which is sold separately:

Supplement: Emergency Procedures (EmS)
Medical First Aid Guide (MFAG)
Solids, including Chemicals, in Bulk (BC Code)
Reporting Procedures
Packing Cargo Transport Units
Use of Pesticides in Ships
INF Code
Appendix containing resolutions, circulars, guidelines and other standards referred to in the IMDG Code and the Supplement

Sales No. English edition IMO-210E

The 5-volume IMDG Code is also available on CD-Rom and diskettes.

3. Wall chart: Labels, marks, signs and placards for packaged dangerous goods.
Sales No. English edition IMO-223E

4. International Convention for Safe Containers (CSC), 1972 (1992 edition)
Sales No. English edition IMO-282E

5. Code for the safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-Level Radioactive Wastes in Flasks on Board Ships (INF Code) (1994 edition)
Sales No. English edition IMO-270E

6. Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas (1995 edition)
Sales No. English edition IMO-290E

7. International Convention for the Safety of Life at Sea (SOLAS) - (Consolidated Edition, 1992)
Sales No. English edition IMO-110E

8. Manual on Chemical Pollution. Section 1 - Problems Assessment and Response Arrangements (1987 edition)
Sales No. English edition IMO-630E

9. Manual on Chemical Pollution. Section 2 - Search and Recovery of Packaged Goods Lost at Sea (1992 edition)
Sales No. English edition IMO-633E

10. IMO/ILO Guidelines for Packing Cargo in Freight Containers or Vehicles (1994 edition)
Sales No. English edition IMO-284E

11. **Medical First Aid Guide (MFAG) for Use in Accidents Involving Dangerous Goods (1994 edition)**
Sales No. English edition IMO-251E

12. **Emergency Procedures for Ships Carrying Dagerous Goods (EmS) (1994 edition)**
Sales No. English edition IMO-254E

13. **Code of Safe Practice for Solid Bulk Cargoes (BC Code) (1994 edition)**
Sales No. English edition IMO-260E

14. **Provisions Concerning the Reporting of Incidents Involving Harmful Substances under MARPOL 73/78 (1990 edition)**
Sales No. English edition IMO-516E

15. **MARPOL 73/78 (Consolidated Edition, 1991)**
Sales No. English edition IMO-520E

_____

Note: See IMO's Publications Catalogue 1995-1996 for further information

_____

L:\LED\INF\FOCUS\IMDG2
4 May 1996