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**INTERIM GUIDELINES FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS  
CARRYING NATURAL GAS HYDRATE PELLETS (NGHP) IN BULK**

- 1 The Maritime Safety Committee, at its eighty-seventh session (12 to 21 May 2010), having considered the proposal by the Sub-Committee on Bulk Liquids and Gases, at its fourteenth session, approved the Interim Guidelines for the construction and equipment of ships carrying natural gas hydrate pellets (NGHP) in bulk, set out in the annex, to provide the basis for determining the detailed requirements for such ships by relevant administrations.
- 2 The Committee, noting that the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) is under review by the Sub-Committee on Bulk Liquids and Gases, agreed to review the Interim Guidelines after the finalization of the revision of the Code.
- 3 Member Governments are invited to bring the annexed Interim Guidelines to the attention of all parties concerned.

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## ANNEX

### INTERIM GUIDELINES FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING NATURAL GAS HYDRATE PELLETS (NGHP) IN BULK

#### 1 SCOPE

These Interim Guidelines provide the information on appropriate safety measures for ships solely intended for the carriage of natural gas hydrate pellets (NGHP) in bulk (NGHP carriers). For this purpose, these Interim Guidelines provide information on the appropriate application of the requirements of the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) to NGHP carriers. Persons in charge of the design, construction and operation of NGHP carriers are invited to consult these Interim Guidelines.

#### 2 APPLICATION

For the purpose of these Interim Guidelines, the provisions of the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), as adopted by the Maritime Safety Committee of the Organization by resolution MSC.5(48), as amended by resolutions MSC.17(58), MSC.30(61), MSC.32(63), MSC.59(67), MSC.103(73), MSC.177(79) and MSC.220(82), apply to the design, construction and operation of NGHP carriers, unless expressly provided otherwise.

#### 3 DEFINITIONS

For the purpose of these Interim Guidelines, unless expressly provided otherwise, the following definitions should apply.

3.1 *Natural gas hydrate pellets (NGHPs)* means artificially formed pellets of "natural gas hydrate". Natural gas hydrate is a crystalline solid which consists of molecules of natural gas (mainly methane) each surrounded by a cage of water molecules.

3.2 *International Gas Carrier Code (IGC Code)* means the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk as adopted by the Maritime Safety Committee of the Organization by resolution MSC.5(48), as amended by resolutions MSC.17(58), MSC.30(61), MSC.32(63), MSC.59(67), MSC.103(73), MSC.177(79) and MSC.220(82).

3.3 *Cargo hold* is a space intended for the stowage of NGHPs.

3.4 *Cargo hold cover space* is a space above cargo holds which may be filled with natural gas.

3.5 *Cargo hold cover* is a structure constituting cargo hold cover space for maintaining gas-tightness.

3.6 *Gas machinery room* is a space containing equipment for natural gas handling.

3.7 *Hatchway cover* is a cover for the opening of a cargo hold, which provides gas-tightness between a cargo hold and a cargo hold cover space, as necessary.

3.8 *MARVS* is the maximum allowable relief valve setting of a cargo hold.

3.9 *Area classification (Zones 0, 1 and 2)* is based on the standard IEC 60079 (Electrical apparatus for explosive gas atmospheres).

#### **4 GENERAL REQUIREMENTS**

##### **4.1 Evaluation of properties of NGHPs**

Prior to shipment, properties of NGHPs should be evaluated through procedures approved by the competent authority. In the evaluation, average dissociation rate during the voyage should be estimated based on data obtained through a test. The composition of gases contained in the NGHPs should be clarified. The possible lowest cargo temperature should be estimated taking into account the planned cargo temperature range at the time of loading and the temperature drop due to dissociation during the voyage.

##### **4.2 Risk assessment**

The design and operation of the NGHP carrier should be evaluated by risk analysis early in the design process. Hazard identification should be carried out based on the design. At a minimum, due consideration should be given to the risks owing to fire and explosion related to cargo holds, cargo handling systems, other systems related to cargo and special features of the NGHP carrier.

##### **4.3 Survey and certificate of integrity of cargo containment systems**

Prior to construction of an NGHP carrier, a programme for the survey of cargo-related systems should be established by the Administration. The programme should determine the detailed procedure for survey including tests during construction and at the time of completion. The structural integrity of NGHP carriers, in particular of cargo-related systems, should be certified by the Administration based on the results of the survey.

##### **4.4 Ship survival capability and location of cargo holds**

4.4.1 The requirements of chapter 2 of the IGC Code, i.e. ship survival capability and location of cargo tanks, should apply to NGHP carriers with the following conditions:

- .1 the NGHP carrier is regarded as "A type 2G/2PG ship"; and
- .2 "cargo tank" reads "cargo hold".

4.4.2 The requirements in chapter 2 of the IGC Code need not apply to cargo hold cover spaces. In other words, a cargo hold cover may be a single-skin construction\*. Cargo hold cover spaces should be located at least 760 mm inboard from the outermost moulded lines of the weather deck.

##### **4.5 Cargo containment system**

4.5.1 NGHPs may be carried in cargo holds of "integral tank" type as defined in paragraph 4.2.1 of the IGC Code provided that the structures of cargo holds are evaluated through analyses taking into account thermal stresses neglecting insulation inside the cargo holds.

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Double skin construction of a cargo hold cover may cause fire/explosion in the intermediate space in the structure and makes it difficult to survey the structure for maintaining integrity.

4.5.2 A secondary barrier is not required for cargo containment systems for NGHPs.

**Note:** The requirements for cargo containment systems of types other than "integral type" may be considered later, as necessary.

#### **4.6 Design loads and supporting structures**

4.6.1 Design loads should be determined based on the methods accepted by the Administration, taking into account the representative loading conditions and reasonably worst ship motion. The provisions in paragraph 4.3 of the IGC Code need not apply to NGHP carriers.

4.6.2 Supporting structures for cargo containment systems should be designed based on the methods accepted by the Administration, taking into account the various loads acting on the structures. The provisions in paragraph 4.6 of the IGC Code need not apply to NGHP carriers.

#### **4.7 Materials for cargo holds and ship's structure**

The materials for cargo holds and ship's structure may be determined based on the recognized standards for ships carrying cargoes with low temperature. The provisions in paragraph 4.9 of the IGC Code need not apply to NGHP carriers.

#### **4.8 Minimum requirements (IGC Code, chapter 19)**

The requirements for "Methane (LNG)" specified in chapter 19 of the IGC Code should apply to NGHP carriers, except that NGHP carriers may be of "A type 2PG ship".

#### **4.9 Requirements for spaces containing cargo handling systems other than cargo holds**

The following requirements should apply to spaces containing mechanical cargo handling systems other than cargo holds.

##### **4.9.1 *Materials***

The materials for the structure of the spaces should be in accordance with recognized standards for the design temperature. The design temperature for the materials should be calculated for the design conditions accepted by the Administration.

##### **4.9.2 *Design pressure***

The design pressure of an enclosed space should be the maximum value of the following:

- .1 MARVS of relevant cargo holds; or
- .2 for an enclosed space which may be segregated from all pressure relief valves, an envisaged maximum pressure at the ambient temperature, at the discretion of the Administration, under the assumption that the total amount of NGHPs on the cargo handling system in the space dissociate and the natural gas is contained in the space.

In this context, the provision of paragraph 5.2.3.3 of the IGC Code, i.e. the requirement of design pressure for process pressure vessels and piping, need not apply to spaces containing cargo handling systems on NGHP carriers.

#### 4.9.3 **Gas-tightness of joints**

Gas-tightness of all joints between gas-tight spaces should be kept to the satisfaction of the Administration.

#### 4.9.4 **Means of closure for openings of gas-tight spaces**

Means of closure should be provided for all openings of the spaces to prevent unexpected ingress or outflow of gases or air. Each means of closure should have remote control function, at the discretion of the Administration, and be capable of being opened and shut at the position of the means of closure.

#### 4.9.5 **Testing**

The pressure test and other non-destructive tests for welded parts should be conducted, as necessary, at the discretion of the Administration.

### 4.10 **Requirements for cargo handling systems**

The following requirements should apply to cargo handling systems.

#### 4.10.1 **Materials**

The materials for cargo handling systems should be in accordance with recognized standards for the design temperature. The design temperature for the materials should be calculated for the design condition accepted by the Administration.

#### 4.10.2 **Securing**

All moving parts of cargo handling systems should be adequately secured to the NGHP carrier during voyage to prevent damage to the ship. Securing devices should be provided in accordance with the established securing plan for the cargo handling systems.

#### 4.10.3 **Emergency shutdown**

4.10.3.1 At least one set of emergency shutdown systems should be provided for the cargo handling systems. Activation of the shutdown systems should be controlled at a continuously manned station during cargo handling. An established shutdown procedure should be followed automatically or by remote control, following activation of the shutdown system. Cargo handling should be stopped automatically in case of activation of the emergency shutdown systems.

4.10.3.2 Appropriate means should be provided to suspend cargo handling. Suspension of cargo handling should be controlled at a continuously manned station during cargo handling.

4.10.3.3 In the case that a cargo hold cover space is filled with natural gas, temperatures of all moving parts of the cargo handling system in the space should be monitored, and the threshold temperature should be determined, based on the ignition temperature of natural gas.

4.10.3.4 Cargo handling should be suspended in the case that one of the following situations takes place:

- .1 ingress of air to a space filled with natural gas is detected;

- .2 pressure of the spaces containing the cargo handling system becomes below atmospheric pressure; or
- .3 monitored temperature of any part of the cargo handling system exceeds the threshold.

In the context of ingress of air, the recommended alarm level is 30% of the Lower Explosive Limit (LEL).

**Note:** The LEL of air in methane is 85%, i.e. the complementary value of the Upper Explosive Limit (UEL) of methane in the air (15%). Thus, 30% of LEL means 25.5% air and the recommended alarm level of oxygen concentration is 5.4%, i.e. 21% of air concentration.

In the context of temperature, the recommended threshold is 450°C, i.e. the ignition temperature criterion "T1" in standard IEC 60079 (Electrical apparatus for explosive gas atmospheres), taking into account that the temperature class of methane is "T1".

#### **4.11 Stability precaution**

If the cargo flows freely like grain\*, the cargo should be carried according to the provisions applicable to the stowage of grain cargoes. The bulk density of the cargo should be taken into account when determining the scantlings and securing arrangements of divisions and bin bulkheads and the stability effect of free cargo surfaces.

### **5 DETAILED APPLICATION OF REQUIREMENTS OF THE IGC CODE**

#### **5.1 General**

5.1.1 Unless expressly provided in these Interim Guidelines, the requirements for "cargo tanks" in the IGC Code should apply to "cargo holds" on NGHP carriers.

5.1.2 Unless expressly provided in these Interim Guidelines, the requirements for "cargo pump-rooms and cargo compressor rooms" in the IGC Code should apply to "gas machinery room".

5.1.3 For the purpose of these Interim Guidelines:

- .1 "Boil-off vapours" and "cargo vapour" should be read as "dissociated gases"; and
- .2 "Boiling point of the cargo" should be read as "the envisaged lowest cargo temperature".

#### **5.2 Requirements in the IGC Code not applicable to NGHP carriers**

The requirements in the IGC Code, listed in table 1 of these Interim Guidelines, need not apply to NGHP carriers. Table 1 does not refer to the requirements not relevant to NGHP carriers, including the following:

- .1 requirements for types 1G and 3G ships; and

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\* The cargo is considered non-cohesive, having an angle of repose less than, or equal to, 30°. Refer to section 5 of the International Maritime Solid Bulk Cargoes (IMSBC) Code.

.2 requirements for cargo holds of types other than "integral tank".

### **5.3 Modification/clarification of the requirements in the IGC Code**

The requirements in the IGC Code, listed in table 2 of these Interim Guidelines, should apply to NGHP carriers with modification/clarification specified in table 2. Table 2 does not refer to the modification of "PREAMBLE".

### **5.4 Additional requirements for NGHP carriers**

In addition to the relevant requirements in the IGC Code other than that specified in paragraph 3 of these Interim Guidelines, and as modified in accordance with paragraph 5 of these Interim Guidelines, the requirements listed in table 3 should apply.

**Note:** Tables 1 to 3 should be reviewed after the revision of the IGC Code.

## **6 SPECIAL DESIGN FEATURE AND REQUIREMENTS**

6.1 The installation of a special enclosed room for electro-hydraulic units<sup>\*</sup>, which should be filled with inert gas, near the "reclaimer unit" (on "trolley") has been considered in order to avoid using a flexible high-pressure oil piping system of extraordinary length, while placement of high-voltage electric power cables in the natural gas atmosphere (Zone 0) is indispensable in that case. In the case that a special enclosed room for electro-hydraulic units is installed, special requirements for high-voltage electric power cables in the natural gas atmosphere (Zone 0) may have to be developed.

6.2 Furthermore, the use of ballast tanks of NGHP carriers for dissociated water after dissociation of NGHPs has been considered<sup>\*\*</sup>. Such water probably contains natural gas and the dissolved gas may be emitted from the water by temperature rise during voyage. In this context, special requirements for prevention of explosion should be developed to permit such use of ballast tanks.

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\* Refer to the Conceptual design of a natural gas hydrate pellet carrier (paragraph 2 in the annex to document BLG 13/12/1).

\*\* Refer to the Conceptual design of a natural gas hydrate pellet carrier (paragraph 5 in the annex to document BLG 13/12/1).



**Table 1 – List of requirements of the IGC Code which need not apply to NGHP carriers**

| <b>IGC Code paragraph number</b> | <b>Note</b>  |
|----------------------------------|--|
| 1.1.2 to 1.1.4.1                 | These application provisions are not applicable to NGHP carriers.  |
| 1.1.6 to 1.1.8                   | These application provisions are not applicable to NGHP carriers.  |
| 1.5.4 to 1.5.6                   | The provisions for certificate is not necessary at this stage for the reason that NGHP carriers will be designed and constructed, based on the agreement of relevant authorities, at first.  |
| 3.1.5.3 and 3.1.5.4              | Cargo handling systems for NGHP carriers will be completely different from cargo handling systems for liquid.  |
| 3.5.3.1.1                        | Provision for "direct access" from the open deck to cargo holds is not applicable to NGHP carriers.  |
| 3.7.2.1                          | This requirement is applicable only to liquid cargoes.   |
| 3.7.4                            | This provision allows the connection of ballast piping to pumps in the machinery spaces. Ballast pumps should be located outside the machinery spaces, similar to on oil tankers, for the reason that ballast tanks are situated adjacent to cargo holds of "integral tank" type on NGHP carriers (see table 3). |
| 4.10.16                          | Inspection for cold spots is not effective for NGHP carriers.  |
| 5.2.3.3                          | Refer to paragraph 3.9 of these Interim Guidelines.  |
| 6.2                              | The requirements for materials in the IGC Code are not suitable for NGHP carriers (see table 3).   |
| 8.2.18                           | The Guidelines for the evaluation of the adequacy of type C tank vent systems (resolution A.829(19)) is not applicable to NGHP carriers.   |
| 8.3                              | "Liquid level control" is not necessary because NGHPs are in solid form.   |
| 13.2 and 13.3                    | The requirements for "level indicators for cargo tanks" and "overflow control" are not applicable to NGHP carriers.  |
| 15                               | The requirements for "filling limits for cargo tanks" are not applicable to NGHP carriers.   |

**Table 2 – Modification/clarification of requirements of the IGC Code for the application to NGHP carriers**

| <b>IGC Code paragraph number</b> | <b>Modification/Clarification</b>  |
|----------------------------------|--|
| 1.1.1                            | <p>The paragraph should read as follows:</p> <p>"The Code applies to ships regardless of their size, including those of less than 500 gross tonnage, engaged in carriage of NGHPs when carried in bulk."</p>   |
| 1.3.6                            | <p>The first sentence of the paragraph should read as follows:</p> <p>""Cargo area" is that part of the ship which contains the cargo containment system and gas machinery room, cargo handling system, cargo hold cover space and includes deck areas over the full length and breadth of the part of the ship over the above-mentioned spaces."</p>  |
| 1.3.9                            | <p>The paragraph should read as follows:</p> <p>""Cargoes" are NGHPs."</p>   |
| 1.3.11                           | <p>The paragraph should read as follows:</p> <p>""Cargo hold" is the gas-tight shell designed to be the primary container of the cargo and includes all such containers whether or not associated with insulation or secondary barriers or both."</p>  |
| 2.6.1.2                          | <p>The following text is added at the end of the paragraph:</p> <p>""Shell plating" means outer hull other than bulkhead deck. Therefore, a cargo hold cover may be a single skin construction and the cargo holds may constitute the weather deck."</p>   |
| 2.7.2                            | <p>The paragraph should read as follows:</p> <p>"Permeability of cargo space should be determined by a competent authority."</p>   |
| 3.1.2                            | <p>The paragraph should read as follows:</p> <p>"Where cargo is carried in a cargo containment system not requiring a secondary barrier, segregation of hold spaces from spaces referred to in paragraph 3.1.1 of the IGC Code or spaces either below or outboard of the hold spaces, other than cargo hold cover space, may be effected by cofferdams, fuel oil tanks or a single gas-tight bulkhead of all-welded construction forming an A-60 class division. A gas-tight A-0 class division is satisfactory if there is no source of ignition or fire hazard in the adjoining spaces (see table 3)."</p>                           |
| 3.1.5.1                          | <p>The paragraph should read as follows:</p> <p>"Any piping system and cargo handling system which may contain cargo or dissociated gas should be segregated from other piping systems, except where interconnections are required for cargo-related operations such as purging, gas-freeing or inerting. Notwithstanding this requirement, fire lines and other piping systems essential for safety need not be segregated from such a cargo handling system. In such cases, precautions should be taken to ensure that cargo or cargo vapour cannot enter such other piping systems through the interconnections (see table 3)."</p> |

| IGC Code paragraph number | Modification/Clarification   |
|---------------------------|--|
| 3.1.5.2                   | <p>The paragraph should read as follows:</p> <p>"Any piping system which may contain cargo or cargo vapour should, except as provided in chapter 16 of the IGC Code, not pass through any accommodation space, service space or control station or through a machinery space other than a gas machinery room."</p>   |
| 3.7.4                     | <p>The paragraph should read as follows:</p> <p>"Any piping in a space adjacent to a cargo hold should not be connected to pumps in a machinery space."</p>  |
| 4.3                       | Refer to paragraph 3.6 of these Interim Guidelines.  |
| 4.6                       | Refer to paragraph 3.6 of these Interim Guidelines.  |
| 4.9                       | Refer to paragraph 3.7 of these Interim Guidelines.  |
| 5                         | Refer to paragraph 3.9 of these Interim Guidelines.  |
| 8.5                       | <p>The paragraph should read as follows:</p> <p>"The capacity of the pressure relief valve for each cargo hold should be determined, to the satisfaction of the Administration, based on the anticipated dissociation rate of NGHPs, taking the following conditions into consideration: (1) dissociation heat of NGHPs; (2) ambient temperature; (3) insulation of the cargo hold."</p> |
| 9.1.2                     | <p>The paragraph should read as follows:</p> <p>"A sufficient number of gas monitoring instruments should be provided for each cargo hold in order to adequately monitor the progress of purging and gas-freeing."</p>   |
| 11.1.2                    | <p>The paragraph should read as follows:</p> <p>"All sources of ignition should be excluded from spaces where flammable vapour may be present except as otherwise provided in chapters 10 and 16 of the IGC Code and in spaces not containing air/oxygen maintaining positive pressure."</p>   |
| 11.2 to 11.4              | Fire safety systems for cargo areas on NGHP carriers should be determined based on the properties of NGHPs and envisaged accident scenarios, taking into account the requirements in these paragraphs of the IGC Code.   |

| IGC Code paragraph number | Modification/Clarification   |
|---------------------------|--|
| 11.5.1                    | <p>The paragraph should read as follows:</p> <p>"The gas machinery room of any ship should be provided with a fixed fire extinguishing system at the discretion of the Administration. A notice should be exhibited at the controls stating that the system is only to be used for fire-extinguishing and not for inerting purposes, due to the electrostatic ignition hazard. The alarms referred to in regulation II-2/5.1.6 of the 1983 SOLAS amendments should be safe for use in a flammable cargo vapour-air mixture. For the purpose of this requirement, an extinguishing system should be provided which would be suitable for machinery spaces. However, in the case that a carbon dioxide system is used, the amount of carbon dioxide gas carried should be sufficient to provide a quantity of free gas equal to 45% of the gross volume of the gas machinery room in all cases."</p> |
| 12.1.2                    | <p>The paragraph should read as follows:</p> <p>"Mechanical ventilation inlets and outlets should be arranged to ensure sufficient air movement through the space to avoid the accumulation of flammable or toxic vapours and to ensure a safe working environment, but in no case should the ventilation systems have total capacity of less than 30 changes of air per hour based upon the total volume of the space. As an exception, gas-safe cargo control rooms may have eight changes of air per hour.</p>  |
| 13.1.1                    | <p>The first sentence of the paragraph should read as follows:</p> <p>"Each cargo hold should be provided with means for indicating the pressure and temperature of the gas."</p>  |
| 13.5.1                    | <p>The paragraph should read as follows:</p> <p>"Each cargo hold should be provided with at least one device for indicating gas temperatures. The temperature-indicating devices should be marked to show the lowest temperature for which the cargo hold has been approved by the Administration."</p>  |
| 13.6.11                   | <p>The first sentence of the paragraph should read as follows:</p> <p>"In the case of flammable products, where cargo containment systems other than independent tanks are used, hold spaces, cargo hold cover space and interbarrier spaces should be provided with a permanently installed gas detection system capable of measuring gas concentration of 0% to 100% by volume."</p>   |
| 16.1.1                    | <p>The paragraph should read as follows:</p> <p>"Methane (NGHP) is the cargo whose dissociated gas may be utilized in machinery spaces of category A and in such spaces may be utilized only in boilers, inert gas generators, combustion engines and gas turbines."</p>   |
| 18.2.1                    | <p>The paragraph should read as follows:</p> <p>"The master should ascertain that the quantity and characteristics of each product to be loaded are within the limits indicated in the Loading and Stability Information booklet (as provided for in paragraph 2.2.5 of the IGC Code)."</p>  |

**Table 3 – Additional requirements for NGHP carriers**

| IGC Code paragraph number | Additional requirement   |
|---------------------------|--|
| 3.1.2<br>(New text)       | Cargo hold cover space and cargo holds should be separated by A-0 class deck and hatchway covers which are resistant to fire and liquids and provide gas-tightness between these spaces, to the satisfaction of the Administration.  |
| 3.1.5.1<br>(New text)     | Any piping system which does not contain cargo or cargo vapour, such as a fire main piping system, should be protected from ingress of natural gas into the piping system to the satisfaction of the Administration.   |
| 3.5.5<br>(New paragraph)  | <p>Any access way having doors should not be fitted on the cargo hold cover space unless all the following arrangements are provided:</p> <ul style="list-style-type: none"> <li>.1 the access way is designed for the dedicated purpose of providing access to inside the cargo hold cover space from the open space on a weather deck and not used for the other purpose;</li> <li>.2 the access way is provided with double-entry doors which are gas-tight, made of steel and self-closing type without holding back arrangements;</li> <li>.3 an interlock system is provided to prevent both doors being opened simultaneously; and</li> <li>.4 an audible and visual alarm system is provided to indicate if more than one door is moved from the closed position and the alarm system gives a warning on both sides and inside the access way.</li> </ul> <p>Note: "Bolted cover" is not an access door.</p> |
| 4.2.7<br>(New text)       | Refer to paragraph 3.1 of these Interim Guidelines.  |
| 4.10.1.1<br>(New text)    | Welded joints of the longitudinal inner side plating and inner bottoms of cargo holds should be of the butt weld, full penetration type. For connections among longitudinal inner side plating and transverse bulkheads near engine-rooms and fore construction, longitudinal inner side plating and upper deck should be the tee welds of the full penetration type.  |
| 4.10.6<br>(New text)      | Gas-tightness of the cargo hold cover and at the hatchway covers should be tested to the satisfaction of the Administration.   |
| 6.2<br>(New text)         | All materials of construction should be approved by the Administration.  |
| 6.3.6.1<br>(New text)     | For all cargo holds, production weld tests should generally be performed for approximately each 50 m of butt weld joints and should be representative of each welding position. Tests, other than those specified in paragraph 6.3.6.4 of the IGC Code, may be required for cargo holds at the discretion of the Administration.   |
| 6.3.7.1<br>(New text)     | Full penetration butt welds of the inner plating of cargo holds should be subjected to radiographic inspection at the discretion of the Administration.  |
| 8.2.1<br>(New text)       | A cargo hold cover space should be provided with pressure relief devices complying with recognized standards.  |

| IGC Code paragraph number  | Additional requirement   |
|----------------------------|--|
| 9.2.1<br>(New text)        | A shipboard inert gas generation system or shipboard inert gas storage which should be sufficient for normal consumption for at least 30 days should be installed to inert cargo holds and cargo hold cover space.   |
| 12.1.2<br>(New text)       | A gas machinery room situated below the weather deck should be provided with at least two sets of ventilation systems having separated power source.   |
| 13.5.3<br>(New text)       | If a cargo hold is provided with a cooling system, the cargo hold boundaries should be fitted with a sufficient number of thermometers to establish that an unsatisfactory temperature gradient does not occur.  |
| 13.6.15<br>(New paragraph) | Notwithstanding the requirements in section 13.6 of the IGC Code, a fixed gas monitoring system of other type, e.g., a system based on remote sensing technology, may be installed in lieu of the fixed gas monitoring equipment required by this section, at the discretion of the Administration, provided that the reliability and effectiveness of the system is not inferior to those of the equipment required by this section.  |
| 13.7<br>(New paragraph)    | <p><b>Detection of oxygen</b></p> <p>13.7.1 Where a mechanical cargo handling system is installed in a cargo hold cover space, oxygen detection equipment acceptable to the Administration should be provided for continuous monitoring of oxygen level.</p> <p>13.7.2 Audible and visual alarms from the oxygen detection equipment, if required by this section, should be located on the navigating bridge, in the control position required by paragraph 13.1.3 of the IGC Code, and at the gas detector readout location.</p> <p>13.7.3 Oxygen detection equipment may be located in the control position required by paragraph 13.1.3 of the IGC Code, on the navigating bridge or at other suitable locations.</p> <p>13.7.4 Oxygen detection equipment should be so designed that it may readily be tested. Testing and calibration should be carried out at regular intervals. Suitable equipment and span gas for this purpose should be carried on board. Where practicable, permanent connections for such equipment should be fitted.</p> <p>13.7.5 A permanently installed system of oxygen detection should be provided for cargo holds and vicinity of doors on cargo hold cover.</p> <p>13.7.6 For the spaces listed in paragraph 13.7.5 of the IGC Code, audible and visual alarms should be activated in the control positions at the threshold concentration determined by the Administration.</p> |
| 18.4.3.1<br>(New text)     | Where insulation is provided inside a cargo hold, special fire precautions should be taken in the event of hot work carried out in the vicinity of the cargo hold. For this purpose, gas absorbing and de-absorbing characteristics of the insulation material should be taken into account.   |