



INTERNATIONAL  
MARITIME  
ORGANIZATION

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MARITIME SAFETY COMMITTEE  
111th session  
Agenda item 22

MSC 111/22/Add.1  
6 July 2026  
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**REPORT OF THE MARITIME SAFETY COMMITTEE  
ON ITS 111TH SESSION**

Attached are annexes 1 to 17 to the report of the Maritime Safety Committee on its 111th session (MSC 111/22).

**(See documents MSC 111/22/Add.2 for annexes 18 to 31,  
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**ANNEX 1**

**OUTCOME OF THE ROLL-CALL VOTE ON THE ADOPTION  
OF RESOLUTION MSC.582(111)**

| <b>No.</b> | <b>MEMBER STATE</b>                      | <b>YES</b> | <b>NO</b> | <b>ABSTAIN</b> | <b>NOT<br/>PRESENT</b> |
|------------|------------------------------------------|------------|-----------|----------------|------------------------|
| 1.         | ALBANIA                                  |            |           |                | X                      |
| 2.         | ALGERIA                                  |            |           | X              |                        |
| 3.         | ANTIGUA AND BARBUDA                      |            |           | X              |                        |
| 4.         | ARGENTINA                                | X          |           |                |                        |
| 5.         | AUSTRALIA                                | X          |           |                |                        |
| 6.         | BAHAMAS                                  |            |           | X              |                        |
| 7.         | BAHRAIN                                  | X          |           |                |                        |
| 8.         | BANGLADESH                               |            |           |                | X                      |
| 9.         | BARBADOS                                 |            |           | X              |                        |
| 10.        | BELGIUM                                  | X          |           |                |                        |
| 11.        | BELIZE                                   |            |           | X              |                        |
| 12.        | BRAZIL                                   |            |           | X              |                        |
| 13.        | BULGARIA                                 | X          |           |                |                        |
| 14.        | CANADA                                   | X          |           |                |                        |
| 15.        | CHILE                                    | X          |           |                |                        |
| 16.        | CHINA                                    |            |           | X              |                        |
| 17.        | COLOMBIA                                 |            |           | X              |                        |
| 18.        | COOK ISLANDS                             | X          |           |                |                        |
| 19.        | CÔTE D'IVOIRE                            |            |           | X              |                        |
| 20.        | CROATIA                                  | X          |           |                |                        |
| 21.        | CUBA                                     |            |           |                | X                      |
| 22.        | CYPRUS                                   | X          |           |                |                        |
| 23.        | CZECHIA                                  | X          |           |                |                        |
| 24.        | DEMOCRATIC PEOPLE'S REPUBLIC<br>OF KOREA |            |           |                | X                      |
| 25.        | DEMOCRATIC REPUBLIC OF THE<br>CONGO      |            |           | X              |                        |
| 26.        | DENMARK                                  | X          |           |                |                        |
| 27.        | DOMINICA                                 |            |           |                | X                      |
| 28.        | ECUADOR                                  |            |           | X              |                        |
| 29.        | EGYPT                                    | X          |           |                |                        |
| 30.        | EL SALVADOR                              |            |           |                | X                      |

| No. | MEMBER STATE               | YES | NO | ABSTAIN | NOT PRESENT |
|-----|----------------------------|-----|----|---------|-------------|
| 31. | ESTONIA                    | X   |    |         |             |
| 32. | FIJI                       |     |    |         | X           |
| 33. | FINLAND                    | X   |    |         |             |
| 34. | FRANCE                     | X   |    |         |             |
| 35. | GABON                      |     |    | X       |             |
| 36. | GEORGIA                    |     |    | X       |             |
| 37. | GERMANY                    | X   |    |         |             |
| 38. | GHANA                      |     |    | X       |             |
| 39. | GREECE                     | X   |    |         |             |
| 40. | GUATEMALA                  | X   |    |         |             |
| 41. | HAITI                      |     |    | X       |             |
| 42. | HONDURAS                   | X   |    |         |             |
| 43. | ICELAND                    | X   |    |         |             |
| 44. | INDIA                      | X   |    |         |             |
| 45. | INDONESIA                  |     |    | X       |             |
| 46. | IRAN (ISLAMIC REPUBLIC OF) |     | X  |         |             |
| 47. | IRAQ                       |     |    | X       |             |
| 48. | IRELAND                    | X   |    |         |             |
| 49. | ISRAEL                     | X   |    |         |             |
| 50. | ITALY                      | X   |    |         |             |
| 51. | JAMAICA                    |     |    | X       |             |
| 52. | JAPAN                      | X   |    |         |             |
| 53. | JORDAN                     |     |    |         | X           |
| 54. | KENYA                      |     |    | X       |             |
| 55. | KUWAIT                     | X   |    |         |             |
| 56. | LATVIA                     | X   |    |         |             |
| 57. | LEBANON                    |     |    |         | X           |
| 58. | LIBERIA                    |     |    | X       |             |
| 59. | LIBYA                      | X   |    |         |             |
| 60. | LITHUANIA                  | X   |    |         |             |
| 61. | LUXEMBOURG                 | X   |    |         |             |
| 62. | MADAGASCAR                 |     |    |         | X           |
| 63. | MALAWI                     |     |    |         | X           |
| 64. | MALAYSIA                   |     |    | X       |             |
| 65. | MALDIVES                   |     |    |         | X           |

| No. | MEMBER STATE                     | YES | NO | ABSTAIN | NOT PRESENT |
|-----|----------------------------------|-----|----|---------|-------------|
| 66. | MALTA                            | X   |    |         |             |
| 67. | MARSHALL ISLANDS                 | X   |    |         |             |
| 68. | MAURITANIA                       |     |    |         | X           |
| 69. | MAURITIUS                        |     |    |         | X           |
| 70. | MEXICO                           |     |    | X       |             |
| 71. | MONTENEGRO                       |     |    |         | X           |
| 72. | MOROCCO                          | X   |    |         |             |
| 73. | MOZAMBIQUE                       |     |    |         | X           |
| 74. | NAMIBIA                          |     |    | X       |             |
| 75. | NETHERLANDS (KINGDOM OF THE)     | X   |    |         |             |
| 76. | NEW ZEALAND                      | X   |    |         |             |
| 77. | NIGERIA                          |     |    | X       |             |
| 78. | NORWAY                           | X   |    |         |             |
| 79. | OMAN                             |     |    | X       |             |
| 80. | PALAU                            | X   |    |         |             |
| 81. | PANAMA                           | X   |    |         |             |
| 82. | PAPUA NEW GUINEA                 |     |    |         | X           |
| 83. | PARAGUAY                         | X   |    |         |             |
| 84. | PERU                             |     |    | X       |             |
| 85. | PHILIPPINES                      |     |    | X       |             |
| 86. | POLAND                           | X   |    |         |             |
| 87. | PORTUGAL                         | X   |    |         |             |
| 88. | QATAR                            | X   |    |         |             |
| 89. | REPUBLIC OF KOREA                | X   |    |         |             |
| 90. | REPUBLIC OF MOLDOVA              | X   |    |         |             |
| 91. | RUSSIAN FEDERATION               |     | X  |         |             |
| 92. | SAINT KITTS AND NEVIS            |     |    |         | X           |
| 93. | SAINT VINCENT AND THE GRENADINES |     |    | X       |             |
| 94. | SAMOA                            | X   |    |         |             |
| 95. | SAN MARINO                       |     |    |         | X           |
| 96. | SAUDI ARABIA                     | X   |    |         |             |
| 97. | SERBIA                           | X   |    |         |             |
| 98. | SIERRA LEONE                     |     |    |         | X           |
| 99. | SINGAPORE                        | X   |    |         |             |

| No.          | MEMBER STATE                                            | YES       | NO       | ABSTAIN   | NOT PRESENT |
|--------------|---------------------------------------------------------|-----------|----------|-----------|-------------|
| 100.         | SLOVAKIA                                                | X         |          |           |             |
| 101.         | SLOVENIA                                                | X         |          |           |             |
| 102.         | SOMALIA                                                 |           |          |           | X           |
| 103.         | SOUTH AFRICA                                            |           |          | X         |             |
| 104.         | SPAIN                                                   | X         |          |           |             |
| 105.         | SRI LANKA                                               |           |          |           | X           |
| 106.         | SWEDEN                                                  | X         |          |           |             |
| 107.         | SWITZERLAND                                             |           |          | X         |             |
| 108.         | THAILAND                                                |           |          | X         |             |
| 109.         | TOGO                                                    |           |          |           | X           |
| 110.         | TONGA                                                   | X         |          |           |             |
| 111.         | TUNISIA                                                 |           |          |           | X           |
| 112.         | TÜRKİYE                                                 |           |          |           | X           |
| 113.         | TUVALU                                                  |           |          |           | X           |
| 114.         | UKRAINE                                                 | X         |          |           |             |
| 115.         | UNITED ARAB EMIRATES                                    | X         |          |           |             |
| 116.         | UNITED KINGDOM OF GREAT<br>BRITAIN AND NORTHERN IRELAND | X         |          |           |             |
| 117.         | UNITED REPUBLIC OF TANZANIA                             |           |          | X         |             |
| 118.         | UNITED STATES OF AMERICA                                | X         |          |           |             |
| 119.         | URUGUAY                                                 |           |          |           | X           |
| 120.         | VENEZUELA (BOLIVARIAN REPUBLIC<br>OF)                   |           |          | X         |             |
| 121.         | YEMEN                                                   | X         |          |           |             |
| <b>TOTAL</b> |                                                         | <b>59</b> | <b>2</b> | <b>33</b> | <b>27</b>   |

**Only YES and NO votes are counted: 61**  
**Simple majority = 31**

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**ANNEX 2****RESOLUTION MSC.582(111)  
(adopted on 21 May 2026)****ACTIONS TO ENSURE THE SAFETY AND SECURITY OF NAVIGATION AND OF  
SEAFARERS IN THE ARABIAN SEA, SEA OF OMAN AND THE GULF REGION,  
PARTICULARLY IN AND AROUND THE STRAIT OF HORMUZ, RESULTING  
FROM THE UNLAWFUL ACTIVITIES OF THE ISLAMIC REPUBLIC OF IRAN**

THE MARITIME SAFETY COMMITTEE,

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

RECALLING ALSO that the purpose of the International Maritime Organization (IMO) as set forth in Article 1 of the IMO Convention and the mission in the Strategic Plan of IMO is to promote safe, secure, environmentally sound, efficient and sustainable shipping through cooperation,

NOTING that the Council, at its thirty-sixth extraordinary session, relating to the impact on shipping and seafarers of the situation in the Arabian Sea, the Sea of Oman and the Gulf Region, particularly in and around the Strait of Hormuz:

- .1 recalled that United Nations Security Council resolution 2817 (2026), inter alia, condemned in the strongest terms the egregious attacks by the Islamic Republic of Iran against the territories of the Member States of the Gulf Cooperation Council and Jordan, determining that such acts constitute a breach of international law, and further condemned any actions or threats by the Islamic Republic of Iran aimed at closing, obstructing, or otherwise interfering with international navigation through the Strait of Hormuz, or threatening maritime security in the Bab al Mandab, and affirmed that any attempt to impede lawful transit passage or freedom of navigation in these waterways constitutes a serious threat to international peace and security;
- .2 further recalled United Nations Security Council resolution 552 (1984), which took into consideration the importance of the Gulf region to international peace and security and its vital role in the stability of the world economy;
- .3 recalled the statements of the IMO Secretary-General of 1 March 2026 and 6 March 2026, which expressed his deep concern about reports of fatalities and injuries to seafarers stemming from attacks in the Strait of Hormuz and underlined that all parties must ensure the protection of seafarers and the freedom of navigation;
- .4 strongly condemned the threats and attacks against vessels and the purported closure of the Strait of Hormuz by the Islamic Republic of Iran, adversely affecting merchant and commercial vessels and threatening the safety and welfare of seafarers, which is contrary to the purposes of IMO as set forth in Article 1 of the Convention, and represents a grave danger to life and serious risk to the safety of navigation and the marine environment;

- .5 demanded that the Islamic Republic of Iran immediately refrain, in accordance with international law, from any actions or threats aimed at closing, obstructing or otherwise interfering with international navigation through the Strait of Hormuz or against merchant or commercial vessels in and around the Strait of Hormuz, to ensure the safety and welfare of seafarers and the security of international shipping and the marine environment, and to respect its obligations under international law;
- .6 urged that all attacks on ships affecting innocent civilian seafarers be halted immediately;
- .7 underscored the paramount importance of preserving the safety and welfare of seafarers and of preserving the security of international shipping and the maritime community, as well as energy and humanitarian supply chains, while emphasizing the need to preserve the marine environment and marine biodiversity;
- .8 called upon Member States to take measures to secure the adequate provision of water, food, fuel and other essential supplies to ships currently unable to leave the region, and encouraged States to facilitate, when required, crew change and crew renewal operations in accordance with international standards, in order to safeguard the health, safety and well-being of the seafarers affected by this situation, further ensuring that their communication with their families and friends can be maintained and that stores and provisions remain adequate for their needs; and
- .9 encouraged the establishment, as a provisional and urgent measure, of a framework such as a safe maritime corridor to facilitate the safe evacuation of merchant ships from the high-risk and affected areas to a safe place, with particular attention to those currently confined within the Gulf region through peaceful means and on a voluntary basis.

NOTING the outcomes of the fiftieth session of the Facilitation Committee (FAL 50), the 113th session of the Legal Committee (LEG 113) and the eighty-fourth session of the Marine Environment Protection Committee (MEPC 84),

RECALLING that the Islamic Republic of Iran's egregious attacks have resulted thus far in the deaths of at least 11 seafarers with a number of seafarers and shipyard workers injured and more than 1,500 vessels and around 20,000 associated seafarers stranded, that 38 merchant ships of various nationalities have been attacked, and that those attacks present a major and grave concern as the merchant shipping community continues to come under attack,

DEEPLY CONCERNED by the direct threat the Islamic Republic of Iran's egregious attacks pose to the navigational rights and freedoms in one of the world's most critical international waterways, and by the impact of these attacks, causing major disruptions to regional and global trade, and impeding the movement of critical food, fuel, humanitarian assistance, and other essential goods throughout the world,

GRAVELY CONCERNED ALSO by the impact of the Islamic Republic of Iran's attacks on maritime security, the safety and welfare of seafarers, including their mental health and that of their families, as well as the significant number of merchant and commercial vessels that remain stranded in the region and the impact on global energy and trade,

RECOGNIZING the devastating impact of the Islamic Republic of Iran's attacks against merchant shipping and seafarers in the Arabian Sea, Sea of Oman and the Gulf Region, particularly in and around the Strait of Hormuz, and the concerns created on the validity and renewal of the relevant certificates of seafarers on board vessels that are unable to leave the region,

BEARING IN MIND the severe impact of the Islamic Republic of Iran's unlawful activities on the safety and security of navigation and the integrity of global supply chains,

1 DEMANDS that the Islamic Republic of Iran immediately and unconditionally cease its attacks on territories of the Member States of the Gulf Cooperation Council and Jordan, which include their territorial seas, as well as attacks in and around the Strait of Hormuz, to remove any sea mines that it may have laid in and around the Strait of Hormuz, and to refrain from any actions or threats aimed at closing, obstructing or otherwise interfering with international navigation in the region, and to abide by its obligations under international law, in particular to ensure unhampered transit passage of vessels in the Strait of Hormuz;

2 EXPRESSES condolences to the families of all seafarers who have lost their lives since the attacks began;

3 EXPRESSES grave concern at the Islamic Republic of Iran's use of unmanned aerial systems (UAS), missiles and sea mines in and around the Strait of Hormuz, which poses a serious threat to the safety of navigation and to seafarers;

4 REQUESTS Member States to support the efforts of the Secretary-General to facilitate the safe evacuation of merchant ships from the high-risk and affected areas to a safe place, with particular attention to those currently confined within the Gulf, using the internationally recognized Traffic Separation Scheme, provided it is safe to do so;

5 STRESSES the critical importance of maintaining the rights and freedom of navigation of commercial ships in the Arabian Sea and the Sea of Oman, and the right of transit passage in the Strait of Hormuz;

6 ENCOURAGES Member States to contribute to ensuring that the safe navigation of commercial and merchant vessels in and around the Strait of Hormuz is respected, in accordance with international law;

7 ENCOURAGES coordination among flag States, shipowners and operators to continue to use the internationally recognized Traffic Separation Scheme (TSS), once safety guarantees are in place;

8 URGES Member States to take measures to secure the adequate provision of water, food, fuel and other essential supplies to ships currently unable to leave the region;

9 ENCOURAGES States to facilitate, when required, crew change and crew renewal operations in accordance with international standards, in order to safeguard the health, safety and well-being of the seafarers affected by this situation;

10 URGES all flag States, NGOs, industry bodies and the State of nationality of seafarers to offer any assistance, including through remote support, helplines and keeping families informed;

11        URGES Member States to raise concerns, at the United Nations Security Council, United Nations General Assembly and other United Nations specialized agencies, regarding the impact of the Islamic Republic of Iran's attacks against the territories, including the territorial seas, of the Member States of the Gulf Cooperation Council and Jordan, as well as its threats and attacks against vessels and attempt to close the Strait of Hormuz, on seafarers, port workers, global supply chains, energy and food security, and the safety and security of navigation and cargo, and to request those bodies to take steps to help bring an end to Iran's unlawful activities and to alleviate their harmful effects, to address the threat posed by UAS, missiles, projectiles, drone boats and sea mines to commercial and merchant vessels in and around the Strait of Hormuz, as well as to ensure that the freedom of navigation exercised by merchant and commercial vessels, integral to the safety and security of seafarers in the region, is protected;

12        ENCOURAGES Member States to provide relevant information to IMO as appropriate;

13        ACKNOWLEDGES and appreciates the IMO Secretary-General's commitment to this matter and supports his and IMO's continued efforts to contribute to enhancing the safety of seafarers and transit of vessels of all States through the Arabian Sea, the Sea of Oman and the Gulf Region, particularly in and around the Strait of Hormuz;

14        REQUESTS the Secretary-General to closely monitor the situation, provide regular updates on the impact of the Islamic Republic of Iran's attacks on international shipping, the well-being of seafarers and port workers, and the security of cargo and to inform Member States and IMO relevant organs; and

15        DETERMINES to keep this matter under review and take such further action as may be necessary in light of developments.

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**ANNEX 3**

**RESOLUTION MSC.583(111)  
(adopted on 21 May 2026)**

**AMENDMENTS TO CHAPTERS IV AND V, AND THE APPENDIX OF  
THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974**

THE MARITIME SAFETY COMMITTEE,

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

RECALLING ALSO article VIII(b) of the International Convention for the Safety of Life at Sea, 1974 ("the Convention"), concerning the amendment procedure applicable to the annex to the Convention, other than to the provisions of chapter I,

HAVING CONSIDERED, at its 111th session, amendments to the Convention proposed and circulated in accordance with article VIII(b)(i) of the Convention,

1 ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the Convention, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the said amendments shall be deemed to have been accepted on 1 July 2027, unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet have notified the Secretary-General of their objections to the amendments;

3 INVITES Contracting Governments to the Convention to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2028 upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, for the purposes of article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Contracting Governments to the Convention;

5 ALSO REQUESTS the Secretary-General to transmit copies of this resolution and its annex to Members of the Organization which are not Contracting Governments to the Convention.

ANNEX

**AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE  
SAFETY OF LIFE AT SEA, 1974**

**CHAPTER IV  
RADIOCOMMUNICATIONS**

**Part B  
Undertakings by Contracting Governments**

**Regulation 5**

*Provision of radiocommunication services*

- 1 The following new paragraph is added after the existing paragraph 2:

"3 Each Contracting Government undertakes to use all operational recognized mobile satellite services in their area of responsibility when disseminating maritime safety information and search and rescue related information via the Enhanced Group Call service."

**CHAPTER V  
SAFETY OF NAVIGATION**

**Regulation 4**

*Navigational warnings*

- 2 Regulation 4 is replaced by the following:

"Each Contracting Government shall take all steps necessary to ensure that, when intelligence of any danger is received from whatever reliable source, it shall be promptly brought to the knowledge of those concerned and communicated to other interested Governments, with due regard to regulation IV/5.3.\*"

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\* Refer to the *Guidance on the IMO/IHO World-Wide Navigational Warning Service* (resolution A.706(17), as amended)."

**Regulation 5**

*Meteorological services and warnings*

- 3 The chapeau of paragraph 2 is replaced by the following:

"2 In particular, Contracting Governments undertake to carry out, in co-operation, the following meteorological arrangements, with due regard to regulation IV/5.3:"

**Regulation 18**

*Approval, surveys and performance standards of navigational systems and equipment and voyage data recorder*

- 4 In the footnote to paragraph 2, the following new entry is added:

"Performance standards for shipborne VHF data exchange system (VDES) (resolution MSC.593(111));"

- 5 Paragraph 9 is replaced by the following:

"9 The automatic identification system (AIS) or VHF data exchange system (VDES) shall be subjected to an annual test. The test shall be conducted by an approved surveyor or an approved testing or servicing facility. The test shall verify the correct programming of the ship static information, correct data exchange with connected sensors as well as verifying the radio performance by radio frequency measurement and on-air test using, e.g. a Vessel Traffic Service (VTS). A copy of the test report shall be retained on board the ship."

## **Regulation 19**

*Carriage requirements for shipborne navigational systems and equipment*

### **1 Application and requirements**

- 6 Paragraph 1.2.3 is replaced by the following:

"1.2 Ships constructed before 1 July 2002 shall:

.3 be fitted with the system as required in paragraph 2.4; and"

### **2 Shipborne navigational equipment and systems**

- 7 Paragraph 2.4 is replaced by the following:

"2.4 All ships of 300 gross tonnage and upwards engaged on international voyages and cargo ships of 500 gross tonnage and upwards not engaged on international voyages and passenger ships irrespective of size shall be fitted with an automatic identification system (AIS) or VHF data exchange system (VDES), as follows:

.1 AIS or VDES shall:

.1 provide automatically to appropriately equipped shore stations, other ships and aircraft information, including the ship's identity, type, position, course, speed, navigational status and other safety-related information;

.2 receive automatically such information from similarly fitted ships;

.3 monitor and track ships; and

.4 exchange data with shore-based facilities;

.2 the requirements of paragraph 2.4.1 shall not be applied to cases where international agreements, rules or standards provide for the protection of navigational information; and

.3 AIS or VDES shall be operated taking into account the guidelines adopted by the Organization.\* Ships fitted with AIS or VDES shall maintain AIS or VDES in operation at all times except where international agreements, rules or standards provide for the protection of navigational information.

\* Refer to the *Revised guidelines for the onboard operational use of shipborne Automatic Identification Systems (AIS)* (resolution A.1106(29)) and *Guidelines for the onboard operational use of shipborne VHF data exchange system (VDES)* (MSC.1/Circ.1699)."

## **Regulation 19-1**

### *Long-range identification and tracking of ships*

8 Paragraph 4.2 is replaced by the following:

"4.2 Ships, irrespective of the date of construction, fitted with an automatic identification system (AIS) or VHF data exchange system (VDES), as defined in regulation 19.2.4, and operated exclusively within sea area A1, as defined in regulation IV/2.1.15, shall not be required to comply with the provisions of this regulation."

## **APPENDIX**

### **CERTIFICATES**

#### **Record of equipment for passenger ship safety (Form P)**

9 In the table for "Details of navigational systems and equipment", item 4.1 is replaced by the following:

"4.1 Automatic identification system (AIS) or VHF data exchange system (VDES)"

#### **Record of equipment for cargo ship safety (Form E)**

10 In the table for "Details of navigational systems and equipment", item 4.1 is replaced by the following:

"4.1 Automatic identification system (AIS) or VHF data exchange system (VDES)"

#### **Record of equipment for cargo ship safety (Form C)**

11 In the table for "Details of navigational systems and equipment", item 4.1 is replaced by the following:

"4.1 Automatic identification system (AIS) or VHF data exchange system (VDES)"

\*\*\*



**ANNEX 4**

**RESOLUTION MSC.584(111)  
(adopted on 21 May 2026)**

**AMENDMENTS TO THE INTERNATIONAL CODE ON THE ENHANCED PROGRAMME  
OF INSPECTIONS DURING SURVEYS OF BULK CARRIERS AND OIL TANKERS, 2011  
(2011 ESP CODE)**

THE MARITIME SAFETY COMMITTEE,

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

NOTING resolution A.1049(27), by which the Assembly adopted the International Code on the Enhanced Programme of Inspections during Surveys of Bulk Carriers and Oil Tankers, 2011 ("the 2011 ESP Code"), which has become mandatory under chapter XI-1 of the International Convention for the Safety of Life at Sea, 1974 ("the Convention"),

NOTING ALSO article VIII(b) and regulation XI-1/2 of the Convention concerning the procedure for amending the 2011 ESP Code,

HAVING CONSIDERED, at its 111th session, amendments to the 2011 ESP Code, proposed and circulated in accordance with article VIII(b)(i) of the Convention,

1 ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the 2011 ESP Code, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the said amendments shall be deemed to have been accepted on 1 July 2027, unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet have notified the Secretary-General of their objections to the amendments;

3 INVITES Contracting Governments to the Convention to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2028 upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, for the purposes of article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Contracting Governments to the Convention;

5 ALSO REQUESTS the Secretary-General to transmit copies of this resolution and its annex to Members of the Organization which are not Contracting Governments to the Convention.

## ANNEX

### AMENDMENTS TO THE INTERNATIONAL CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF BULK CARRIERS AND OIL TANKERS, 2011 (2011 ESP CODE)

#### Contents

1 Under "ANNEX A", "Part A", existing "Annex 5" is renumbered as "Annex 5A" and the following new item is added after renumbered "Annex 5A":

"Annex 5B Procedures for certification of a firm engaged in close-up survey of hull structures using a Remote Inspection Technique (RIT)"

2 Under "ANNEX A", "Part B", existing "Annex 5" is renumbered as "Annex 5A" and the following new item is added after renumbered "Annex 5A":

"Annex 5B Procedures for certification of a firm engaged in close-up survey of hull structures using a Remote Inspection Technique (RIT)"

3 Under "ANNEX B", "Part A", existing "Annex 8" is renumbered as "Annex 8A" and the following new item is added after renumbered "Annex 8A":

"Annex 8B Procedures for certification of a firm engaged in close-up survey of hull structures using a Remote Inspection Technique (RIT)"

4 Under "ANNEX B", "Part B", existing "Annex 7" is renumbered as "Annex 7A" and the following new item is added after renumbered "Annex 7A":

"Annex 7B Procedures for certification of a firm engaged in close-up survey of hull structures using a Remote Inspection Technique (RIT)"

## ANNEX A

### CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING THE SURVEYS OF BULK CARRIERS

#### PART A

#### CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF BULK CARRIERS HAVING SINGLE-SIDE SKIN CONSTRUCTION

##### 1 General

##### 1.2 Definitions

5 Paragraph 1.2.21 is replaced by the following:

"1.2.21 *Administration* means the Administration or organization recognized by the Administration, unless defined otherwise in this Code."

6 The following new paragraph 1.2.22 is added after paragraph 1.2.21, together with the associated footnote:

"1.2.22 *Remote Inspection Technique (RIT)* is a means of survey of any parts of the structure without the need for direct physical access of the surveyor.\*

\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700)."

## **1.5 Thickness measurements and close-up surveys**

7 Section 1.5 is replaced by the following:

### **"1.5 Thickness measurements and close-up surveys**

1.5.1 In any kind of survey, i.e. renewal, intermediate, annual or other surveys having the scope of the foregoing ones, for structures in areas where close-up surveys are required, thickness measurements, when required by annex 2, shall be carried out simultaneously with close-up surveys.

1.5.2 For periodic surveys after the third renewal survey, the use of a RIT is subject to the agreement of the Administration, which may impose additional requirements or limitations; in this case the Administration means the Government of the State whose flag the ship is entitled to fly and not the recognized organization."

8 The following new section 1.6 is added after existing section 1.5, together with the associated footnote:

### **"1.6 Remote inspection techniques**

1.6.1 RIT surveys shall be carried out in accordance with the requirements given herein and taking into account the guidelines developed by the Organization.\*

1.6.2 Where a RIT for a close-up survey is not carried out by the Administration, it shall be conducted by a firm approved as a service supplier by the Administration according to the principles stated in annex 5B of part A of annex A and shall be carried out under the presence of the surveyor and their continuous direction and control of the RIT process.

1.6.3 If the RIT reveals damage or deterioration that the surveyor judges requires attention or further investigation, the surveyor shall require a traditional survey to be undertaken without the use of a RIT.

1.6.4 Random confirmatory surveys or close-up surveys shall be carried out at locations selected by the surveyor for the purpose of verifying the results of the RIT.

\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700)."

## **2 Renewal survey**

### **2.5 *Extent of overall and close-up surveys***

9 The following new paragraph 2.5.5 is added after existing paragraph 2.5.4:

"2.5.5 When using a RIT to assist the close-up survey, the following applies:

- .1 the surveyor may use a RIT to assist the close-up survey when there are no permanent means of access provided;
- .2 the use of a RIT to assist the close-up survey shall not be permitted after the third renewal survey, unless agreed with the Administration (see 1.5.2);
- .3 the RIT shall not be used in ballast tanks or any spaces where a hard protective coating is required and it is found to be in less than GOOD condition as defined in 1.2.11, or ballast tanks where a soft or semi-hard coating has been applied, or ballast tanks where a hard protective coating has not been applied from the time of construction;
- .4 the RIT shall not be used to assist the surveyor during the close-up survey in areas which have a recorded significant history of structural failures (corrosion, cracks and buckling). See guidelines in annex 9, paragraph 3.1.1; and
- .5 in addition to the requirements of 1.5.1, when the RIT reveals suspected areas that require thickness measurements, these shall be carried out simultaneously with the close-up survey. Details of how this will be facilitated shall be included in the survey programme."

## **5 Preparations for survey**

### **5.1 *Survey programme***

10 The following new paragraph 5.1.6 is added after existing paragraph 5.1.5:

"5.1.6 If it is proposed to use a RIT, the proposal shall be submitted before the survey as part of the survey programme detailed above, discussed and approved by the Administration. The following shall be taken into account when preparing the survey programme:

- .1 the RIT limitations, if any, shall be detailed in the survey programme;
- .2 details of the areas not fully accessed by the permanent means of access and proposed to be covered by a RIT shall be detailed in the survey programme;
- .3 the use of a RIT to assist the close-up survey shall not be permitted after the third renewal survey, unless agreed with the Administration (see 1.5.2);

- .4 the RIT shall not be used in ballast tanks or any spaces where a hard protective coating is required and it is found to be in less than GOOD condition as defined in 1.2.11, or ballast tanks where a soft or semi-hard coating has been applied, or ballast tanks where a hard protective coating has not been applied from the time of construction;
- .5 the RIT shall not be used to assist the surveyor during the close-up in areas which have a recorded significant history of structural failures, defects, damage or deterioration (corrosion, cracks and buckling). See guidelines in annex 9, paragraph 3.1.1; and
- .6 in addition to the requirements of 1.5.1, when the RIT reveals suspected areas that require thickness measurements, these shall be carried out simultaneously with the close-up survey, details of how this will be facilitated shall be included in the survey programme."

## **5.2 Conditions for survey**

11 Paragraph 5.2.6 is replaced by the following:

"5.2.6 In preparation for survey (including for surveys making use of a RIT) and thickness measurements and to allow for a thorough examination, all spaces shall be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces shall be sufficiently clean and free from water, scale, dirt, oil residues, etc., to reveal corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating. However, those areas of structure whose renewal has already been decided by the owner need only be cleaned and descaled to the extent necessary to determine the limits of the areas to be renewed."

## **5.4 Equipment for survey**

12 The following new paragraph 5.4.6 is added after existing paragraph 5.4.5, together with the associated footnote:

"5.4.6 The surveyor shall be satisfied with the method of data presentation including pictorial representation, and a good two-way communication between the surveyor and RIT operator shall be provided. Prior to every survey onboard, the RIT shall be validated, taking into account the guidelines developed by the Organization\* and the existing conditions (light, humidity, dust, etc.), to confirm that the expected results can be achieved.

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700)."

## **5.7 Survey planning meeting**

13 Paragraph 5.7.2 is replaced by the following:

"5.7.2 Prior to commencement of any part of the renewal or intermediate survey, a survey planning meeting shall be held between the attending surveyor(s), the owner's representative in attendance, the thickness measurement firm representative, the RIT firm representative, where involved, and the master of the ship or an appropriately

qualified representative appointed by the master or company; for the purpose to ascertain that all the arrangements envisaged in the survey programme are in place, so as to ensure the safe and efficient conduct of the survey work to be carried out (see also 7.1.2)."

14 Paragraph 5.7.3 is replaced by the following:

"5.7.3 The following is an indicative list of items that shall be addressed in the meeting:

- .1 schedule of the ship (i.e. the voyage, docking and undocking manoeuvres, periods alongside, cargo and ballast operations, etc.);
- .2 provisions and arrangements for thickness measurements (i.e. access, cleaning/descaling, illumination, ventilation, personal safety);
- .3 extent of the thickness measurements;
- .4 acceptance criteria (refer to the list of minimum thicknesses);
- .5 extent of close-up survey and thickness measurement considering the coating condition and suspect areas/areas of substantial corrosion;
- .6 execution of thickness measurements;
- .7 taking representative readings in general and where uneven corrosion/pitting is found;
- .8 mapping of areas of substantial corrosion;
- .9 communication between attending surveyor(s), the thickness measurement firm operator(s) and owner's representative(s) concerning findings;
- .10 the RIT limitations, if any;
- .11 details of the areas not fully accessed by permanent means of access and proposed to be covered by a RIT; and
- .12 confirmatory surveys for RIT."

## **7 Procedures for thickness measurements**

### **7.2 Certification of thickness measurement firm**

15 Section 7.2 is replaced by the following:

#### **"7.2 Certification of thickness measurement firm**

The thickness measurements shall be carried out by a qualified firm certified by the Administration according to the principles stated in annex 5A."

Annex 4B

**SURVEY PLANNING QUESTIONNAIRE**

**2 Information on access provision for close-up surveys and thickness measurement**

16 Section 2 is replaced by the following:

**"2 Information on access provision for close-up surveys and thickness measurement**

The owner shall indicate, in the table below, the means of access to the structures subject to close-up survey and thickness measurement. A close-up survey is an examination where the details of structural components are within the close visual inspection range of the attending surveyor, i.e. normally within reach of hand.

When any part of the close-up survey is being undertaken by means of a RIT, the means of how thickness measurements are going to be taken are also to be indicated in the table below; the thickness measurements shall be carried out simultaneously with the close-up survey, either when required by the ESP Code or by the surveyor as a result of the close-up survey. Note: A RIT to assist the close-up survey may only be used when access is not provided by the permanent means of access (see 1.5 and 5.1.6).

| Hold/Tank No. | Structure                          | Permanent means of access | Temporary staging | Rafts | Ladders | RIT | Direct access | Other means (please specify) |
|---------------|------------------------------------|---------------------------|-------------------|-------|---------|-----|---------------|------------------------------|
| F.P.          | Fore peak                          |                           |                   |       |         |     |               |                              |
| A.P.          | Aft peak                           |                           |                   |       |         |     |               |                              |
| Cargo holds   | Hatch side coamings                |                           |                   |       |         |     |               |                              |
|               | Topside sloping plate              |                           |                   |       |         |     |               |                              |
|               | Upper stool plating                |                           |                   |       |         |     |               |                              |
|               | Cross deck                         |                           |                   |       |         |     |               |                              |
|               | Side shell, frames and brackets    |                           |                   |       |         |     |               |                              |
|               | Transverse bulkhead                |                           |                   |       |         |     |               |                              |
|               | Hopper tank plating                |                           |                   |       |         |     |               |                              |
|               | Lower stool                        |                           |                   |       |         |     |               |                              |
|               | Tank top                           |                           |                   |       |         |     |               |                              |
| Topside tanks | Under-deck structure               |                           |                   |       |         |     |               |                              |
|               | Side shell and structure           |                           |                   |       |         |     |               |                              |
|               | Sloping plate and structure        |                           |                   |       |         |     |               |                              |
|               | Webs and bulkheads                 |                           |                   |       |         |     |               |                              |
| Hopper tanks  | Hopper sloping plate and structure |                           |                   |       |         |     |               |                              |
|               | Side shell and structure           |                           |                   |       |         |     |               |                              |
|               | Bottom structure                   |                           |                   |       |         |     |               |                              |
|               | Webs and bulkheads                 |                           |                   |       |         |     |               |                              |
|               | Double-bottom structure            |                           |                   |       |         |     |               |                              |
|               | Upper stool internal structure     |                           |                   |       |         |     |               |                              |
|               | Lower stool internal structure     |                           |                   |       |         |     |               |                              |

| History of bulk cargoes of a corrosive nature (e.g. high sulphur content) |
|---------------------------------------------------------------------------|
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |
|                                                                           |

## Annex 5

## PROCEDURES FOR APPROVAL AND CERTIFICATION OF A FIRM ENGAGED IN THICKNESS MEASUREMENT OF HULL STRUCTURES

17 Existing annex 5 is renumbered as "Annex 5A" and the following new annex 5B is inserted after renumbered annex 5A, together with the associated footnotes:

## "Annex 5B

## PROCEDURES FOR CERTIFICATION OF A FIRM ENGAGED IN CLOSE-UP SURVEY OF HULL STRUCTURES USING A REMOTE INSPECTION TECHNIQUE (RIT)

### 1 Application

This procedure applies to RIT firms providing visual livestreaming of video and images to support close-up surveys.

### 2 General requirements

#### *Supervisor and operators*

2.1 The firm shall designate a supervisor who shall be certified according to the recognized national requirements or an equivalent industrial standard and shall have a minimum of two years' experience in the inspection of ships' structures.

2.2 An operator of a RIT shall be certified according to the recognized national requirements or an equivalent industrial standard and have had at least one year's experience as an assistant carrying out inspections of ships' structures (including participation in a minimum of five different assignments). An operator of a RIT who, according to the international and national legislations, is required to be licensed for operation of a RIT shall hold valid documentation issued by the appropriate bodies (e.g. unmanned aerial vehicle (UAV) pilots shall be qualified and licensed in accordance with applicable national requirements).

#### *Training and qualification of operators*

2.3 The firm is responsible for the training and qualification of its operators. UAV pilots shall be qualified and licensed in accordance with applicable national requirements or an equivalent industrial standard acceptable to the Administration.

2.4 The firm shall maintain a documented training plan for RIT equipment operators. The plan shall include requirements for training in the renewal survey requirements for the structure as specified in this Code, the identification of structural deterioration (including corrosion, buckling, cracking and deteriorated coatings) and the reporting requirements of this Code.

2.5 Knowledge of the following shall be documented:

- .1 guidelines developed by the Organization;\*
- .2 marine and/or offshore nomenclatures;
- .3 the structural configuration of relevant ship types, including internal structure;
- .4 the remote inspection equipment and its operation; and
- .5 survey plans for examination of hull spaces of various configurations, including appropriate flight plans if using a UAV.

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

#### *RIT equipment*

2.6 As a minimum, the following equipment shall be available:

- .1 remotely operated platform with data capture devices capable of operation within an enclosed space;
- .2 means of powering the platforms with sufficient capacity to complete the required inspections, including spare batteries if applicable;
- .3 data collection devices which may include cameras capable of capturing in high definition both video images and still images;
- .4 illumination equipment;
- .5 high-definition display screen with live high-definition feed from inspection cameras;
- .6 means of communication, as applicable; and
- .7 data recording devices.

2.7 The RIT equipment shall be approved taking into account the guidelines developed by the Organization.\*

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

*Firm procedures and guidelines on the use of RITs*

2.8 The firm shall have documented operational procedures and guidelines on the use of RITs for how to plan, carry out and report inspections; how to handle/operate the equipment; collection and storage of data. These shall take into account the guidelines developed by the Organization\* and include:

- .1 requirements for preparation of inspection plans;
- .2 operation of the remotely operated platforms;
- .3 operation of lighting;
- .4 calibration of the data capture devices;
- .5 operation of the data capture devices;
- .6 two-way communication between the operator, platform, surveyor and other personnel, such as support staff and ships' crew;
- .7 guidance for the operator on how to achieve complete coverage of the structure to be inspected;
- .8 guidance for the maintenance of the remotely operated platforms, data capture and storage devices, and display screens, as applicable;
- .9 requirements for the collection and validation of data;
- .10 if data is to be stored, then requirements for location attribution, and, time and date attribution, as available, validation and storage of data;
- .11 requirements for the reporting of inspections, including the recording of damages and defects found during inspection and repair work; and
- .12 if capable of undertaking cleaning/surface preparation, then procedures for undertaking this work.

---

\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

*Documents and records*

2.9 The firm shall maintain the following:

- .1 training records;
- .2 operators' statutory and regulatory certificates and licences;
- .3 equipment register for RIT equipment, including delivery device (e.g. UAVs, robots), data capture devices, data analysis devices and any associated equipment necessary to perform inspections;
- .4 equipment maintenance manuals and records/logbook;

- .5 records of calibration; and
- .6 RIT equipment operation logbook.

### **3 Procedures for certification**

#### *Submission of documents*

3.1 The following documents shall be submitted to the Administration for approval, together with a list of the documents submitted:

- .1 outline of the firm, e.g. organization and management structure;
- .2 experience of the firm with close-up survey of hull structures of ships using the RIT;
- .3 technicians' careers, i.e. experience of technicians as RIT operators, technical knowledge and experience of hull structure, etc.;
- .4 equipment used, including capturing devices (i.e. drones, cameras, etc.), streaming devices (i.e. screens) and other supporting equipment (i.e. illumination), and their maintenance/calibration procedures;
- .5 operational procedures and instructions on how to carry out the servicing of the equipment and/or system. These shall either contain or make reference to the manufacturer's servicing manuals, servicing bulletins, instructions and training manuals, as appropriate, and to relevant international requirements;
- .6 training programmes for RIT operators; and
- .7 report format taking into account the guidelines developed by the Organization.\*

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

#### *Auditing of the firm\**

3.2 Upon reviewing the documents submitted with satisfactory results, the firm shall be audited in order to ascertain that it is duly organized and managed in accordance with the documents submitted, and eventually is capable of conducting close-up surveys of the hull structure of ships using RIT.

3.3 Certification is conditional upon a demonstration (on board or in a test environment) of a close-up survey using the RIT, as well as satisfactory reporting.

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

#### **4 Certification**

4.1 Upon satisfactory results of both the audit of the firm referred to in 3.2 and the demonstration tests referred to in 3.3, the Administration shall issue a certificate of approval stating that the firm's operation system has been found to be satisfactory and that the results of services performed in accordance with that system may be accepted and utilized by the Administration in making decisions affecting certification. The certificate shall clearly state the type and scope of services, type of equipment and/or names of manufacturers of equipment where these are limiting restraints and any limitations or restrictions imposed and include a statement that the RIT shall support the close-up survey for the areas which may not be fully accessed by use of the permanent means of access.

4.2 Renewal/endorsement of the certificate shall be made at intervals not exceeding three years by verification that original conditions are maintained.

#### **5 Report of any alteration to the certified operation system of the RIT firm**

In cases where any alteration to the certified RIT firm is made, such an alteration shall be immediately reported to the Administration. A re-audit shall be conducted where deemed necessary by the Administration.

#### **6 Withdrawal of the certification**

The certification may be withdrawn in the following cases:

- .1 where the RIT was improperly used or the results were improperly reported;
- .2 where the Administration found any deficiency in the operation systems of the RIT firm; and
- .3 where the firm failed to report any alteration referred to in 5 above to the Administration as required."

### **Annex 6**

#### **SURVEY REPORTING PRINCIPLES**

##### **1 General**

18 The following new paragraphs 1.4 and 1.5 are added after existing paragraph 1.3:

"1.4 When a RIT has been used then:

- .1 the RIT report shall include all videos and images with a chapter detailing the areas covered and damages found with locations, type, details and dimensions; and
- .2 the report shall include the details of: RIT firm, approval certificate, equipment used and operators.

1.5 The report shall provide evidence of having been reviewed and approved by the attending surveyor(s)."

**3      Result of the survey**

19      Paragraph 3.2.2 is replaced by the following:

"2      identification of compartments where no structural damages/defects have been found. The report may be supplemented by sketches/photographs/videos; and"

## PART B

### CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF BULK CARRIERS HAVING DOUBLE-SIDE SKIN CONSTRUCTION

#### 1 General

##### 1.2 Definitions

20 Paragraph 1.2.21 is replaced by the following:

"1.2.21 *Administration* means the Administration or organization recognized by the Administration, unless defined otherwise in this Code."

21 The following new paragraph 1.2.22 is added after paragraph 1.2.21, together with the associated footnote:

"1.2.22 *Remote Inspection Technique (RIT)* is a means of survey of any parts of the structure without the need for direct physical access of the surveyor.\*

\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700)."

##### 1.5 Thickness measurements and close-up surveys

22 Section 1.5 is replaced by the following:

##### "1.5 Thickness measurements and close-up surveys

1.5.1 In any kind of survey, i.e. renewal, intermediate, annual or other surveys having the scope of the foregoing ones, for structures in areas where close-up surveys are required, thickness measurements, when required by annex 2, shall be carried out simultaneously with close-up surveys.

1.5.2 For periodic surveys after the third renewal survey, the use of a RIT is subject to the agreement of the Administration, which may impose additional requirements or limitations; in this case the Administration means the Government of the State whose flag the ship is entitled to fly and not the recognized organization."

23 The following new section 1.6 is added after existing section 1.5, together with the associated footnote:

##### "1.6 Remote inspection techniques

1.6.1 RIT surveys shall be carried out in accordance with the requirements given herein and taking into account the guidelines developed by the Organization.\*

1.6.2 Where a RIT for close-up survey is not carried out by the Administration, it shall be conducted by a firm approved as a service supplier by the Administration according to the principles stated in annex 5B of part B of annex A and shall be carried out under the presence of the surveyor and their continuous direction and control of the RIT process.

1.6.3 If the RIT reveals damage or deterioration that the surveyor judges requires attention or further investigation, the surveyor shall require a traditional survey to be undertaken without the use of a RIT.

1.6.4 Random confirmatory surveys or close-up surveys shall be carried out at locations selected by the surveyor for the purpose of verifying the results of the RIT.

\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700)."

## **2 Renewal survey**

### **2.5 Extent of overall and close-up surveys**

24 The following new paragraph 2.5.5 is added after existing paragraph 2.5.4:

"2.5.5 When using a RIT to assist the close-up survey, the following applies:

- .1 the surveyor may use a RIT to assist the close-up survey when there are no permanent means of access provided;
- .2 the use of a RIT to assist the close-up survey shall not be permitted after the third renewal survey, unless agreed with the Administration (see 1.5.2);
- .3 the RIT shall not be used in ballast tanks or any spaces where a hard protective coating is required and it is found to be in less than GOOD condition as defined in 1.2.11, or ballast tanks where a soft or semi-hard coating has been applied, or ballast tanks where a hard protective coating has not been applied from the time of construction;
- .4 the RIT shall not be used to assist the surveyor during the close-up survey in areas which have a recorded significant history of structural failures (corrosion, cracks and buckling). See guidelines in annex 9, paragraph 3.1.1; and
- .5 in addition to the requirements of 1.5.1, when the RIT reveals suspected areas that require thickness measurements, these shall be carried out simultaneously with the close-up survey. Details of how this will be facilitated shall be included in the survey programme."

## **5 Preparations for survey**

### **5.1 Survey programme**

25 The following new paragraph 5.1.6 is added after existing paragraph 5.1.5:

"5.1.6 If it is proposed to use a RIT, the proposal shall be submitted before the survey as part of the survey programme detailed above, discussed and approved by the Administration. The following shall be taken into account when preparing the survey programme:

- .1 the RIT limitations, if any, shall be detailed in the survey programme;
- .2 details of the areas not fully accessed by the permanent means of access and proposed to be covered by a RIT shall be detailed in the survey programme;
- .3 the use of a RIT to assist the close-up survey shall not be permitted after the third renewal survey, unless agreed with the Administration (see 1.5.2);
- .4 the RIT shall not be used in ballast tanks or any spaces where a hard protective coating is required and it is found to be in less than GOOD condition as defined in 1.2.11, or ballast tanks where a soft or semi-hard coating has been applied, or ballast tanks where a hard protective coating has not been applied from the time of construction;
- .5 the RIT shall not be used to assist the surveyor during the close-up in areas which have a recorded significant history of structural failures, defects, damage or deterioration (corrosion, cracks and buckling). See guidelines in annex 9, paragraph 3.1.1; and
- .6 in addition to the requirements of 1.5.1, when the RIT reveals suspected areas that require thickness measurements, these shall be carried out simultaneously with the close-up survey, details of how this will be facilitated shall be included in the survey programme."

## **5.2 Conditions for survey**

26 Paragraph 5.2.6 is replaced by the following:

"5.2.6 In preparation for survey (including for surveys making use of a RIT) and thickness measurements and to allow for a thorough examination, all spaces shall be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces shall be sufficiently clean and free from water, scale, dirt, oil residues, etc., to reveal corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating. However, those areas of structure whose renewal has already been decided by the owner need only be cleaned and descaled to the extent necessary to determine the limits of the areas to be renewed."

## **5.4 Equipment for survey**

27 The following new paragraph 5.4.6 is added after existing paragraph 5.4.5, together with the associated footnote:

"5.4.6 The surveyor shall be satisfied with the method of data presentation including pictorial representation, and a good two-way communication between the surveyor and RIT operator shall be provided. Prior to every survey onboard, the RIT shall be validated, taking into account the guidelines developed by the Organization\* and the existing conditions (light, humidity, dust, etc.), to confirm that the expected results can be achieved."

- \* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700)."

## **5.7 Survey planning meeting**

28 Paragraph 5.7.2 is replaced by the following:

"5.7.2 Prior to commencement of any part of the renewal or intermediate survey, a survey planning meeting shall be held between the attending surveyor(s), the owner's representative in attendance, the thickness measurement firm representative, the RIT firm representative, where involved, and the master of the ship or an appropriately qualified representative appointed by the master or company; for the purpose to ascertain that all the arrangements envisaged in the survey programme are in place, so as to ensure the safe and efficient conduct of the survey work to be carried out (see also 7.1.2)."

29 Paragraph 5.7.3 is replaced by the following:

"5.7.3 The following is an indicative list of items that shall be addressed in the meeting:

- .1 schedule of the ship (i.e. the voyage, docking and undocking manoeuvres, periods alongside, cargo and ballast operations, etc.);
- .2 provisions and arrangements for thickness measurements (i.e. access, cleaning/descaling, illumination, ventilation, personal safety);
- .3 extent of the thickness measurements;
- .4 acceptance criteria (refer to the list of minimum thicknesses);
- .5 extent of close-up survey and thickness measurement considering the coating condition and suspect areas/areas of substantial corrosion;
- .6 execution of thickness measurements;
- .7 taking representative readings in general and where uneven corrosion/pitting is found;
- .8 mapping of areas of substantial corrosion;
- .9 communication between attending surveyor(s), the thickness measurement firm operator(s) and owner's representative(s) concerning findings;
- .10 the RIT limitations, if any;
- .11 details of the areas not fully accessed by permanent means of access and proposed to be covered by a RIT; and
- .12 confirmatory surveys for RIT."

**7 Procedures for thickness measurements**

**7.2 Certification of thickness measurement firm**

30 Section 7.2 is replaced by the following:

**"7.2 Certification of thickness measurement firm**

The thickness measurements shall be carried out by a qualified firm certified by the Administration according to the principles stated in annex 5A."

Annex 4B

**SURVEY PLANNING QUESTIONNAIRE**

**2 Information on access provision for close-up surveys and thickness measurement**

31 Section 2 is replaced by the following:

**"2 Information on access provision for close-up surveys and thickness measurement**

The owner shall indicate, in the table below, the means of access to the structures subject to close-up survey and thickness measurement. A close-up survey is an examination where the details of structural components are within the close visual inspection range of the attending surveyor, i.e. normally within reach of hand.

When any part of the close-up survey is being undertaken by means of a RIT, the means of how thickness measurements are going to be taken are also to be indicated in the table below; the thickness measurements shall be carried out simultaneously with the close-up survey, either when required by the ESP Code or by the surveyor as a result of the close-up survey. Note: A RIT to assist the close-up survey may only be used when access is not provided by the permanent means of access (see 1.5 and 5.1.6).

| Tank/Hold No.              | Structure                               | Permanent means of access | Temporary staging | Rafts | Ladders | RIT | Direct access | Other means (please specify) |
|----------------------------|-----------------------------------------|---------------------------|-------------------|-------|---------|-----|---------------|------------------------------|
| F.P.                       | Fore peak                               |                           |                   |       |         |     |               |                              |
| A.P.                       | Aft peak                                |                           |                   |       |         |     |               |                              |
| Cargo holds                | Hatch side coamings                     |                           |                   |       |         |     |               |                              |
|                            | Topside sloping plate                   |                           |                   |       |         |     |               |                              |
|                            | Upper stool plating                     |                           |                   |       |         |     |               |                              |
|                            | Cross deck                              |                           |                   |       |         |     |               |                              |
|                            | Double-side tank plating                |                           |                   |       |         |     |               |                              |
|                            | Transverse bulkhead                     |                           |                   |       |         |     |               |                              |
|                            | Hopper tank plating                     |                           |                   |       |         |     |               |                              |
|                            | Lower stool plating                     |                           |                   |       |         |     |               |                              |
|                            | Tank top                                |                           |                   |       |         |     |               |                              |
| Topside tanks              | Under-deck structure                    |                           |                   |       |         |     |               |                              |
|                            | Side shell and structure                |                           |                   |       |         |     |               |                              |
|                            | Sloping plate and structure             |                           |                   |       |         |     |               |                              |
|                            | Webs and bulkheads                      |                           |                   |       |         |     |               |                              |
| Hopper tanks               | Hopper sloping plate and structure      |                           |                   |       |         |     |               |                              |
|                            | Side shell and structure                |                           |                   |       |         |     |               |                              |
|                            | Bottom structure                        |                           |                   |       |         |     |               |                              |
|                            | Webs and bulkheads                      |                           |                   |       |         |     |               |                              |
| Double-side tanks          | Side shell and structure                |                           |                   |       |         |     |               |                              |
|                            | Inner skin and structure                |                           |                   |       |         |     |               |                              |
|                            | Webs and bulkheads                      |                           |                   |       |         |     |               |                              |
|                            | Double-bottom structure                 |                           |                   |       |         |     |               |                              |
|                            | Upper stool internal structure          |                           |                   |       |         |     |               |                              |
|                            | Lower stool internal structure          |                           |                   |       |         |     |               |                              |
| Wing tanks of ore carriers | Underdeck and structure                 |                           |                   |       |         |     |               |                              |
|                            | Side shell and structure                |                           |                   |       |         |     |               |                              |
|                            | Side shell vertical web and structure   |                           |                   |       |         |     |               |                              |
|                            | Longitudinal bulkhead and structure     |                           |                   |       |         |     |               |                              |
|                            | Longitudinal bulkhead web and structure |                           |                   |       |         |     |               |                              |
|                            | Bottom plating and structure            |                           |                   |       |         |     |               |                              |
|                            | Cross ties/stringers                    |                           |                   |       |         |     |               |                              |

| History of bulk cargoes of a corrosive nature (e.g. high sulphur content) |
|---------------------------------------------------------------------------|
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## Annex 5

## PROCEDURES FOR APPROVAL AND CERTIFICATION OF A FIRM ENGAGED IN THICKNESS MEASUREMENT OF HULL STRUCTURES

32 Existing annex 5 is renumbered as "Annex 5A" and the following new annex 5B is inserted after renumbered annex 5A, together with the associated footnotes:

## "Annex 5B

### PROCEDURES FOR CERTIFICATION OF A FIRM ENGAGED IN CLOSE-UP SURVEY OF HULL STRUCTURES USING A REMOTE INSPECTION TECHNIQUE (RIT)

#### 1 Application

This procedure applies to RIT firms providing visual livestreaming of video and images to support close-up surveys.

#### 2 General requirements

##### *Supervisor and operators*

2.1 The firm shall designate a supervisor who shall be certified according to the recognized national requirements or an equivalent industrial standard and shall have a minimum of two years' experience in the inspection of ships' structures.

2.2 An operator of a RIT shall be certified according to the recognized national requirements or an equivalent industrial standard and have had at least one year's experience as an assistant carrying out inspections of ships' structures (including participation in a minimum of five different assignments). An operator of a RIT who, according to the international and national legislations, is required to be licensed for operation of a RIT shall hold valid documentation issued by the appropriate bodies (e.g. unmanned aerial vehicles (UAV) pilots shall be qualified and licensed in accordance with applicable national requirements).

##### *Training and qualification of operators*

2.3 The firm is responsible for the training and qualification of its operators. UAV pilots shall be qualified and licensed in accordance with applicable national requirements or an equivalent industrial standard acceptable to the Administration.

2.4 The firm shall maintain a documented training plan for RIT equipment operators. The plan shall include requirements for training in the renewal survey requirements for the structure as specified in this Code, the identification of structural deterioration (including corrosion, buckling, cracking and deteriorated coatings) and the reporting requirements of this Code.

2.5 Knowledge of the following shall be documented:

- .1 guidelines developed by the Organization;\*
- .2 marine and/or offshore nomenclatures;
- .3 the structural configuration of relevant ship types, including internal structure;
- .4 the remote inspection equipment and its operation; and
- .5 survey plans for examination of hull spaces of various configurations, including appropriate flight plans if using a UAV.

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

#### *RIT equipment*

2.6 As a minimum, the following equipment shall be available:

- .1 remotely operated platform with data capture devices capable of operation within an enclosed space;
- .2 means of powering the platforms with sufficient capacity to complete the required inspections, including spare batteries if applicable;
- .3 data collection devices which may include cameras capable of capturing in high definition both video images and still images;
- .4 illumination equipment;
- .5 high-definition display screen with live high-definition feed from inspection cameras;
- .6 means of communication, as applicable; and
- .7 data recording devices.

2.7 The RIT equipment shall be approved taking into account the guidelines developed by the Organization.\*

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

#### *Firm procedures and guidelines on the use of RITs*

2.8 The firm shall have documented operational procedures and guidelines on the use of RITs for how to plan, carry out and report inspections; how to handle/operate the equipment; collection and storage of data. These shall take into account the guidelines developed by the Organization\* and include:

- .1 requirements for preparation of inspection plans;
- .2 operation of the remotely operated platforms;
- .3 operation of lighting;
- .4 calibration of the data capture devices;
- .5 operation of the data capture devices;
- .6 two-way communication between the operator, platform, surveyor and other personnel, such as support staff and ships' crew;
- .7 guidance for the operator on how to achieve complete coverage of the structure to be inspected;
- .8 guidance for the maintenance of the remotely operated platforms, data capture and storage devices, and display screens, as applicable;
- .9 requirements for the collection and validation of data;
- .10 if data is to be stored, then requirements for location attribution, and, time and date attribution, as available, validation and storage of data;
- .11 requirements for the reporting of inspections, including the recording of damages and defects found during inspection and repair work; and
- .12 if capable of undertaking cleaning/surface preparation, then procedures for undertaking this work.

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

#### *Documents and records*

#### 2.9 The firm shall maintain the following:

- .1 training records;
- .2 operators' statutory and regulatory certificates and licences;
- .3 equipment register for RIT equipment, including delivery device (e.g. UAVs, robots), data capture devices, data analysis devices and any associated equipment necessary to perform inspections;
- .4 equipment maintenance manuals and records/logbook;
- .5 records of calibration; and
- .6 RIT equipment operation logbook.

### **3 Procedures for certification**

#### *Submission of documents*

3.1 The following documents shall be submitted to the Administration for approval, together with a list of the documents submitted:

- .1 outline of the firm, e.g. organization and management structure;
- .2 experience of the firm with close-up survey of hull structures of ships using the RIT;
- .3 technicians' careers, i.e. experience of technicians as RIT operators, technical knowledge and experience of hull structure, etc.;
- .4 equipment used, including capturing devices (i.e. drones, cameras, etc.), streaming devices (i.e. screens) and other supporting equipment (i.e. illumination), and their maintenance/calibration procedures;
- .5 operational procedures and instructions on how to carry out the servicing of the equipment and/or system. These shall either contain or make reference to the manufacturer's servicing manuals, servicing bulletins, instructions and training manuals, as appropriate, and to relevant international requirements;
- .6 training programmes for RIT operators; and
- .7 report format taking into account the guidelines developed by the Organization.\*

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

#### *Auditing of the firm\**

3.2 Upon reviewing the documents submitted with satisfactory results, the firm shall be audited in order to ascertain that it is duly organized and managed in accordance with the documents submitted, and eventually is capable of conducting close-up surveys of the hull structure of ships using RIT.

3.3 Certification is conditional upon a demonstration (on board or in a test environment) of a close-up survey using the RIT, as well as satisfactory reporting.

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

## **4 Certification**

4.1 Upon satisfactory results of both the audit of the firm referred to in 3.2 and the demonstration tests referred to in 3.3, the Administration shall issue a certificate of approval stating that the firm's operation system has been found to be satisfactory and that the results of services performed in accordance with that system may be accepted and utilized by the Administration in making decisions affecting certification. The certificate shall clearly state the type and scope of services, type of equipment and/or names of manufacturers of equipment where these are limiting restraints and any limitations or restrictions imposed and include a statement that the RIT shall support the close-up survey for the areas which may not be fully accessed by use of the permanent means of access.

4.2 Renewal/endorsement of the certificate shall be made at intervals not exceeding three years by verification that original conditions are maintained.

## **5 Report of any alteration to the certified operation system of the RIT firm**

In cases where any alteration to the certified RIT firm is made, such an alteration shall be immediately reported to the Administration. A re-audit shall be conducted where deemed necessary by the Administration.

## **6 Withdrawal of the certification**

The certification may be withdrawn in the following cases:

- .1 where the RIT was improperly used or the results were improperly reported;
- .2 where the Administration found any deficiency in the operation systems of the RIT firm; and
- .3 where the firm failed to report any alteration referred to in 5 above to the Administration as required."

## **Annex 6**

### **SURVEY REPORTING PRINCIPLES**

#### **1 General**

33 The following new paragraphs 1.4 and 1.5 are added after existing paragraph 1.3:

"1.4 When a RIT has been used then:

- .1 the RIT report shall include all videos and images with a chapter detailing the areas covered and damages found with locations, type, details and dimensions; and
- .2 the report shall include the details of: RIT firm, approval certificate, equipment used and operators.

1.5 The report shall provide evidence of having been reviewed and approved by the attending surveyor(s)."

**3 Result of the survey**

34 Paragraph 3.2.2 is replaced by the following:

".2 identification of compartments where no structural damages/defects have been found. The report may be supplemented by sketches/photographs/videos; and"

## **ANNEX B**

### **CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF OIL TANKERS**

#### **PART A**

### **CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF DOUBLE-HULL OIL TANKERS**

#### **1 General**

##### **1.2 Definitions**

35 Paragraph 1.2.20 is replaced by the following:

"1.2.20 *Administration* means the Administration or organization recognized by the Administration, unless defined otherwise in this Code."

36 The following new paragraph 1.2.21 is added after paragraph 1.2.20, together with the associated footnote:

"1.2.21 *Remote Inspection Technique (RIT)* is a means of survey of any parts of the structure without the need for direct physical access of the surveyor.\*

\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700)."

##### **1.5 Thickness measurements and close-up surveys**

37 Section 1.5 is replaced by the following:

##### **"1.5 Thickness measurements and close-up surveys**

1.5.1 In any kind of survey, i.e. renewal, intermediate, annual or other surveys having the scope of the foregoing ones, for structures in areas where close-up surveys are required, thickness measurements, when required by annex 2, shall be carried out simultaneously with close-up surveys.

1.5.2 For periodic surveys after the third renewal survey, the use of a RIT is subject to the agreement of the Administration, which may impose additional requirements or limitations; in this case Administration means the Government of the State whose flag the ship is entitled to fly and not the recognized organization."

38 The following new section 1.6 is added after existing section 1.5, together with the associated footnote:

##### **"1.6 Remote inspection techniques**

1.6.1 RIT surveys shall be carried out in accordance with the requirements given herein and taking into account the guidelines developed by the Organization.\*

1.6.2 Where a RIT for a close-up survey is not carried out by the Administration, it shall be conducted by a firm approved as a service supplier by the Administration according to the principles stated in annex 8B of part A of annex B and shall be carried out under the presence of the surveyor and their continuous direction and control of the RIT process.

1.6.3 If the RIT reveals damage or deterioration that the surveyor judges requires attention or further investigation, the surveyor shall require a traditional survey to be undertaken without the use of a RIT.

1.6.4 Random confirmatory surveys or close-up surveys shall be carried out at locations selected by the surveyor for the purpose of verifying the results of the RIT.

\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700)."

## **2 Renewal survey**

### **2.4 Extent of overall and close-up surveys**

39 The following new paragraph 2.4.5 is added after existing paragraph 2.4.4:

"2.4.5 When using a RIT to assist the close-up survey, the following applies:

- .1 the surveyor may use a RIT to assist the close-up survey when there are no permanent means of access provided;
- .2 the use of a RIT to assist the close-up survey shall not be permitted after the third renewal survey, unless agreed with the Administration (see 1.5.2);
- .3 the RIT shall not be used in ballast tanks or any spaces where a hard protective coating is required and it is found to be in less than GOOD condition as defined in 1.2.11, or ballast tanks where a soft or semi-hard coating has been applied, or ballast tanks where a hard protective coating has not been applied from the time of construction;
- .4 the RIT shall not be used to assist the surveyor during the close-up survey in areas which have a recorded significant history of structural failures (corrosion, cracks and buckling). See guidelines in annex 12, paragraph 3.1.1; and
- .5 in addition to the requirements of 1.5.1, when the RIT reveals suspected areas that require thickness measurements, these shall be carried out simultaneously with the close-up survey. Details of how this will be facilitated shall be included in the survey programme."

## **2.6      *Extent of tank pressure testing***

40      Paragraph 2.6.1.3 is replaced by the following:

"3      the tank testing is carried out within the renewal survey window and not more than three months prior to the date on which the overall or close-up survey is completed;"

## **5          *Preparations for survey***

### **5.1      *Survey programme***

41      The following new paragraph 5.1.6 is added after existing paragraph 5.1.5:

"5.1.6    If it is proposed to use a RIT, the proposal shall be submitted before the survey as part of the survey programme detailed above, discussed and approved by the Administration. The following shall be taken into account when preparing the survey programme:

- .1      the RIT limitations, if any, shall be detailed in the survey programme;
- .2      details of the areas not fully accessed by the permanent means of access and proposed to be covered by a RIT shall be detailed in the survey programme;
- .3      the use of a RIT to assist the close-up survey shall not be permitted after the third renewal survey, unless agreed with the Administration (see 1.5.2);
- .4      the RIT shall not be used in ballast tanks or any spaces where a hard protective coating is required and it is found to be in less than GOOD condition as defined in 1.2.11, or ballast tanks where a soft or semi-hard coating has been applied, or ballast tanks where a hard protective coating has not been applied from the time of construction;
- .5      the RIT shall not be used to assist the surveyor during the close-up in areas which have a recorded significant history of structural failures, defects, damage or deterioration (corrosion, cracks and buckling). See guidelines in annex 12, paragraph 3.1.1; and
- .6      in addition to the requirements of 1.5.1, when the RIT reveals suspected areas that require thickness measurements, these shall be carried out simultaneously with the close-up survey, details of how this will be facilitated shall be included in the survey programme."

## **5.2 Conditions for survey**

42 Paragraph 5.2.3 is replaced by the following:

"5.2.3 In preparation for survey (including for surveys making use of a RIT) and thickness measurements and to allow for a thorough examination, all spaces shall be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces shall be sufficiently clean and free from water, scale, dirt, oil residues, etc., to reveal corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating. However, those areas of structure whose renewal has already been decided by the owner need only be cleaned and descaled to the extent necessary to determine the limits of the areas to be renewed."

## **5.4 Equipment for survey**

43 The following new paragraph 5.4.6 is added after existing paragraph 5.4.5, together with the associated footnote:

"5.4.6 The surveyor shall be satisfied with the method of data presentation including pictorial representation, and a good two-way communication between the surveyor and RIT operator shall be provided. Prior to every survey onboard, the RIT shall be validated, taking into account the guidelines developed by the Organization\* and the existing conditions (light, humidity, dust, etc.), to confirm that the expected results can be achieved.

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700)."

## **5.7 Survey planning meeting**

44 Paragraph 5.7.2 is replaced by the following:

"5.7.2 Prior to commencement of any part of the renewal or intermediate survey, a survey planning meeting shall be held between the attending surveyor(s), the owner's representative in attendance, the thickness measurement firm representative, the RIT firm representative, where involved, and the master of the ship or an appropriately qualified representative appointed by the master or company; for the purpose to ascertain that all the arrangements envisaged in the survey programme are in place, so as to ensure the safe and efficient conduct of the survey work to be carried out (see also 7.1.2)."

45 Paragraph 5.7.3 is replaced by the following:

"5.7.3 The following is an indicative list of items that shall be addressed in the meeting:

- .1 schedule of the ship (i.e. the voyage, docking and undocking manoeuvres, periods alongside, cargo and ballast operations, etc.);
- .2 provisions and arrangements for thickness measurements (i.e. access, cleaning/descaling, illumination, ventilation, personal safety);
- .3 extent of the thickness measurements;

- .4 acceptance criteria (refer to the list of minimum thicknesses);
- .5 extent of close-up survey and thickness measurement considering the coating condition and suspect areas/areas of substantial corrosion;
- .6 execution of thickness measurements;
- .7 taking representative readings in general and where uneven corrosion/pitting is found;
- .8 mapping of areas of substantial corrosion;
- .9 communication between attending surveyor(s), the thickness measurement firm operator(s) and owner's representative(s) concerning findings;
- .10 the RIT limitations, if any;
- .11 details of the areas not fully accessed by permanent means of access and proposed to be covered by a RIT; and
- .12 confirmatory surveys for RIT."

## **7 Procedures for thickness measurements**

### **7.2 Certification of thickness measurement firm**

46 Section 7.2 is replaced by the following:

#### **"7.2 Certification of thickness measurement firm**

The thickness measurements shall be carried out by a qualified firm certified by the Administration according to the principles stated in annex 8A."

Annex 7B

## **SURVEY PLANNING QUESTIONNAIRE**

### **2 Information on access provision for close-up surveys and thickness measurement**

47 Section 2 is replaced by the following:

"The owner shall indicate, in the table below, the means of access to the structures subject to close-up survey and thickness measurement. A close-up survey is an examination where the details of structural components are within the close visual inspection range of the attending surveyor, i.e. normally within reach of hand.

When any part of the close-up survey is being undertaken by means of a RIT, the means of how thickness measurements are going to be taken are also to be indicated in the table below; the thickness measurements shall be carried out simultaneously with the close-up survey, either when required by the ESP Code or by the surveyor as a result of the close-up survey. Note: A RIT to assist the close-up survey may only be used when access is not provided by the permanent means of access (see 1.5 and 5.1.6).

| Tank No.     | Structure         | C (Cargo)/<br>B (Ballast) | Permanent<br>means of<br>access | Temporary<br>staging | Rafts | Ladders | RIT | Direct<br>access | Other means<br>(please<br>specify) |
|--------------|-------------------|---------------------------|---------------------------------|----------------------|-------|---------|-----|------------------|------------------------------------|
| F.P.         | Fore peak         |                           |                                 |                      |       |         |     |                  |                                    |
| A.P.         | Aft peak          |                           |                                 |                      |       |         |     |                  |                                    |
| Wing Tanks   | Underdeck         |                           |                                 |                      |       |         |     |                  |                                    |
|              | Side shell        |                           |                                 |                      |       |         |     |                  |                                    |
|              | Bottom transverse |                           |                                 |                      |       |         |     |                  |                                    |
|              | Longitudinal      |                           |                                 |                      |       |         |     |                  |                                    |
|              | Transverse        |                           |                                 |                      |       |         |     |                  |                                    |
| Centre tanks | Under deck        |                           |                                 |                      |       |         |     |                  |                                    |
|              | Bottom transverse |                           |                                 |                      |       |         |     |                  |                                    |
|              | Transverse        |                           |                                 |                      |       |         |     |                  |                                    |

|                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>History of cargo with H<sub>2</sub>S content or heated cargo for the last three years together with indication as to whether cargo was heated and, where available, Material Safety Data Sheets (MSDS)*</b> |
|                                                                                                                                                                                                                |
|                                                                                                                                                                                                                |
|                                                                                                                                                                                                                |
|                                                                                                                                                                                                                |
|                                                                                                                                                                                                                |
|                                                                                                                                                                                                                |

\* Refer to resolution MSC.150(77) on *Recommendation for material safety data sheets for MARPOL Annex I cargoes and marine fuel oils.*"

## Annex 8

### PROCEDURES FOR APPROVAL AND CERTIFICATION OF A FIRM ENGAGED IN THICKNESS MEASUREMENT OF HULL STRUCTURES

48 Existing annex 8 is renumbered as "Annex 8A" and the following new annex 8B is inserted after renumbered annex 8A, together with the associated footnotes:

#### "Annex 8B

### PROCEDURES FOR CERTIFICATION OF A FIRM ENGAGED IN CLOSE-UP SURVEY OF HULL STRUCTURES USING A REMOTE INSPECTION TECHNIQUE (RIT)

#### 1 Application

This procedure applies to RIT firms providing visual livestreaming of video and images to support close-up surveys.

#### 2 General requirements

##### *Supervisor and operators*

2.1 The firm shall designate a supervisor who shall be certified according to the recognized national requirements or an equivalent industrial standard and shall have a minimum of two years' experience in the inspection of ships' structures.

2.2 An operator of a RIT shall be certified according to the recognized national requirements or an equivalent industrial standard and have had at least one year's experience as an assistant carrying out inspections of ships' structures (including participation in a minimum of five different assignments). An operator of a RIT who, according to the international and national legislations, is required to be licensed for operation of a RIT shall hold valid documentation issued by the appropriate bodies (e.g. unmanned aerial vehicle (UAV) pilots shall be qualified and licensed in accordance with applicable national requirements).

*Training and qualification of operators*

2.3 The firm is responsible for the training and qualification of its operators. UAV pilots shall be qualified and licensed in accordance with applicable national requirements or an equivalent industrial standard acceptable to the Administration.

2.4 The firm shall maintain a documented training plan for RIT equipment operators. The plan shall include requirements for training in the renewal survey requirements for the structure as specified in this Code, the identification of structural deterioration (including corrosion, buckling, cracking and deteriorated coatings) and the reporting requirements of this Code.

2.5 Knowledge of the following shall be documented:

- .1 guidelines developed by the Organization;\*
- .2 marine and/or offshore nomenclatures;
- .3 the structural configuration of relevant ship types, including internal structure;
- .4 the remote inspection equipment and its operation; and
- .5 survey plans for examination of hull spaces of various configurations, including appropriate flight plans if using a UAV.

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

*RIT equipment*

2.6 As a minimum, the following equipment shall be available:

- .1 remotely operated platform with data capture devices capable of operation within an enclosed space;
- .2 means of powering the platforms with sufficient capacity to complete the required inspections, including spare batteries if applicable;
- .3 data collection devices which may include cameras capable of capturing in high definition both video images and still images;
- .4 illumination equipment;
- .5 high-definition display screen with live high-definition feed from inspection cameras;
- .6 means of communication, as applicable; and
- .7 data recording devices.

2.7 The RIT equipment shall be approved taking into account the guidelines developed by the Organization.\*

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

*Firm procedures and guidelines on the use of RITs*

2.8 The firm shall have documented operational procedures and guidelines on the use of RITs for how to plan, carry out and report inspections; how to handle/operate the equipment; collection and storage of data. These shall take into account the guidelines developed by the Organization\* and include:

- .1 requirements for preparation of inspection plans;
- .2 operation of the remotely operated platforms;
- .3 operation of lighting;
- .4 calibration of the data capture devices;
- .5 operation of the data capture devices;
- .6 two-way communication between the operator, platform, surveyor and other personnel, such as support staff and ships' crew;
- .7 guidance for the operator on how to achieve complete coverage of the structure to be inspected;
- .8 guidance for the maintenance of the remotely operated platforms, data capture and storage devices and display screens, as applicable;
- .9 requirements for the collection and validation of data;
- .10 if data is to be stored, then requirements for location attribution, and, time and date attribution, as available, validation and storage of data;
- .11 requirements for the reporting of inspections, including the recording of damages and defects found during inspection and repair work; and
- .12 if capable of undertaking cleaning/surface preparation, then procedures for undertaking this work.

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

*Documents and records*

2.9 The firm shall maintain the following:

- .1 training records;
- .2 operators' statutory and regulatory certificates and licences;
- .3 equipment register for RIT equipment, including delivery device (e.g. UAVs, robots), data capture devices, data analysis devices and any associated equipment necessary to perform inspections;

- .4 equipment maintenance manuals and records/logbook;
- .5 records of calibration; and
- .6 RIT equipment operation logbook.

### **3 Procedures for certification**

#### *Submission of documents*

3.1 The following documents shall be submitted to the Administration for approval, together with a list of the documents submitted:

- .1 outline of the firm, e.g. organization and management structure;
- .2 experience of the firm with close-up survey of hull structures of ships using the RIT;
- .3 technicians' careers, i.e. experience of technicians as RIT operators, technical knowledge and experience of hull structure, etc.;
- .4 equipment used, including capturing devices (i.e. drones, cameras, etc.), streaming devices (i.e. screens) and other supporting equipment (i.e. illumination), and their maintenance/calibration procedures;
- .5 operational procedures and instructions on how to carry out the servicing of the equipment and/or system. These shall either contain or make reference to the manufacturer's servicing manuals, servicing bulletins, instructions and training manuals, as appropriate, and to relevant international requirements;
- .6 training programmes for RIT operators; and
- .7 report format taking into account the guidelines developed by the Organization.\*

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

#### *Auditing of the firm\**

3.2 Upon reviewing the documents submitted with satisfactory results, the firm shall be audited in order to ascertain that it is duly organized and managed in accordance with the documents submitted, and eventually is capable of conducting close-up surveys of the hull structure of ships using RIT.

3.3 Certification is conditional upon a demonstration (on board or in a test environment) of a close-up survey using the RIT, as well as satisfactory reporting.

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

## **4 Certification**

4.1 Upon satisfactory results of both the audit of the firm referred to in 3.2 and the demonstration tests referred to in 3.3, the Administration shall issue a certificate of approval stating that the firm's operation system has been found to be satisfactory and that the results of services performed in accordance with that system may be accepted and utilized by the Administration in making decisions affecting certification. The certificate shall clearly state the type and scope of services, type of equipment and/or names of manufacturers of equipment where these are limiting restraints and any limitations or restrictions imposed and include a statement that the RIT shall support the close-up survey for the areas which may not be fully accessed by use of the permanent means of access.

4.2 Renewal/endorsement of the certificate shall be made at intervals not exceeding three years by verification that original conditions are maintained.

## **5 Report of any alteration to the certified operation system of the RIT firm**

In cases where any alteration to the certified RIT firm is made, such an alteration shall be immediately reported to the Administration. A re-audit shall be conducted where deemed necessary by the Administration.

## **6 Withdrawal of the certification**

The certification may be withdrawn in the following cases:

- .1 where the RIT was improperly used or the results were improperly reported;
- .2 where the Administration found any deficiency in the operation systems of the RIT firm; and
- .3 where the firm failed to report any alteration referred to in 5 above to the Administration as required."

## **Annex 9**

### **SURVEY REPORTING PRINCIPLES**

#### **1 General**

49 The following new paragraphs 1.4 and 1.5 are added after existing paragraph 1.3:

"1.4 When a RIT has been used then:

- .1 the RIT report shall include all videos and images with a chapter detailing the areas covered and damages found with locations, type, details and dimensions; and
- .2 the report shall include the details of: RIT firm, approval certificate, equipment used and operators.

1.5 The report shall provide evidence of having been reviewed and approved by the attending surveyor(s)."

**3 Result of the survey**

50 Paragraph 3.2.2 is replaced by the following:

".2 identification of compartments where no structural damages/defects have been found. The report may be supplemented by sketches/photographs/videos;"

## PART B

### CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF OIL TANKERS OTHER THAN DOUBLE-HULL OIL TANKERS

#### 1 General

##### 1.2 Definitions

51 Paragraph 1.2.17 is replaced by the following:

"1.2.17 *Administration* means the Administration or organization recognized by the Administration, unless defined otherwise in this Code."

52 The following new paragraph 1.2.18 is added after paragraph 1.2.17, together with the associated footnote:

"1.2.18 *Remote Inspection Technique (RIT)* is a means of survey of any parts of the structure without the need for direct physical access of the surveyor.\*

\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700)."

##### 1.5 Thickness measurements and close-up surveys

53 Section 1.5 is replaced by the following:

##### "1.5 Thickness measurements and close-up surveys

1.5.1 In any kind of survey, i.e. renewal, intermediate, annual or other surveys having the scope of the foregoing ones, for structures in areas where close-up surveys are required, thickness measurements, when required by annex 2, shall be carried out simultaneously with close-up surveys.

1.5.2 For periodic surveys after the third renewal survey, the use of a RIT is subject to the agreement of the Administration, which may impose additional requirements or limitations; in this case the Administration means the Government of the State whose flag the ship is entitled to fly and not the recognized organization."

54 The following new section 1.6 is added after existing section 1.5, together with the associated footnote:

##### "1.6 Remote inspection techniques

1.6.1 RIT surveys shall be carried out in accordance with the requirements given herein and taking into account the guidelines developed by the Organization.\*

1.6.2 Where a RIT for close-up survey is not carried out by the Administration, it shall be conducted by a firm approved as a service supplier by the Administration according to the principles stated in annex 7B of part B of annex B and shall be carried out under the presence of the surveyor and their continuous direction and control of the RIT process.

1.6.3 If the RIT reveals damage or deterioration that the surveyor judges requires attention or further investigation, the surveyor shall require a traditional survey to be undertaken without the use of a RIT.

1.6.4 Random confirmatory surveys or close-up surveys shall be carried out at locations selected by the surveyor for the purpose of verifying the results of the RIT.

\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700)."

## **2 Renewal survey**

### **2.4 Extent of overall and close-up surveys**

55 The following new paragraph 2.4.5 is added after existing paragraph 2.4.4:

"2.4.5 When using a RIT to assist the close-up survey, the following applies:

- .1 the surveyor may use a RIT to assist the close-up survey when there are no permanent means of access provided;
- .2 the use of a RIT to assist the close-up survey shall not be permitted after the third renewal survey, unless agreed with the Administration (see 1.5.2);
- .3 the RIT shall not be used in ballast tanks or any spaces where a hard protective coating is required and it is found to be in less than GOOD condition as defined in 1.2.11, or ballast tanks where a soft or semi-hard coating has been applied, or ballast tanks where a hard protective coating has not been applied from the time of construction;
- .4 the RIT shall not be used to assist the surveyor during the close-up survey in areas which have a recorded significant history of structural failures (corrosion, cracks and buckling). See guidelines in annex 11, paragraph 3.1.1; and
- .5 in addition to the requirements of 1.5.1, when the RIT reveals suspected areas that require thickness measurements, these shall be carried out simultaneously with the close-up survey. Details of how this will be facilitated shall be included in the survey programme."

### **2.6 Extent of tank pressure testing**

56 Paragraph 2.6.1.3 is replaced by the following:

- "3 the tank testing is carried out within the renewal survey window and not more than three months prior to the date on which the overall or close-up survey is completed;"

## **5 Preparations for survey**

### **5.1 Survey programme**

57 The following new paragraph 5.1.6 is added after existing paragraph 5.1.5:

"5.1.6 If it is proposed to use a RIT, the proposal shall be submitted before the survey as part of the survey programme detailed above, discussed and approved by the Administration. The following shall be taken into account when preparing the survey programme:

- .1 the RIT limitations, if any, shall be detailed in the survey programme;
- .2 details of the areas not fully accessed by the permanent means of access and proposed to be covered by a RIT shall be detailed in the survey programme;
- .3 the use of a RIT to assist the close-up survey shall not be permitted after the third renewal survey, unless agreed with the Administration (see 1.5.2);
- .4 the RIT shall not be used in ballast tanks or any spaces where a hard protective coating is required and it is found to be in less than GOOD condition as defined in 1.2.11, or ballast tanks where a soft or semi-hard coating has been applied, or ballast tanks where a hard protective coating has not been applied from the time of construction;
- .5 the RIT shall not be used to assist the surveyor during the close-up in areas which have a recorded significant history of structural failures, defects, damage or deterioration (corrosion, cracks and buckling). See guidelines in annex 12, paragraph 3.1.1; and
- .6 in addition to the requirements of 1.5.1, when the RIT reveals suspected areas that require thickness measurements, these shall be carried out simultaneously with the close-up survey, details of how this will be facilitated shall be included in the survey programme."

### **5.2 Conditions for survey**

58 Paragraph 5.2.3 is replaced by the following:

"5.2.3 In preparation for survey (including for surveys making use of a RIT) and thickness measurements and to allow for a thorough examination, all spaces shall be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces shall be sufficiently clean and free from water, scale, dirt, oil residues, etc., to reveal corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating. However, those areas of structure whose renewal has already been decided by the owner need only be cleaned and descaled to the extent necessary to determine the limits of the areas to be renewed."

#### **5.4      *Equipment for survey***

59      The following new paragraph 5.4.6 is added after existing paragraph 5.4.5, together with the associated footnote:

"5.4.6    The surveyor shall be satisfied with the method of data presentation including pictorial representation, and a good two-way communication between the surveyor and RIT operator shall be provided. Prior to every survey onboard, the RIT shall be validated, taking into account the guidelines developed by the Organization\* and the existing conditions (light, humidity, dust, etc.), to confirm that the expected results can be achieved.

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\*      Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700)."

#### **5.7      *Survey planning meeting***

60      Paragraph 5.7.2 is replaced by the following:

"5.7.2    Prior to commencement of any part of the renewal or intermediate survey, a survey planning meeting shall be held between the attending surveyor(s), the owner's representative in attendance, the thickness measurement firm representative, the RIT firm representative, where involved, and the master of the ship or an appropriately qualified representative appointed by the master or company; for the purpose to ascertain that all the arrangements envisaged in the survey programme are in place, so as to ensure the safe and efficient conduct of the survey work to be carried out (see also 7.1.2)."

61      Paragraph 5.7.3 is replaced by the following:

"5.7.3    The following is an indicative list of items that shall be addressed in the meeting:

- .1      schedule of the ship (i.e. the voyage, docking and undocking manoeuvres, periods alongside, cargo and ballast operations, etc.);
- .2      provisions and arrangements for thickness measurements (i.e. access, cleaning/descaling, illumination, ventilation, personal safety);
- .3      extent of the thickness measurements;
- .4      acceptance criteria (refer to the list of minimum thicknesses);
- .5      extent of close-up survey and thickness measurement considering the coating condition and suspect areas/areas of substantial corrosion;
- .6      execution of thickness measurements;
- .7      taking representative readings in general and where uneven corrosion/pitting is found;

- .8 mapping of areas of substantial corrosion;
- .9 communication between attending surveyor(s), the thickness measurement firm operator(s) and owner's representative(s) concerning findings;
- .10 the RIT limitations, if any;
- .11 details of the areas not fully accessed by permanent means of access and proposed to be covered by a RIT; and
- .12 confirmatory surveys for RIT."

## **7 Procedures for thickness measurements**

### **7.2 Certification of thickness measurement firm**

62 Section 7.2 is replaced by the following:

#### **"7.2 Certification of thickness measurement firm**

The thickness measurements shall be carried out by a qualified firm certified by the Administration according to the principles stated in annex 7A."

Annex 6B

## **SURVEY PLANNING QUESTIONNAIRE**

### **2 Information on access provision for close-up surveys and thickness measurement**

63 Section 2 is replaced by the following:

"The owner shall indicate, in the table below, the means of access to the structures subject to close-up survey and thickness measurement. A close-up survey is an examination where the details of structural components are within the close visual inspection range of the attending surveyor, i.e. normally within reach of hand.

When any part of the close-up survey is being undertaken by means of a RIT, the means of how thickness measurements are going to be taken are also to be indicated in the table below; the thickness measurements shall be carried out simultaneously with the close-up survey, either when required by the ESP Code or by the surveyor as a result of the close-up survey. Note: A RIT to assist the close-up survey may only be used when access is not provided by the permanent means of access (see 1.5 and 5.1.6).

| Tank No.     | Structure         | C (Cargo)/<br>B (Ballast) | Temporary<br>staging | Rafts | Ladders | RIT | Direct<br>access | Other means<br>(please specify) |
|--------------|-------------------|---------------------------|----------------------|-------|---------|-----|------------------|---------------------------------|
| F.P.         | Fore peak         |                           |                      |       |         |     |                  |                                 |
| A.P.         | Aft peak          |                           |                      |       |         |     |                  |                                 |
| Wing tanks   | Underdeck         |                           |                      |       |         |     |                  |                                 |
|              | Side shell        |                           |                      |       |         |     |                  |                                 |
|              | Bottom transverse |                           |                      |       |         |     |                  |                                 |
|              | Longitudinal      |                           |                      |       |         |     |                  |                                 |
|              | Transverse        |                           |                      |       |         |     |                  |                                 |
| Centre tanks | Under deck        |                           |                      |       |         |     |                  |                                 |
|              | Bottom transverse |                           |                      |       |         |     |                  |                                 |
|              | Transverse        |                           |                      |       |         |     |                  |                                 |

|                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>History of cargo with H<sub>2</sub>S content or heated cargo for the last three years together with indication as to whether cargo was heated and, where available, Material Safety Data Sheets (MSDS)*</b> |
|                                                                                                                                                                                                                |
|                                                                                                                                                                                                                |
|                                                                                                                                                                                                                |
|                                                                                                                                                                                                                |
|                                                                                                                                                                                                                |
|                                                                                                                                                                                                                |

\* Refer to resolution MSC.150(77) on *Recommendation for material safety data sheets for MARPOL Annex I cargoes and marine fuel oils.*"

## Annex 7

### **PROCEDURES FOR APPROVAL AND CERTIFICATION OF A FIRM ENGAGED IN THICKNESS MEASUREMENT OF HULL STRUCTURES**

64 Existing annex 7 is renumbered as "Annex 7A" and the following new annex 7B is inserted after renumbered annex 7A, together with the associated footnotes:

#### "Annex 7B

### **PROCEDURES FOR CERTIFICATION OF A FIRM ENGAGED IN CLOSE-UP SURVEY OF HULL STRUCTURES USING A REMOTE INSPECTION TECHNIQUE (RIT)**

#### **1 Application**

This procedure applies to RIT firms providing visual livestreaming of video and images to support close-up surveys.

#### **2 General requirements**

##### *Supervisor and operators*

2.1 The firm shall designate a supervisor who shall be certified according to the recognized national requirements or an equivalent industrial standard and shall have a minimum of two years' experience in the inspection of ships' structures.

2.2 An operator of a RIT shall be certified according to the recognized national requirements or an equivalent industrial standard and have had at least one year's experience as an assistant carrying out inspections of ships' structures (including participation in a minimum of five different assignments). An operator of a RIT who, according to the international and national legislations, is required to be licensed for operation of a RIT shall hold valid documentation issued by the appropriate bodies (e.g. unmanned aerial vehicle (UAV) pilots shall be qualified and licensed in accordance with applicable national requirements).

*Training and qualification of operators*

2.3 The firm is responsible for the training and qualification of its operators. UAV pilots shall be qualified and licensed in accordance with applicable national requirements or an equivalent industrial standard acceptable to the Administration.

2.4 The firm shall maintain a documented training plan for RIT equipment operators. The plan shall include requirements for training in the renewal survey requirements for the structure as specified in this Code, the identification of structural deterioration (including corrosion, buckling, cracking and deteriorated coatings) and the reporting requirements of this Code.

2.5 Knowledge of the following shall be documented:

- .1 guidelines developed by the Organization;\*
- .2 marine and/or offshore nomenclatures;
- .3 the structural configuration of relevant ship types, including internal structure;
- .4 the remote inspection equipment and its operation; and
- .5 survey plans for examination of hull spaces of various configurations, including appropriate flight plans if using a UAV.

---

\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

*RIT equipment*

2.6 As a minimum, the following equipment shall be available:

- .1 remotely operated platform with data capture devices capable of operation within an enclosed space;
- .2 means of powering the platforms with sufficient capacity to complete the required inspections, including spare batteries if applicable;
- .3 data collection devices which may include cameras capable of capturing in high definition both video images and still images;
- .4 illumination equipment;
- .5 high-definition display screen with live high-definition feed from inspection cameras;
- .6 means of communication, as applicable; and
- .7 data recording devices.

2.7 The RIT equipment shall be approved taking into account the guidelines developed by the Organization.\*

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

*Firm procedures and guidelines on the use of RITs*

2.8 The firm shall have documented operational procedures and guidelines on the use of RITs for how to plan, carry out and report inspections; how to handle/operate the equipment; collection and storage of data. These shall take into account the guidelines developed by the Organization\* and include:

- .1 requirements for preparation of inspection plans;
- .2 operation of the remotely operated platforms;
- .3 operation of lighting;
- .4 calibration of the data capture devices;
- .5 operation of the data capture devices;
- .6 two-way communication between the operator, platform, surveyor and other personnel, such as support staff and ships' crew;
- .7 guidance for the operator on how to achieve complete coverage of the structure to be inspected;
- .8 guidance for the maintenance of the remotely operated platforms, data capture and storage devices and display screens, as applicable;
- .9 requirements for the collection and validation of data;
- .10 if data is to be stored, then requirements for location attribution, and, time and date attribution, as available, validation and storage of data;
- .11 requirements for the reporting of inspections, including the recording of damages and defects found during inspection and repair work; and
- .12 if capable of undertaking cleaning/surface preparation, then procedures for undertaking this work.

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

*Documents and records*

2.9 The firm shall maintain the following:

- .1 training records;
- .2 operators' statutory and regulatory certificates and licences;

- .3 equipment register for RIT equipment, including delivery device (e.g. UAVs, robots), data capture devices, data analysis devices and any associated equipment necessary to perform inspections;
- .4 equipment maintenance manuals and records/logbook;
- .5 records of calibration; and
- .6 RIT equipment operation logbook.

### **3 Procedures for certification**

#### *Submission of documents*

3.1 The following documents shall be submitted to the Administration for approval, together with a list of the documents submitted:

- .1 outline of the firm, e.g. organization and management structure;
- .2 experience of the firm with close-up survey of hull structures of ships using the RIT;
- .3 technicians' careers, i.e. experience of technicians as RIT operators, technical knowledge and experience of hull structure, etc.;
- .4 equipment used, including capturing devices (i.e. drones, cameras, etc.), streaming devices (i.e. screens) and other supporting equipment (i.e. illumination), and their maintenance/calibration procedures;
- .5 operational procedures and instructions on how to carry out the servicing of the equipment and/or system. These shall either contain or make reference to the manufacturer's servicing manuals, servicing bulletins, instructions and training manuals, as appropriate, and to relevant international requirements;
- .6 training programmes for RIT operators; and
- .7 report format taking into account the guidelines developed by the Organization.\*

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

*Auditing of the firm\**

3.2 Upon reviewing the documents submitted with satisfactory results, the firm shall be audited in order to ascertain that it is duly organized and managed in accordance with the documents submitted, and eventually is capable of conducting close-up surveys of the hull structure of ships using RIT.

3.3 Certification is conditional upon a demonstration (on board or in a test environment) of a close-up survey using the RIT, as well as satisfactory reporting.

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\* Refer to the *Guidelines on the use of remote inspection techniques for ESP Code surveys* (MSC.1/Circ.1700).

#### **4 Certification**

4.1 Upon satisfactory results of both the audit of the firm referred to in 3.2 and the demonstration tests referred to in 3.3, the Administration shall issue a certificate of approval stating that the firm's operation system has been found to be satisfactory and that the results of services performed in accordance with that system may be accepted and utilized by the Administration in making decisions affecting certification. The certificate shall clearly state the type and scope of services, type of equipment and/or names of manufacturers of equipment where these are limiting restraints and any limitations or restrictions imposed and include a statement that the RIT shall support the close-up survey for the areas which may not be fully accessed by use of the permanent means of access.

4.2 Renewal/endorsement of the certificate shall be made at intervals not exceeding three years by verification that original conditions are maintained.

#### **5 Report of any alteration to the certified operation system of the RIT firm**

In cases where any alteration to the certified RIT firm is made, such an alteration shall be immediately reported to the Administration. A re-audit shall be conducted where deemed necessary by the Administration.

#### **6 Withdrawal of the certification**

The certification may be withdrawn in the following cases:

- .1 where the RIT was improperly used or the results were improperly reported;
- .2 where the Administration found any deficiency in the operation systems of the RIT firm; and
- .3 where the firm failed to report any alteration referred to in 5 above to the Administration as required."

Annex 8

**SURVEY REPORTING PRINCIPLES**

**1 General**

65 The following new paragraphs 1.4 and 1.5 are added after existing paragraph 1.3:

"1.4 When a RIT has been used then:

- .1 the RIT report shall include all videos and images with a chapter detailing the areas covered and damages found with locations, type, details and dimensions; and
- .2 the report shall include the details of: RIT firm, approval certificate, equipment used and operators.

1.5 The report shall provide evidence of having been reviewed and approved by the attending surveyor(s)."

**3 Result of the survey**

66 Paragraph 3.2.2 is replaced by the following:

"2 identification of compartments where no structural damages/defects have been found. The report may be supplemented by sketches/photographs/videos;"

\*\*\*

**ANNEX 5****RESOLUTION MSC.585(111)  
(adopted on 21 May 2026)****AMENDMENTS TO THE INTERNATIONAL CODE OF SAFETY  
FOR HIGH-SPEED CRAFT, 1994 (1994 HSC CODE)**

THE MARITIME SAFETY COMMITTEE,

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

NOTING resolution MSC.36(63), by which it adopted the International Code of Safety for High-Speed Craft ("the 1994 HSC Code"), which has become mandatory under chapter X of the International Convention for the Safety of Life at Sea, 1974 ("the Convention"),

NOTING ALSO article VIII(b) and regulation X/1.1 of the Convention concerning the procedure for amending the 1994 HSC Code,

HAVING CONSIDERED, at its 111th session, amendments to the 1994 HSC Code proposed and circulated in accordance with article VIII(b)(i) of the Convention,

1 ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the 1994 HSC Code, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the said amendments shall be deemed to have been accepted on 1 July 2027, unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet have notified the Secretary-General of their objections to the amendments;

3 INVITES Contracting Governments to the Convention to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2028 upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, for the purposes of article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Contracting Governments to the Convention;

5 ALSO REQUESTS the Secretary-General to transmit copies of this resolution and its annex to Members of the Organization which are not Contracting Governments to the Convention.

ANNEX

**AMENDMENTS TO THE INTERNATIONAL CODE OF SAFETY  
FOR HIGH-SPEED CRAFT, 1994 (1994 HSC CODE)**

**CHAPTER 13  
SHIPBORNE NAVIGATIONAL SYSTEMS AND EQUIPMENT  
AND VOYAGE DATA RECORDER**

**13.15 Automatic identification system (AIS)**

1 Paragraph 13.15 is replaced by the following:

**"13.15 Automatic identification system (AIS) and VHF data exchange system (VDES)**

13.15.1 Craft should be provided with automatic identification system (AIS) or VHF data exchange system (VDES).

13.15.2 AIS or VDES should:

- .1 provide automatically to appropriately equipped shore stations, other vessels and aircraft information, including the craft's identity, type, position, course, speed, navigational status and other safety-related information;
- .2 receive automatically such information from similarly fitted vessels and craft;
- .3 monitor and track vessels; and
- .4 exchange data with shore-based facilities.

13.15.3 The requirements of 13.15.2 should not be applied to cases where international agreements, rules or standards provide for the protection of navigational information.

13.15.4 AIS or VDES should be operated taking into account the guidelines developed by the Organization.\*

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\* Refer to the *Revised guidelines for the onboard operational use of shipborne Automatic Identification Systems (AIS)* (resolution A.1106(29)) and *Guidelines for the onboard operational use of shipborne VHF data exchange system (VDES)* (MSC.1/Circ.1699)."

Annex 1

**FORM OF HIGH-SPEED CRAFT SAFETY CERTIFICATE**

**Record of Equipment for High-Speed Craft Safety Certificate**

**5 Details of navigational systems and equipment**

2 In the table for "Details of navigational systems and equipment", item 13 is replaced by the following:

"13 Automatic identification system (AIS) or VHF data exchange system (VDES)"

\*\*\*



**ANNEX 6**

**RESOLUTION MSC.586(111)  
(adopted on 21 May 2026)**

**AMENDMENTS TO THE INTERNATIONAL CODE OF SAFETY  
FOR HIGH-SPEED CRAFT, 2000 (2000 HSC CODE)**

THE MARITIME SAFETY COMMITTEE,

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

NOTING resolution MSC.97(73), by which it adopted the International Code of Safety for High-Speed Craft, 2000 ("the 2000 HSC Code"), which has become mandatory under chapter X of the International Convention for the Safety of Life at Sea, 1974 ("the Convention"),

NOTING ALSO article VIII(b) and regulation X/1.2 of the Convention concerning the procedure for amending the 2000 HSC Code,

HAVING CONSIDERED, at its 111th session, amendments to the 2000 HSC Code proposed and circulated in accordance with article VIII(b)(i) of the Convention,

1 ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the 2000 HSC Code, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the said amendments shall be deemed to have been accepted on 1 July 2027, unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet have notified the Secretary-General of their objections to the amendments;

3 INVITES Contracting Governments to the Convention to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2028 upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, for the purposes of article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Contracting Governments to the Convention;

5 ALSO REQUESTS the Secretary-General to transmit copies of this resolution and its annex to Members of the Organization which are not Contracting Governments to the Convention.

ANNEX

**AMENDMENTS TO THE INTERNATIONAL CODE OF SAFETY  
FOR HIGH-SPEED CRAFT, 2000 (2000 HSC CODE)**

**CHAPTER 13  
SHIPBORNE NAVIGATIONAL SYSTEM AND EQUIPMENT  
AND VOYAGE DATA RECORDERS**

**13.15 Automatic identification system**

1 Paragraph 13.15 is replaced by the following:

**"13.15 Automatic identification system (AIS) and VHF data exchange system (VDES)**

13.15.1 Craft shall be provided with an automatic identification system (AIS) or VHF data exchange system (VDES).

13.15.2 AIS or VDES shall:

- .1 provide automatically to appropriately equipped shore stations, other vessels and aircraft information, including the craft's identity, type, position, course, speed, navigational status and other safety-related information;
- .2 receive automatically such information from similarly fitted vessels;
- .3 monitor and track vessels; and
- .4 exchange data with shore-based facilities.

13.15.3 The requirements of 13.15.2 shall not apply where international agreements, rules or standards provide for the protection of navigational information.

13.15.4 AIS or VDES shall be operated taking into account the guidelines adopted by the Organization.\*

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\* Refer to the *Revised guidelines for the onboard operational use of shipborne Automatic Identification Systems (AIS)* (resolution A.1106(29)) and *Guidelines for the onboard operational use of shipborne VHF data exchange system (VDES)* (MSC.1/Circ.1699)."

Annex 1

**FORM OF HIGH-SPEED CRAFT SAFETY CERTIFICATE**

**Record of Equipment for High-Speed Craft Safety Certificate**

**3 Details of navigational systems and equipment**

2 In the table for "Details of navigational systems and equipment", item 15 is replaced by the following:

"15 Automatic identification system (AIS) or VHF data exchange system (VDES)"

\*\*\*



**ANNEX 7**

**RESOLUTION MSC.587(111)  
(adopted on 21 May 2026)**

**AMENDMENTS TO THE  
INTERNATIONAL MARITIME DANGEROUS GOODS (IMDG) CODE**

THE MARITIME SAFETY COMMITTEE,

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

RECALLING ALSO resolution MSC.122(75) by which it adopted the International Maritime Dangerous Goods Code (hereinafter referred to as "the IMDG Code"), which has become mandatory under chapter VII of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended (hereinafter referred to as "the Convention"),

RECALLING FURTHER article VIII(b) and regulation VII/1.1 of the Convention concerning the procedure for amending the IMDG Code,

HAVING CONSIDERED, at its 111th session, amendments to the IMDG Code, proposed and circulated in accordance with article VIII(b)(i) of the Convention,

1 ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the IMDG Code, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that said amendments shall be deemed to have been accepted on 1 July 2027, unless prior to that date more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have notified their objections to the amendments;

3 INVITES Contracting Governments to the Convention to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2028 upon their acceptance in accordance with paragraph 2 above;

4 AGREES that Contracting Governments to the Convention may apply the aforementioned amendments in whole or in part on a voluntary basis from 1 January 2027;

5 REQUESTS the Secretary-General, for the purposes of article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Contracting Governments to the Convention;

6 ALSO REQUESTS the Secretary-General to transmit copies of this resolution and its annex to Members of the Organization which are not Contracting Governments to the Convention.

ANNEX

**DRAFT AMENDMENTS TO THE INTERNATIONAL MARITIME  
DANGEROUS GOODS (IMDG) CODE  
(AMENDMENT 43-26)**

**PART 1  
GENERAL PROVISIONS, DEFINITIONS AND TRAINING**

**Chapter 1.1  
General provisions**

**1.1.3 Dangerous goods forbidden from transport**

1.1.3.1 At the end of the paragraph, add the sentence "For vehicles which are prohibited from transport, see special provision SP980".

**Chapter 1.2  
Definitions, units of measurement and abbreviations**

**1.2.1 Definitions**

Amend the existing definitions as indicated below:

In the definition for "*Bundles of cylinders*", at the end, add the words "The test pressure volume product taking into account the total water capacity of all pressure receptacles in the bundle shall not exceed 1.5 million bar L".

In the definition for "*Cylinders*", at the end, add the words "with a test pressure volume product not exceeding 1.5 million bar L".

In the definition for "*Filling ratio*", replace the words "a pressure receptacle" with the words "the means of containment".

In the definition for "*Large packagings*", in .2, replace the words "a volume" with the words "an internal volume".

In the definition for "*Large salvage packaging*", in .2, replace the words "a volume" with the words "an internal volume".

In the definition for "*Net explosive mass (NEM)*", after the word "*(NEQ)*", replace the comma with the word "or" and after the word "*(NEC)*", delete the words ", or net explosive weight (*NEW*)".

In the definition for "*Salvage pressure receptacle*", delete the words "with a water capacity not exceeding 3,000 L" and, after the words "pressure receptacle(s)", add the words "having a total test pressure volume product not exceeding 1.5 million bar L".

In the definition for "*Tube*", at the end, add the words "with a test pressure volume product not exceeding 1.5 million bar L".

In the definition for "Unit load", in paragraph ".2 placed in a protective outer enclosure, such as a pallet box;" insert the word "or", to read as follows: ".2 placed in a protective outer enclosure, such as a pallet box; or"

Insert the following new definitions in alphabetical order:

*"Usable water capacity* means the water capacity of salvage pressure receptacles remaining after the installation of equipment into a salvage pressure receptacle, which is necessary for, e.g. opening or drilling a stored pressure receptacle inside a closed salvage pressure receptacle. The usable water capacity may be lower than the water capacity originally approved and marked. It is expressed in litres".

*"Single packaging* means a packaging which does not require any inner packaging to perform its containment function during transport".

*"Pressure volume product (pV-product)* means the value resulting from multiplying the (usable) water capacity of a containment with its relevant maximum pressure during filling and usage (e.g. test pressure or charging pressure) as referenced for the relevant kind of containment. It is expressed in bar L".

1.2.2.1 In the table, in the second row for "Mass", in column "Acceptable alternative unit", replace the word "(ton)" with the words "(tonne (metric ton))".

In the table on round figures that are applicable for the conversion of the units into SI units:

Delete the sections for "Force" and "Stress".

In the section for "Pressure":

For "1 Pa", delete " $= 1.02 \times 10^{-5} \text{ kg/cm}^2 = 0.75 \times 10^{-2} \text{ torr}$ ".

For "1 bar", delete " $= 1.02 \text{ kg/cm}^2 = 750 \text{ torr}$ ".

Delete the lines for "1 kg/cm<sup>2</sup>" and "1 torr".

In the section for "Energy, work, quantity of heat":

For "1 J", delete " $= 0.102 \text{ kg}\cdot\text{m}$ ".

For "1 kWh", delete " $= 367 \times 10^3 \text{ kg}\cdot\text{m}$ ".

Delete the line for "1 kg·m".

For "1 kcal", delete " $= 427 \text{ kg}\cdot\text{m}$ ".

In the section for "Power":

For "1 W", delete " $= 0.102 \text{ kg}\cdot\text{m/s}$ ".

Delete the line for "1 kg·m/s<sup>2</sup>".

For "1 kcal/h", delete " $= 0.119 \text{ kg}\cdot\text{m/s}$ ".

In the section for "Dynamic viscosity":

For "1 Pa·s", delete "= 0.102 kg·s/m<sup>2</sup>".

For "1 P", delete "= 1.02 × 10<sup>-2</sup> kg·s/m<sup>2</sup>".

Delete the line for "1 kg·s/m<sup>2</sup>".

## Chapter 1.5 General provisions concerning radioactive material

1.5.1.3 In the second sentence, after the words "in-transit storage", add the words ", shipment after storage".

## PART 2 CLASSIFICATION

### Chapter 2.0 Introduction

#### 2.0.2 UN numbers and proper shipping names

In the third paragraph (entries in the Dangerous Goods List are of the following four types:), replace the following proper shipping names with upper-case text, to read as follows:

".1 single entries for well-defined substances or articles:

|      |         |                        |
|------|---------|------------------------|
| e.g. | UN 1090 | ACETONE                |
|      | UN 1194 | ETHYL NITRITE SOLUTION |

".2 generic entries for well-defined groups of substances or articles:

|      |         |                                   |
|------|---------|-----------------------------------|
| e.g. | UN 1133 | ADHESIVES                         |
|      | UN 1266 | PERFUMERY PRODUCT                 |
|      | UN 2757 | CARBAMATE PESTICIDE, SOLID, TOXIC |
|      | UN 3101 | ORGANIC PEROXIDE TYPE B, LIQUID   |

".3 specific N.O.S. entries covering a group of substances or articles of a particular chemical or technical nature:

|      |         |                             |
|------|---------|-----------------------------|
| e.g. | UN 1477 | NITRATES, INORGANIC, N.O.S. |
|      | UN 1987 | ALCOHOLS, N.O.S.            |

".4 general N.O.S. entries covering a group of substances or articles meeting the criteria of one or more classes:

|      |         |                                  |
|------|---------|----------------------------------|
| e.g. | UN 1325 | FLAMMABLE SOLID, ORGANIC, N.O.S. |
|      | UN 1993 | FLAMMABLE LIQUID, N.O.S."        |

2.0.2.9 After the words "N.O.S. or generic entry", delete the words "and one or more substances" and at the end, add the words "or division".

## 2.0.4 Transport of samples

### 2.0.4.3 Samples of energetic materials for testing purposes

In **2.0.4.3**, add a new 2.0.4.3.2 and a new 2.0.4.3.3 to read as follows:

"2.0.4.3.2 Samples of organic substances carrying functional groups listed in tables A6.1 or A6.3 in appendix 6 of the *Manual of Tests and Criteria* may be assigned to one of the appropriate entries for self-reactive substances type C (UN Nos.3223, 3224, 3233 or 3234, as applicable) of division 4.1 and transported under the provisions of 2.4.2.3.2.4.2 for the transport in amounts of not more than 200 g per outer packaging provided that:

- .1 they fulfil the criteria of 2.0.4.3.1.1 to .3; and
- .2 their decomposition energy is:
  - .1 less than 1,500 J/g for salts or complexes of organic compounds;
  - .2 less than 2,000 J/g for other organic substances;
  - .3 1,500 J/g or more for salts or complexes of organic compounds, and in test C.1 the result is not "yes, rapidly" and in any one of test series F the result is not "not low"; or
  - .4 2,000 J/g or more for other organic substances, and in test C.1 the result is not "yes, rapidly" and in any one of test series F the result is not "not low".

The assessment in .2.3 and .2.4 may be based on a single test C.1 and a single test from test series F. If the criteria in .2 are fulfilled, it can be assumed that the sample is not more dangerous than self-reactive substances type B.

An appropriate method to determine temperature control requirements is described in section 20.3.4 of the *Manual of Tests and Criteria*.

Samples not passing the criteria in .2.3 or .2.4 may be transported by an approval issued by the competent authority of the country of origin. The approval shall be based on the available information and contain the classification and the relevant transport conditions. Alternatively, the sample may be dissolved or diluted with an inert compound to form a homogeneous mixture in agreement with the criteria in .2.1 or .2.2, as applicable.

2.0.4.3.3 A flow chart describing the classification of energetic samples is shown in figure 2.0.1.

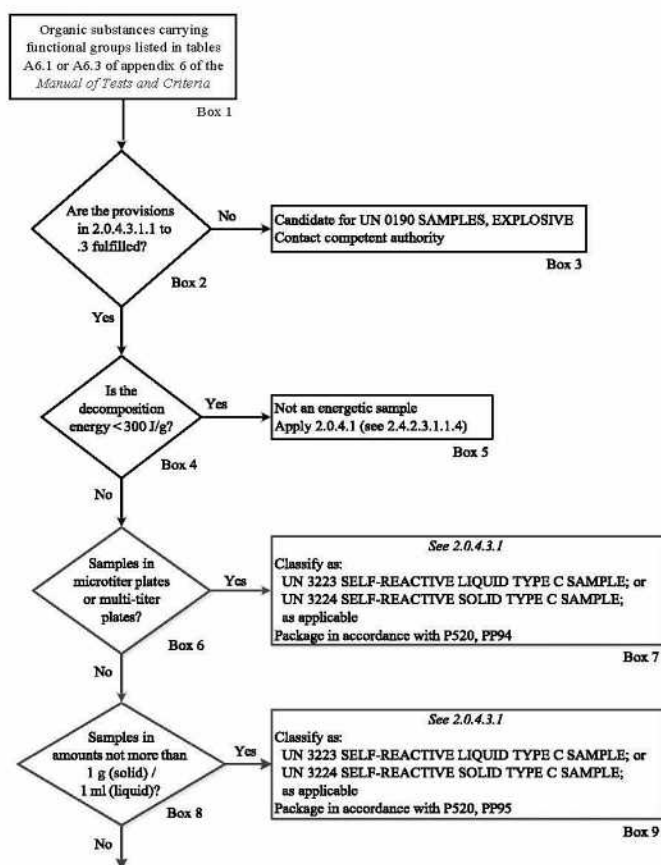


Figure 2.0.1 – Classification of energetic samples

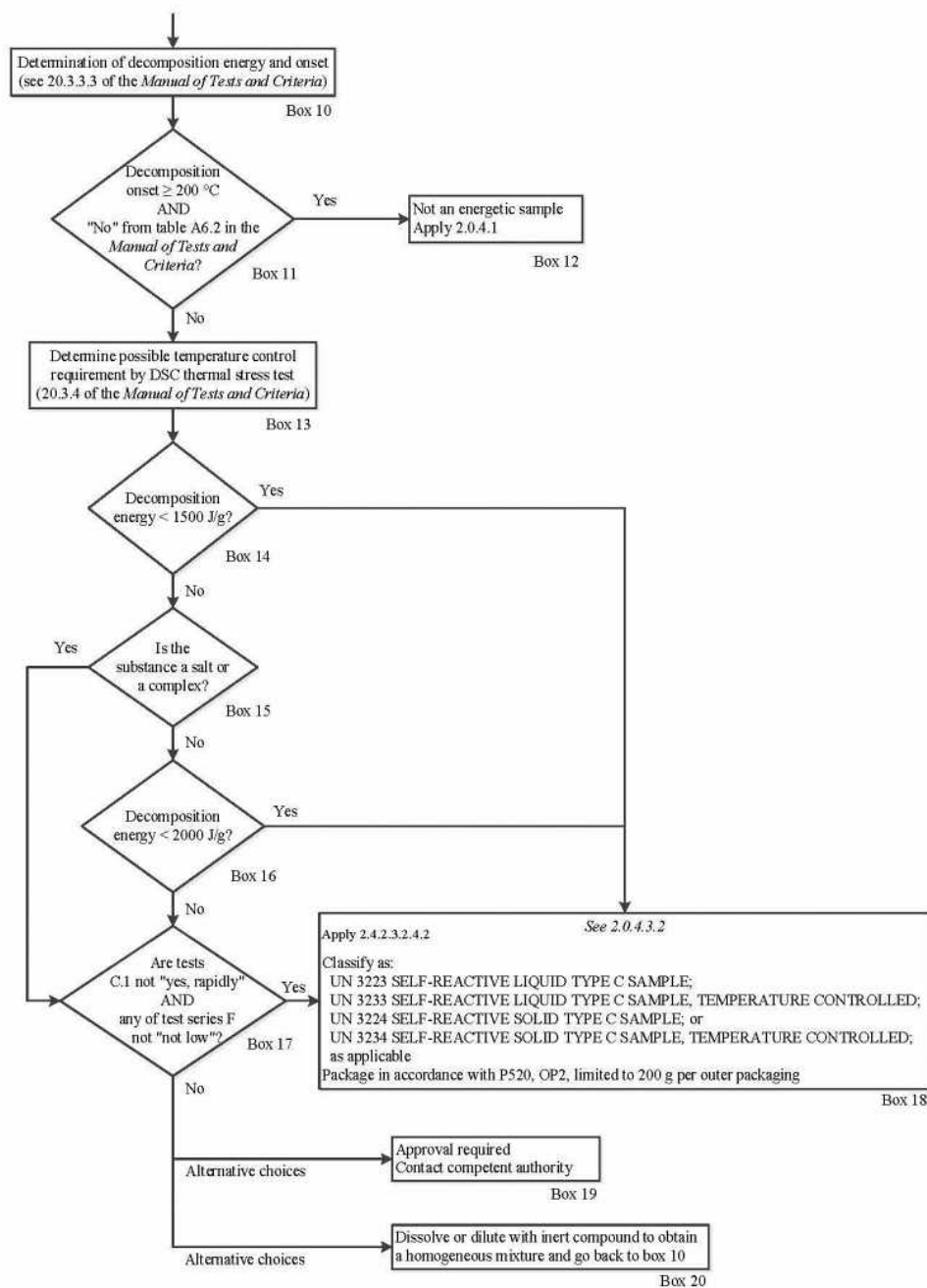


Figure 2.0.1 – Classification of energetic samples (continued)"

**2.0.6 Classification of articles as articles containing dangerous goods, N.O.S.**

**2.0.6.2** In the second sentence, replace the words "Lithium cells and batteries" with the words "Lithium metal, lithium ion and sodium ion cells and batteries". In the third sentence, replace the words "lithium cells or batteries" with the words "lithium metal, lithium ion or sodium ion cells or batteries" (*twice*).

**Chapter 2.1  
Class 1 Explosives****2.1.1 Definitions and general provisions**

**2.1.1.1** In .2, after the word "except", add the words "those that are too dangerous to transport or".

**2.1.1.3 Definitions**

In .6, delete the words ", in the context of 2.1.1.1.3,".

**2.1.3 Classification procedure****2.1.3.4 Exclusion from class 1**

Renumber **2.1.3.4.2** as **2.1.3.4.4** and add the following new paragraphs:

**"2.1.3.4.2** Where a substance provisionally accepted into class 1 is excluded from class 1 by performing test series 6 of section 16 of part I of the UN *Manual of Tests and Criteria* on a specific type and size of package, this substance, when meeting the classification criteria or definition for another class or division, shall be listed in the Dangerous Goods List of chapter 3.2 in that class or division with a special provision restricting it to the type and size of package tested.

**2.1.3.4.3** Where a substance is assigned to class 1 but is diluted to be excluded from class 1 by test series 6 of section 16 of part I of the UN *Manual of Tests and Criteria*, this diluted substance (hereafter referred to as desensitized explosive) shall be listed in the Dangerous Goods List of chapter 3.2 with an indication of the highest concentration which excluded it from class 1 (see 2.3.1.4 and 2.4.2.4.1) and, if applicable, the concentration below which it is no longer deemed subject to this Code. New solid desensitized explosives subject to this Code shall be listed in class 4.1 and new liquid desensitized explosives shall be listed in class 3. When the desensitized explosive meets the criteria or definition for another class or division, the corresponding subsidiary hazard(s) shall be assigned to it."

## Chapter 2.4

### Class 4 – Flammable solids; substances liable to spontaneous combustion; substances which, in contact with water, emit flammable gases

#### 2.4.3 Class 4.2 – Substances liable to spontaneous combustion

##### 2.4.3.2 Classification of class 4.2 substances

##### 2.4.3.2.3 Self-heating substances

2.4.3.2.3.1 In .2 and .3, replace the word "a volume" with the words "an internal volume".

2.4.3.2.3.2 In .2 and .3, replace the word "a volume" with the words "an internal volume".

2.4.3.3.3 In .1 and .2, replace the word "a volume" with the words "an internal volume".

## Chapter 2.5

### Class 5 – Oxidizing substances and organic peroxides

#### 2.5.3 Class 5.2 – Organic peroxides

##### 2.5.3.2 Classification of organic peroxides

##### 2.5.3.2.4 List of currently assigned organic peroxides in packagings

In the table, delete the entry for "([3R-(3R,5aS,6S,8aS,9R,10R,12S,12aR\*\*)]-DECAHYDRO-10-METHOXY-3,6,9-TRIMETHYL-3,12-EPOXY-12H-PYRANO[4,3-j]-1,2-ENZODIOXEPIN)".

In the table, add the following new entries in proper order:

|      |                                                                                   |       |      |  |  |  |     |     |     |      |
|------|-----------------------------------------------------------------------------------|-------|------|--|--|--|-----|-----|-----|------|
| 3115 | <i>tert</i> -AMYL PEROXYPIVALATE                                                  | ≤ 72  | ≥ 28 |  |  |  | OP7 | +10 | +15 |      |
| 3105 | 1,2,4,5,7,8-HEXOXONANE, 3,6,9-TRIMETHYL-3,6,9-tris (Ethyl and Propyl) derivatives | ≤ 41  | ≥ 59 |  |  |  | OP7 |     |     | (35) |
| 3106 | ARTEETHER (including stereoisomers)                                               | ≤ 100 |      |  |  |  | OP7 |     |     |      |
| 3106 | ARTEMETHER (including stereoisomers)                                              | ≤ 100 |      |  |  |  | OP7 |     |     |      |
| 3106 | ARTEMISININ                                                                       | ≤ 100 |      |  |  |  | OP7 |     |     |      |
| 3106 | ARTESUNATE (including stereoisomers)                                              | ≤ 100 |      |  |  |  | OP7 |     |     |      |
| 3106 | DIHYDROARTEMISININ (including stereoisomers)                                      | ≤ 100 |      |  |  |  | OP7 |     |     |      |

In the list of "Remarks", add the following entry:

"(35) Available oxygen  $\leq$  7.3%".

## **Chapter 2.6**

### **Class 6 – Toxic and infectious substances**

#### **2.6.2 Class 6.1 – Toxic substances**

##### **2.6.2.2 Assignment of packing groups to toxic substances**

**2.6.2.2.4.1** In the note, after the word "Substances", add the words "or mixtures".

#### **2.6.3 Class 6.2 – Infectious substances**

##### **2.6.3.2 Classification of infectious substances**

**2.6.3.2.2** Replace the words "the following categories:" with the words "categories A and B".

**2.6.3.2.2.1** Replace the text before the table to read as follows:

###### **"2.6.3.2.2.1 Category A**

An infectious substance which is transported in a form that, when exposure to it occurs, is capable of causing permanent disability, life-threatening or fatal disease in otherwise healthy humans or animals is assigned to category A. Indicative examples of substances that meet these criteria are given in the table in this paragraph.

**Note:** An exposure occurs when an infectious substance is released outside of the protective packaging, resulting in physical contact with humans or animals.

Infectious substances meeting these criteria which cause disease in humans or both in humans and animals shall be assigned to UN 2814 INFECTIOUS SUBSTANCE, AFFECTING HUMANS. Infectious substances which cause disease only in animals shall be assigned to UN 2900 INFECTIOUS SUBSTANCE, AFFECTING ANIMALS.

Assignment to UN Nos.2814 or 2900 shall be based on the known medical history and symptoms of the source human or animal, endemic local conditions, or professional judgement concerning individual circumstances of the source human or animal.

The following table is not exhaustive. Infectious substances, including new or emerging pathogens, which do not appear in the table but which meet the same criteria shall be assigned to category A. In addition, if there is doubt as to whether or not a substance meets the criteria, it shall be included in category A. To address emerging health situations, more up-to-date information on the applicable categories can be obtained from human and animal health intergovernmental organizations and national authorities."

In the table:

In the heading, delete "(2.6.3.2.2.1.1)" to read "Indicative examples of infectious substances included in category A in any form unless otherwise indicated".

In the heading of the second column, after the word "Microorganism" add the words "(bacteria and fungi are written in italics)".

In the first column, for UN 2900, at the end, delete the word "only".

**2.6.3.2.2.2** Replace the text before the note to read as follows:

**"2.6.3.2.2.2 Category B**

An infectious substance which does not meet the criteria for inclusion in category A is assigned to category B. Infectious substances in category B shall be assigned to UN 3373 BIOLOGICAL SUBSTANCE, CATEGORY B."

Delete the note.

**2.6.3.2.3.9** In .3, at the end, add the words "other than lithium cells or batteries or sodium ion cells or batteries contained in or packed with equipment (UN Nos.3091, 3481 and 3552);".

At the end, add the following new paragraph:

"When used medical devices contain or are packed with lithium cells or batteries or sodium ion cells or batteries, the relevant entry of the Dangerous Goods List in chapter 3.2 shall be used and all applicable provisions of this Code shall apply."

**Chapter 2.8**  
**Class 8 – Corrosive substances**

**2.8.2 General classification provisions**

In 2.8.2.4, after the word "ingestion", replace the words "or dermal contact only in the range" with the words "and dermal contact in the range".

**Chapter 2.9**  
**Miscellaneous dangerous substances and articles (class 9)**  
**and environmentally hazardous substances**

**2.9.2 Assignment to class 9**

**2.9.2.2 Under "Lithium batteries":**

In the line for "3536", after the word "LITHIUM", add the word "ION" and delete the lower-case text "lithium ion batteries or lithium metal batteries" at the end of the line.

After the line for "3536", add a new line to read as follows:

"3563 LITHIUM METAL BATTERIES INSTALLED IN CARGO TRANSPORT UNIT"

Under "**Sodium ion batteries**":

After the lines for UN 3552, add a new entry to read as follows:

"3564 SODIUM ION BATTERIES INSTALLED IN CARGO TRANSPORT UNIT"

#### 2.9.4 Lithium batteries

Replace the chapeau with the following text:

"Cells and batteries, cells and batteries contained in articles, engines, equipment or vehicles or cells and batteries packed with equipment, containing lithium in any form may be transported under the appropriate entries if they meet the following provisions:"

In .1, renumber the existing note as "**Note 1**" and add a new note 2 to read as follows:

**"Note 2:** A battery with a change resulting from treatment, such as repairing, refurbishing, or remanufacturing in accordance with 38.3.2.2 (c) of the *Manual of Tests and Criteria* may be considered to differ from a tested type."

In the note in .7, delete the words "for lithium cells or batteries or equipment with installed lithium cells or batteries".

Add a new .8 to read as follows:

- ".8 Hybrid batteries, containing both lithium ion cells and sodium ion cells (see special provision 410 of chapter 3.3), shall meet the following conditions:
- .1 the lithium ion cells and sodium ion cells are electrically connected;
  - .2 the battery has been tested as a lithium ion battery in accordance with 2.9.4.1; and
  - .3 each component lithium ion and sodium ion cell of the battery shall be of a type proved to meet the respective testing requirements of the *Manual of Tests and Criteria*, part III, subsection 38.3."

#### 2.9.5 Sodium ion batteries

Replace the chapeau with the following text:

"Cells and batteries, cells and batteries contained in articles, engines, equipment or vehicles, or cells and batteries packed with equipment containing sodium ion, which are a rechargeable electrochemical system where the positive and negative electrode are both intercalation or insertion compounds, constructed with no metallic sodium (or sodium alloy) in either electrode and with an organic non aqueous compound as electrolyte, may be transported under the appropriate entry if they meet the following provisions:"

Delete the sentence "They may be transported under these entries if they meet the following provisions:"

In .1, at the end, add the following new note:

**"Note:** Batteries shall be of a type proved to meet the testing requirements of the *Manual of Tests and Criteria*, part III, subsection 38.3, irrespective of whether the cells of which they are composed are of a tested type."

In .6, at the end, add the following new note:

**"Note:** The term "make available" means that manufacturers and subsequent distributors ensure that the test summary is accessible so that the consignor or other persons in the supply chain can confirm compliance."

## PART 3 DANGEROUS GOODS LIST, SPECIAL PROVISIONS AND EXCEPTIONS

### Chapter 3.2 Dangerous Goods List

#### 3.2.1 Structure of the Dangerous Goods List

With regard to "Column 17", replace the second paragraph to read as follows:

**"Note:** The following table provides examples of properties that may be included, as appropriate, in column 17 for the following specific classes:

|             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All classes | <ul style="list-style-type: none"> <li>• Physical state (i.e. solid, liquid, gas)</li> <li>• Form (e.g. flakes, powder, crystals, etc.)</li> <li>• Colour</li> <li>• Odour</li> <li>• Miscibility/solubility</li> <li>• Density</li> <li>• Human effect (e.g. irritating, drying, etc.)</li> <li>• Reactivity (e.g. with water, air, moisture, etc.)</li> <li>• Decomposition (e.g. with heat, fire or water)</li> <li>• Freezing/melting point</li> <li>• Vapour pressure</li> </ul>                                                                                                                                                        |
| Class 1     | <ul style="list-style-type: none"> <li>• Stability (e.g. needs to be submerged in liquid)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Class 2     | <ul style="list-style-type: none"> <li>• Boiling point</li> <li>• Upper explosive or flammable limit (UEL/UFL) for class 2.1</li> <li>• Lower explosive or flammable limit (LEL/LFL) for class 2.1</li> <li>• Expansion ratio</li> <li>• Density in relation to air</li> <li>• "lighter than air" when the vapour density is down to half that of air;</li> <li>• "much lighter than air" when the vapour density is less than half that of air;</li> <li>• "heavier than air" when the vapour density is up to twice that of air; and</li> <li>• "much heavier than air" when the vapour density is more than twice that of air.</li> </ul> |
| Class 3     | <ul style="list-style-type: none"> <li>• Boiling point</li> <li>• Initial boiling point</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

|         |                                                                                                                                                                                                 |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|         | <ul style="list-style-type: none"> <li>Flashpoint</li> <li>Viscosity</li> </ul>                                                                                                                 |
| Class 4 | <ul style="list-style-type: none"> <li>None</li> </ul>                                                                                                                                          |
| Class 5 | <ul style="list-style-type: none"> <li>None</li> </ul>                                                                                                                                          |
| Class 6 | <ul style="list-style-type: none"> <li>Toxicity route for class 6.1</li> <li>Toxicity level for class 6.1 (LD<sub>50</sub>, LC<sub>50</sub>, saturated vapour concentration at 20°C)</li> </ul> |
| Class 7 | <ul style="list-style-type: none"> <li>None</li> </ul>                                                                                                                                          |
| Class 8 | <ul style="list-style-type: none"> <li>Corrosivity to metal or skin or both</li> <li>pH</li> </ul>                                                                                              |
| Class 9 | <ul style="list-style-type: none"> <li>Any of the above or other properties, as appropriate</li> </ul>                                                                                          |

The following are some examples of observations on substances and articles for inclusion in column 17 that would be useful to the crew:

- .1 May form explosive mixtures with combustible material, powdered metals, or ammonium compounds.
- .2 These mixtures are sensitive to friction and are liable to ignite.
- .3 When involved in a fire, it evolves extremely toxic (e.g. phosgene) and corrosive (e.g. hydrogen chloride) fumes."

### Dangerous Goods List

Amend the following existing entries as indicated below:

| UN No.      | Amendment                                                                                  |
|-------------|--------------------------------------------------------------------------------------------|
| 0012        | In column 9, add "PP100" against "P130"                                                    |
| 0014        | In column 9, add "PP100" against "P130"                                                    |
| 1040        | In column 4, add "8"                                                                       |
| 1041        | In column 4, add "8"                                                                       |
| 1075        | In column 6, add "412"                                                                     |
| 1599 PG III | In column 14, replace "TP1" with "TP2"                                                     |
| 1727        | In column 4, add "6.1"                                                                     |
| 1761 PG III | In column 14, replace "TP1" with "TP2"                                                     |
| 1897        | In column 14, replace "TP1" with "TP2"                                                     |
| 1965        | In column 6, add "412"                                                                     |
| 2020        | Replace column 2 to read "CHLOROPHENOLS, TOXIC, SOLID, N.O.S." and in column 6, add "274"  |
| 2021        | Replace column 2 to read "CHLOROPHENOLS, TOXIC, LIQUID, N.O.S." and in column 6, add "274" |
| 2029        | In column 16(a), add "SW1", "SW11", "H2" and "H3". In column 9, replace "P001" with "PP98" |
| 2046        | In column 14, replace "TP1" with "TP2"                                                     |
| 2052        | In column 14, replace "TP1" with "TP2"                                                     |
| 2203        | In column 16a, replace the words "Category E" with the words "Category D"                  |
| 2225 PG III | In column 16b, add "SG36" and "SG49"                                                       |
| 2235        | In column 14, replace "TP1" with "TP2"                                                     |

| UN No.      | Amendment                                                                                                                                                                           |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2279        | In column 14, replace "TP1" with "TP2"                                                                                                                                              |
| 2315        | In column 14, replace "TP1" with "TP2"                                                                                                                                              |
| 2321        | In column 14, replace "TP1" with "TP2"                                                                                                                                              |
| 2348 PG III | In column 17, replace the text to read "See entry above. Flashpoint: 23°C to 41°C c.c."                                                                                             |
| 2372        | In column 4, add "6.1" and "8". In column 13, replace "T4" with "T7". In column 14, add "TP28"                                                                                      |
| 2433        | In column 14, replace "TP1" with "TP2"                                                                                                                                              |
| 2504        | In column 14, replace "TP1" with "TP2"                                                                                                                                              |
| 2514        | In column 14, replace "TP1" with "TP2"                                                                                                                                              |
| 2515        | In column 14, replace "TP1" with "TP2"                                                                                                                                              |
| 2518        | In column 14, replace "TP1" with "TP2"                                                                                                                                              |
| 2735 PG II  | In column 14, replace "TP1" with "TP2"                                                                                                                                              |
| 2857        | In column 2, after the words "REFRIGERATING MACHINES", add the words "or HEATING MACHINES"                                                                                          |
| 2862 PG III | In column 2, at the end, add the words ", containing less than 10% respirable particles". In column 17, replace the text to read "See entry above."                                 |
| 2941        | Delete the entry                                                                                                                                                                    |
| 3028        | In column 5, replace "III" with "-"                                                                                                                                                 |
| 3082        | In column 6, add "413" and in column 9, after "PP1", add "PP99"                                                                                                                     |
| 3166        | In column 6, add "980"                                                                                                                                                              |
| 3171        | In column 6, add "980"                                                                                                                                                              |
| 3300        | In column 4, add "8"                                                                                                                                                                |
| 3358        | In column 2, after the words "REFRIGERATING MACHINES", add the words "or HEATING MACHINES"                                                                                          |
| 3408 PG II  | In column 14, replace "TP1" with "TP2"                                                                                                                                              |
| 3408 PG III | In column 14, replace "TP1" with "TP2"                                                                                                                                              |
| 3480        | In column 6, add "410"                                                                                                                                                              |
| 3481        | In column 6, add "410"                                                                                                                                                              |
| 3536        | In column 2, replace the existing text to read "LITHIUM ION BATTERIES INSTALLED IN CARGO TRANSPORT UNIT". In column 6, add "410". In column 17, delete the words "lithium metal or" |
| 3538        | In column 6, add "411"                                                                                                                                                              |
| 3551        | In column 6, add "410"                                                                                                                                                              |
| 3552        | In column 6, add "410"                                                                                                                                                              |
| 3556        | In column 6, replace "405" by "980"                                                                                                                                                 |
| 3557        | In column 6, replace "405" by "980"                                                                                                                                                 |
| 3558        | In column 6, replace "405" by "980" and delete "404"                                                                                                                                |

| (1)  | (2)                                                                                   | (3) | (4) | (5) | (6) | (7a)  | (7b) | (8)  | (9) | (10)  | (11)  | (12) | (13) | (14)      | (15)     | (16a)             | (16b) | (17)                                                                                                                                                                                                     |
|------|---------------------------------------------------------------------------------------|-----|-----|-----|-----|-------|------|------|-----|-------|-------|------|------|-----------|----------|-------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2348 | BUTYL ACRYLATES, STABILIZED                                                           | 3   | -   | II  | 386 | 1 L   | E2   | P001 | -   | IBC02 | -     | -    | T4   | TP1       | F-E, S-D | Category C SW1SW2 | -     | Colourless liquid with an unpleasant odour. Flashpoint: 14°C to < 23°C c.c. Explosive limits: 0.7% to 9.9%. Immiscible with water. Harmful by inhalation. Irritating to skin, eyes and mucous membranes. |
| 2862 | VANADIUM PENTOXIDE, non-fused form, containing not less than 10% respirable particles | 6.1 | -   | II  | -   | 500 g | E4   | P002 | -   | IBC08 | B2 B4 | -    | T3   | TP33 TP43 | F-A, S-A | Category A        | -     | Brownish powder. Slightly soluble in water. Toxic if swallowed, by skin contact or by inhalation.                                                                                                        |

Add the following entries:

|      |                                                           |   |     |    |         |      |    |      |   |       |       |   |    |      |          |                    |   |                                                                                                                   |
|------|-----------------------------------------------------------|---|-----|----|---------|------|----|------|---|-------|-------|---|----|------|----------|--------------------|---|-------------------------------------------------------------------------------------------------------------------|
| 3561 | CHLOROPHENOLS, CORROSIVE, TOXIC, SOLID, N.O.S.            | 8 | 6.1 | II | 274     | 1 kg | E2 | P002 | - | IBC08 | B2 B4 | - | T3 | TP33 | F-A, S-B | Category B SW2     | - | Causes burns to skin, eyes and mucous membranes. Toxic if swallowed, by skin contact or by inhalation.            |
| 3562 | CHLOROPHENOLS, CORROSIVE, SOLID, N.O.S.                   | 8 | -   | II | -       | 1 kg | E2 | P002 | - | IBC08 | B2 B4 | - | T3 | TP33 | F-A, S-B | Category A         | - | Causes burns to skin, eyes and mucous membranes.                                                                  |
| 3563 | LITHIUM METAL BATTERIES INSTALLED IN CARGO TRANSPORT UNIT | 9 | -   | -  | 389 410 | 0    | E0 | -    | - | -     | -     | - | -  | -    | F-A, S-I | Category D SW1 SW2 | - | Cargo transport unit containing lithium metal batteries which is designed to serve as a mobile power supply unit. |
| 3564 | SODIUM ION BATTERIES INSTALLED IN CARGO TRANSPORT UNIT    | 9 | -   | -  | 389 410 | 0    | E0 | -    | - | -     | -     | - | -  | -    | F-A, S-I | Category D SW1 SW2 | - | Cargo transport unit containing sodium ion batteries which is designed to serve as a mobile power supply unit.    |

### **Chapter 3.3**

#### **Special provisions applicable to certain substances, materials or articles**

Amend the following existing provision as indicated below:

SP63 Replace .6 and .7 to read as follows:

"6 The aerosol shall have a subsidiary hazard of division 6.1 or class 8 where the contents, other than the propellant of aerosol dispensers, are classified as:

.1 division 6.1, packing groups II or III; or

.2 class 8, packing groups II or III.

The aerosol shall be prohibited from transport where the contents are classified as:

.1 division 6.1, packing group I; or

.2 class 8, packing group I.

.7 The aerosol shall be prohibited from transport where the contents additionally meet the classification criteria of:

.1 class 1, explosives;

.2 liquid desensitized explosives of class 3;

.3 self-reactive substances and solid desensitized explosives of division 4.1;

.4 division 4.2, substances liable to spontaneous combustion;

.5 division 4.3, substances which, in contact with water, emit flammable gases;

.6 division 5.2, organic peroxides;

.7 division 6.2, infectious substances; or

.8 class 7, radioactive material;"

In the last paragraph, delete the second sentence and replace the last sentence to read: "The chemical heats of combustion shall be determined either by reference to published scientific literature, through calculation or by using suitable calorimetric test methods (e.g. ASTM D 240 and NFPA 30B)".

SP119 After the first sentence, add a new sentence to read: "Heating machines include machines or other appliances which have been designed for the specific purpose of heating".

In the now third sentence (previously second sentence), replace the words "Refrigerating machines and refrigerating machine components" by the words "Refrigerating or heating machines and their components".

At the end, add a new sentence to read: "Machines or other appliances that are used to perform heating and cooling functions may be transported either as "REFRIGERATING MACHINES" or "HEATING MACHINES".

SP145 Replace the words "of packing group III" with the words "with more than 24% but not more than 70% alcohol by volume".

SP172 In .3, replace the words "this (these) subsidiary hazard(s)" with the words "each subsidiary hazard".

In .4, before the words "subsidiary", replace the word "the" with the word "each".

SP188 In .3, replace the words "and 2.9.4.7" with ", 2.9.4.7 and 2.9.4.8 if applicable".

In .6:

in the first sentence, replace the words "with the appropriate lithium or sodium battery mark, as illustrated in" with the words "according to";

in the note, replace the words "(lithium battery mark)" with the words "(battery mark)";

in .2, at the end, add the following new sentence: "Where the equipment contains one or more button cells in addition to cells or batteries, the button cell or cells do not count toward package or consignment limits."

in the last paragraph, in the first sentence, replace the words "lithium or sodium battery mark" with the words "battery mark".

SP277 In the first sentence, after the word "value", add the words "for the purposes of exemptions in chapter 3.4".

SP280 In the second sentence, delete the words "described in special provision 296". At the end, add a new sentence to read: "However, this entry may be used for safety devices of class 9 transported for installation in life-saving appliances (UN 2990) in accordance with special provision 296".

SP291 In the first sentence, replace the words "refrigerating-machine components" with the words "refrigerating- or heating-machine components".

In the third sentence, replace the words "The refrigerating machines" with the words "Refrigerating or heating machines", and replace the words "refrigerating-machine components" with "their components".

In the fourth sentence, replace the words "Refrigerating machines and refrigerating-machine components" with the words "Refrigerating or heating machines and their components".

At the end, add a new sentence to read: "Machines that are used to perform heating and cooling functions may be transported either as "REFRIGERATING MACHINES" or "HEATING MACHINES".

- SP296 In the first sentence, after the words "personal flotation devices", add the words ", self-inflating protective equipment".

Replace .2 to read as follows:

".2 for UN 2990 only:

.1 cartridges, power device of division 1.4, compatibility group S; or

.2 safety devices of class 9 (UN 3268),

installed for purposes of the self-inflating mechanism and provided that the quantity of explosives per appliance does not exceed 3.2 g;"

In .4, replace the words "lithium or sodium ion batteries" with the words "lithium batteries or sodium ion batteries".

- SP301 After the third sentence, insert the following new sentence and sub-paragraphs:

"Such articles may in addition contain lithium cells or batteries or sodium ion cells or batteries, provided that the cells or batteries:

.1 provide electrical power for the operation of the article; and

.2 meet the requirements of special provision 188.1 to .3, .5 and .6."

In the fifth sentence (old fourth), after the first instance of the words "dangerous goods", add the words "other than cells or batteries". Insert a paragraph break after this sentence and replace the first sentence of this new paragraph to read: "If the articles contain more than one item of dangerous goods and these could react dangerously with one another during transport, each of the dangerous goods shall be enclosed separately (see 4.1.1.6)".

At the end, add the following new paragraph:

"Articles containing no other dangerous goods than cells or batteries shall be transported under UN Nos.3091, 3481 or 3552, as appropriate."

- SP310 At the end of the first paragraph, replace the words "and 2.9.4.7" with the words ", 2.9.4.7, 2.9.4.8.2 if applicable and 2.9.4.8.3 if applicable for lithium cells or batteries, and shall meet the provisions of 2.9.5 with the exception of 2.9.5.1 and 2.9.4.5.7 (as referred to in 2.9.5.5) for sodium ion cells or batteries".

- SP360 Before the last sentence, add the following new sentence: "Vehicles powered only by hybrid batteries containing both lithium ion cells and sodium ion cells in accordance with 2.9.4.8 shall be assigned to the entry UN 3556 VEHICLE, LITHIUM ION BATTERY POWERED".

Replace the last sentence to read: "Lithium batteries, sodium ion batteries or hybrid batteries containing both lithium ion cells and sodium ion cells in accordance with 2.9.4.8 installed in cargo transport units, designed only to provide power external to the transport unit shall be assigned to entries UN 3536 LITHIUM ION BATTERIES INSTALLED IN CARGO TRANSPORT UNIT, UN 3563 LITHIUM METAL BATTERIES INSTALLED IN CARGO TRANSPORT UNIT or UN 3564 SODIUM ION BATTERIES INSTALLED IN CARGO TRANSPORT UNIT, as applicable".

SP373 In the last sentence, replace the word "Category" with the word "category".

SP379 In .4.1, after "ISO 11114-1:2020", add "+ Amd 1:2023".

SP387 In the second sentence, replace the word "capacity" with the words "watt-hour rating".

SP388 In the second and third paragraphs, in the second sentence, replace the words "sodium batteries, lithium metal batteries or lithium ion batteries" with the words "nickel-metal hydride batteries, metallic sodium batteries, sodium alloy batteries, lithium metal batteries, lithium ion batteries, hybrid batteries containing both lithium ion cells and sodium ion cells in accordance with 2.9.4.8 or sodium ion batteries".

In the sixth paragraph, add a new second sentence to read "Vehicles powered only by hybrid batteries containing both lithium ion cells and sodium ion cells in accordance with 2.9.4.8 shall be assigned to the entry UN 3556 VEHICLE, LITHIUM ION BATTERY POWERED".

Replace the eighth paragraph to read as follows:

"Examples of equipment are lawnmowers, cleaning machines or model boats and model aircraft. Equipment powered by lithium metal batteries, lithium ion batteries or sodium ion batteries shall be assigned to the entries UN 3091 LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT or UN 3091 LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT or UN 3481 LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT or UN 3481 LITHIUM ION BATTERIES PACKED WITH EQUIPMENT or UN 3552 SODIUM ION BATTERIES CONTAINED IN EQUIPMENT or UN 3552 SODIUM ION BATTERIES PACKED WITH EQUIPMENT, as appropriate. Lithium ion batteries, lithium metal batteries, hybrid batteries containing both lithium ion cells and sodium ion cells in accordance with 2.9.4.8 or sodium ion batteries installed in a cargo transport unit and designed only to provide power external to the cargo transport unit shall be assigned to the entries UN 3536 LITHIUM ION BATTERIES INSTALLED IN CARGO TRANSPORT UNIT, UN 3563 LITHIUM METAL BATTERIES INSTALLED IN CARGO TRANSPORT UNIT or UN 3564 SODIUM ION BATTERIES INSTALLED IN CARGO TRANSPORT UNIT, as appropriate."

In the tenth paragraph, replace the words "and 2.9.4.7" with ", 2.9.4.7, 2.9.4.8.2 if applicable and 2.9.4.8.3 if applicable".

In the tenth paragraph, add a new last sentence to read: "Furthermore, sodium ion batteries shall meet the provisions of 2.9.5, except that 2.9.5.1, 2.9.5.5 and 2.9.5.6 do not apply when batteries of a production run of not more than 100 cells or batteries, or pre-production prototypes of cells or batteries when these prototypes are transported for testing, are installed in machinery or engines".

SP389 Replace the first paragraph to read:

"This entry only applies to lithium ion batteries, lithium metal batteries, sodium ion batteries or hybrid batteries containing both lithium ion cells and sodium ion cells in accordance with 2.9.4.8 installed in a cargo transport unit and designed only to provide power external to the cargo transport unit. Lithium batteries shall meet the requirements of 2.9.4.1 to .7. Hybrid batteries shall meet the requirements of 2.9.4.1 to .8. Sodium ion batteries shall meet the requirements of 2.9.5.1 to .6. All batteries shall contain the necessary systems to prevent overcharge and over discharge between the batteries."

SP393 At the end, add the words "to dry or unmodified nitrocellulose".

SP400 In .1, replace the words "shall be" with the word "is". In .3, replace the words "shall be" with the word "is". In .4, replace the words "shall be" with the word "is". In .5, first sentence, replace the words "shall be" with the word "are". In .5, second sentence, replace the words "shall be" with the word "is". In .6, replace the words "shall only contain" with the words "only contains".

SP401 In the last sentence, after the words "UN 2795", delete the words "BATTERIES, WET, FILLED WITH ALKALI, electric storage". At the end, add a new sentence to read: "Batteries containing metallic sodium or sodium alloy shall be transported as UN 3292".

SP403 In .2.1 and .2.2, replace the words "according to" with the words "in accordance with".

SP404 is deleted.

SP405 is deleted.

SP406 Replace the words "This entry" with the words "Substances under this entry".

SP407 In .2, replace the words "shall be" with the word "is".

In .3, replace the words "shall be" with the word "is" and the words "shall not" with the words "do not".

In .4, replace the words "shall be" with the word "is".

SP408 In .1 and .2, replace the word "must" with the word "shall".

SP961 The existing special provision, is replaced by the following:

"961 Vehicles which are not prohibited for transport in accordance with SP980 are not subject to the provisions of this Code, other than those in P912, SP388 and SP977 when applicable, if any of the following conditions are met:

- .1 vehicles are stowed on the vehicle, special category and ro-ro spaces or on the weather deck of a ro-ro ship or a cargo space designated by the Administration (flag State) in accordance with SOLAS 74, chapter II-2, regulation 20 as specifically designed and approved for the carriage of vehicles, and there are no signs of leakage from the battery, engine, fuel cell, compressed gas cylinder or accumulator, or fuel system, or braking system when applicable. When packed in a cargo transport unit, the exception does not apply to container cargo spaces of a ro-ro ship;

- .2 vehicles powered by a flammable liquid fuel with a flashpoint of 38°C or above, there are no leaks in any portion of the fuel system, the fuel tank(s) contains 450 L of fuel or less and installed batteries are electrically insulated to protect from short-circuit;
- .3 vehicles powered by a flammable liquid fuel with a flashpoint less than 38°C, the fuel tank(s) are empty and installed batteries are electrically insulated to protect from short-circuit. Vehicles are considered to be empty of flammable liquid fuel when the fuel tank has been drained and the vehicles cannot be operated owing to a lack of fuel. Engine components such as fuel lines, fuel filters and injectors do not need to be cleaned, drained or purged to be considered empty. The fuel tank does not need to be cleaned or purged;
- .4 vehicles powered by a flammable gas (liquefied or compressed), the fuel tank(s) are empty and the positive pressure in the tank does not exceed 2 bar, the fuel shut-off or isolation valve is closed and secured, and installed batteries are electrically insulated to protect from short-circuit;
- .5 vehicles solely powered by a wet or dry electric storage battery or a sodium battery, and the battery is electrically insulated to protect from short-circuit; and
- .6 vehicles solely powered by a sodium-ion battery, and the battery is short-circuited in a way that the battery does not contain electrical energy. The short circuiting shall be easily identifiable (e.g. busbar between terminals).

For vehicles powered by both a flammable liquid fuel and a flammable gas, all applicable conditions from .2 to .4 shall be met.

Sub-paragraphs .2 to .4 do not apply to hybrid electric vehicles as identified in special provision 388. Sub-paragraph .5 does not apply to vehicles powered by lithium batteries."

SP962 The existing special provision, is replaced by the following:

"962 Vehicles, which are not prohibited for transport in accordance with SP980 and do not meet the conditions of SP961 shall be assigned to class 9 and shall meet the following requirements:

- .1 for flammable liquid-powered vehicles, the fuel tank(s) containing the flammable liquid shall not be more than one fourth full and, in any case, the flammable liquid shall not exceed 250 L unless otherwise approved by the competent authority;
- .2 for flammable gas-powered vehicles, the fuel shut-off valve of the fuel tank(s) shall be securely closed; and
- .3 installed batteries shall meet the provisions of SP388 or SP977, as applicable, and be protected from damage, accidental activation during transport, and electrically insulated to protect from short-circuit.

Unpackaged vehicles are not subject to the marking and labelling requirements of chapter 5.2.

**Note:** When transported in a cargo transport unit (CTU) the placarding requirements of chapter 5.3 apply, regardless of whether the vehicle is packaged or unpackaged."

Add the following new special provisions:

"410 Hybrid batteries in conformity with 2.9.4.8 containing both lithium ion cells and sodium ion cells shall be assigned to UN Nos.3480, 3481 or 3536, as appropriate. When such batteries are transported in accordance with special provision 188, the watt-hour rating shall not exceed 100 Wh and shall be marked on the outside case."

"411 Articles transported under this entry include magnetic resonance imaging (MRI) scanners containing non-flammable, non-toxic gas. The non-flammable, non-toxic gas shall be contained within the MRI scanner components. The MRI scanners shall be designed and constructed to contain the gas and preclude the risk of bursting or cracking of the gas retaining components during normal conditions of transport. MRI scanners are not subject to this Code if they contain less than 12 kg of gas in division 2.2."

"412 This entry may contain not more than 12% by mass of dimethyl ether."

"413 Liquid organic hydrogen carriers (LOHC) based on substances classified under this entry with physically dissolved hydrogen may only be transported under this entry when the content of physically dissolved hydrogen does not exceed the limit of 0.5 L(H<sub>2</sub>)/kg(LOHC)."

"980 This Special Provision is not applicable to vehicles driven on board under their own power by a passenger, when carried on ro-ro passenger ships as defined in SOLAS regulation II-2/3.42.

The consignor shall assess the safety condition of the vehicle prior to offering for transport.

A vehicle shall not be offered for transport if it is forbidden in accordance with 1.1.3.1 or if it:

has, or shows signs of, leakage from the battery, engine, fuel cell, compressed gas cylinder or accumulator, fuel system, or braking system, when applicable; or

has, or shows signs of, damage to electric equipment (including but not limited to frayed or damaged cables); or

has, or shows signs of, damage to supplemental restraint systems (SRS) (e.g. airbags, seat belt tensioners); or

has been impacted by extreme events (e.g. flood, hurricane, tsunami, fire, submersion).

If any of the above condition(s) applies, the vehicle shall not be offered for transport unless corrective actions have been taken. Such corrective actions shall be evaluated regarding their effectiveness ensuring that the condition(s) no longer apply.

Batteries subject to Special Provision 376 shall be removed.

Vehicles transported as waste are also subject to the provisions of 2.0.5."

## **PART 4 PACKING AND TANK PROVISIONS**

### **Chapter 4.1 Use of packagings, including intermediate bulk containers (IBCs) and large packagings**

#### **4.1.1 General provisions for the packing of dangerous goods in packagings, including IBCs and large packagings**

##### **4.1.1.2**

In paragraph .1, delete the word "and" after the sentence "shall not be affected or significantly weakened by those dangerous goods;".

In paragraph .2 insert the word "and" after the sentence "shall not cause a dangerous effect, such as catalysing a reaction or reacting with the dangerous goods;".

##### **4.1.1.19 Use of salvage pressure receptacles**

**4.1.1.19.3** In .3, first sentence, replace the words "and volume" with the words ", in usable water capacity and in pressure volume product".

#### **4.1.3 General provisions concerning packing instructions**

**4.1.3.4** Replace the section for "Packagings" to read as follows:

##### **"Single packagings**

For substances of packing group I, unless approved for the transport of liquids of packing group I:

Drums: 1A2, 1B2, 1H2 and 1N2

Jerricans: 3A2, 3B2 and 3H2

For substances of packing groups I, II and III:

Drums: 1D and 1G

Boxes: 4A, 4B, 4C1, 4C2, 4D, 4F, 4G, 4H1, 4H2 and 4N

Bags: 5L1, 5L2, 5L3, 5H1, 5H2, 5H3, 5H4, 5M1 and 5M2

Composite packagings: 6HC, 6HD1, 6HD2, 6HG1, 6HG2, 6PC, 6PD1, 6PD2, 6PG1, 6PG2, 6PH1 and 6PH2"

**4.1.3.6.5** In the first sentence, replace the words "level of filling" with the words "degree of filling".

#### **4.1.4 List of packing instructions**

##### **4.1.4.1 Packing instructions concerning the use of packagings (except IBCs and large packagings)**

P001 Add the following new special packing provisions:

"PP98 For UN 2029, when a pressure receptacle is used, the internal pressure at 65°C shall not exceed the test pressure.

PP99 For mixtures assigned to UN 3082 containing less than 1% of substances of highly toxic ingredients with an M factor of 10, 100, or 1000 (as described in 2.9.3.4.6.4), plastics drums with removable heads containing quantities of more than 5 litres and not more than 20 litres per packaging are not subject to the performance tests in chapter 6.1 for a transitional period until 31 December 2034, provided the packagings have successfully passed the stacking test in 6.1.5.6 for plastics drums intended for liquids and meet the general provisions of 4.1.1, except for 4.1.1.3, and 4.1.3."

P002 Delete table notes <sup>4</sup> and <sup>5</sup> and references to these notes.

After the row for "**Pressure receptacles**", provided that the general provisions of 4.1.3.6 are met." add a new row with the following text:

***"Additional requirement:***

Where the solid may become liquid during transport, see 4.1.3.4."

P006 In (5), first sentence, after the words "lithium cells or batteries", add the words "or sodium ion cells or batteries" (*twice*) and replace the words "have not met" with the words "has not met".

P130 Add the following new special packing provision:

"**PP100** For UN Nos.0012 and 0014, despite the requirements of 4.1.5.11, articles may be packed without internal cushioning, fittings, coating or liner in metal outer packagings."

P200 In (4) (d), replace the words "degree or pressure of filling" with the words "filling ratio or pressure of filling".

P410 Delete table note <sup>3</sup> and references to this note. Table note <sup>4</sup> becomes table note <sup>3</sup>.

After the row for "**Pressure receptacles**", provided that the general provisions of 4.1.3.6 are met", add a new row with the following text:

***"Additional requirement:***

Where the solid may become liquid during transport, see 4.1.3.4."

P520 In special provision PP95, in .1, replace the word "consist" with the word "consists" and in .2, at the end, add the words "or  $24 \pm 2.4$  g/L".

P903 In (2), at the beginning, replace the words "In addition" with the word "Alternatively,".

P907 At the end, add a new row with the following text:

**"Additional requirement:**

Cells and batteries shall be protected from damage and short circuit, and the article shall be equipped with an effective means of preventing accidental activation."

P911 In (2), first sentence, before the word "specified", add the word "approved or".

P912 In (c), at the beginning, replace the words "where the vehicles" with the words "where they".

#### 4.1.4.2 Packing instructions concerning the use of IBCs

IBC04 and IBC05 After the second row, add a new row with the following text:

**"Additional requirement:**

Where the solid may become liquid during transport, see 4.1.3.4."

IBC520 For UN 3119, add a new entry to read as follows:

|  |                                                                                  |              |                |                |                |
|--|----------------------------------------------------------------------------------|--------------|----------------|----------------|----------------|
|  | <i>tert</i> -Butyl peroxy-2-ethylhexanoate, not more than 52%, in diluent type A | 31HA1<br>31A | 1,000<br>1,250 | +30°C<br>+30°C | +35°C<br>+35°C |
|--|----------------------------------------------------------------------------------|--------------|----------------|----------------|----------------|

LP02 Before the row for "**Special packing provisions**", add a new row with the following text:

**"Additional requirement:**

Where the solid may become liquid during transport, see 4.1.3.4."

In table note <sup>a</sup>, before the word "packagings", add the word "inner".

LP03 In (4), first sentence, after the words "lithium cells or batteries", add the words "or sodium ion cells or batteries" (*twice*).

LP906 In (2), first sentence, before the word "specified", add the words "approved or".

#### 4.1.6 Special packing provisions for goods of class 2

##### 4.1.6.1 General provisions

4.1.6.1.2 In the second sentence, after "ISO 11114-1:2020", add "+ Amd 1:2023".

4.1.6.1.8 In the paragraph after .5, third sentence, after "ISO 10297:2014 + Amd 1:2017", add the words "or clause 5.4.2 of ISO 10297:2024".

#### **4.1.7 Special packing provisions for organic peroxides (class 5.2) and self-reactive substances of class 4.1**

##### **4.1.7.1 Use of packagings (except IBCs)**

4.1.7.1.1 At the end of the paragraph add the following new sentence:

"To avoid the unnecessary confinement of liquids, metal packagings meeting the criteria of the internal pressure (hydraulic) test for packing group I shall not be used."

After the paragraph, add the following new note:

**"Note:** The consignor should consult with the packaging manufacturer to verify that the metal packaging does not meet the internal pressure (hydraulic) test criteria for packing group I."

### **Chapter 4.2**

#### **Use of portable tanks and multiple-element gas containers (MEGCs)**

##### **4.2.0 Transitional provisions**

4.2.0.3 Insert new paragraphs at the end to read as follows:

"Portable tanks manufactured before 1 January 2027 which were marked in accordance with the requirements of 6.7.4.15.1 (i) (iv) applicable in Amendment 41-22 of this Code may continue to be used.

Portable tanks constructed before 1 January 2029 that do not conform to the requirements of 6.7.4.5.2 regarding the filling and discharge openings in the vapour phase may continue to be used."

##### **4.2.1 General provisions for the use of portable tanks for the transport of substances of class 1 and classes 3 to 9**

###### **4.2.1.9 Degree of filling**

4.2.1.9.2 Replace the words "The maximum degree of filling (in %) for general use is determined by the formula:" with the words "Except for liquids meeting any condition in 4.2.1.9.3, the maximum degree of filling (in %) for general use is determined by the formula:".

##### **4.2.2 General provisions for the use of portable tanks for the transport of non-refrigerated liquefied gases and chemicals under pressure**

4.2.2.8 In .1, replace the words "an ullage condition" with the words "a filling condition".

##### **4.2.3 General provisions for the use of portable tanks for the transport of refrigerated liquefied gases of class 2**

4.2.3.8 In .1, replace the words "an ullage condition" with the words "a filling condition".

##### **4.2.5 Portable tank instructions and special provisions**

###### **4.2.5.3 Portable tank special provisions**

Add the following new portable tank special provision:

"TP43 Portable tank instruction T1 may continue to be applied until 31 December 2028."

## **PART 5 CONSIGNMENT PROCEDURES**

### **Chapter 5.2 Marking and labelling of packages including IBCs**

#### **5.2.1 Marking of packages including IBCs**

##### **5.2.1.10 Lithium or sodium ion battery mark**

Replace the heading to read:

"5.2.1.10 Battery mark".

**5.2.1.10.1** Replace the words "lithium or sodium ion cells or batteries" with the words "lithium cells or batteries or sodium ion cells or batteries" and replace the words "provision 188" with the words "provisions 188 or 400".

**5.2.1.10.2** At the end of the first paragraph, add the following new sentence: "However, where equipment contains one or more button cells in addition to cells or batteries, there is no requirement for the UN number indicating the button cell or cells to be included on the mark."

In figure "Lithium or sodium ion battery mark", replace the words "Lithium or sodium ion battery mark" with the words "Battery mark".

**5.2.1.10** Add a new 5.2.1.10.3 to read as follows:

**5.2.1.10.3** When both the battery mark and labels in accordance with 5.2.2.2 other than model No.9A are required, the battery mark shall be located on the same surface as the labels if the package dimensions are adequate."

#### **5.2.2 Labelling of packages including IBCs**

##### **5.2.2.1 Labelling provisions**

###### **5.2.2.1.13 *Labels for articles containing dangerous goods transported as UN Nos.3537, 3538, 3539, 3540, 3541, 3542, 3543, 3544, 3545, 3546, 3547 and 3548***

In .1, in the second sentence, replace the words "lithium or sodium ion batteries" with the words "lithium batteries or sodium ion batteries" and replace the words "lithium or sodium ion battery mark" with the words "battery mark". In the third sentence, replace the words "lithium or sodium ion batteries" with the words "lithium batteries or sodium ion batteries".

##### **5.2.2.2 Provisions for labels**

###### **5.2.2.2.2 *Specimen labels***

Delete the word "Note:"

## **Chapter 5.4 Documentation**

### **5.4.1.4.4 Examples of dangerous goods descriptions**

Replace the text:

"UN 1092, Acrolein, stabilized, class 6.1 (3), PG I, (-24°C c.c.), MARINE POLLUTANT/ENVIRONMENTALLY HAZARDOUS

UN 1603, ETHYL BROMOACETATE 6.1 (3) II (58°C c.c.)

UN 1603, ETHYL BROMOACETATE, class 6.1, (class 3), PG II, (58°C c.c.)

UN 2761, Organochlorine pesticide, solid, toxic, (Aldrin 19%), class 6.1, PG III, MARINE POLLUTANT"

To be read as follows:

"UN 1092, ACROLEIN, STABILIZED, Class 6.1, (3), PG I, (-26°C c.c.), MARINE POLLUTANT, ENVIRONMENTALLY HAZARDOUS

UN 1603 ETHYL BROMOACETATE 6.1 (3) II (58°C c.c.)

UN 1603, ETHYL BROMOACETATE, Class 6.1, (Class 3), PG II, (58°C c.c.)

UN 2761 ORGANOCHLORINE PESTICIDE, SOLID, TOXIC (Aldrin 19%) Class 6.1 PG III MARINE POLLUTANT"

## **PART 6 CONSTRUCTION AND TESTING OF PACKAGINGS, INTERMEDIATE BULK CONTAINERS (IBCs), LARGE PACKAGINGS, PORTABLE TANKS, MULTIPLE-ELEMENT GAS CONTAINERS (MEGCs) AND ROAD TANK VEHICLES**

### **Chapter 6.1 Provisions for the construction and testing of packagings (other than for class 6.2 substances)**

#### **6.1.4 Provisions for packagings**

##### **6.1.4.12 Fibreboard boxes (including corrugated fibreboard boxes)**

**6.1.4.12.1** In the second sentence, replace "ISO 535:2014" with "ISO 535:2023".

#### **6.1.5 Test provisions for packagings**

##### **6.1.5.1 Performance and frequency of tests**

**6.1.5.1.3** Replace the word "Tests" with the words "Appropriate tests".

## Chapter 6.2

### Provisions for the construction and testing of pressure receptacles, aerosol dispensers, small receptacles containing gas (gas cartridges) and fuel cell cartridges containing liquefied flammable gas

#### 6.2.1 General provisions

##### 6.2.1.5 Initial inspection and test

**6.2.1.5.1** In .7, before the words "technical code", add the word "recognized".

##### 6.2.1.6 Periodic inspection and test

**6.2.1.6.1** In .4, note 3, first sentence, after "Amd 1:2021", add "+ Amd 2:2024". After the second sentence, add the following new sentence: "For a transitional period until 31 December 2028, the standard ISO 18119:2018 + Amd 1:2021 may be used for this same purpose".

#### 6.2.2 Provisions for UN pressure receptacles

##### 6.2.2.1 Design, construction and initial inspection and test

**6.2.2.1.1** In the table, in the row for ISO 4706:2008, in column "Applicable for manufacture", replace the words "Until further notice" by "Until 31 December 2030". Add a new row beneath this row as follows:

|               |                                                                                       |                      |
|---------------|---------------------------------------------------------------------------------------|----------------------|
| ISO 4706:2023 | Gas cylinders – Refillable welded steel cylinders<br>– Test pressure 60 bar and below | Until further notice |
|---------------|---------------------------------------------------------------------------------------|----------------------|

**6.2.2.1.2** In the table, in the row for ISO 11515:2013 + Amd 1:2018, in column "Applicable for manufacture", replace the words "Until further notice" with the words "Until 31 December 2030". Add a new row beneath this row as follows:

|                |                                                                                                                                        |                      |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| ISO 11515:2022 | Gas cylinders – Refillable composite reinforced tubes of water capacity between 450 l and 3000 l<br>– Design, construction and testing | Until further notice |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------|

**6.2.2.1.3** In the first table, in the row for ISO 4706:2008, in column "Applicable for manufacture", replace the words "Until further notice" with the words "Until 31 December 2030". Add a new row beneath this row as follows:

|               |                                                                                       |                      |
|---------------|---------------------------------------------------------------------------------------|----------------------|
| ISO 4706:2023 | Gas cylinders – Refillable welded steel cylinders<br>– Test pressure 60 bar and below | Until further notice |
|---------------|---------------------------------------------------------------------------------------|----------------------|

**6.2.2.1.8** In the table, in the row for ISO 4706:2008, in column "Applicable for manufacture", replace the words "Until further notice" with the words "Until 31 December 2030". Add a new row beneath this row as follows:

|               |                                                                                       |                      |
|---------------|---------------------------------------------------------------------------------------|----------------------|
| ISO 4706:2023 | Gas cylinders – Refillable welded steel cylinders<br>– Test pressure 60 bar and below | Until further notice |
|---------------|---------------------------------------------------------------------------------------|----------------------|

### 6.2.2.2 Materials

In the table, in the row for ISO 11114-1:2020, in the first column, after "ISO 11114-1:2020", add "+ Amd 1:2023".

### 6.2.2.3 Closures and their protection

In the first table, in the row for ISO 10297:2014 + Amd 1:2017, in column "Applicable for manufacture", replace the words "Until further notice" with the words "Until 31 December 2028". Add a new row beneath this row as follows:

|                |                                                                  |                      |
|----------------|------------------------------------------------------------------|----------------------|
| ISO 10297:2024 | Gas cylinders – Cylinder valves – Specification and type testing | Until further notice |
|----------------|------------------------------------------------------------------|----------------------|

In the first table, in the row for ISO 14246:2014 + Amd 1:2017, in column "Applicable for manufacture", replace the words "Until further notice" with the words "Until 31 December 2030". Add a new row beneath this row as follows:

|                |                                                                        |                      |
|----------------|------------------------------------------------------------------------|----------------------|
| ISO 14246:2022 | Gas cylinders – Cylinder valves – Manufacturing tests and examinations | Until further notice |
|----------------|------------------------------------------------------------------------|----------------------|

### 6.2.2.4 Periodic inspection and test

In the first table, in the row for ISO 18119:2018 + Amd 1:2021, in column "Applicable", replace the words "Until further notice" with the words "Until 31 December 2028". Add a new row beneath this row as follows:

|                                          |                                                                                                                       |                      |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------|
| ISO 18119:2018 + Amd 1:2021 + Amd 2:2024 | Gas cylinders – Seamless steel and seamless aluminium-alloy gas cylinders and tubes – Periodic inspection and testing | Until further notice |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------|

In the first table, in the row for ISO 11623:2015, in column "Applicable", replace the words "Until further notice" with the words "Until 31 December 2028". Add a new row beneath this row as follows:

|                |                                                                                                                                                                                                                                                       |                      |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| ISO 11623:2023 | Gas cylinders – Composite cylinders and tubes – Periodic inspection and testing<br><b>Note:</b> The pressure test shall not be replaced by a non-destructive examination (NDE) technique, though such techniques can be used for monitoring purposes. | Until further notice |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|

In the first table, in the row for ISO 22434:2006, in column "Applicable", replace the words "Until further notice" with the words "Until 31 December 2028". Add a new row beneath this row as follows:

|                |                                                                                                                                                                             |                      |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| ISO 22434:2022 | Gas cylinders – Inspection and maintenance of valves<br><b>Note:</b> These requirements may be met at times other than at the periodic inspection and test of UN cylinders. | Until further notice |
|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|

#### **6.2.2.7 Marking of refillable UN pressure receptacles**

##### **6.2.2.7.3** In (k) and (l), at the end, add the following new paragraph:

"Acetylene cylinders constructed in accordance with Amendment 40-20 of this Code may continue to be used without the application of the marks detailed in (ii) and (iii) when the marking can neither be applied on the cylinder shoulder nor applied on any neck ring."

At the end, delete the note.

##### **6.2.2.7.4** In (p), after "ISO 11114-1:2020", add "+ Amd 1:2023".

#### **6.2.2.8 Marking of non-refillable UN cylinders**

##### **6.2.2.8.1** At the end, add a new paragraph to read as follows:

"Non-refillable UN cylinders of seamless construction with a diameter of 40 mm or less may instead be permanently marked (e.g. stencilled, stamped, engraved or etched) on their side walls, provided no harmful stress concentration is created, and the minimum cylindrical shell wall thickness is maintained. The minimum size of the marks shall be 1.5 mm. The minimum size of the UN packaging symbol shall be 3 mm. The minimum size of the "DO NOT REFILL" mark shall be 3 mm."

#### **6.2.2.9 Marking of UN metal hydride storage systems**

##### **6.2.2.9.2** In (j), after "ISO 11114-1:2020", add "+ Amd 1:2023".

### **6.2.3 Provisions for non-UN pressure receptacles**

#### **6.2.3.5 Salvage pressure receptacles**

Replace the existing note with the following note:

**"Note:** Salvage pressure receptacles with a water capacity of not more than 3,000 L may continue to be used without bearing the additional PVP mark until 31 December 2030."

In **6.2.3.5.2**, before the last sentence, add the following:

"This indication of authorized pressure receptacles shall contain the following information:

- .1 the test pressure to which the salvage pressure receptacle can be loaded at maximum temperature, which limits the storage of pressure receptacles filled with liquified gases; and
- .2 the usable water capacity and the maximum pV-product authorized for stored pressure receptacles, which limits the storage of pressure receptacles filled with compressed gases. The value of this maximum pV-product is the lowest value of either of the following:

- .1 the general limit of the pV-product of 1.5 million bar litres; or
- .2 the pV-product of the salvage pressure receptacle based on the test pressure to which it is allowed to be loaded at maximum temperature and its usable water capacity."

The last sentence of **6.2.3.5.2** becomes a new **6.2.3.5.3**, and the following paragraphs are renumbered as **6.2.3.5.4** and **6.2.3.5.5**, respectively. At the end of the new **6.2.3.5.3**, add the words "in the approval certificate".

In the renumbered **6.2.3.5.5**, replace the last sentence to read as follows:

"The marking of the salvage pressure receptacle shall include the usable water capacity, the test pressure and the maximum pressure volume product. This mark shall start with the letters "PVP", followed by the pV-product and the units. The pV-product shall include a space in front of the last three digits of the value. The units "BAR" and "L" shall be separated by a dot. For harmonized readability and to avoid subsequent manipulation, the mark shall not contain more spaces. An example of the PVP mark is given below:

PVP1500 000BAR.L"

### **Chapter 6.3** **Provisions for the construction and testing of packagings** **for class 6.2 infectious substances of category A** **(UN 2814 and UN 2900)**

#### **6.3.5 Test provisions for packagings**

##### **6.3.5.1 Performance and frequency of tests**

**6.3.5.1.3** Replace the words "Tests" with the words "Appropriate tests".

### **Chapter 6.4** **Provisions for the construction, testing and approval** **of packages for radioactive material and for the approval** **of such material**

#### **6.4.11 Provisions for packages containing fissile material**

**6.4.11.2** In (d), second sentence, replace the word "weight" with the word "mass".

### **Chapter 6.5** **Provisions for the construction and testing** **of intermediate bulk containers (IBCs)**

#### **6.5.2 Marking**

##### **6.5.2.1 Primary marking**

**6.5.2.1.1** In .7, first sentence, replace the words "stacking test load" with the words "superimposed stacking test mass".

**6.5.2.1.3** In the first example, first sentence, replace the words "stacking test load" with the words "superimposed stacking test mass".

#### **6.5.2.2 Additional marking**

**6.5.2.2.2** In the first sentence, replace the words "stacking load" with the words "superimposed stacking mass".

#### **6.5.4 Testing, certification and inspection**

##### **6.5.4.4 Inspection and testing**

**6.5.4.4.2** At the end, add a new note to read as follows:

**"Note:** The initial leakproofness test in accordance with (a) does not necessarily have to comply with the design type test in 6.5.6.7. However, samples of IBCs taken from the production shall meet the requirements for the leakproofness test according to 6.5.6.7. The periodic leakproofness test in accordance with (b) does not necessarily have to comply with the design type test in 6.5.6.7."

#### **6.5.5 Specific provisions for IBCs**

##### **6.5.5.2 Specific provisions for flexible IBCs**

**6.5.5.2.2** After the first sentence, add the following new sentences: "No parts of IBC bodies recovered from previously used flexible IBCs shall be used in the manufacture of new IBC bodies, except as recycled material. For IBC bodies manufactured from recycled plastics material, only recycled plastics material as defined in 1.2.1 shall be used".

**6.5.5.2.8** Delete the first two sentences. In the remaining sentence, replace the word "used" with the word "reused".

##### **6.5.5.4 Specific provisions for composite IBCs with plastics inner receptacles**

**6.5.5.4.16** In the second sentence, replace "ISO 535:2014" with "ISO 535:2023".

##### **6.5.5.5 Specific provisions for fibreboard IBCs**

**6.5.5.5.3** In the second sentence, replace "ISO 535:2014" with "ISO 535:2023".

#### **6.5.6 Test provisions for IBCs**

##### **6.5.6.6 Stacking test**

###### **6.5.6.6.4 *Calculation of superimposed test load***

Replace the words "load to be placed on the IBC" with the words "mass placed on the IBC surface to create the superimposed test load".

## **Chapter 6.6**

### **Provisions for the construction and testing of large packagings**

#### **6.6.3 Marking**

##### **6.6.3.1 Primary marking**

In (g), first sentence, replace the words "stacking test load" with the words "superimposed stacking test mass".

##### **6.6.3.2 Examples of marking**

In the first and second examples, replace the words "stacking load" with the words "superimposed stacking test mass".

**6.6.3.3** In the first sentence, replace the words "stacking load" with the words "superimposed stacking mass".

#### **6.6.4 Specific provisions for large packagings**

##### **6.6.4.4 Specific provisions for fibreboard large packagings**

**6.6.4.4.1** In the second sentence, replace "ISO 535:2014" with "ISO 535:2023".

#### **6.6.5 Test provisions for large packagings**

##### **6.6.5.1 Performance and frequency of test**

**6.6.5.1.3** In the first sentence, replace the word "Tests" with the words "Appropriate tests".

##### **6.6.5.3 Test provisions**

###### **6.6.5.3.3 *Stacking test***

###### **6.6.5.3.3.4 *Calculation of superimposed test load***

Replace the words "load to be placed on the large packaging" with the words "mass placed on the large packaging surface to create the superimposed test load".

## **Chapter 6.7**

### **Provisions for the design, construction, inspection and testing of portable tanks and multiple-element gas containers (MEGCs)**

#### **6.7.2 Provisions for the design, construction, inspection and testing of portable tanks intended for the transport of substances of class 1 and classes 3 to 9**

##### **6.7.2.1 Definitions**

In the definition of "*Portable tank*", in the last sentence, delete the words ", non-metallic tanks (except FRP portable tanks, see chapter 6.10)".

#### **6.7.2.5 Service equipment**

**6.7.2.5.11** After the word "metals", add the words "or fibre reinforced plastic (FRP) in accordance with 6.10.3".

#### **6.7.2.17 Portable tank supports, frameworks, lifting and tie-down attachments**

**6.7.2.17.5** In .4, replace "ISO 1496-3:1995" with the words "ISO 1496-3:2019. Design types conforming to ISO 1496-3:1995 approved before 1 January 2030 may continue to be used".

#### **6.7.2.18 Design approval**

**6.7.2.18.2** In .1, replace "ISO 1496-3:1995;" with the words "ISO 1496-3:2019. Tests specified in ISO 1496-3:1995 may continue to be used until 31 December 2029".

### **6.7.3 Provisions for the design, construction, inspection and testing of portable tanks intended for the transport of non-refrigerated liquefied gases of class 2**

#### **6.7.3.13 Portable tank supports, frameworks, lifting and tie-down attachments**

**6.7.3.13.5** In .4, replace "ISO 1496-3:1995" with the words "ISO 1496-3:2019. Design types conforming to ISO 1496-3:1995 approved before 1 January 2030 may continue to be used".

#### **6.7.3.14 Design approval**

**6.7.3.14.2** In .1, replace "ISO 1496-3:1995;" with the words "ISO 1496-3:2019. Tests specified in ISO 1496-3:1995 may continue to be used until 31 December 2029".

### **6.7.4 Provisions for the design, construction, inspection and testing of portable tanks intended for the transport of refrigerated liquefied gases of class 2**

#### **6.7.4.5 Service equipment**

**6.7.4.5.2** After the first sentence, add the following new sentence: "Filling and discharge openings also include the openings in the vapour phase of the portable tank that are used for vapour recovery".

#### **6.7.4.12 Portable tank supports, frameworks, lifting and tie-down attachments**

**6.7.4.12.5** In .4, replace "ISO 1496-3:1995;" with the words "ISO 1496-3:2019. Design types conforming to ISO 1496-3:1995 approved before 1 January 2030 may continue to be used".

#### **6.7.4.13 Design approval**

**6.7.4.13.2** In .1, replace "ISO 1496-3:1995;" with the words "ISO 1496-3:2019. Tests specified in ISO 1496-3:1995 may continue to be used until 31 December 2029".

### **6.7.5 Provisions for the design, construction, inspection and testing of multiple-element gas containers (MEGCs) intended for the transport of non-refrigerated gases**

#### **6.7.5.2 General design and construction provisions**

**6.7.5.2.4.1** After "ISO 11114-1:2020", add "+ Amd 1:2023".

#### **6.7.5.10 MEGC supports, frameworks, lifting and tie-down attachments**

**6.7.5.10.4** In .4, replace "ISO 1496-3:1995" with the words "ISO 1496-3:2019. Design types conforming to ISO 1496-3:1995 approved before 1 January 2030 may continue to be used".

#### **6.7.5.11 Design approval**

**6.7.5.11.2** In .1, replace "ISO 1496-3:1995;" with the words "ISO 1496-3:2019. Tests specified in ISO 1496-3:1995 may continue to be used until 31 December 2029".

### **Chapter 6.9 Provisions for the design, construction, inspection and testing of bulk containers**

#### **6.9.3 Provisions for the design, construction, inspection and testing of freight containers used as BK1 or BK2 bulk containers**

**6.9.3.1.1** Replace "ISO 1496-4:1991" with "ISO 1496-4:2023". At the end, add the following new sentence: "Bulk container types complying with ISO 1496-4:1991 may continue to be used until 31 December 2034".

**6.9.3.1.2** Replace "ISO 1496-4:1991" with "ISO 1496-4:2023" and add the following new sentence: "The test requirement of ISO 1496-4:1991 may continue to be used until 31 December 2034".

#### **6.9.5 Requirements for the design, construction, inspection and testing of flexible bulk containers BK3**

##### **6.9.5.5 Marking**

**6.9.5.5.1** In (g), replace the words "stacking test load" with the words "superimposed stacking test mass".

### **Chapter 6.10 Provisions for the design, construction, inspection and testing of portable tanks with shells made of fibre-reinforced plastics (FRP) materials**

#### **6.10.1 Application and general requirements**

Add a new **6.10.1.5** to read as follows:

**"6.10.1.5** The requirements of 6.10.3 are applied to FRP service equipment for portable tanks with shells made of metallic or FRP materials intended for the carriage of dangerous goods of classes or divisions 1, 3, 5.1, 6.1, 6.2, 8 and 9 by all modes of transport."

## **6.10.2 Provisions for the design, construction, inspection and testing of FRP portable tanks**

### **6.10.2.1 Definitions**

Replace the definition of "*FRP shell*" to read as follows:

*"FRP shell* means the part of the portable tank constructed from FRP, which retains the substance intended for transport (tank proper), including openings and their closures, but does not include service equipment or external structural equipment. Openings and their closures may be manufactured from metallic materials or FRP."

Replace the definition of "*FRP tank*" with the following new definition:

*"FRP portable tank* means a portable tank, as defined in 6.7.2.1, with an FRP shell."

### **6.10.2.2 General design and construction provisions**

#### **6.10.2.2.3 *FRP Shells***

**6.10.2.2.3.14** *Special provisions for the carriage of substances with a flashpoint of not more than 60°C*

**6.10.2.2.3.14.1** Replace the words "FRP tanks" with the words "FRP portable tanks."

**6.10.2.2.3.16** *Construction process for FRP shells*

**6.10.2.2.3.16.2** In the first sentence, replace the word "weight" with the word "mass".

#### **6.10.2.5 Equipment components for portable tanks with FRP shell**

**6.10.2.5** In the heading, replace the words "portable tanks with FRP shell" with the words "FRP portable tanks".

In the text under the heading, in the first sentence, delete the words "bottom openings, pressure relief devices, gauging devices," and replace the words "portable tanks" with the words "FRP portable tanks".

At the end, add a new sentence to read: "FRP service equipment in accordance with 6.10.3 may be used".

#### **6.10.2.6 Design approval**

**6.10.2.6.4** Replace the word "tank" with the words "FRP portable tank".

#### **6.10.2.7 Additional provisions applicable to FRP portable tanks**

##### **6.10.2.7.1 *Material testing***

###### **6.10.2.7.1.5 *Fire resistance test***

**6.10.2.7.1.5.1** In the first sentence, replace the word "tank" with the words "FRP portable tank" and at the end, delete the words ", caused by an open heating oil pool fire or any other type of fire with the same effect".

In the second sentence, replace the word "tank" with the words "FRP shell".

After the third sentence, add the following new sentence: "These requirements shall be deemed to be met if the fire is caused by an open heating oil pool fire or any other type of fire with the same effect".

In the fifth sentence (old fourth), replace the first instance of the word "tank" with the words "FRP portable tank" and the second instance of the word "tank" with the words "FRP shell".

In the last sentence, replace the word "tank" with the words "FRP portable tank".

#### **6.10.2.8 Inspection and testing**

**6.10.2.8.1** In the first sentence, replace the words "portable FRP tanks" with the words "FRP portable tanks".

**6.10.2.8.3** Replace the word "tank" with the words "FRP portable tank".

**6.10.2.8.4** Replace the word "shell" with the words "FRP shell" (*twice*).

#### **6.10.2.9 Retention of samples**

Replace the word "shell" with the words "FRP shell" (*twice*) and the word "tank" with the words "FRP portable tank".

#### **6.10.2.10 Marking**

**6.10.2.10.2** Replace the word "Shell" with the words "FRP shell".

### **6.10.3 Requirements for design, construction, inspection and testing of FRP service equipment for portable tanks**

Add a whole new section 6.10.3 with the following:

#### **"6.10.3 Requirements for design, construction, inspection and testing of FRP service equipment for portable tanks**

##### **6.10.3.1 Definitions**

For the purposes of this section, the definitions in 6.7.2.1 and 6.10.2.1 apply except for definitions related to metal materials for the construction of the service equipment of portable tanks.

Additionally, the following definitions apply to FRP service equipment:

*FRP service equipment* means service equipment as defined in 6.7.2.1 made of FRP materials including parts fabricated from other materials, such as gate and seal assemblies, metallic parts, e.g. springs, fixings, applicable to both metallic and FRP shells of the portable tanks.

*Injection moulding* means a process of melting plastic pellets (thermosetting/thermoplastic polymers) and mixing with reinforcement agents like chopped glass fibres. Then, the mixture is metered into a mould with the help of high-pressure pumps or injection cylinders, which fills and solidifies to produce the final product.

*Compression moulding* means a process for producing composite parts in a wide range of volumes typically employing a matched metal tool in a heated (normally hydraulic) press to consolidate sheet materials or moulding compounds under pressure.

*Reinforced reaction injection moulding (RRIM)* means a process of mixing of two or more resins together in the mixing chamber to form a thermosetting polymer under high pressure. Reinforcement agents like glass fibres are added to the mixture. Then, the resin mixture is metered into a mould with the help of high-pressure pumps or injection cylinders.

*Coupon-sample* means an FRP sample fabricated and tested in accordance with national or international standards to determine design allowables.

*Inspection-sample* means a sample cut out from the FRP service equipment to establish the conformity of the serial FRP device to the prototype.

*FRP constituents* means reinforcement fibres or particles, thermoset or thermoplastic polymer (matrix), adhesives, and additives.

#### **6.10.3.2 General design and construction requirements**

**6.10.3.2.1** For the purposes of this section, the requirements of 6.7.2.2.11, 6.7.2.5.1 to 6.7.2.5.6, 6.7.2.5.10, 6.7.2.6.3, 6.7.2.8.2, 6.7.2.8.3, 6.7.2.9, 6.7.2.12, 6.7.2.14 and 6.7.2.15 shall be applied to FRP service equipment, including metallic parts (springs, fixings, etc.). FRP service equipment shall be designed and constructed in accordance with the requirements of a pressure vessel code and national and international standards, applicable to FRP materials and recognized by the competent authority.

##### **6.10.3.2.2 Manufacturer's quality system**

**6.10.3.2.2.1** FRP service equipment manufacturers shall have a documented quality system ensuring conformity of every item of the serial production of FRP service equipment to the approved prototype. The quality assurance programme shall be submitted to the competent authority for approval. All manufacturer's suppliers of material and components for FRP service equipment shall have a documented quality system. The quality system shall be developed in compliance with the general principles of international and national quality standards.

**6.10.3.2.2.2** The applicable provisions of 6.10.2.2.2 shall apply to the FRP service equipment manufacturer's quality system.

##### **6.10.3.2.3 FRP service equipment**

**6.10.3.2.3.1** FRP service equipment shall have appropriate rigid joints to the portable tank shell. The connections shall cause no local stress concentrations exceeding the design allowables for all operating and test conditions.

**6.10.3.2.3.2** FRP service equipment shall be made of suitable materials, capable of operating within a minimum design temperature range of -40°C to +50°C, unless temperature ranges are specified for specific more severe climatic or operating conditions (e.g. heating elements) by the competent authority of the country where the transport operation is being performed.

**6.10.3.2.3.3** FRP service equipment shall be designed and manufactured to withstand a test pressure that is not less than 1.5 times MAWP. Stop valves, piping devices and pipefittings intended for filling or discharging shall be designed and manufactured to withstand a pressure that is not less than four times MAWP. Specific provisions are laid down for certain substances in the applicable portable tank instruction indicated in column 13 of the Dangerous Goods List and described in 4.2.5, or by the portable tank special provision indicated in column 14 of the Dangerous Goods List and described in 4.2.5.3.

**6.10.3.2.3.4** FRP service equipment shall withstand vibration, service impacts, exposure to substance temperature and environmental effects.

**6.10.3.2.3.5** Design calculations for FRP service equipment and its joints to the portable tank shell shall be performed by the finite element method or another method recognized by the competent authority.

**6.10.3.2.3.6** FRP service equipment shall meet the same requirements as given in 6.10.2.2.3.14 for the carriage of substances with a flashpoint of not more than 60°C.

#### **6.10.3.2.4** *Materials*

##### **6.10.3.2.4.1** *Resins*

The processing of the resin mixture shall be carried out in strict compliance with the recommendations of the supplier. This concerns mainly the use of hardeners, initiators and accelerators. The resins can be:

- .1 unsaturated polyester resins;
- .2 vinyl ester resins;
- .3 epoxy resins;
- .4 phenolic resins; or
- .5 thermoplastic resins.

The heat distortion temperature (HDT) of the resin and FRP, determined in accordance with standard ISO 75-1:2020, shall be at least 20°C higher than the maximum service temperature of the tank, but shall, in any case, not be lower than 70°C.

##### **6.10.3.2.4.2** *Additives*

Additives necessary for the treatment of the resin, such as catalysts, accelerators, hardeners and thixotropic substances, as well as materials used to improve the FRP service equipment, such as fillers, colours, pigments, etc., shall not cause weakening of the material, taking into account the lifetime and temperature expectancy of the design.

##### **6.10.3.2.4.3** *Reinforcement fibres*

Reinforcement fibres shall be chopped or continuous fibres of several types.

**6.10.3.2.4.4** FRP service equipment shall be manufactured by compression moulding, injection moulding, reinforced reaction injection moulding or hand lay-up. Other manufacturing technologies may be applied with the approval of the competent authority.

### 6.10.3.3 Design criteria

**6.10.3.3.1** FRP service equipment shall be of a design capable of being stress-analysed mathematically or experimentally by resistance strain gauges, or by other methods approved by the competent authority.

**6.10.3.3.2** FRP service equipment shall be designed and manufactured to withstand the test pressures specified in 6.10.3.2.3.3.

**6.10.3.3.3** At the specified test pressure, the maximum tensile relative deformation measured in mm/mm in the FRP service equipment shall not result in the formation of microcracks, and therefore not be greater than the first measured point of elongation-based fracture or damage of the resin, measured during the tensile tests prescribed under 6.10.2.7.1.2.3 and 6.10.3.4.1.1.

**6.10.3.3.4** For the internal test pressure specified in 6.10.3.2.3.3, the failure criterion ( $FC$ ) shall not exceed the following value:

$$FC \leq \frac{1}{K}$$

where:

$$K = K_0 \times K_1 \times K_2 \times K_3 \times K_4 \times K_5$$

where:

$K$  shall have a minimum value of 4;

$K_0, K_1, K_2, K_3, K_4$  are given in 6.10.2.3.4;

$K_5$  is a factor related to the deterioration in the material properties due to effects of salt fog spray and ultraviolet exposure. It shall be determined by the formula:

$$K_5 = \frac{\sigma_n}{\sigma_{eff}}$$

where:

$\sigma_n$  is the nominal (under normal conditions) tensile strength of the FRP material and  $\sigma_{eff}$  is the tensile strength of the material after consecutive salt fog exposure in accordance with ISO 12944-2:2017, ISO 12944-6:2018, 168 hours at  $+(35 \pm 2)^\circ\text{C}$  and ultraviolet exposure in accordance with ISO 4892-2, 168 hours at  $+(23 \pm 2)^\circ\text{C}$ ;

$\sigma_{eff}$  is the minimum of  $(\sigma_{eff1}, \sigma_{eff2}, \dots, \sigma_{effk})$ , where 1, 2, ... k are identifiers of substances approved for transportation by the given portable tank. If a protective coating is used, the samples with the coating shall be fabricated and tested.

A design validation exercise using numerical analysis and a suitable composite failure criterion is to be undertaken to verify that stresses in the FRP service equipment are below the allowable. Suitable composite failure criteria include, but are not limited to strain invariant failure theory, maximum strain, or maximum stress. Other relations for the strength criterion are allowed upon agreement with the competent authority. The method, a proof of suitability for the chosen failure criterion with a list of relevant experiments for all parameters used in the chosen failure criterion, and results of this design validation exercise are to be submitted to the competent authority.

The parameters used in the chosen failure criterion are to be determined using the relevant experiments and the maximum strain in tension prescribed in 6.10.2.3.5, combined with factor of safety  $K$ . At least all experiments defined in 6.10.3.4.2 shall be performed.

**6.10.3.3.5** Check calculations of the strength for FRP service equipment and its joints to the portable tank shell shall be performed by the finite element method. Treatment of singularities shall be undertaken using an appropriate method in accordance with the applicable pressure vessel code.

#### **6.10.3.4 Material testing**

##### **6.10.3.4.1 Resins**

Where neat resin specimens are used for the materials testing set out in 6.10.3.4.1.1 and 6.10.3.4.1.2, the resin shall be processed in the same manner as when it is used in a composite material, taking into account mix ratios, resin additives, post-cure, and any other parameters deemed relevant to cure.

**6.10.3.4.1.1** Resin tensile elongation shall be tested in accordance with ISO 527-2:2012.

**6.10.3.4.1.2** Heat distortion temperature shall be tested in accordance with ISO 75-1:2020.

##### **6.10.3.4.2 Coupon-samples**

Coupon-samples shall be manufactured by the same technology as the appropriate FRP service equipment.

**6.10.3.4.2.1** Ultimate tensile strength and elongation shall be tested in accordance with ISO 527-4:2021 or ISO 527-5:2021 depending on the reinforcing fibres and layups used.

**6.10.3.4.2.2** Determination of compressive properties shall be tested in the in-plane direction in accordance with ISO 14126:1999 + Cor 1:2001.

**6.10.3.4.2.3** Determination of the in-plane shear stress/strain response and shear modulus shall be tested in accordance with ISO 20337:2018.

**6.10.3.4.2.4** Mass density shall be tested in accordance with ISO 1183-1:2019.

**6.10.3.4.2.5** Mass content and composition of the reinforcement fibres shall be tested in accordance with ISO 1172:1996 or ISO 14127:2008. The fibre mass content of the coupon-samples shall be between 90% and 100% of the minimum fibre mass content specified for the appropriate FRP service equipment and obtained from testing of the inspection-samples.

**6.10.3.4.2.6** Heat distortion temperature shall be tested in accordance with ISO 75-1:2020, ISO 75-2:2013 or ISO 75-3:2004 depending on the reinforcing fibres and layups used.

**6.10.3.4.2.7** Hardness shall be tested in accordance with ISO 868:2003.

**6.10.3.4.2.8** Creep factor  $\alpha$  shall be measured in accordance with the procedure prescribed by 6.10.2.7.1.2.5. The test samples shall be taken in accordance with ISO 14125:1998.

**6.10.3.4.2.9** Ageing factor  $\beta$  shall be determined in accordance with the procedure prescribed by 6.10.2.7.1.2.6. The test samples shall be taken in accordance with ISO 14125:1998. This testing may be undertaken on either pristine samples or on samples pre-subjected to salt fog spray exposure conditioning as outlined in 6.10.3.2.4.10.

**6.10.3.4.2.10** Salt fog exposure test shall be determined in accordance with ISO 12944-2:2017, ISO 12944-6:2018, 168 hours at  $35 \pm 2^\circ\text{C}$ .

**6.10.3.4.2.11** Ultraviolet exposure test shall be determined in accordance with ISO 4892-2:2013, 168 hours at  $23 \pm 2^\circ\text{C}$ .

**6.10.3.4.2.12** The chemical compatibility with the transported substances shall be tested in accordance with 6.10.2.7.1.3.

#### **6.10.3.4.3**      ***Additional material tests***

The additional material tests shall be carried out for determination of material properties required for design calculation.

**6.10.3.4.3.1** Flexural strength shall be measured in accordance with ISO 14125:1998.

**6.10.3.4.3.2** Bearing test shall be determined in accordance with ISO 12815:2013.

#### **6.10.3.4.4**      ***Inspection-samples***

Prior to testing, all coatings shall be removed from the samples. The tests shall cover 6.10.3.4.2.1 to 6.10.3.4.2.8.

#### **6.10.3.5**      **Design approval**

**6.10.3.5.1** The competent authority or its authorized body shall issue the type approval certificate for FRP service equipment. This certificate shall attest that the design has been surveyed by the authority and is suitable for its intended purpose and meets the requirements of this chapter. The certificate shall have a reference that prototype testing was carried out in accordance with 6.10.3.5.2, the information on the substances allowed for transportation, body and seal materials and certificate number.

**6.10.3.5.2** The FRP service equipment prototype test report shall include at least the following:

- .1 results of the material tests used for fabrication of FRP service equipment in accordance with 6.10.3.4.1 to 6.10.3.4.3;
- .2 results of tests in accordance with ISO 4126-1:2013 for the appropriate relief devices;
- .3 results of the pressure tests carried out in accordance with relevant ISO standards, where applicable, or in accordance with the procedure approved by the competent authority. The test pressure shall not be less than the pressure defined in 6.10.3.2.3.3;
- .4 a representative prototype of FRP service equipment shall be subjected to the fire test prescribed in the *Manual of Tests and Criteria*, part IV, section 42;
- .5 results of the electrical resistance tests in accordance with a procedure recognized by the competent authority; and
- .6 results of the other tests prescribed in applicable pressure equipment standards or codes in agreement with the competent authority.

**6.10.3.5.3** A service life inspection programme shall be established, which shall be a part of the operation manual, to monitor the condition of the FRP service equipment at periodic inspections. The service life inspection programme shall be approved by the competent authority.

#### **6.10.3.6 Inspection and testing**

6.10.3.6.1 FRP service equipment shall be inspected and tested before being put into service. The initial inspection and test after manufacture shall include a check of the design characteristics and an external examination of FRP service equipment with due regard to the substances to be transported, and a pressure test. Before putting the FRP service equipment into service, a leak proofness test and a test of the satisfactory operation shall also be performed. Relief valves shall be tested for opening/closing pressure before installation. The initial inspection and testing programme shall be approved by the competent authority.

6.10.3.6.2 Periodic inspection and testing of FRP service equipment shall be carried out during inspection of the portable tank in accordance with 6.7.2.19.2, 6.7.2.19.4, and 6.7.2.19.5 or 6.10.2.8.1 in accordance with the service life inspection programme approved by the competent authority.

6.10.3.6.3 The inspections and tests in 6.10.3.6.1 and 6.10.3.6.2 shall be performed or witnessed by an expert approved by the competent authority.

6.10.3.6.4 Repair work of FRP service equipment shall be limited to replacement of damaged components by components covered by the type approval of the service equipment.

### **6.10.3.7 Marking**

#### **6.10.3.7.1 *Marking of relief devices***

Each relief device shall be marked as follows:

- .1 name of the manufacturer and the serial number of the equipment;
- .2 name of body and seal materials;
- .3 type approval certificate number;
- .4 the pressure at which the device is set to discharge (MPa or bar);
- .5 the allowable tolerance at the discharge pressure for spring-loaded devices;
- .6 the rated flow capacity of spring-loaded pressure relief devices under normal conditions (external pressure is 1 bar and ambient temperature is 0°C) in standard (normal) cubic metres of air per second, m<sup>3</sup>/s (determined in accordance with 6.7.2.13.2);
- .7 cross-sectional area of spring-loaded pressure relief devices, mm<sup>2</sup>;
- .8 MAWP, MPa or bar;
- .9 external design pressure (if relevant), MPa or bar; and
- .10 design temperature range.

#### **6.10.3.7.2 *Marking of stop valves***

Each stop valve shall be marked as follows:

- .1 name of the manufacturer and the serial number of the equipment;
- .2 name of body and seal materials;
- .3 type approval certificate number;
- .4 designation of the stop device;
- .5 nominal diameter, mm;
- .6 MAWP, MPa or bar;
- .7 test pressure, MPa or bar;
- .8 direction of medium flow; and
- .9 design temperature range."

## PART 7 PROVISIONS CONCERNING TRANSPORT OPERATIONS

### Chapter 7.1 General stowage provisions

#### 7.1.2 Definitions

After "Note 2: Cargo holds cannot be interpreted as closed cargo transport units.", in the definition of "Clear of living quarters", add the word "spaces" after the word "accommodation", to be read as "means that packages or cargo transport units shall be stowed a minimum distance of 3 m from accommodation spaces, air intakes, machinery spaces and other enclosed work areas."

#### 7.1.4 Special stowage provisions

##### 7.1.4.5 Stowage of goods of class 7

**7.1.4.5.3.1** In the table for TI limits for freight containers and conveyances not under exclusive use, in the first column, delete twice "(closed containers)".

**7.1.4.5.3.4** In the table for CSI limits for freight containers and conveyances containing fissile material, in the first column, delete twice "(closed containers)".

**Table 7.1.4.5.18 – CLASS 7 – Radioactive material**  
*Segregation table for persons*

**7.1.4.5.18** Replace the existing table with the following with the corresponding footnotes:  
"

| Sum of transport Indices (TI) | Segregation distance of radioactive material from passengers and crew*                                                           |                                                                                      |                                       |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------|
|                               | Containership <sup>2</sup><br>general cargo ship <sup>2</sup> ,<br>ro-ro ship <sup>2</sup> ,<br>barge-carrying ship <sup>2</sup> | Ferry, etc. <sup>3</sup>                                                             | Offshore support vessel <sup>4</sup>  |
| ≤ 10                          | At least 6 m                                                                                                                     | Stow at bow or stern furthest from living quarters and regularly occupied work areas | Stow at stern or at platform midpoint |
| 10 < TI ≤ 20                  | At least 8 m                                                                                                                     | as above                                                                             | as above                              |
| 20 < TI ≤ 50                  | At least 13 m                                                                                                                    | as above                                                                             | not applicable                        |
| 50 < TI ≤ 100                 | At least 18 m                                                                                                                    | as above                                                                             | not applicable                        |
| 100 < TI ≤ 200                | At least 26 m                                                                                                                    | as above                                                                             | not applicable                        |
| 200 < TI ≤ 400                | At least 36 m                                                                                                                    | as above                                                                             | not applicable                        |

\* The segregation distance is measured horizontally and projected vertically. This distance may be filled with cargo, but shall be according to the relevant segregation provisions of this Code.

<sup>2</sup> Containership, general cargo ship, ro-ro ship, and barge-carrying ship, all of 150 m minimum length.

<sup>3</sup> Ferry or cross-channel, coastal and inter-island ship, all of 100 m minimum length.

<sup>4</sup> Offshore support vessel of 50 m minimum length (in this case the practical maximum sum of TI's carried is 20)."

#### **7.1.4.7 Stowage of stabilized dangerous goods**

In the text "For substances, for which the word "STABILIZED" is added as part of the proper shipping name of the substances in accordance with 3.1.2.6, Stowage Category D and SW1 shall apply" replace the words "Stowage Category D and SW1 shall apply" with the words "stowage category D and SW1 shall apply".

#### **7.1.5 Stowage codes**

In the stowage codes given in column 16a of the Dangerous Goods List as specified in the table, replace the description as follows:

In SW14 Stowage category A only if the special stowage provisions of 7.4.1.4 and 7.6.2.8.4 are complied with.

In SW17 "Category E ..." with the words "Stowage category E".

In SW18 "Category A..." with the words "Stowage category A".

In SW19 "For batteries transported in accordance with special provisions 376 or 377, category C, unless transported on a short international voyage" replace the words "category C" with the words "stowage category C".

In SW20 "... category D applies" replace the words "stowage, category D" with the words "stowage category D applies".

In SW21 "... category D applies" replace the words "stowage, category D" with the words "stowage category D applies".

In SW22 "For AEROSOLS with a maximum capacity of 1 L: category A. For AEROSOLS with a capacity above 1 L: category B. For WASTE AEROSOLS or WASTE GAS CARTRIDGES: category C, clear of living quarters." replace the text to be read as: "For AEROSOLS with a maximum capacity of 1 L: stowage category A. For AEROSOLS with a capacity above 1 L: stowage category B. For WASTE AEROSOLS or WASTE GAS CARTRIDGES: stowage category C, clear of living quarters."

In SW29 replace the word "Category" with the word "category".

### **Chapter 7.2 General segregation provisions**

#### **7.2.4 Segregation table**

In the table, in the first column, replace the word "CLASS" by "CLASS/DIVISION".

#### **7.2.7 Segregation of goods of class 1**

##### **7.2.7.1 Segregation between goods of class 1**

7.2.7.1.5 In the second sentence ("where this is not permitted, closed cargo transport units shall be separated from one another"), replace the word "unit" with the word "units".

### Chapter 7.3

#### Consigning operations concerning the packing and use of cargo transport units (CTUs) and related provisions

#### 7.3.3 Packing of cargo transport units

**7.3.3.7** Add a new second sentence to read "Unless otherwise indicated, packagings that have had a stacking test shall be loaded in the same orientation as when the samples were tested."

At the end, add the following new note:

**"Note:** The stacking test is generally carried out on the top surface of the packaging. Packages, other than bags, should therefore be stacked on the top surface of the packages unless indicated otherwise."

#### 7.3.7 Cargo transport units under temperature control

##### 7.3.7.4 Methods of temperature control

**7.3.7.4.3** In the third sentence, replace the words "using two measuring devices independent of each other" with the words "using two independently powered measuring devices".

### Chapter 7.6

#### Stowage and segregation on general cargo ships

#### 7.6.3 Segregation provisions

##### 7.6.3.5.2 Segregation table

In the table, in the first column, replace the words "Corrosive substance" with the words "Corrosive substances".

In the table, in the second column, replace the word "CLASS" with "CLASS/DIVISION".

### Appendix A

#### List of generic and N.O.S. proper shipping names

In the table, for Division 6.1, under "Specific entries", add the following new entries:

|     |  |      |                                      |
|-----|--|------|--------------------------------------|
| 6.1 |  | 2020 | CHLOROPHENOLS, TOXIC, SOLID, N.O.S.  |
| 6.1 |  | 2021 | CHLOROPHENOLS, TOXIC, LIQUID, N.O.S. |

In the table, for class 8, under "Specific entries", add the following new entries:

|   |     |      |                                                |
|---|-----|------|------------------------------------------------|
| 8 | 6.1 | 3561 | CHLOROPHENOLS, CORROSIVE, TOXIC, SOLID, N.O.S. |
| 8 |     | 3562 | CHLOROPHENOLS, CORROSIVE, SOLID, N.O.S.        |

## INDEX

In the table, in the third column, replace the word "CLASS" by "CLASS/DIVISION".

Delete the entries for "Dichlorophenols, liquid, see", "Dichlorophenols, solid, see" and "Fluoric acid, see".

For "CHLOROPHENOLS, LIQUID", replace the entry in column "Substance, material or article" to read "CHLOROPHENOLS, TOXIC, LIQUID, N.O.S".

For "CHLOROPHENOLS, SOLID", replace the entry in column "Substance, material or article" to read "CHLOROPHENOLS, TOXIC, SOLID, N.O.S".

Delete the entry for "FLUOROANILINES".

For "2,4-Difluoroaniline, see", in column "UN No.", replace "2941" with "2810".

For "LITHIUM BATTERIES INSTALLED IN CARGO TRANSPORT UNIT lithium ion batteries or lithium metal batteries", replace the entry in column "Substance, material or article" to read "LITHIUM ION BATTERIES INSTALLED IN CARGO TRANSPORT UNIT":

Add the following new entries in alphabetical order:

"

| Substance, material or article                                                             | MP | Class | UN. No. |
|--------------------------------------------------------------------------------------------|----|-------|---------|
| CHLOROPHENOLS, CORROSIVE, TOXIC, SOLID, N.O.S.                                             |    | 8     | 3561    |
| CHLOROPHENOLS, CORROSIVE, SOLID, N.O.S.                                                    |    | 8     | 3562    |
| Heat pumps, see                                                                            |    | 2.2   | 2857    |
|                                                                                            |    | 2.1   | 3358    |
| HEATING MACHINES containing non-flammable, non-toxic, gases or ammonia solutions (UN 2672) |    | 2.2   | 2857    |
| HEATING MACHINES containing flammable, non-toxic, liquefied gas                            |    | 2.1   | 3358    |
| Magnetic resonance imaging (MRI) scanners containing non-flammable, non-toxic gas, see     |    | 2.2   | 3538    |
| SODIUM ION BATTERIES INSTALLED IN CARGO TRANSPORT UNIT                                     |    | 9     | 3564    |
| LITHIUM METAL BATTERIES INSTALLED IN CARGO TRANSPORT UNIT                                  |    | 9     | 3563    |

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**ANNEX 8****RESOLUTION MSC.588(111)  
(adopted on 21 May 2026)****AMENDMENTS TO THE INTERNATIONAL CODE OF SAFETY FOR SHIPS  
CARRYING INDUSTRIAL PERSONNEL (IP CODE)**

THE MARITIME SAFETY COMMITTEE,

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

NOTING resolution MSC.527(106), by which it adopted the International Code of Safety for Ships Carrying Industrial Personnel ("the IP Code"), which has become mandatory under chapter XV of the International Convention for the Safety of Life at Sea, 1974 ("the Convention"),

NOTING ALSO article VIII(b) and regulation XV/1.2 of the Convention concerning the procedure for amending the IP Code,

HAVING CONSIDERED, at its 111th session, amendments to the IP Code, proposed and circulated in accordance with article VIII(b)(i) of the Convention,

1 ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the IP Code, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the said amendments shall be deemed to have been accepted on 1 July 2027, unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet have notified the Secretary-General of their objections to the amendments;

3 INVITES Contracting Governments to the Convention to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2028 upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, for the purposes of article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Contracting Governments to the Convention;

5 ALSO REQUESTS the Secretary-General to transmit copies of this resolution and its annex to Members of the Organization which are not Contracting Governments to the Convention.

ANNEX

**AMENDMENTS TO THE INTERNATIONAL CODE OF SAFETY FOR SHIPS  
CARRYING INDUSTRIAL PERSONNEL (IP CODE)**

**PART IV  
ADDITIONAL REGULATIONS FOR SHIPS CERTIFIED  
IN ACCORDANCE WITH SOLAS CHAPTER I**

**Regulation 2**

*Subdivision and stability*

- 1 The following new sub-paragraph .7 is added after existing paragraph 2.1.6:
- " .7 The mass of each industrial personnel shall be assumed to be 90 kg instead of 75 kg in the ship stability calculation, for ships:
- .1 for which the building contract is placed on or after 1 January 2028;  
or
  - .2 in the absence of a building contract, the keel of which is laid or which is at a similar stage of construction on or after 1 January 2028 + 6 months; or
  - .3 the delivery of which is on or after 1 January 2028 + 4 years."

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**ANNEX 9**

**RESOLUTION MSC.589(111)  
(adopted on 21 May 2026)**

**AMENDMENTS TO THE INTERNATIONAL LIFE-SAVING APPLIANCE (LSA) CODE**

THE MARITIME SAFETY COMMITTEE,

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

RECALLING ALSO resolution MSC.48(66), by which it adopted the International Life-Saving Appliance (LSA) Code ("the LSA Code"), which has become mandatory under chapter III of the International Convention for the Safety of Life at Sea (SOLAS), 1974 ("the Convention"),

RECALLING FURTHER article VIII(b) and regulation III/3.10 of the Convention concerning the procedure for amending the LSA Code,

HAVING NOTED, at its 108th session, that the application provisions in the amendments to the LSA Code adopted at that session and in some other previous amendments to the Code had been included in the text of the resolutions instead of the text of the requirements, which might hinder their effective implementation,

HAVING AGREED, at its 109th session, that a systematic approach be taken to ensure the insertion of relevant application provisions during the regulatory development and amendment processes,

HAVING CONSIDERED, at its 111th session, amendments to the LSA Code proposed and circulated in accordance with article VIII(b)(i) of the Convention,

1 ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the LSA Code, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the amendments shall be deemed to have been accepted on 1 July 2027 unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet have notified the Secretary-General of their objections to the amendments;

3 INVITES Contracting Governments to the Convention to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2028 upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, in conformity with article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Contracting Governments to the Convention;

5 ALSO REQUESTS the Secretary-General to transmit copies of this resolution and its annex to Members of the Organization which are not Contracting Governments to the Convention.

## ANNEX

### AMENDMENTS TO THE INTERNATIONAL LIFE-SAVING APPLIANCE CODE (LSA CODE)

#### Preamble

- 1 The preamble is replaced by the following:

"1 The purpose of this Code is to provide international standards for life-saving appliances required by chapter III of the International Convention for the Safety of Life at Sea (SOLAS), 1974.

2 The requirements of this Code are mandatory under the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, for ships constructed on or after 1 July 1998. Amendments to the Code are adopted and brought into force in accordance with the procedure laid down in article VIII of that Convention."

#### CHAPTER II PERSONAL LIFE-SAVING APPLIANCES

#### 2.2 Lifejackets

##### 2.2.1 General requirements for lifejackets

- 2 Paragraph 2.2.1.6.2 is replaced by the following:

".2 for adult lifejackets provided on or after 1 January 2026, turn the body of unconscious, face-down persons in the water to a face-up position where the nose and mouth are clear of the water in an average time not exceeding that of the RTD plus 1 s;"

- 3 The following new paragraph 2.2.1.18 is added after existing paragraph 2.2.1.17:

"2.2.1.18 For the application of the requirement in paragraph 2.2.1.6.2, the expression *"lifejackets provided on or after 1 January 2026"* means lifejackets having a contractual delivery date to the ship on or after 1 January 2026 or, in the absence of a contractual delivery date to the ship, actually delivered to the ship on or after 1 January 2026."

## **CHAPTER IV SURVIVAL CRAFT**

### **4.4 General requirements for lifeboats**

#### **4.4.7 Lifeboat fittings**

4 Paragraph 4.4.7.6.8 is replaced by the following:

"8 for those lifeboats installed on or after 1 January 2026, to prevent an accidental release during recovery of the boat, the hook shall not be able to support any load unless the hook is completely reset. In the case of a hook which is capable of releasing the lifeboat or rescue boat with a load on the hook when it is not fully waterborne, the handle or safety pins shall not be able to be returned to the reset (closed) position, and any indicators shall not indicate the release mechanism is reset, unless the hook is completely reset. Additional danger signs shall be posted at each hook station to alert crew members to the proper method of resetting;"

5 At the end of paragraph 4.4.7.6.16, the word "and" is deleted.

6 Paragraph 4.4.7.6.17 is replaced by the following:

".17 for those lifeboats installed on or after 1 January 2026, where a single fall and hook system is used for launching a lifeboat or rescue boat in combination with a suitable painter, the requirements of paragraphs 4.4.7.6.7 and 4.4.7.6.15 need not be applicable; provided that the single fall and hook system does not have the capability to release the lifeboat or rescue boat with a load on the hook when it is not fully waterborne; and"

7 The following new paragraph 4.4.7.6.18 is added after paragraph 4.4.7.6.17:

".18 for the application of the requirements in paragraphs 4.4.7.6.8 and 4.4.7.6.17, the expression "*lifeboats installed on or after 1 January 2026*" means lifeboats having a contractual delivery date to the ship on or after 1 January 2026 or, in the absence of a contractual delivery date to the ship, actually delivered to the ship on or after 1 January 2026."

### **4.6 Totally enclosed lifeboats**

#### **4.6.6 Ventilation means**

8 The following new explanatory sentence is added after the title of paragraph 4.6.6:

"(For totally enclosed lifeboats installed on or after 1 January 2029, the following requirements apply)"

#### **4.6.7 Openings of the ventilation system and their means of closing**

9 The following new explanatory sentence is added after the title of paragraph 4.6.7:

"(For totally enclosed lifeboats installed on or after 1 January 2029, the following requirements apply.)"

- 10 The following new paragraph 4.6.8 is added after existing paragraph 4.6.7:

"4.6.8 For the application of the requirements in paragraphs 4.6.6 and 4.6.7, the expression "*totally enclosed lifeboats installed on or after 1 January 2029*" means totally enclosed lifeboats having a contractual delivery date to the ship on or after 1 January 2029 or, in the absence of a contractual delivery date to the ship, actually delivered to the ship on or after 1 January 2029."

#### **4.7 Free-fall lifeboats**

- 11 The following new paragraph 4.7.7 is inserted after existing paragraph 4.7.6, and existing paragraph 4.7.7 is renumbered as 4.7.8:

#### **"4.7.7 Lifeboat release testing**

4.7.7.1 For each free-fall lifeboat installed on or after 1 January 2031, the arrangement to test the release system under load without launching the lifeboat into the water, in accordance with paragraph 4.7.6.4, shall be designed with a safety factor of at least 6 on the basis of the calculated maximum working load with full complement of persons and equipment and the ultimate strength of the materials used for its construction considering static and relevant dynamic loads. Components of this arrangement that are exposed to the marine environment, other than falls and temporarily installed equipment, shall be constructed from materials that are corrosion resistant in the marine environment without the need for coatings or galvanizing.

4.7.7.2 For the application of the requirements in paragraph 4.7.7.1, the expression "*free-fall lifeboat installed on or after 1 January 2031*" means a free-fall lifeboat having a contractual delivery date to the ship on or after 1 January 2031 or, in the absence of a contractual delivery date to the ship, actually delivered to the ship on or after 1 January 2031."

### **CHAPTER VI LAUNCHING AND EMBARKATION APPLIANCES**

#### **6.1 Launching and embarkation appliances**

12 Paragraph 6.1.1.3 is replaced by the following:

"6.1.1.3 A launching appliance shall not depend on any means other than gravity or stored mechanical power which is independent of the ship's power supplies to launch the survival craft or rescue boat it serves in the fully loaded and equipped condition and also in the light condition.

Notwithstanding the above, for a rescue boat installed on or after 1 January 2024 on a cargo ship which is not one of the ship's survival craft, having a mass not more than 700 kg in fully equipped condition, with engine, but without the crew, the launching appliance of the boat does not need to be fitted with stored mechanical power provided that:

- .1 manual hoisting from the stowed position and turning out to the embarkation position is possible by one person;
- .2 the force on the crank handle does not exceed 160 N at the maximum crank radius of 350 mm; and
- .3 means having sufficient strength such as a bousing line is provided for bringing the rescue boat against the ship's side and holding it alongside so that persons can be safely embarked."

- 13 The following new text is added at the end of existing paragraph 6.1.1.3:

"6.1.1.3.1.1 For the application of the requirements in this paragraph, the expression "*rescue boat installed on or after 1 January 2024*" means a rescue boat having a contractual delivery date to the ship on or after 1 January 2024 or, in the absence of a contractual delivery date to the ship, actually delivered to the ship on or after 1 January 2024."

## **6.1.2 Launching appliances using falls and a winch**

- 14 Paragraph 6.1.2.8 is replaced by the following:

"6.1.2.8 For launching appliances installed on or after 1 January 2026, the speed at which the fully loaded survival craft or rescue boat is lowered to the water shall not be less than that obtained from the formula:

$$S = 0.4 + 0.02 \cdot H \text{ or } 1.0, \text{ whichever is less}$$

where:

$S$  is the lowering speed in metres per second and

$H$  is the height in metres from the davit head to the waterline with the ship at the lightest seagoing condition."

- 15 Paragraph 6.1.2.10 is replaced by the following:

"6.1.2.10 For launching appliances installed on or after 1 January 2026, the maximum lowering speed of a fully loaded survival craft or rescue boat shall be 1.3 m/s. The Administration may accept a maximum lowering speed other than 1.3 m/s, having regard to the design of the survival craft or rescue boat, the protection of its occupants from excessive forces, and the strength of the launching arrangements taking into account inertia forces during an emergency stop. Means shall be incorporated in the appliance to ensure that this speed is not exceeded."

- 16 The following new paragraph 6.1.2.14 is added after existing paragraph 6.1.2.13:

"6.1.2.14 For the application of the requirements in paragraphs 6.1.2.8 and 6.1.2.10, the expression "*launching appliances installed on or after 1 January 2026*" means launching appliances having a contractual delivery date to the ship on or after 1 January 2026 or, in the absence of a contractual delivery date to the ship, actually delivered to the ship on or after 1 January 2026."

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**ANNEX 10**

**RESOLUTION MSC.590(111)  
(adopted on 21 May 2026)**

**AMENDMENTS TO THE REQUIREMENTS FOR MAINTENANCE, THOROUGH  
EXAMINATION, OPERATIONAL TESTING, OVERHAUL AND REPAIR OF LIFEBOATS  
AND RESCUE BOATS, LAUNCHING APPLIANCES AND RELEASE GEAR  
(RESOLUTION MSC.402(96))**

THE MARITIME SAFETY COMMITTEE,

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

RECALLING ALSO resolution MSC.402(96), by which it adopted the Requirements for maintenance, thorough examination, operational testing, overhaul and repair of lifeboats and rescue boats, launching appliances and release gear ("the Requirements"), which has become mandatory under chapter III of the International Convention for the Safety of Life at Sea (SOLAS), 1974 ("the Convention"), as amended by resolution MSC.404(96),

RECALLING FURTHER article VIII(b) and regulation III/3.25 of the Convention concerning the procedure for amending the Requirements,

TAKING INTO ACCOUNT the amendments to the LSA Code adopted by resolution MSC.589(111), with respect to the arrangements to test the release system under load without launching the lifeboat into the water,

RECOGNIZING the need to keep the Requirements up to date with regard to annual thorough examination and operational testing of the arrangements to test the release system under load without launching the free-fall lifeboat into the water,

HAVING CONSIDERED, at its 111th session, amendments to the Requirements, proposed and circulated in accordance with VIII(b)(i) of the Convention,

1 ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the Requirements for maintenance, thorough examination, operational testing, overhaul and repair of lifeboats and rescue boats, launching appliances and release gear, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the amendments shall be deemed to have been accepted on 1 July 2027, unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet have notified the Secretary-General of their objections to the amendments;

3 INVITES SOLAS Contracting Governments to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2028 upon their acceptance in accordance with paragraph 2 above;

4 ALSO INVITES Contracting Governments to note that the provisions in the annex are to be applied to free-fall lifeboats installed on or after 1 January 2031, or having a contractual delivery date to the ship on or after 1 January 2031 or, in the absence of a contractual delivery date to the ship, actually delivered to the ship on or after 1 January 2031;

5 REQUESTS the Secretary-General, in conformity with article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Contracting Governments to the Convention;

6 ALSO REQUESTS the Secretary-General to transmit copies of this resolution and its annex to Members of the Organization which are not Contracting Governments to the Convention.

ANNEX

**AMENDMENTS TO THE REQUIREMENTS FOR MAINTENANCE, THOROUGH  
EXAMINATION, OPERATIONAL TESTING, OVERHAUL AND REPAIR OF LIFEBOATS  
AND RESCUE BOATS, LAUNCHING APPLIANCES AND RELEASE GEAR  
(RESOLUTION MSC.402(96))**

**6 SPECIFIC PROCEDURES FOR INSPECTION, MAINTENANCE, THOROUGH  
EXAMINATION, OPERATIONAL TESTING, OVERHAUL AND REPAIR**

**6.2 Annual thorough examination and operational test**

1 Paragraph 6.2.3 is replaced by the following:

"6.2.3 For lifeboats (including free-fall lifeboats), rescue boats and fast rescue boats, the following items shall be thoroughly examined and checked for satisfactory condition and operation:

- .1 condition of the boat structure, including fixed and loose equipment (including a visual examination of the external boundaries of the void spaces, as far as practicable);
- .2 engine and propulsion system;
- .3 sprinkler system, where fitted;
- .4 air supply system, where fitted;
- .5 manoeuvring system;
- .6 power supply system;
- .7 bailing system;
- .8 fender/skate arrangements;
- .9 rescue boat righting system, where fitted;
- .10 ventilation system, where fitted; and
- .11 arrangement to test the release system under load without launching the lifeboat into the water (free-fall lifeboats only)."

2 Paragraph 6.2.7 is replaced by the following:

"6.2.7 The operational test of the free-fall lifeboat release function shall be carried out as follows:

- .1 engage the arrangements for the test without launching the lifeboat, required by paragraphs 4.7.6.4 and 4.7.7 of the LSA Code, as specified in the manufacturer's operating instructions;

- .2 if required to be on board, ensure that the operator is properly seated and secured in the seat location from which the release mechanism is to be operated;
- .3 operate the release mechanism to release the lifeboat;
- .4 reset the lifeboat in the stowed configuration;
- .5 repeat the procedures referred to in .2 to .4 above, using the back-up release mechanism, if applicable;
- .6 remove the arrangements for the test without launching the lifeboat, required by paragraphs 4.7.6.4 and 4.7.7 of the LSA Code; and
- .7 verify that the lifeboat is in the ready-to-launch stowed configuration."

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**ANNEX 11**

**RESOLUTION MSC.591(111)  
(adopted on 21 May 2026)**

**AMENDMENTS TO THE PROTOCOL OF 1988 RELATING TO  
THE INTERNATIONAL CONVENTION ON LOAD LINES, 1966  
(1988 LOAD LINES PROTOCOL)**

THE MARITIME SAFETY COMMITTEE,

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

RECALLING ALSO article VI of the Protocol of 1988 relating to the International Convention on Load Lines, 1966 ("1988 Load Lines Protocol") concerning amendment procedures,

HAVING CONSIDERED, at its 111th session, amendments to the 1988 Load Lines Protocol proposed and circulated in accordance with article VI(2)(a) thereof,

1 ADOPTS, in accordance with article VI(2)(d) of the 1988 Load Lines Protocol, amendments to the 1988 Load Lines Protocol, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article VI(2)(f)(ii)(bb) of the 1988 Load Lines Protocol, that the said amendments shall be deemed to have been accepted on 1 July 2027, unless, prior to that date, more than one third of the Parties to the 1988 Load Lines Protocol, or Parties the combined merchant fleets of which constitute not less than 50% of the gross tonnage of all the merchant fleets of all Parties, have notified their objections to the amendments;

3 INVITES the Parties concerned to note that, in accordance with article VI(2)(g)(ii) of the 1988 Load Lines Protocol, the amendments shall enter into force on 1 January 2028 upon their acceptance in accordance with paragraph 2 above;

4 REQUESTS the Secretary-General, in conformity with article VI(2)(e) of the 1988 Load Lines Protocol, to transmit certified copies of the present resolution and the text of the amendments contained in the annex to all Parties to the 1988 Load Lines Protocol;

5 ALSO REQUESTS the Secretary-General to transmit copies of this resolution and its annex to Members of the Organization which are not Parties to the 1988 Load Lines Protocol.

ANNEX

**DRAFT AMENDMENTS TO THE PROTOCOL OF 1988 RELATING TO  
THE INTERNATIONAL CONVENTION ON LOAD LINES, 1966  
(1988 LOAD LINES PROTOCOL)**

**Annex B  
ANNEXES TO THE CONVENTION AS MODIFIED BY  
THE PROTOCOL OF 1988 RELATING THERETO**

**Annex I  
Regulations for determining load lines**

**Chapter II  
Conditions of assignment of freeboard**

**Regulation 25**

*Protection of the crew*

- 1 The following application provision is inserted before paragraph (1):  
  
"This regulation, as amended by resolution MSC.591(111), shall apply to ships the keels of which are laid, or which are at a similar stage of construction on or after 1 January 2028."
- 2 Paragraph (2) is replaced by the following:  
  
"(2) Guard rails or bulwarks shall be fitted around all exposed decks and all exposed sea access holes (such as edges of moonpools) accessible to the crew during navigation. The height of the bulwarks or guard rails shall be at least 1 m from the deck. Where this height interferes with the normal operation of the ship, a lesser height providing adequate protection may be approved by the Administration."
- 3 The chapeau of paragraph (3) is replaced by the following:  
  
"(3) Guard rails referred to in paragraph (2) shall have at least three courses. The opening below the lowest course of the guard rails shall not exceed 230 mm. The other courses shall be not more than 380 mm apart. In the case of ships with rounded gunwales the guard rail supports shall be placed on the flat of the deck. Guard rails shall comply with the following provisions:"
- 4 Sub-paragraph (3)(d) is replaced by the following:  
  
"(d) where necessary for the normal operation of the ship, chains fitted between two fixed stanchions and/or bulwarks are acceptable in lieu of guard rails, provided that the chains are tightened as much as reasonably practicable and are detachable."

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## ANNEX 12

### RESOLUTION MSC.509(105)/REV.2 (adopted on 21 May 2026)

#### PROVISION OF RADIO SERVICES FOR THE GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS)

THE MARITIME SAFETY COMMITTEE,

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

RECALLING ALSO that the Assembly, at its nineteenth session, adopted resolution A.801(19) on *Provision of radio services for the Global Maritime Distress and Safety System (GMDSS)*, authorizing the Maritime Safety Committee to keep the resolution under review and to adopt amendments thereto, as necessary,

RECALLING FURTHER resolution MSC.509(105), by which it adopted, at its 105th session, a revision of resolution A.801(19), as amended by resolution MSC.199(80), superseding the latter resolutions from 1 January 2024,

RECALLING resolution MSC.509(105)/Rev.1, adopted at its 109th session, which introduced a new annex on Criteria for use when providing a NAVDAT service, superseding resolution MSC.509(105),

TAKING INTO ACCOUNT the amendments to chapters IV and V of the International Convention for the Safety of Life at Sea, 1974 ("the Convention"), adopted by resolution MSC.583(111),

NOTING, in particular, regulation IV/5 of the Convention concerning the provision of radiocommunication services,

HAVING CONSIDERED, at its 111th session, the recommendation made by the Sub-Committee on Navigation, Communications and Search and Rescue at its twelfth session,

1 ADOPTS the revised *Recommendation on provision of radio services for the GMDSS*, the *Criteria for use when providing shore-based digital selective calling (DSC) facilities for use in the GMDSS*, the *Criteria for establishing GMDSS sea areas*, the *Criteria for use when providing a NAVTEX service*, the *Criteria for use when providing a NAVDAT service* and the *Criteria for use when providing an international Enhanced Group Call service in the GMDSS* set out in annexes 1 to 6, respectively, to the present resolution;

2 RECOMMENDS that Governments ensure that provision of radio services for the GMDSS established on or after the date of adoption of the present resolution conforms to criteria not inferior to those set out in the annexes to the present resolution;

3 INVITES Governments to:

- .1 provide, either individually or in cooperation with other Governments, the radio services deemed practicable and necessary for the proper operation of the GMDSS; and

- .2 inform the Secretary-General of the shore-based facilities to be provided in support of the GMDSS in response to this resolution through the Organization's Global Integrated Shipping Information System (GISIS);
- 4 REVOKES resolution MSC.509(105)/Rev.1.

## ANNEX 1

### RECOMMENDATION ON PROVISION OF RADIO SERVICES FOR THE GMDSS

- 1 Governments should establish such coast stations, individually or in cooperation with other Governments, as are needed to designate a sea area or areas A1 or A2, or both, off their coasts. Each sea area should be established in accordance with the *Criteria for establishing GMDSS sea areas* recommended in annex 3.
- 2 Governments that do not define sea areas A1 or A2 should establish such coast stations, individually or in cooperation with other Governments, as are needed to designate a sea area (or areas) A3 or A4 in accordance with SOLAS regulations IV/2.1.17 and 2.1.18. Each sea area should be established in accordance with the *Criteria for establishing GMDSS sea areas* recommended in annex 3.
- 3 Each Government should submit to the Organization information on the sea area or sea areas (A1, A2, A3 and/or A4) designated, radiocommunication services it has established for the GMDSS, and when there are changes to the sea area or areas it has so defined.
- 4 Governments should make provision for radiocommunication services in each sea area they have defined, so that a ship, while at sea, can receive shore-to-ship radiocommunication and that coast stations can receive ship-to-shore radiocommunication in accordance with the functional requirements set out in SOLAS regulation IV/4.1.

## ANNEX 2

### **CRITERIA FOR USE WHEN PROVIDING SHORE-BASED DIGITAL SELECTIVE CALLING (DSC) FACILITIES FOR USE IN THE GMDSS**

1 Governments, individually or in cooperation with other Governments, desiring to provide a high frequency (HF) digital selective calling (DSC) coast station for use in the GMDSS should notify the Organization so it can maintain in the GMDSS Master Plan details of HF coast stations providing HF DSC distress watch. Governments should ensure that such HF DSC coast stations are provided in accordance with appendix 1.

2 Governments, individually or in cooperation with other Governments, desiring to provide a medium frequency (MF) DSC coast station serving, either wholly or in part, a particular sea area A2, should notify the Organization as to the extent of continuous coverage and the extent of coverage from shore. This information should be determined by Governments in accordance with the criteria recommended in annex 3. Governments should ensure that MF DSC coast stations are provided in accordance with appendix 2.

3 Governments, individually or in cooperation with other Governments desiring to provide a very high frequency (VHF) DSC coast station serving, either wholly or in part, a particular sea area A1, should notify the Organization as to the extent of continuous coverage and the extent of coverage from shore. This information should be determined by Governments in accordance with the criteria recommended in annex 3. Governments should ensure that VHF DSC coast stations are provided in accordance with appendix 3.

4 In addition, Report ITU-R M.2027 provides engineering guidance to upgrade shore-based facilities to operate the GMDSS in sea areas A1, A2, A3 and A4.

## **APPENDIX 1**

### **1 BASIC PRINCIPLES FOR ESTABLISHING HF DSC COAST STATIONS FOR SEA AREAS A3 AND A4**

The location of HF DSC coast stations for sea areas A3 and A4 should be based, where practicable, on the following principles:

- .1 each area should have a minimum of two stations to provide the required coverage;
- .2 stations should be selected to provide redundant coverage; and
- .3 in areas of high traffic density, more than two stations should be provided.

Governments are encouraged to cooperate in order to achieve the above basic principles for establishing HF DSC coast stations and a complete global coverage.

### **2 CRITERIA FOR THE PROVISION OF HF DSC COAST STATIONS**

Stations participating in HF DSC watchkeeping in the GMDSS should:

- .1 be affiliated with an RCC and have reliable communications between them;
- .2 monitor all HF DSC distress frequencies;
- .3 provide as complete a coverage of their area as possible;
- .4 be in continuous operation; and
- .5 be able to relay distress alerts and communications under an international common procedure as agreed by the Organization.<sup>1</sup>

### **3 AVAILABILITY AND COVERAGE OF HF DSC COAST STATIONS**

The minimum number of HF DSC coast stations indicated in paragraph 1 may need to be adjusted in future in order to:

- .1 ensure coast stations can provide a mutual backup in the event of operational failure; and
- .2 provide a methodology for predicting coverage to include in the GMDSS Master Plan.

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<sup>1</sup> Refer to IAMSAR Manual, Volume II, section 3.6 "Designation of the RCC or RSC responsible for initiating SAR action".

## **APPENDIX 2**

### **1 BASIC PRINCIPLES FOR ESTABLISHING MF DSC COAST STATIONS FOR SEA AREA A2**

The selection of MF DSC coast stations for sea area A2 should be based on the following principles:

- .1 each sea area designated as A2 requires a continuous MF guard on the distress frequencies and a sufficient number of coast stations to provide MF coverage in the coastal area of the Government concerned; and
- .2 in certain areas, several Governments may collectively provide complete coverage (e.g. the North Sea).

### **2 CRITERIA FOR THE PROVISION OF MF DSC COAST STATIONS**

Stations participating in MF DSC watchkeeping in the GMDSS should:

- .1 be affiliated to an RCC and have reliable communications between them;
- .2 provide as complete a coverage of their immediate sea area as possible; and
- .3 be in continuous operation.

## **APPENDIX 3**

### **1 BASIC PRINCIPLES FOR ESTABLISHING VHF DSC COAST STATIONS FOR SEA AREA A1**

The selection of VHF DSC coast stations for sea area A1 should be based on the following principles:

- .1 each sea area designated as A1 requires a continuous VHF guard and should have the minimum number of stations necessary to provide VHF coverage in the coastal area of the Government concerned; and
- .2 in certain areas, several Governments may collectively provide complete coverage along their coasts (e.g. the North Sea).

### **2 CRITERIA FOR THE PROVISION OF VHF DSC COAST STATIONS**

Stations participating in VHF DSC watchkeeping in the GMDSS should:

- .1 be affiliated to an RCC and have reliable communications between them;
- .2 provide as complete a coverage of their immediate sea area as possible; and
- .3 be in continuous operation.

## ANNEX 3

### CRITERIA FOR ESTABLISHING GMDSS SEA AREAS

#### 1 INTRODUCTION

Governments should use the following criteria when establishing sea areas as defined in SOLAS regulation IV/2.

#### 2 SEA AREA A1

##### 2.1 General

The communication range of stations operating in the maritime mobile VHF band is likely to be limited by propagation factors rather than by a lack of radiated power.

##### 2.2 Guidance criteria

Sea area A1 is that sea area which is within a circle of radius A nautical miles over which the radio propagation path lies substantially over water. The radius A is equal to the transmission distance between a ship's VHF antenna at a height of 4 m above sea level and the antenna of the VHF coast station which lies at the centre of the circle.

##### 2.3 Determination of radius A

2.3.1 The following formula should be used to calculate the range A in nautical miles:

$$A = 2.5 \left( \sqrt{H(\text{in metres})} + \sqrt{h(\text{in metres})} \right)$$

H is the height above sea level of the VHF coast station receiving antenna and h is the height above sea level of the ship's transmitting antenna, which is assumed to be 4 m.

2.3.2 The formula given above applies to line-of-sight cases but is not considered adequate for cases where both antennae are at a low level. The VHF range in sea area A1 should be verified by field strength measurements.

#### 3 SEA AREA A2

##### 3.1 General

3.1.1 Consideration of the reception of radio signals in the 2 MHz band indicates that the range is likely to be limited by propagation conditions and atmospheric noise, which are affected by variations in geographical position and time of day, as well as radiated power.

3.1.2 The theoretical distance to be expected from ground-wave propagation can be determined by reference to the "Ground-wave propagation curves for frequencies between 10 kHz and 30 MHz" in the most recent version of Recommendation ITU-R P.368, to be used above seawater and adjusted as necessary to take account of the actual radiated field strength from the transmitting antenna and the minimum field strength necessary for the proper operation of a receiver conforming with the latest performance standard adopted by the Organization.

3.1.3 The determination of the minimum signal level required for satisfactory radio reception in the absence of other unwanted signals necessitates taking account of the noise with which the wanted signal must compete. The latest Recommendation ITU-R P.372 gives the world distribution of values of noise level and of other noise parameters and shows the method of using these in the evaluation of the probable performance of a radio circuit.

3.1.4 In addition, the most recent version of Recommendation ITU-R M.1467 provides guidance to Administrations for predicting sea area A2 by taking into account variations in the propagation conditions.

### **3.2 Guidance criteria**

Sea area A2 is that sea area which is within a circle of radius B nautical miles over which the propagation path lies substantially over water and which is not part of any sea area A1, the centre of the circle being the position of the coast station receiving antenna.

### **3.3 Determination of radius B**

The radius B may be determined for each coast station by reference to the most recent versions of Recommendations ITU-R P.368 and ITU-R P.372 for the performance of a single sideband (J3E) system under the following conditions:

|                                            |   |                       |
|--------------------------------------------|---|-----------------------|
| Frequency                                  | - | 2 182 kHz             |
| Bandwidth                                  | - | 3 kHz                 |
| Propagation                                | - | ground wave           |
| Time of day                                | - | <sup>2</sup>          |
| Season                                     | - | <sup>2</sup>          |
| Ship's transmitter power (PEP)             | - | 60 W <sup>3</sup>     |
| Ship's antenna efficiency                  | - | 25%                   |
| Radio frequency signal over noise (RF S/N) | - | 9 dB (voice)          |
| Mean transmitter power                     | - | 8 dB below peak power |
| Fading margin                              | - | 3 dB                  |

The range of sea area A2 should be verified by field strength measurements.

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<sup>2</sup> Administrations should determine time periods and seasons appropriate to their geographic area based on prevailing noise level.

<sup>3</sup> In the absence of field strength measurements, it may be assumed that this range will be obtained by a radio frequency power of 60 watts PEP for full carrier emissions generated by a single sinusoidal oscillation in an antenna of 25% efficiency.

#### **4        SEA AREA A3**

##### **Guidance criteria**

Sea area A3 means an area, excluding sea areas A1 and A2, within the coverage of a recognized mobile satellite service supported by the ship earth station carried on board in which continuous alerting is available.

#### **5        SEA AREA A4**

##### **Guidance criteria**

Sea area A4 means an area outside of sea areas A1, A2 and A3.

## ANNEX 4

### CRITERIA FOR USE WHEN PROVIDING A NAVTEX SERVICE

1 There are two basic areas which must be defined when establishing a NAVTEX service. They are:

**Coverage area:** An area defined by an arc of a circle having a radius from the transmitter calculated according to the method and criteria given in this annex.

**Service area:** A unique and precisely defined sea area, wholly contained within the coverage area, for which MSI is provided from a particular NAVTEX transmitter. It is normally defined by a line which takes full account of local propagation conditions and the character and volume of information and maritime traffic patterns in the region.

2 Governments desiring to provide a NAVTEX service should use the following criteria for calculating the coverage area of the NAVTEX transmitter they intend to install, in order to:

- .1 determine the most appropriate location for NAVTEX stations having regard to existing or planned stations;
- .2 avoid interference with existing or planned NAVTEX stations; and
- .3 establish a service area for promulgation to seafarers.

3 The ground-wave coverage may be determined for each coast station by reference to the most recent versions of Recommendations ITU-R P.368 and ITU-R P.372 for the performance of a system under the following conditions:

|                                                                |   |                   |
|----------------------------------------------------------------|---|-------------------|
| Frequency                                                      | - | 518 kHz           |
| Bandwidth                                                      | - | 300 Hz            |
| Propagation                                                    | - | ground wave       |
| Time of day                                                    | - | 4                 |
| Season                                                         | - | 4                 |
| Transmitter power                                              | - | 5                 |
| Antenna efficiency                                             | - | 5                 |
| Radio frequency signal over noise (RF S/N) in 500 Hz bandwidth | - | 8 dB <sup>6</sup> |
| Percentage of time                                             | - | 90                |

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<sup>4</sup> Administrations should determine time periods in accordance with NAVTEX time transmission table (see NAVTEX Manual) and seasons appropriate to their geographic area based on prevailing noise level.

<sup>5</sup> The range of a NAVTEX transmitter depends on the transmitter power and local propagation conditions. The actual range achieved should be adjusted to the minimum required for adequate reception in the NAVTEX area served, taking into account the needs of ships approaching from other areas. Experience has indicated that the required range of 250 to 400 nautical miles (nm) can generally be attained by transmitter power in the range between 100 and 1,000 W during daylight with a 60% reduction at night. The receiver characteristics, particularly as regards the bandwidth response, must be compatible with that of the NAVTEX transmitter.

<sup>6</sup> Bit error rate  $1 \times 10^{-2}$ .

4 Full coverage of a NAVTEX service area should be verified by field strength measurements.

5 In addition, the most recent version of Recommendation ITU-R M.1467 provides guidance to Administrations for predicting NAVTEX coverage areas by taking into account variations in the propagation conditions.

## ANNEX 5

### CRITERIA FOR USE WHEN PROVIDING A NAVDAT SERVICE

1 There are two basic areas which must be defined when establishing a NAVDAT service. They are:

**Coverage area:** An area defined for ground-wave propagation by an arc of a circle having a radius from the coast station calculated according to the method and criteria given in this annex.

**Service area:** A unique and precisely defined sea area, wholly contained within the coverage area, for which MSI is provided from a particular NAVDAT coast station. It is normally defined by a line which takes full account of local propagation conditions and the character and volume of information and maritime traffic patterns in the region.

2 Governments desiring to provide a NAVDAT service should use the following criteria for calculating the coverage area of the NAVDAT coast station they intend to install, in order to:

- .1 determine the most appropriate location for the NAVDAT coast station having regard to existing or planned coast stations;
- .2 avoid interference with existing or planned GMDSS coast stations by determining the transmit power level; and
- .3 establish a service area for promulgation to seafarers.

3 NAVDAT can be used in the MF and HF maritime frequency bands. In the MF frequency band, the main propagation is on ground wave with some sky wave at night-time. In HF, ground-wave and sky-wave propagation modes are both possible.

4 The ground-wave coverage may be determined for each coast station by reference to the most recent version of Recommendations ITU-R P.368 and ITU-R P.372 or by appropriate software coverage calculation for the performance of a system under the following conditions:

|                                                                                              |                                                      |
|----------------------------------------------------------------------------------------------|------------------------------------------------------|
| Frequency:                                                                                   | 500 kHz or 4 226 kHz                                 |
| Modulation:                                                                                  | 4 QAM, 16 QAM or 64 QAM                              |
| Bandwidth:                                                                                   | 1, 3, 5 or 10 kHz                                    |
| Propagation                                                                                  | ground wave                                          |
| Transmitter power:                                                                           | 1 to 4 kW rms (10 to 40 kW pep)                      |
| Antenna polarization:                                                                        | vertical                                             |
| Antenna efficiency:                                                                          | 30 to 85% (depending on frequency and antenna model) |
| Minimum radio frequency signal over noise (RF S/N) for BER $10^{-4}$ relating to modulation: | 4 QAM: 11.5 dB<br>16 QAM: 18.5 dB<br>64 QAM: 24.5 dB |
| Percentage of time:                                                                          | 90%                                                  |

5 This S/N ratio is also affected by the bandwidth used by the receiver (i.e. narrow bandwidth requires less S/N).

6 When calculating the radio coverage, the transmit RF power should use the rms value.

7 During daylight hours, solar radiation penetrates the atmosphere far enough to ionize the lowest "D" layer roughly 60 km above ground. This "D" layer completely absorbs signals on MF frequencies so that they do not carry on upwards out into space. This is the case of a pure ground-wave propagation.

8 With the approach of sunset, the "D" layer absorption decreases rapidly and within a few hours, MF signals continue to move in the upward direction towards the atmosphere. However, MF signals then encounter higher regions of the ionosphere which, instead of absorbing the signal, tend to refract or bend the path of the signal's travel. With enough refraction, the signal can be redirected back to the Earth's surface far away from the transmitter site. This is the case of a mixed propagation: ground wave and sky wave. According to this explanation, propagation at night could cause interference between NAVDAT stations.

9 The dominant means of communication in the HF band is skywave ("skip") propagation, in which radio waves directed at an angle into the sky refract back to Earth from layers of ionized atoms in the ionosphere. By this method, HF radio waves can travel beyond the horizon, around the curvature of the Earth, and can be received at intercontinental distances. However, the suitability of this band for medium or short-distance communications is reduced and this characteristic should be considered in the coverage analysis.

10 Full coverage of a NAVDAT service area should be verified by field strength measurements.

## ANNEX 6

### CRITERIA FOR USE WHEN PROVIDING AN INTERNATIONAL ENHANCED GROUP CALL SERVICE IN THE GMDSS

1 The following criteria should be taken into consideration for the broadcast of maritime safety information (MSI) by MSI providers and the broadcast of search and rescue (SAR) related information by SAR authorities.

#### **Maritime safety information**

2 Contracting Governments should ensure that MSI broadcast via Enhanced Group Call (EGC) is appropriately disseminated through all operational recognized mobile satellite services (RMSS) providing coverage within their areas of responsibility. This will ensure that all ships navigating within those areas receive the information regardless of the type of EGC equipment installed on board.

3 MSI providers should obtain authorization from the relevant international organization to access EGC services directly.

#### **SAR-related information**

4 Contracting Governments should ensure that SAR-related information is appropriately disseminated through all operational RMSSs providing coverage within the SAR regions under their responsibility. This will ensure that all ships navigating within those areas receive the information regardless of the type of EGC equipment installed on board.

5 SAR authorities requiring to disseminate information through RMSSs should either:

- .1 establish arrangements with an existing authorized EGC information provider that can disseminate the information on their behalf; or
- .2 obtain an authorization from the IMO EGC Coordinating Panel to access EGC services directly, including through their designated rescue coordination centres (RCCs).

6 Guidance for the dissemination of SAR-related information through the international EGC service is provided in MSC.1/Circ.1659<sup>7</sup>, as may be revised.

#### **Obtaining an authorization to access EGC services directly**

7 The processes for authorization, certification and registration of EGC information providers are described in MSC.1/Circ.1635<sup>8</sup>, annex 2. These processes have been established to protect the integrity of the international EGC service and the GMDSS.

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<sup>7</sup> *Guidance for the dissemination of search and rescue-related information through the international enhanced group call service.*

<sup>8</sup> *IMO Enhanced Group Call Coordinating Panel.*



## **ANNEX 13**

### **RESOLUTION MSC.592(111) (adopted on 21 May 2026)**

#### **INTRODUCTION OF VHF DATA EXCHANGE SYSTEM (VDES) INTO THE IMO REGULATORY FRAMEWORK**

THE MARITIME SAFETY COMMITTEE,

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

TAKING INTO ACCOUNT resolution MSC.583(111) by which the Committee adopted amendments to chapter V and the appendix (Certificates) of the International Convention for the Safety of Life at Sea, 1974 ("the Convention"), introducing the VHF data exchange system (VDES) as an alternative shipborne navigational equipment and system to the automatic identification system (AIS),

TAKING ALSO INTO ACCOUNT resolution MSC.593(111) on *Performance standards for shipborne VHF data exchange system (VDES)* and MSC.1/Circ.1699 on *Guidelines for the onboard operational use of shipborne VHF data exchange system (VDES)*,

RECOGNIZING that AIS is one of the four components of VDES, which allows the existing AIS to coexist with VDES,

RECOGNIZING ALSO that existing AIS requirements, guidelines and recommendations should be considered as also applicable to the AIS component of VDES,

RECOGNIZING FURTHER that any additional functionalities or communication capabilities provided by VDES beyond its AIS component, even if offering similar functions or services to AIS, are not to be considered equivalent to AIS nor a substitute for the AIS equipment required under SOLAS regulations,

HAVING CONSIDERED, at its 111th session, the recommendation made by the Sub-Committee on Navigation, Communications and Search and Rescue, at its twelfth session,

1 DECIDES that, in order to facilitate the introduction and implementation of the VHF data exchange system (VDES) into the IMO regulatory framework, references made to the carriage and use of "automatic identification system" or "AIS" in the IMO regulatory framework should also be understood as references to the AIS component of VDES, as defined in resolution MSC.593(111) on *Performance standards for shipborne VHF data exchange system (VDES)*;

2 INVITES Member States and international organizations to apply the above decision in the implementation and use of VDES.

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**ANNEX 14**

**RESOLUTION MSC.593(111)  
(adopted on 21 May 2026)**

**PERFORMANCE STANDARDS FOR  
SHIPBORNE VHF DATA EXCHANGE SYSTEM (VDES)**

THE MARITIME SAFETY COMMITTEE,

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

RECALLING ALSO resolution A.886(21), by which the Assembly resolved that the functions of adopting performance standards and technical specifications, as well as amendments thereto, shall be performed by the Maritime Safety Committee on behalf of the Organization,

RECALLING FURTHER resolution MSC.570(109), by which the Committee adopted revised *Performance standards for a universal shipborne automatic identification system (AIS)* to improve the safety of navigation,

TAKING INTO ACCOUNT resolution MSC.583(111) by which the Committee adopted amendments to chapter V of the International Convention for the Safety of Life at Sea, 1974 ("the Convention"), introducing a VHF data exchange system (VDES) as an alternative shipborne navigational equipment and system to comply with the existing requirements of the automatic identification system (AIS),

TAKING ALSO INTO ACCOUNT MSC.1/Circ.1699 on *Guidelines for the onboard operational use of shipborne VHF data exchange system (VDES)*,

RECOGNIZING that AIS is one of the four components of VDES, which allows the existing AIS to coexist with VDES,

HAVING CONSIDERED, at its 111th session, the recommendation made by the Sub-Committee on Navigation, Communications and Search and Rescue at its twelfth session,

1 ADOPTS *Performance standards for a shipborne VHF data exchange system (VDES)*, set out in the annex to the present resolution;

2 RECOMMENDS that Governments ensure that shipborne VDES equipment conforms to performance standards not inferior to those specified in the present resolution.

## ANNEX

### PERFORMANCE STANDARDS FOR SHIPBORNE VHF DATA EXCHANGE SYSTEM (VDES)

#### 1 Scope

1.1 These performance standards specify the requirements for the shipborne VHF data exchange system (VDES) for the use of VDES equipment on board vessels.

1.2 The VDES equipment integrates four components and their functions. These components are the automatic identification system (AIS) component, the application-specific messages (ASM) component, the terrestrial component of VHF data exchange (VDE-TER) and the satellite component of VHF data exchange (VDE-SAT).

1.3 VDES should be capable of providing information exchange between ships, ships and shore authorities and services, automatically with minimal involvement of the ship's personnel and with a high level of availability and security.<sup>1</sup>

1.4 VDES should be capable of providing the following functions:

- .1 exchanging data to improve safety, security and efficiency of navigation and protection of the marine environment;
- .2 means for coastal States to request and obtain information about a ship and its cargo and/or passengers;
- .3 means for providing Maritime Services in the context of e-navigation; and
- .4 means for standardized and automated reporting in accordance with MSC.1/Circ.1595<sup>2</sup> and MSC.1/Circ.1610,<sup>3</sup> as amended.

1.5 The installations, in addition to meeting the requirements of the Radio Regulations, applicable ITU-R Recommendations and the general requirements set out in resolutions A.694(17)<sup>4</sup> and MSC.191(79),<sup>5</sup> as amended, should comply with these performance standards.

#### 2 Equipment functionalities

2.1 The general functions of VDES equipment (see figure 1) are as follows:

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<sup>1</sup> High level of security can be achieved by implementing authentication of data and encryption where necessary.

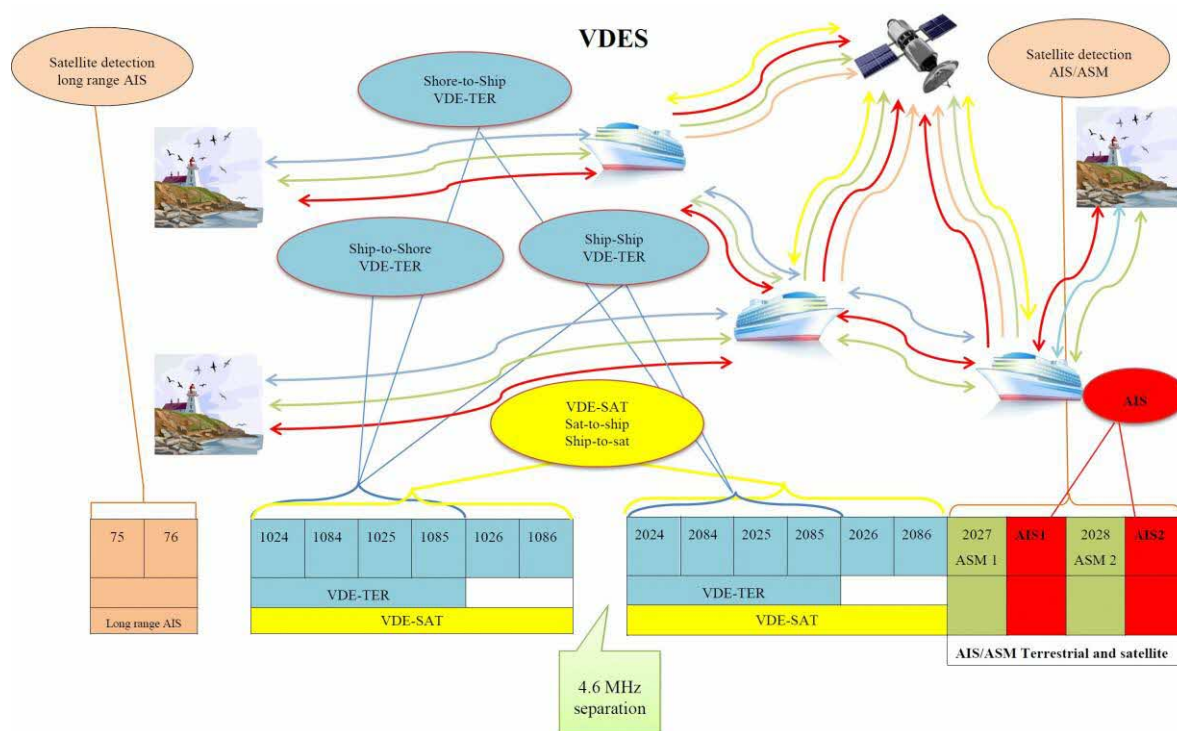
<sup>2</sup> *E-navigation Strategy Implementation Plan – Update 1.*

<sup>3</sup> *Descriptions of Maritime Services in the context of e-navigation.*

<sup>4</sup> *Recommendation on general requirements for shipborne radio equipment forming part of the Global Maritime Distress and Safety System (GMDSS) and for electronic navigational aids.*

<sup>5</sup> *Recommendation on performance standards for the presentation of navigation-related information on shipborne navigational displays.*

- .1 The AIS component should not be interfered with by other communication means within the VDES, ensuring accurate AIS position reporting and the provision of safety-related information;
- .2 VDES should allow the flexibility to prioritize some applications and, consequently, adapt some parameters of the transmission (robustness or capacity) while minimizing system complexity;
- .3 VDES should give its highest priority to AIS position reporting and safety-related information, followed by second priority to ASM, third priority to VDE-TER and then to VDE-SAT;
- .4 The AIS component of VDES should be capable of providing all modes of operation as described in Recommendation ITU-R M.1371;
- .5 VDES should be capable of exchanging data between ship-to-ship, ship-to-shore, shore-to-ship, ship-to-satellite and satellite-to-ship;
- .6 VDES should be capable of implementing software/firmware updates;
- .7 VDES should be capable of separately disabling VDE-SAT, VDE-TER, or ASM;
- .8 VDES should be capable of changing its transmission power from the default setting to a low setting (1 W) or stopping transmission except for the AIS component when operations such as loading or discharging dangerous cargo require it; and
- .9 VDES should be capable of temporarily disabling VDE-SAT transmission when receiving a message from an AIS or VDES shore station within its coverage area.



**Figure 1: VDES functions**

2.2 The AIS component of VDES should comply with the requirements set out in resolution MSC.570(109) and Recommendation ITU-R M.1371.

2.3 The ASM component of VDES should provide a robust and efficient terrestrial data transfer link, enabling the transmission of a wide variety of messages, including application-specific messages currently transmitted by AIS.<sup>6</sup> These messages should be encoded in accordance with Recommendation ITU-R M.1371 annexes on *Application-specific messages* and *Automatic identification system messages*, as well as Recommendation ITU-R M.2092 annex on *Common technical elements of VDES* and the technical characteristics should meet the requirements specified in Recommendation ITU-R M.2092 annex on *Technical characteristics of the application-specific message channels for the VDES in the VHF maritime band*.

2.4 The VDE-TER function of VDES should provide an efficient terrestrial data transfer link. The technical characteristics should comply with Recommendation ITU-R M.2092 annex on *Common technical elements of VDES* and with the annex on *Technical characteristics of VHF data exchange-terrestrial in the maritime mobile band*.

2.5 The VDE-SAT function of VDES should provide an efficient satellite data transfer link. The technical characteristics should meet the requirements specified in Recommendation ITU-R M.2092 annex on *Common technical elements of VDES* and in the annex on *Technical characteristics of VHF data exchange-satellite operating in the VHF maritime mobile satellite band*.

### **3 Capability**

3.1 VDES should support the functions of ASM, VDE-TER and VDE-SAT specified in this performance standard in addition to the AIS functions specified in resolution MSC.570(109).

3.2 In addition, VDES should be capable of:

- .1 selecting the communication component which is controlled through the user interface;
- .2 receiving digital data according to Recommendation ITU-R M.2092 and output through the user interface;
- .3 transmitting digital data according to Recommendation ITU-R M.2092 as input via the user interface; and
- .4 operating continuously under all modes of operation.

### **4 User interface**

4.1 The human-machine interface should include a keyboard and display for configuration, monitoring and control.

4.2 To enable a user to access, select and display the information on a separate system, the VDES should be provided with at least one interface conforming to an appropriate international marine interface standard.<sup>7</sup>

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<sup>6</sup> See SN.1/Circ.289 and those identified by IALA List of reference for ASM.

<sup>7</sup> IEC 61162 series, as applicable.

## **5 Identification**

Shipborne VDES stations should be uniquely identified with a unique numerical identifier as defined by the most recent version of Recommendation ITU-R M.585 on *Assignment and use of identities in the maritime mobile services*.

## **6 Information**

6.1 VDES information consists of AIS, ASM and other information.

6.2 AIS information is defined by resolution MSC.570(109) and should be exchanged by the AIS component of VDES.

6.3 Other information is information other than AIS and ASM, and should be exchanged by VDE-TER and VDE-SAT components of VDES.<sup>8</sup>

## **7 Security**

### **7.1 Cybersecurity**

Since VDES is networked with other navigational/communication equipment or systems on board, appropriate cybersecurity measures conforming to international standards such as IEC 61162-460 and IEC 63154 should be provided.

### **7.2 Integrity and authentication**

- .1 VDES should be capable of verifying a digital signature to ensure the integrity of the data and the identity of the sender; and
- .2 VDES should be capable of providing authentication of AIS messages.

## **8 Operational readiness time**

VDES should be operational within two minutes of being switched on by the user.

## **9 Power supply**

VDES and associated equipment should be powered by the ship's main and emergency sources of electrical energy. In addition, it should be possible to operate VDES and associated equipment from a reserve source of electrical energy.

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<sup>8</sup> *Guidelines for the onboard operational use of shipborne VHF data exchange system (VDES)* (MSC.1/Circ.1699).



**ANNEX 15**

**RESOLUTION MSC.594(111)  
(adopted on 21 May 2026)**

**AMENDMENTS TO THE REVISED RECOMMENDATION ON  
TESTING OF LIFE-SAVING APPLIANCES (RESOLUTION MSC.81(70))**

THE MARITIME SAFETY COMMITTEE,

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

RECALLING ALSO that the Assembly, when adopting resolution A.689(17) on *Testing of life-saving appliances*, authorized the Committee to keep the annexed Recommendation on testing of life-saving appliances under review and to adopt, when appropriate, amendments thereto,

RECALLING FURTHER that, since the adoption of resolution A.689(17), the Committee has amended the Recommendation annexed thereto by resolutions MSC.54(66) and MSC.81(70), and by circulars MSC/Circ.596, MSC/Circ.615 and MSC/Circ.809,

RECOGNIZING the need to ensure that the references in the *Revised recommendation on testing of life-saving appliances* (resolution MSC.81(70)) are kept up to date,

TAKING INTO ACCOUNT the amendments to the LSA Code adopted by resolution MSC.589(111) with respect to the arrangements to test the release system under load without launching the free-fall lifeboat into the water,

1 ADOPTS the *Amendments to the Revised recommendation on testing of life-saving appliances* (resolution MSC.81(70)), set out in the annex to the present resolution;

2 RECOMMENDS that Governments ensure that arrangements to test the release system under load without launching the free-fall lifeboat installed on or after 1 January 2031, conform to the amended prototype, production and installation tests as set out in the annex to the present resolution;

3 INVITES Contracting Governments to the SOLAS Convention to bring the above amendments to the attention of all parties concerned.

ANNEX

**AMENDMENTS TO THE REVISED RECOMMENDATION ON TESTING OF  
LIFE-SAVING APPLIANCES (RESOLUTION MSC.81(70))**

**PART 1 – PROTOTYPE TESTS FOR LIFE-SAVING APPLIANCES**

**6 Lifeboats**

**6.9 Release mechanism test**

1 Paragraph 6.9.7 is replaced by the following:

"6.9.7 The release mechanism should be mounted on a tensile strength testing device. The load should be increased to at least six times the maximum working load of the release mechanism without failure of the release mechanism."

2 The following new paragraph 6.9.8 is added after existing paragraph 6.9.7:

"6.9.8 The arrangement to test the release system without launching the lifeboat into the water, as required by paragraph 4.7.7 of the LSA Code, should be mounted on a tensile strength testing device. The load should be increased to at least six times the maximum working load with full complement of persons and equipment of the arrangement to test the release system without failure."

**7 Rescue boats and fast rescue boats**

**7.1 Rigid rescue boats**

3 Paragraph 7.1.1 is replaced by the following:

"7.1.1 Rigid rescue boats should be subjected to the tests prescribed in 6.2 to 6.12 (except 6.3, 6.4.2, 6.5, 6.6.2, 6.7.1, 6.9.6 to 6.9.8, 6.10.1) and 7.2.4.2."

**7.4 Rigid fast rescue boats**

4 Paragraph 7.4.1 (as amended by resolution MSC.544(107)) is replaced by the following:

"7.4.1 Rigid fast rescue boats should be subjected to the tests prescribed in 6.2 to 6.12 (except 6.3, 6.4.2, 6.5, 6.6.2, 6.7.1, 6.9.6 to 6.9.8, 6.10.1), 6.14.1 to 6.14.8 (if a rigid fast rescue boat is self-righting), 7.1.2 to 7.1.4, 7.1.6, 7.1.7 (if a rigid fast rescue boat is not self-righting), 7.1.8, 7.1.9 and 7.2.4.2. In the case of open fast rescue boats, the self-righting test should only be done in the light condition, and 6.14.1.1, 6.14.3 to 6.14.5 and 6.14.9 are not applicable. With regard to 6.14.2, a boat fitted with a helmsman's emergency release switch should be considered to be arranged to stop automatically when inverted."

## **PART 2 – PRODUCTION AND INSTALLATION TESTS**

### **6 Launching and stowage arrangements**

#### **6.1 Launching appliances using falls and winches**

5 Paragraph 6.1.1 is replaced by the following:

*"Factory overload test*

6.1.1 Each launching appliance, except the winch, should be tested with a static load of 2.2 times the working load with the appliance in the full outboard position. For a free-fall lifeboat launching appliance, each launching ramp and its connection to the release mechanism should be tested with a static load of 2.2 times the working load. The appliance should not be deformed or damaged. Winches with the brakes applied should be tested by applying a static load of 1.5 times the maximum working load. Any cast components of the frame and arm should be hammer-tested to determine that they are sound and without flaw. The arrangement to test the release system under load without launching the free-fall lifeboat into the water should be tested with a load of 2.2 times the calculated maximum working load of the arrangement utilizing properly distributed weights to represent the full complement of persons and equipment. The arrangement should not be deformed or damaged."

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**ANNEX 16**

**RESOLUTION MSC.595(111)**

**INTERNATIONAL CODE OF SAFETY FOR  
MARITIME AUTONOMOUS SURFACE SHIPS (MASS CODE)**

THE MARITIME SAFETY COMMITTEE,

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

RECOGNIZING rapid developments in technological innovation within the maritime industry that will lead to the commercial use of maritime autonomous surface ships (MASS), whether they are operated remotely or autonomously,

RECOGNIZING ALSO that instruments of the Organization currently do not adequately or fully address the safe operation of MASS, warranting the need for guidance for administrations, shipbuilders, owners, operators, insurers and other stakeholders to design, build and operate MASS safely, in particular when they are operating jointly with conventional ships,

HAVING CONSIDERED, at its 111th session, the text of the proposed Code,

1 ADOPTS the International Code of Safety for Maritime Autonomous Surface Ships (MASS Code), the text of which is set out in the annex to the present resolution;

2 INVITES all Governments concerned to take appropriate steps to give effect to the MASS Code set out in the annex, on 1 July 2026;

3 ALSO INVITES all Governments concerned to apply the MASS Code, as far as practicable, to MASS of less than 500 gross tonnage;

4 RECOMMENDS that all Governments concerned bring the MASS Code to the attention of shipowners, ship operators, ship designers, shipbuilders, ship repairers, equipment manufacturers and installers, insurers and all other parties concerned with the operation of MASS;

5 URGES Governments to facilitate the safe operation of MASS, provided that the Governments concerned are satisfied that the MASS in question comply with the provisions of this Code, together with any additional measures necessary to ensure the safe operation of such ships within their respective jurisdictions; and

6 REQUESTS the Secretary-General to bring this resolution and its annex to the attention of all stakeholders concerned.

ANNEX

**INTERNATIONAL CODE OF SAFETY  
FOR MARITIME AUTONOMOUS SURFACE SHIPS  
(MASS CODE)**

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## PREAMBLE

1 Existing IMO instruments have historically been developed on the basis that the ship will have at least a required minimum level of manning on board to carry out the various tasks required to ensure safe, secure, and environmentally sound ship operations.

2 The ever increasing use of automation in the operation of ships, along with the anticipated increase in the use of autonomous and remote operation of key functions, will require a different approach and, therefore, some adjustment to the accepted norms regarding onboard manual intervention and control as reflected within the International Convention for the Safety of Life at Sea (SOLAS), 1974, and other IMO instruments.

3 Notwithstanding the above, enhanced automation does not qualify a ship as a MASS. The qualifier to distinguish a MASS from a conventional ship is the introduction of autonomous or remotely-operated technology augmenting or replacing functions otherwise performed by onboard crew involved in conducting or controlling these ship functions.

4 In facing these challenges, it is recognized that some aspects associated with MASS are not adequately or fully addressed in SOLAS or other IMO instruments and that additional guidance is required on the design and operation of MASS to ensure a level of safety and security and environmental protection that is expected of a conventional ship.

5 This Code is intended to be supplementary to other IMO instruments, such as SOLAS, and provides a regulatory framework for autonomous and remote operation of key functions.

6 This Code, and the use of MASS, are required to conform to the relevant rules of international law, including the United Nations Convention on the Law of the Sea (UNCLOS), and generally accepted international regulations, procedures and practices developed by IMO as the competent international organization for global shipping.

7 The safety principles and objectives of this Code reflect changes in the operational risks which may result from the introduction of autonomous and remote operation of key functions. This Code addresses the management and reduction of these risks through mitigation measures and controls. This includes the human element issues which may result from the anticipated increase in human-machine interaction, cooperation or collaboration.

8 This Code has been developed based on the *Principles to be considered when drafting IMO instruments* (resolution A.1103(29)), and on the *Generic guidelines for developing IMO goal-based standards* (MSC.1/Circ.1394/Rev.2) for Part III.

9 The provisions of this Code should be implemented for individual autonomous or remote functions even where persons are on board to handle other functions.

10 This Code takes into account that certain operational functions may be controlled from a location remote from the MASS and addresses necessary aspects of such Remote Operations Centres (ROCs).

## **PART I**

### **INTRODUCTION**

#### **CHAPTER 1 – PURPOSE, PRINCIPLES AND OBJECTIVES**

##### **1.1 Purpose**

The purpose of this Code is to provide an international regulatory framework to address autonomous or remote operation of key functions and systems, and ensure safe, secure, and environmentally sound operation of Maritime Autonomous Surface Ships (MASS). The Code further aims to support the adoption and integration of new technology for ship operations, and provide for a consistent approach to the design, build and operation of MASS.

##### **1.2 Principles**

This Code is developed on the principles that it be:

- .1 supplementary to any other applied instruments, and only addressing MASS operations and functions as far as they are not adequately or fully addressed in the other applied instruments;
- .2 holistic to ensure the objectives, aims and principles of the other applied instruments are maintained while also enabling the MASS operations and functions to be addressed across all instruments;
- .3 goal-based and addressing matters at the functional level;
- .4 non-mandatory although developed in such a way as to facilitate future transition to mandatory status; and
- .5 technology neutral, acknowledging industry practices and experience in the deployment of new technologies.

##### **1.3 Objectives**

In achieving its purpose, this Code is intended to:

- .1 ensure standards of an acceptable level for design, construction, and operation of MASS in order to achieve levels of safety and security expected of a conventional ship;
- .2 enable all ships to safely coexist without impeding or negatively impacting each other, regardless of whether MASS operations or functions are autonomous or remotely-operated;
- .3 allow for the application of solutions that are demonstrably safe, secure, and environmentally sound in performing the designated MASS operations or functions under all defined conditions;
- .4 avoid the unintended placement of regulatory barriers to new or novel application of autonomous or remotely-operated technology on ships;

- .5 require human oversight and control of MASS operations or functions while ensuring effective collaboration between human operators and autonomous systems; and
- .6 address responsibility for the operation, and human oversight, of a MASS.

## **CHAPTER 2 – APPLICATION**

2.1 This Code applies to cargo ships to which SOLAS chapter I applies, including any associated Remote Operations Centre(s) (ROC(s)), which have systems and functions that enable autonomous or remote operations, when the Administration deems that compliance with other applicable instruments is impracticable or insufficient. This Code does not apply to:

- .1 cargo high-speed craft to which SOLAS chapter X applies; and
- .2 warships, naval auxiliaries, and other ships owned or operated by a Contracting Government and used only on Government non-commercial service.

2.2 Where in this Code reference is made to a "MASS", this means a ship to which this Code applies.

2.3 The provisions of this Code should be implemented for individual autonomous or remotely-operated functions even where persons are on board to handle other functions.

## **CHAPTER 3 – CODE STRUCTURE**

The structure and intent of the parts of this Code are:

- Part I: Introduction covering overarching matters to be considered in the application of the Code.
- Part II: Principles applicable in all cases when applying the Code. These principles and the resulting provisions should be met as part of any MASS approval and certification process.
- Part III: Goals, functional requirements, and expected performances applicable to specific MASS operations and functions. Depending on the modes of operation and functionality being certified, not all chapters of part III may be applicable.

## **CHAPTER 4 – DEFINITIONS**

For the purposes of the Code, unless expressly provided otherwise, terms used have the meanings defined in the following paragraphs. For terms used, but not defined in this Code, the definitions as given in SOLAS, should apply.

4.1 *Agent* means a human or software (computer or computer system(s)) responsible for performing or supervising control actions.

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- 4.2 *Autonomous* means processes or equipment in a MASS system which are designed and verified to, under specified conditions, determine control action(s) without human intervention.
- 4.3 *Autonomous Navigation System (ANS)* means a system which, under specified conditions, is capable of the navigation of a MASS without human intervention.
- 4.4 *Concept of Operations (ConOps)* means a document describing the characteristics of a MASS.
- 4.5 *Connectivity* means capabilities that allow appropriate and applicable MASS systems and the Remote Operations Centre(s) (ROC(s)), to connect to a communication network.
- 4.6 *Control* is purposeful action on or in a process, to meet specified objectives.
- 4.7 *Control action* means the acquisition of information, analysis of information, decision-making, or implementation of actions.
- 4.8 *Control station* means a single or multiple position(s), including all equipment, such as computers and communication terminals and furniture, from which functions or operations of a MASS can be controlled or monitored.
- 4.9 *Degraded state* means a deviation in the normal operation or condition of the MASS which can potentially result in a fallback state.
- 4.10 *Failure* means the loss of the ability of an item to perform the specified function.
- 4.11 *Fallback response* means the actions and procedures to enter into, safely stay within, and eventually recover from, a predefined fallback state.
- 4.12 *Fallback state* means a predefined state entered when it is not possible for the MASS to stay within the Operational Envelope (OE).
- 4.13 *Fault* means an abnormal condition that can cause an element or an item to fail.
- 4.14 *Fault tolerant* means the ability of a functional unit to perform a required function in the presence of faults or errors.
- 4.15 *Hazards* are situations having the potential to threaten human life, health, property or the environment.
- 4.16 *Human-centred design* is an approach to system design and development that aims to make interactive systems more usable by focusing on the use of the system; applying human factors, ergonomics and usability knowledge and techniques.
- 4.17 *Human-Machine Interface (HMI)* means the part of a system with which an operator interacts. The interface is the aggregate of means by which the users interact with a machine, device, and system. The interface provides means for input, allowing the users to control the system and output, allowing the system to inform the users.
- 4.18 *Intolerable risk* means a level of risk that would neither be negligible nor tolerable.
- 4.19 *Maritime Autonomous Surface Ship (MASS)* means a ship which, to a varying degree, can operate independently of human interaction.

4.20 *MASS function* means a task or group of tasks, duties and responsibilities, as specified in the Code, necessary for the operation of the MASS.

4.21 *Mitigation* means a measure implemented to prevent unsafe conditions or modes from resulting in losses.

4.22 *Modes of operation* means the condition(s) under which the functions of a MASS are operated, i.e. autonomous or remotely-operated, with or without persons on board.

4.23 *Monitoring* means the use of measurements and analytical methods to understand the condition and any changes in the state of MASS including its systems and components.

4.24 *Normal operation* means operations within the Operational Envelope of a MASS.

4.25 *Onboard crew* means a master, officers or operational staff physically on board.

4.26 *Operational Design Domain* (ODD) refers to the design range in which a system can operate as intended. It includes both internal events, such as component or subsystem failure or degradation; and relevant external factors, such as available resources, geographical, or environmental situations.

4.27 *Operational Envelope* (OE) means the description of the MASS's operational capabilities and limitations.

4.28 *Override* means to take over control of functions or systems that are under autonomous or remote operation.

4.29 *Quality of service* is a network's ability to maintain acceptable connectivity in the intended Operational Envelope, achieve maximum bandwidth, and deal with other network performance elements.

4.30 *Remote operation* is when functions and systems are operated from outside the MASS.

4.31 *Remote Operations Centre* (ROC) means a location remote from the MASS and from which some or all of the functions of the MASS can be operated.

4.32 *Remote operator* means a qualified person who is employed or engaged to operate some or all of the functions of a MASS from a ROC.

4.33 *Situational awareness* means the perception of surroundings and environmental elements in different modes of operation, the condition of all relevant systems and events with respect to time and space, the comprehension of their meaning, and the projection of their future status.

4.34 *Submitter* is an entity seeking approval of a MASS from the Administration, and responsible for communicating with the Administration for the submission and follow up of the approval process.

4.35 *System* means the combination of interacting elements organized to achieve one or more stated purpose.

4.36 *Systematic failure* means an event that is the consequence of inadequate work processes and may occur at any stage in the systems' lifecycle.

4.37 *Systemic failure* means an event which occurs not only by the malfunctions of a distinct component in the system but due to inherent deficiencies, flaws or oversights in the system's structure, including unforeseen interactions or dependencies among other various constitutive elements of the system.

4.38 *Task* means a set of actions taken to enable functions and the performance of operations.

4.39 *Task station* means a multifunction display with dedicated controls providing the possibility to display and operate any tasks. A task station is part of a control station.

4.40 *Third parties* means persons or entities that are not involved in the operations of the MASS or an associated ROC but are engaging with it (e.g. vessel traffic services (VTS), ports, pilots or other persons on board or in the ROC for maintenance reasons, persons in distress, etc.).

4.41 *Unsafe state* means when a system is operating outside its Operational Envelope but not within a fallback state owing to degraded performance (e.g. faults or failures), or is exceeding capabilities which, if left uncorrected or unmitigated, has the potential to directly cause an accident.

4.42 *Validation* means the testing and evaluation to prove that a MASS and its systems, including hardware and software components, are effective, dependable and safe during real-world operations and satisfy all the technical requirements representative of normal, abnormal and adverse operating conditions.

4.43 *Verification* means the testing and evaluation to prove MASS and its systems, including hardware and software components meet the technical requirements at a particular stage of their development.

4.44 *Voyage phase* means the parts of the voyage typically characterized by a recognizable shift in where the MASS is located in terms of geographical surroundings, or the start and end of one or more operations.

## PART II

### PRINCIPLES FOR MASS AND MASS FUNCTIONS

#### GENERAL

Each chapter in this part consists of the principles applicable in all cases when applying the Code. These principles and the resulting provisions should be met as part of any MASS approval and certification process.

### CHAPTER 5 – SURVEYS AND CERTIFICATES

#### 5.1 MASS Safety Certificate

5.1.1 Every MASS should have on board a valid MASS Safety Certificate, issued after an initial or renewal survey confirming compliance with the relevant requirements of this Code.

5.1.2 The MASS Safety Certificate should be issued either by the Administration or an organization recognized by it, in accordance with SOLAS regulation XI-1/1.

5.1.3 The MASS Safety Certificate should be accompanied by a MASS Record, containing the following:

- .1 description of the Concept of Operations (ConOps);
- .2 survey requirements associated with the systems to which this Code applies;
- .3 task allocation summary;
- .4 regulatory gap analysis; and
- .5 list of any Remote Operations Centre(s) (ROC(s)) approved for the MASS.

5.1.4 The MASS Safety Certificate and MASS Record should be drawn up in a form corresponding to the models given in the appendix. If the language used is neither English, nor French nor Spanish, the text should include a translation into one of these languages.

5.1.5 The MASS Safety Certificate and the MASS Record should be issued in addition to other relevant certificates required in SOLAS regulation I/12.

5.1.6 Where compliance with any of the requirements of SOLAS is achieved through application of this Code, resulting exemptions or equivalent arrangements should be reflected on the appropriate SOLAS certificates.

#### 5.2 MASS surveys

5.2.1 The MASS Safety Certificate validity, survey dates and endorsements should be harmonized with the relevant SOLAS certificates in accordance with the principles of *Survey guidelines under the harmonized system of survey and certification (HSSC), 2025* (resolution A.1207(34), as amended), and SOLAS.

5.2.2 MASS surveys should be carried out as follows:

- .1 an initial survey that should include complete inspection, verification and testing of the MASS functionality and connectivity with any associated ROCs intended to be certified, to ensure compliance with the requirements of this Code;
- .2 a renewal survey that should consist of an inspection, with tests, of the MASS functionality and connectivity with any associated ROCs, to ensure compliance with the requirements of this Code, that they are in satisfactory condition, and are fit for the service for which the MASS is intended;
- .3 intermediate and annual surveys that should include, as appropriate, general inspection, verification and testing of the MASS functionality, including inspection of operational records of related systems, to ensure that they comply with the requirements of this Code, are in satisfactory condition, and are fit for the service for which the MASS is intended; and
- .4 additional surveys after repairs resulting from investigations prescribed in SOLAS regulation I/11, or after any major repairs, renewals or modifications of equipment, or systems related to autonomous or remotely-operated functions, to ensure that the MASS complies with the relevant requirements of this Code. Such major repairs, renewals or modifications of equipment and/or systems may include, inter alia, the following:
  - .1 replacements or updates that may affect the compatibility, security and stability of any software system;
  - .2 modifications to the ConOps and verification that the functionality of MASS systems and functions continues to comply;
  - .3 repairs after serious failure or defects of equipment and/or systems; and
  - .4 any change to the list of ROCs associated with the MASS.

5.2.3 The MASS Safety Certificate should be endorsed after intermediate and annual surveys referred to in II/5.2.2.

### 5.3 MASS ROC Certificate

5.3.1 Every ROC should, for each MASS it operates, have a valid MASS ROC Certificate issued after an initial or renewal survey.

5.3.2 The MASS ROC Certificate should be issued either by the Administration or an organization recognized by it, in accordance with SOLAS regulation XI-1/1.

5.3.3 The MASS ROC Certificate should be accompanied by a MASS ROC Record, containing the following:

- .1 a description of the ConOps;
- .2 all operational restrictions on the ROC; and

- .3 the infrastructure for connectivity, and its performance and quality of service as accepted by the Administration.

5.3.4 A copy of the MASS Safety Certificate and MASS Record should accompany the MASS ROC Certificate.

5.3.5 The MASS ROC Certificate and MASS ROC Record should be drawn up in a form corresponding to the models given in the appendix. If the language used is neither English, nor French nor Spanish, the text should include a translation into one of these languages.

## **5.4 MASS ROC surveys**

5.4.1 MASS ROC Certificate validity, survey dates and endorsements should be harmonized with the relevant SOLAS certificates in accordance with the principles of *Survey guidelines under the harmonized system of survey and certification (HSSC), 2025* (resolution A.1207(34), as amended), and SOLAS.

5.4.2 MASS ROC surveys should be carried out, as follows:

- .1 an initial survey that should include a complete inspection, verification and testing of the ROC and the remote operation functionality, to ensure compatibility between the MASS and ROC and that they comply with the requirements of this Code;
- .2 a renewal survey that should consist of an inspection, with tests, of the ROC and the remote operation functionality, to ensure compatibility between the MASS and ROC and that they comply with the requirements of this Code, are in satisfactory condition, and are fit for the service for which the MASS and ROC are intended;
- .3 intermediate and annual surveys that should, as considered appropriate, include general inspection, verification and testing of the ROC and the remote operation functionality, to ensure compatibility between the MASS and ROC and that they comply with the requirements of this Code, are in satisfactory condition, and are fit for the service for which the MASS and ROC are intended; and
- .4 additional surveys of equipment and/or systems related to autonomous or remotely-operated functions should be made after repairs resulting from investigations prescribed in SOLAS regulation I/11, or other major repairs, renewals or modifications, to ensure that the ROC complies with the requirements of this Code. Such major repairs, renewals or modifications of equipment and/or systems may include, inter alia, the following:
  - .1 replacements or updates that may affect the compatibility, security and stability of any software system;
  - .2 modifications to the ConOps, and verification that the ROC and MASS functionality continues to comply; and
  - .3 repairs after serious failure or defects of equipment and/or systems.

5.4.3 The MASS ROC Certificate should be endorsed after intermediate and annual surveys referred to in II/5.4.2.

## **5.5 Provisional Certificates**

5.5.1 Provisional MASS Safety and MASS ROC Certificates may be issued to a MASS and ROC that will enable initiation of operations while they are undergoing testing during step 3 of the approval process, as described in II/6.1.

5.5.2 Provisional MASS Safety and MASS ROC Certificate(s) may be issued before performing the full-scale test of the MASS and ROC, provided that individual MASS systems have been tested and verified and results of simulation (if applicable) are reviewed and accepted, in accordance with the verification and validation plan approved at step 2 of the approval process, and all the design documents have been updated accordingly and approved according to the simulation and system testing results.

5.5.3 Provisional MASS Safety and MASS ROC Certificate(s) should be issued by the Administration to a MASS and ROC for a period and area of testing specified by the Administration, based on the arrangements proposed by the Submitter in the verification and validation plan.

5.5.4 In addition to surveys covered by the verification and validation plan, MASS and ROCs issued with Provisional MASS Safety and MASS ROC Certificate(s) should be subject to the surveys listed in II/5.2 and II/5.4, as appropriate.

## **5.6 Validity of certificates**

5.6.1 A certificate issued under II/5.1, II/5.3 or II/5.5 should cease to be valid in any of the following cases:

- .1 if the relevant surveys and inspections are not completed within the periods specified under II/5.2 or II/5.4;
- .2 if the certificate is not endorsed in accordance with the present requirements;  
or
- .3 upon transfer of the MASS to the flag of another State. A new certificate should only be issued when the Administration issuing the new certificate is fully satisfied that the MASS is in compliance with the requirements of this Code.

5.6.2 Where a MASS ROC Certificate is withdrawn or ceases to be valid, the Administration should review the effect on the associated MASS Safety Certificate as well as on other MASS ROC Certificates issued for this ROC by that Administration.

## **5.7 Safety management certification**

5.7.1 Every International Safety Management (ISM) Company intending to operate a MASS should, in accordance with chapter 11 of this Code, develop its Safety Management System (SMS) to address autonomous and/or remote operations, as applicable.

5.7.2 The Company should ensure that the SMS is implemented and maintained on the MASS and at any ROC(s) involved in its operation. The Company should clearly identify and document the subdivision of tasks and relationship between the Company and any associated ROCs and MASS.

5.7.3 Any operational procedures specified by this Code for the autonomous or remote operations, including watchkeeping arrangements, should be included in the SMS of the MASS and ROC respectively.

5.7.4 The operation of the ROC, including the remote operation of the MASS, should be included in the ISM verification and certification process for a Company to the satisfaction of the Administration.

5.7.5 Where the alternative management described in II/11.3 is used for the operation of a ROC(s), certification should follow a similar approach as the ISM Code with:

- .1 a ROC Safety Management System (ROCSMS);
- .2 a Document of Compliance for the Remote Operation Management Company (ROM DoC); and
- .3 a ROC Management Certificate (RMC) for each ROC.

## **5.8 International Ship and Port Facility Security certification**

A MASS and any ROC operating a MASS should be subject to the International Ship and Port Facility Security (ISPS) Code, as supplemented by this Code.

## **5.9 Minimum safe manning documents**

5.9.1 A MASS or ROC operating a MASS should be sufficiently, effectively and efficiently manned in accordance with the principles of minimum safe manning as set out in *Principles of minimum safe manning* (resolution A.1047(27), as amended), and as supplemented by this Code.

5.9.2 A MASS should be issued with a minimum safe manning document (MSMD) according to resolution A.1047(27), as amended, and to the satisfaction of the Administration.

5.9.3 A ROC operating a MASS should be issued with a MSMD for operation of that MASS, based on the principles of resolution A.1047(27), as amended, and to the satisfaction of the Administration.

5.9.4 A ROC operating several MASS should be issued with one MSMD per MASS. For such ROCs, a MASS ROC Master Plan (MRMP) for watchkeeping and other tasks should be developed and approved by each Administration who has issued MSMDs covered by the MRMP.

5.9.5 The Company should be able to demonstrate compliance with the MSMD(s), through issuing and maintaining appropriate records.

5.9.6 The determination of safe manning should consider the specific personnel qualifications (see chapter 14), operational policy and procedures (see chapter 11), and the infrastructure/technology necessary to perform operational functions (see chapter 8). This determination should consider normal operation (including degraded states), fallback states and emergency situations.

## CHAPTER 6 – APPROVAL PROCESS

### 6.1 Process description

6.1.1 A structured approval process should take place to enable the MASS to obtain the required approval including the necessary certificates related to requirements for the intended operation. By following this process, a Submitter and the Administration would be working in cooperation to ensure that all aspects of safety, security and environmental protection are adequately assessed. This process is intended for the MASS as a whole, while individual systems are covered in the verification and validation step.

6.1.2 The approval process for MASS should be based on and follow the main principles of the *Guidelines for the approval of alternatives and equivalents as provided for in various IMO instruments* (MSC.1/Circ.1455), taking into consideration parts II and III. The level of detail should be proportional to the complexity, level of novelty and associated risk of the MASS and on whether the Submitter is applying for preliminary or final approval. The necessary documentation may vary accordingly.

6.1.3 The Concept of Operations (ConOps) (as described in II/8.2) should be a base document in the approval process and should be the basis for the assessment in each step.

6.1.4 The steps and documentation required in this chapter (and annex 1) provide the general basis of the approval process, without prejudice to other information or documentation that may be requested by the Administration, or to an alternative process which may be followed to the satisfaction of the Administration.

6.1.5 Sufficient information should be supplied to enable the Administration to fully assess the features of the MASS. After appropriate identification of relevant stakeholders by the Submitter, discussions should commence at the earliest possible stage, so that the Administration may fully evaluate the level of safety of the MASS.

6.1.6 The following steps should be observed in the approval process:

- .1 preliminary design development;
- .2 preliminary design approval;
- .3 testing, simulation, and other verification and validation methods;
- .4 final approval; and
- .5 operation.

6.1.7 Table 1 in annex 1 provides additional guidance in relation to the approval steps that require relevant documentation.

### 6.2 Evaluation criteria

The basic principle for the evaluation criteria should be to ensure a level of safety, security and environmental protection that is expected of a conventional ship. The evaluation criteria should be developed through compliance with the principles of part II and goals and functional requirements of the applicable chapters of part III in combination with a risk assessment (as described in II/7.2). The evaluation criteria and an assessment plan thereof should be agreed with the Administration.

### 6.3 Design and documentation requirements

For each approval step, information and supporting documentation required by the Administration should be produced and submitted. The various documents required in the approval process steps are expected to be reviewed according to any possible design or operational changes and added details. The approval steps do not need to be sequential, meaning that they may also run at the same time.

### 6.4 Operation

6.4.1 Conditions for maintaining the safety level agreed during the design approval may be imposed on MASS operations. Any operational conditions should be determined during the approval process, and they should be clearly documented and communicated to relevant parties.

6.4.2 If, during the operational phase, the initial assumptions, systems and equipment are changed, resulting in any change in the ConOps, the part of the risk assessment with the respective changes should be repeated. The extent of work needed will be dependent on the risk-based features and the changes and the operation of the MASS, and may be decided by the Administration. For example, in the case of a Remote Operations Centre (ROC) with remote operators approved for the control of one MASS, it may be necessary to review the approval assumptions if a second MASS is added to the same ROC.

6.4.3 A MASS may initiate operations while it is being tested. During such tests, the certification of the MASS should follow the process for provisional MASS certification described in II/5.5. In addition, further mitigation layers to the system being tested should be foreseen such as different modes of operation from the ones of the final design.

## CHAPTER 7 – RISK ASSESSMENT

7.1 A risk assessment should be conducted to ensure that risks arising from the use of MASS functions, including relevant functions in Remote Operations Centres (ROCs), affecting persons on board, the environment, and the safety of the MASS are addressed, taking into account identified goals and functional requirements, ensuring a level of safety expected of a conventional ship.

7.2 The risk assessment can be conducted on MASS as a whole, and/or on the MASS functions. It should also consider the Operational Envelope (OE) or Concept of Operations (ConOps) of the MASS, and address relevant mitigation measures.

7.3 Should the risk assessment be carried out on specific MASS functions, the consequences on other functions should be considered and mitigated.

7.4 Appropriate risk assessment methodologies<sup>1</sup> should be used for the different steps of the approval process as required in chapter 6 (Approval process). Such risk assessments, inter alia, might include:

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<sup>1</sup> Refer to:

- MSC.1/Circ.1455 on *Guidelines for the approval of alternatives and equivalents as provided for in various IMO instruments*
- IEC/ISO 31010:2019 – Risk management — Risk assessment techniques
- IEC 61508 on *Functional safety of electrical/electronic/programmable electronic safety-related systems* - Parts 1 to 7
- STPA: [http://psas.scripts.mit.edu/home/get\\_file.php?name=STPA\\_handbook.pdf](http://psas.scripts.mit.edu/home/get_file.php?name=STPA_handbook.pdf)
- RBAT: <https://www.emsa.europa.eu/mass/rbat.html>

- .1 MASS (including ROC(s)) and system design; and
- .2 alteration or modification of any major characteristic of the MASS or of the OE or ConOps of MASS that may impact MASS functions.

7.5 A risk assessment should be carried out by personnel with relevant expertise as required by the Administration (*Revised guidelines on alternative design and arrangements for SOLAS chapters II-1 and III* (MSC.1/Circ.1212/Rev.2), section 4 (Design team)).

7.6 The output format should be justified by the Submitter and be agreed between the Submitter and the Administration.

7.7 The risk assessment should include a comprehensive description of autonomous and remotely-operated function utilization, effectiveness and reliability by performing a hazard and mitigation analysis, evaluating the identified risks, and implementing effective risk control measures.

7.8 The risk assessment should analyze and address hazards associated with the intended OE of the MASS including any associated ROCs, as described in the ConOps. Apart from the hazards such as loss of function, cyber incidents, software application failure, component damage, fire, explosion and electric shock, it should also consider the random, systematic, and systemic hazards involved within the OE.

7.9 The adopted mitigation measures should take into consideration single failure events, but also foreseeable events within the OE of the MASS that may influence the performance of more than one system at the same time. Such features should consist mainly of independent mitigation layers, including predefined fallback states. The number of such mitigation layers should be proportional to the risk.

7.10 The assessment should ensure that hazards are eliminated wherever possible through inherently safe design and hazards that cannot be eliminated should be mitigated as needed. The effectiveness of the mitigation measures considered in the risk assessment should be verified according to the verification and validation plan stipulated in paragraph 2.7 of annex 1.

## **CHAPTER 8 – OPERATIONAL CONTEXT**

### **8.1 General**

8.1.1 The operational context for a MASS should, within the applicable regulatory framework, and on the understanding that it does not have any privilege over conventional ships, consider all aspects of the MASS operation and describe the autonomous or remotely-operated function(s) and the external environment that influences its operation.

8.1.2 The operational context encompasses the Concept of Operations (ConOps), the Operational Envelope (OE), the system-specific Operational Design Domain (ODD), fallback states, the modes of operation and the human control and supervision, all of which should be considered as part of the certification. Figure 1 in annex 2 illustrates the relationship between the OE, ODD, fallback state and contingency plans.

## **8.2 Concept of Operations**

8.2.1 The ConOps should be drafted to ensure the safe, secure and environmentally sound operation of the MASS.

8.2.2 The ConOps may be drawn up in a form corresponding to the model given in annex 2, or an alternative acceptable to the Administration.

8.2.3 Risk assessments for the MASS and Remote Operations Centre (ROC) should take the ConOps into consideration. The ConOps and the associated risk assessment should ensure that all relevant risks are addressed.

8.2.4 The ConOps should include consideration of the OE and the technical design of the MASS and of the ROC(s), if applicable, including connectivity and communication lines. The ConOps should address the control, monitoring, and intervention on board the MASS and at the ROC, if applicable, together with the integration of humans in the operation.

8.2.5 The ConOps should be re-evaluated when there are hardware, software, operational or management changes to the MASS or ROC.

## **8.3 Operational Envelope and Operational Design Domain**

A MASS should have a clearly defined OE for the MASS as an integrated system, which also includes the ODDs of all relevant systems or functions.

### **8.3.1 Operational Envelope**

8.3.1.1 The OE of the MASS should encompass the operational capabilities and limitations of the autonomous or remote operation, and ship-specific capabilities and limitations to indicate the condition in which a MASS can operate safely in all operating conditions, including all reasonably foreseeable degraded states.

8.3.1.2 The OE should, inter alia, contain:

- .1 definition of the MASS functions and states, and its use case(s);
- .2 geographic area of operations, including coverage/connectivity and traffic conditions;
- .3 description of the environmental limitations;
- .4 description of operational limitations for different modes of operation during a single voyage;
- .5 the use and management of the modes of operation, including the division of functions and allocation of tasks between humans and systems which enable autonomous or remote operations; and
- .6 any other factors that have a significant impact on MASS operations.

### **8.3.2 Operational Design Domain**

8.3.2.1 The ODD of individual autonomous or remotely-operated functions or systems should be based on the results of a risk assessment. The relevant design documents should include:

- .1 conditions and limitations under which any relevant individual system or function operates safely;
- .2 reasonably foreseeable system or equipment malfunctions including corresponding degraded states;
- .3 extent of human interaction;
- .4 capabilities and limitations to be accomplished before activation of the individual system or function; and
- .5 descriptions of the external and internal conditions, such as geographical boundaries within which the MASS is to operate, the maximum wind speed and wave heights, etc.

8.3.2.2 An autonomous or remotely-operated system and related equipment should operate within its ODD and should be able to detect whether its current state of operation meets the ODD.

### **8.3.3 Degraded state**

A single autonomous or remotely-operated system or function deviating from its ODD should not necessarily result in the MASS deviating from its OE. As long as the MASS, as an integrated system, can continue to be operated within its OE the deviation of an autonomous or remotely-operated system or function from its ODD should be considered as a degraded state.

### **8.4 Fallback state**

8.4.1 In case of deviating from its OE, a MASS should enter a predefined fallback state, offering an additional mitigation layer. There may be more than one predefined fallback state, to address failures or conditions identified at the design stage that might lead to a MASS deviating from its OE.

8.4.2 The conditions, actions and procedure to enter into, and recover from, a fallback state should be considered as the fallback response and should be predefined and able to be tested.

8.4.3 When a MASS enters a fallback state, the predefined fallback response should avoid harm to human life, other ships, infrastructure, and the marine environment while the MASS returns into its OE and normal operation is restored.

8.4.4 Fallback states should be risk-assessed and demonstrate effectiveness in avoiding further deterioration in the status of the MASS or increases in the threat to human life, marine environment, other ships or infrastructure. Depending on the result of the risk assessment, more than one independent fallback state should be available at any time during normal operations. Being in a fallback state should not result in an intolerable risk.

8.4.5 The MASS should be capable of notifying its onboard crew and remote operators when transitioning to, and operating in, a fallback state.

## **8.5 Contingency plans**

A deviation from an OE beyond a predefined fallback state should lead to the activation of contingency plan(s).

## **8.6 Mode(s) of operation**

8.6.1 The mode of operation of a MASS may be changed for different phases of a voyage, and procedures to change from one mode of operation to another, along with the criteria for any such change, should be described in the ConOps.

8.6.2 The description of mode(s) of operation should also identify:

- .1 which functions are autonomous or remotely-operated;
- .2 how autonomous or remotely-operated functions are allocated to different agents (human or software);
- .3 how the affected functions are supervised, and by which agents;
- .4 where the different agents are located (on board or remote); and
- .5 which other systems and other roles (personnel) are involved in performing the control action.

## **8.7 Human oversight and control**

8.7.1 All onboard crew and remote operators responsible for managing MASS operations should be able to exercise human oversight and control for operation of the MASS, including the ability to:

- .1 understand and interpret system outputs;
- .2 supervise the system, and verify system-initiated decisions, as appropriate; and
- .3 intervene and/or override the system, if required.

8.7.2 The allocation of functions as per II/8.6.2.2 should be based on the understanding that the operation of a MASS without any human interaction has limitations. Therefore, any onboard crew and remote operators responsible for managing MASS operations should always be able and prepared to take over the responsibilities of autonomous functions without risk to the outcome of the task.

8.7.3 There should be a human master responsible for a MASS, regardless of the mode of operation and the master should have the means to intervene when necessary.

8.7.4 The onboard crew or remote operator should be provided with ample time and sufficient information to be able to establish situational awareness, assume responsibility and exercise direct or supervisory control of all functions according to the ConOps (see II/10.7).

## **CHAPTER 9 – SYSTEM DESIGN**

In addition to complying with relevant rules, regulations, and standards, systems related to MASS functions should comply with the following high-level principles.

### **9.1 Safety-centric design**

Systems should be designed to minimize threat to the MASS, human life, marine environment, other ships and infrastructure by incorporating inherently safe design principles. All systems used for MASS operations should include fail-safe mechanisms and emergency protocols to ensure comprehensive safety and effective risk management. Hazards should be eliminated wherever possible, and those that cannot be eliminated should be mitigated as needed by using a risk assessment as described in chapter 7 (Risk assessment).

### **9.2 Human-centred design**

Systems should be designed, and further developed throughout their life-cycle, using a human-centred approach, which takes into account the characteristics and competence of expected users, including their tasks and working environment.

### **9.3 Robustness**

Systems should be robust and should be able to operate effectively under adverse conditions, including diverse maritime environments and operational challenges.

### **9.4 Reliability**

It should be ensured that the systems perform their required functions effectively during the operational period specified by the manufacturer, up to predetermined maintenance intervals.

### **9.5 Adaptability**

Systems should have the ability to adapt to changing environments, tasks, and user requirements, and allow for updates and modifications to accommodate necessary technical and regulatory updates, and future needs.

### **9.6 Redundancy and fault tolerance**

9.6.1 Redundant sub-systems should be implemented to maintain functionality in case of component failures including systemic or systematic failures.

9.6.2 Systems should be designed to handle and recover from failures and continue operating at a reduced performance level (fallback state).

### **9.7 Scalability**

It should be ensured that system designs are scalable, allowing for expansion or updates as technology advances or operational needs change.

## **9.8 Security and cybersecurity**

Measures to mitigate security risks and cyber risks should be incorporated in the systems of the MASS and the Remote Operations Centre (ROC), including prevention of unauthorized access.

## **9.9 Data management and quality**

Data management systems should be incorporated that ensure data accuracy, integrity, and quality.

### **9.10 Proper record keeping (data logging)**

9.10.1 Systems should support data logging for performance, failure and incident analysis.<sup>2</sup>

9.10.2 Data should be electronically stored for a predetermined period, not less than 30 days, and be made available in an appropriate format.<sup>3</sup>

9.10.3 For data stored on board, means should be available to protect data during, and retrieve data following, an incident.

9.10.4 Logged data should contain appropriate detail to restore a complete record of the MASS operations, including, where applicable, remote operations and automated decision-making processes.

9.10.5 Logged data should be made available to the Administration and other marine investigation authorities upon request.

9.10.6 The requirements of SOLAS regulation V/20 (Voyage Data Recorders) should apply to all MASS.

## **9.11 Interoperability**

Compatibility and interoperability with systems, devices, applications, and technologies should be ensured.

## **9.12 Testing and validation**

9.12.1 Systems should undergo comprehensive testing and validation to ensure compliance with design specifications and operational requirements. This process includes a structured procedure comprising detailed simulation, component testing, integration testing, and system testing.

9.12.2 Remote operators should be actively involved in the system validation phase in real-case scenarios to ensure practical usability and operational soundness meeting all regulatory requirements, before obtaining the necessary certifications.

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<sup>2</sup> Refer to resolution MSC.333(90) on *Adoption of revised performance standards for shipborne Voyage Data Recorder (VDRs)*; IEC 61996-1:2013+A1:2021 *Maritime navigation and radiocommunication equipment and systems - Shipborne voyage data recorder (VDR) - Part 1: Performance requirements, methods of testing and required test results*.

<sup>3</sup> Refer to MSC.1/Circ.1024 on *Guidelines on voyage data recorder (VDR) ownership and recovery*.

### 9.13 Transparency

Transparency should be maintained in the system design for systems operations and decision-making processes.

## CHAPTER 10 – SOFTWARE PRINCIPLES

The principles in this chapter should be implemented to ensure that software on MASS or supporting MASS functions is reliable, trustworthy, safe and secure. They should be used within the context of complying with this Code, including the use of autonomous and remotely-operated functions, and should be considered as part of the approval process, and this may be done using software quality assurance standards.<sup>4</sup>

### 10.1 Proportionality

Software should have an explicit and well-defined Operational Design Domain (ODD). The use of software should not go beyond what is provided for in the Concept of Operations (ConOps). Risk assessment(s) should be used to identify and manage hazards from the software.

### 10.2 Reliability

The continued effectiveness of software capabilities should be subject to testing and assurance across their entire lifecycles.

### 10.3 Safety and security

Unwanted harm (safety risks) as well as vulnerabilities to external factors (security risks) should be avoided and addressed, as described in chapter 7 (Risk assessment). Safety and security (including cybersecurity) risks should be identified, addressed, and mitigated throughout the software's operational life to prevent and/or limit, any potential or actual harm to shipping, human life, or the marine environment.

### 10.4 Transparency and explainability

Software should be transparent and explainable at all stages of its operational life, and for all decision-making processes. The transparency and explainability should ensure relevant personnel possess an appropriate understanding of the technology, development processes, and operational methods applicable to autonomous capabilities, including with transparent and auditable methodologies, data sources, and design procedures and documentation.

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<sup>4</sup> Refer to:

- MSC.1/Circ.1512 on *Guidelines on software quality assurance and human-centred design for e-Navigation*
- IEC 61508 on *Functional safety of safety-related electrical/electronic/programmable electronic safety-related systems — Parts 1 to 7*
- IEC 61924-2:2021 on *Maritime navigation and radiocommunication equipment and systems – Integrated navigation systems (INS) – Part 2: Modular structure for INS – Operational and performance requirements, methods of testing and required test results*
- IEC 61162 series of standards on *Maritime navigation and radiocommunication equipment and systems – Digital interfaces*
- IACS UR E22 on *Computer-based systems Rev.3* (June 2023)
- ISO/IEC/IEEE 90003:2018 on *Software engineering – Guidelines for the application of ISO 9001 to computer software*
- ISO/IEC 25000:2014 on *Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) – Guide to SQuaRE*
- MSC-FAL.1/Circ.3/Rev.3 on *Guidelines on maritime cyber risk management*

## **10.5 Accountability**

Entities developing, deploying, or operating software should implement mechanisms to ensure accountability and proper operation of their software. Software should be auditable and traceable to such entities. There should be governance mechanisms in place for oversight, impact assessment, audit, and due diligence to ensure accountability for the software's performance and reliability throughout its operational life.

## **10.6 Robustness**

Safe and secure software should be enabled through robust frameworks. Software should perform consistently with intended objectives, in a stable and resilient manner in a variety of circumstances. The robustness of such software should be tested and assured across its entire life cycle within that domain of use.

## **10.7 Controllability**

Software should be designed and developed to ensure that any onboard crew and remote operators responsible for managing MASS operations can exercise human oversight and control, including the means to:

- .1 interpret appropriate context by delivering accurate, timely, sufficient and unambiguous information to operators and other systems;
- .2 verify system behaviour with respect to the accuracy of system output and effectiveness of system performance at any time during operations by providing timely indicators of task status;
- .3 take over control, and adjust or override system behaviour in a time frame that minimizes risk and disruption to ongoing operations; and
- .4 provide timely input and direction as required to prevent or minimize risks to MASS operations by enabling performance of all required operator actions, providing accurate, understandable and relevant feedback and confirmation where necessary.

## **10.8 Unintended bias**

Software should be designed and developed to prevent unintended bias.

# **CHAPTER 11 – MANAGEMENT OF SAFE OPERATIONS**

## **11.1 Purpose**

The purpose of this chapter is to ensure adequate management for safe operations.

## **11.2 Safety Management System provisions for MASS operations**

11.2.1 The MASS, the Company and the Remote Operations Centre (ROC) should follow the provisions of this chapter, which are supplementary to the requirements for the management of the safe operation of ships in SOLAS and the ISM Code.

11.2.2 The Safety Management System (SMS) of the Company should provide for safe MASS operations through the establishment of procedures, plans and instructions for all foreseeable modes of operation, including for any ROC(s) involved, if applicable. In order to accomplish this, the following should be considered:

- .1 Risk control measures addressing autonomous or remotely-operated functions.
- .2 Internal processes should verify the effectiveness of procedures, plans and instructions to address autonomous or remotely-operated functions.
- .3 Human-machine interface (HMI) aspects of autonomous or remotely-operated functions.
- .4 The role and expected performance for ROC(s), where autonomous or remotely-operated functions are executed.
- .5 With respect to autonomous or remotely-operated functions:
  - .1 their interaction, capabilities and limitations;
  - .2 the complexity of systems, including software systems or data services;
  - .3 equipment and systems necessary to maintain contact with the MASS;
  - .4 lines of communication to maintain contact with the MASS;
  - .5 cyber risks; and
  - .6 fallback actions and processes to maintain their safe operation.

11.2.3 The SMS of the Company should provide for the safety and well-being of the personnel involved in the operations by identification of resources and training required and establishment of procedures, plans and instructions for all foreseeable operating conditions of the MASS, including for any ROC involved, if applicable. In order to accomplish this, the following should be considered:

- .1 Risk control measures addressing autonomous or remotely-operated functions.
- .2 Internal processes verifying the effectiveness of procedures, plans and instructions addressing autonomous or remotely-operated functions.
- .3 HMI aspects of autonomous or remotely-operated functions.
- .4 Responsibilities with regard to the interaction in MASS operations.
- .5 Maintenance of the principle of the overriding authority of the master.
- .6 Emotional pressure, specific stresses and strains to humans involved in the MASS operations.

11.2.4 The SMS of the Company should provide for the safety of the MASS under all expected emergency conditions by establishment of contingency plan(s), including emergency scenarios involving different physical locations, if applicable. In order to accomplish this, the following should be considered:

- .1 Risk control measures addressing autonomous or remotely-operated functions.
- .2 Internal processes verifying the effectiveness of procedures, plans and instructions addressing autonomous or remotely-operated functions.
- .3 HMI aspects of autonomous or remotely-operated functions.
- .4 Monitoring the performance of autonomous or remotely-operated functions, including relevant system and MASS parameters.
- .5 Assistance for emergency handling or handling of other potentially unsafe situations.
- .6 Capabilities and limitations of emergency response in the MASS operation.
- .7 Maintaining a minimum level of connectivity between the MASS and the ROC, if applicable.
- .8 Procedures for connecting to shore-based assistance during emergencies.
- .9 Cyber risks during emergencies addressing autonomous or remotely-operated functions.
- .10 Means and procedures for emergency standby arrangements and equipment addressing autonomous or remotely-operated functions.
- .11 Emergency procedures should be executed based on predefined contingency plans and adjusted appropriately as needed, considering further:
  - .1 An appropriate mode of operation should be adopted, including suspension of operations if necessary.
  - .2 Emergency response data and relevant information should be accessible at any location involved in the response.
  - .3 Resources from the MASS and the ROC should be promptly mobilized to address the emergency situations.

### **11.3 Alternative management for the safe operation of Remote Operations Centre(s)**

11.3.1 With regard to a Remote Operation Management (ROM) company operating one or multiple ROC(s), this company could, to the satisfaction of the Administration, establish a SMS for the operation of those ROCs (ROC Safety Management System (ROCSMS)) under their responsibility. This ROCSMS should supplement the MASS's SMS developed by the Company, and the MASS ROC Certificate clearly establishing the relationship between the SMS and ROCSMS, to ensure that the safety level of the MASS established through the MASS's SMS is maintained.

11.3.2 The alternative ROM certification should follow a similar approach to that of the ISM Code with:

- .1 a ROCSMS;
- .2 a Document of Compliance for ROM (ROM DoC); and
- .3 a ROC Management Certificate (RMC) for each ROC.

## **CHAPTER 12 – SPECIAL MEASURES TO ENHANCE MARITIME SECURITY**

### **12.1 Purpose**

The purpose of this chapter is to ensure adequate security.

### **12.2 General**

To achieve the above-mentioned purpose, in addition to the requirements in SOLAS chapter XI-2 and the ISPS Code, the following provisions should be applied.

### **12.3 Implementation of security measures**

12.3.1 The ship security assessment (SSA) and ship security plan (SSP) should identify and address additional security risks related to MASS operations.

12.3.2 The following should be considered in the implementation of security measures:

- .1 Measures and procedures should be in place on board a MASS to ensure a level of security not less than that of a conventional ship.
- .2 The security of the MASS should not be compromised by the use of autonomous and remotely-operated systems, considering inter alia:
  - .1 physical security;
  - .2 structural integrity;
  - .3 personnel protection systems;
  - .4 procedural policies including the SSP;
  - .5 radio and telecommunication systems including computer systems and networks; and
  - .6 that any other areas, if damaged or used for illicit observation, should not pose a risk to persons, property, or operations on board the MASS.
- .3 Systems deployed to serve security purposes should be secure, resilient to attempts to compromise them, and exchange information in such a way that it does not compromise the security of the data.

- .4 The MASS should be able to communicate and exchange security-related information, as appropriate, with a Remote Operations Centre (ROC), the Administration, Governments, port authorities, port facilities and Company upon request, taking into account the sensitivity of the information and authorization to access security-sensitive information.
- .5 Means should be provided to enable the assessment of the effectiveness of additional security measures for MASS operations.
- .6 The SSP should be stored such that duly authorized personnel required to take action are able to access it.
- .7 Record of activities addressed in the SSP should be stored such that duly authorized personnel required to access and amend them are able to do so at any time.

## **12.4 Remote operations**

12.4.1 Ship security assessment and plans should account for the ROC(s), where appropriate, aligning as closely as possible with the concept, terminology and appropriate provisions of the ISPS Code.

12.4.2 Where responsibilities are transferred from onboard crew to remote operators, the remote operators should be subject to the requirements of the ISPS Code as supplemented by the following:

- .1 The role of remote operators, and those with responsibilities that have been transferred from the MASS, should be addressed in the SSP.
- .2 Remote operators should take part in training, drills and exercises as laid out in the ISPS Code.
- .3 Records of the activities as laid out in the ISPS Code, section A/10.1, should include the involvement of remote operators.
- .4 When conducting ship security assessments, identification of weaknesses in the infrastructure, policies and procedures should consider human factors, including remote operators.

12.4.3 In the event of the security of a ROC being compromised, measures and procedures should be in the SSP and should be implemented to ensure that this does not impact the security of the MASS.

- .1 Means should be provided for early detection of a security breach.
- .2 There should be a separate mechanism for safely isolating and shutting down communications and control when the security of the ROC has been compromised
- .3 The MASS should either enter a predefined fallback state until secure communications can be established with a secure ROC or, if available, control can be assumed at a separate control location, which may include the MASS itself.

- .4 Communication with the compromised ROC should only be re-established once the security of the ROC has been ensured and validated.
- .5 Procedures should be documented in the SSP, with plans in place to state where control will be assumed, and how communications will be re-established.

## **12.5 Access control**

Unauthorized access should be prevented to ensure the security of the MASS, its cargo and onboard personnel, and any ROCs, if appropriate.

- .1 Means should be provided to detect:
  - .1 physical intrusion by unauthorized personnel;
  - .2 physical attacks on the MASS during its voyage; and
  - .3 cyber intrusion or interference.

## **12.6 Communications**

Communication with the MASS should be maintained during and following a security event on board, or impacting upon, a MASS.

- .1 Systems should allow for coordination between the MASS and third-party responders, and should provide sufficient information to ensure the safety and security of external responders, other ships, and the marine environment.
- .2 Means should be included in the design and implementation of communication systems such that reasonably foreseeable security incidents would not result in damage to, or compromise of, all other systems.
- .3 In the event communication is lost following a security incident, the MASS should enter an appropriate fallback state and be capable of maintaining that state during and following the event until secure communications and control can be re-established.

# **CHAPTER 13 – ALERT MANAGEMENT**

## **13.1 Purpose**

The purpose of alert management is to enhance the monitoring, handling, distribution, and presentation of alerts for MASS and Remote Operations Centres (ROCs) thereby allowing for the prompt identification and addressing of any alert situation that arises and ensuring safe operation.

## **13.2 General**

13.2.1 As part of the alert management system, taking into account the specificities of MASS operation, the following should be considered.

13.2.2 An alert management optimization should be performed taking into account the Concept of Operations (ConOps) so that the alert management provides:

- .1 the means to draw the attention of the onboard crew and remote operators to the existence of alert situations;
- .2 the means to enable the human operator to identify and evaluate the situation and handle alert announcements;
- .3 the means for onboard crew and remote operators and relevant third parties to assess the urgency of different alerts in cases where more than one alert should be handled;
- .4 the means to manage alerts in a distributed system structure in a consistent manner; and
- .5 support for effective supervision of autonomous and remotely-operated functions.

### 13.3 Principles

The alert management for MASS and ROC should be based on the following principles:

- .1 Alerting should follow the basic principles of the Bridge Alert Management (BAM) concept outlined by resolution MSC.302(87) on *Performance Standards for Bridge Alert Management (BAM)*, as may be amended.
- .2 If practicable, there should be no more than one alert for one situation that requires attention.
- .3 Alerts should provide information for the operator to sufficiently understand the consequences of the situation and determine appropriate actions.
- .4 The alert management should handle alerts from all systems or components required to support MASS and ROC operation. Furthermore, it should have the capability to handle all other alerts in a consistent manner.
- .5 The logical architecture of the alert management and the handling concept for alerts should provide the capability to minimize the number of alerts, especially those on a high priority level.
- .6 Audible alerts should guide human operators to the task stations or displays which are directly assigned to the function generating the alert and presenting upon request at least the cause of the announcement and related information for decision support, e.g., dangerous target alarms should appear and have to be acknowledged at the control station where the collision avoidance function is provided.
- .7 As alerts can be displayed at several locations and task stations, the system should be consistent as far as practicable with respect to how alerts are presented, silenced and acknowledged at any one task station. Actions taken in a task station should be visible to all other relevant task stations.

- .8 Alerts should only be presented for handling (e.g. acknowledgement or silencing) at task station(s) used by the operator in charge of the tasks related to the initiated alerts. Alerts may be presented visually for information at other task stations.
- .9 The master should receive alerts and have access to the alert management at all times.
- .10 The operator responsible for the MASS should be able to directly handle the alert management Human-Machine Interface (HMI). It should be possible to provide the central alert management HMI at the control position for the operator.

#### **13.4 Autonomous or remote operations and functions**

13.4.1 In addition to relevant alerts associated with conventional ships, specific consideration should be given to those alerts related to the operations and functions to which this Code applies, as outlined in other chapters. Examples of such alerts, inter alia, would include:

- .1 upon entering a fallback state or upon recognizing the need to enter a fallback state;
- .2 in case the MASS is not able to enter a fallback state when deviating from its Operational Envelope (OE);
- .3 in case of equipment failure affecting operations of MASS functions or significantly increasing the risk of MASS operation e.g. loss of redundancy;
- .4 in case a system, that is critical to MASS operation, exceeds or is about to exceed its Operational Design Domain (ODD); and
- .5 in case of ROC-specific alerts and conditions requiring attention (e.g. power failures, task station failures, communication system failures at ROC-level, software failures at ROC-level).

13.4.2 Task stations presenting alerts for multiple MASS should have the means to organize alerts per MASS and have the means to delegate alert handling for selected MASS to another task station.

13.4.3 When an emergency alarm is activated, dedicated human operators, including the master, should be able to take control of the MASS until the emergency is over.

13.4.4 The observation of abnormal situations and conditions concerning more than one MASS should be classified as alarms.

### **CHAPTER 14 – MANNING, TRAINING AND WATCHKEEPING**

#### **14.1 Purpose**

14.1.1 The purpose of this chapter is to ensure that all MASS are appropriately manned and operated by trained, competent and experienced personnel.

14.1.2 For the purpose of this chapter, the training and watchkeeping standards as addressed by the 1978 STCW Convention and STCW Code may be considered by the Administration for the assigned roles in the Remote Operations Centre (ROC).

14.1.3 A ROC may be considered by the Administration as a directly associated location to the navigational bridge or part of the machinery space, as applicable, to ensure that the watchkeeping provisions of the 1978 STCW Convention and STCW Code may also apply to remote operators.

## **14.2 Safe manning**

### **14.2.1 General**

To ensure all MASS are manned safely as outlined in II/5.9 (Minimum safe manning documents), the following principles should be followed:

- .1 The applicable international instruments, regulations and principles of safe manning should be adhered to when structuring manning levels.
- .2 The task allocation summary (annex 1, paragraph 2.4) should be taken into account when determining the safe manning levels.
- .3 The minimum level of safe manning should ensure sufficient onboard crew and/or remote operators to operate the MASS in an effective and efficient manner:
  - .1 providing safety and security of the MASS, safe navigation and operations at sea, safe operations in port, prevention of human injury or loss of life, avoidance of damage to the marine environment and property;
  - .2 ensuring the welfare and health of onboard crew and/or remote operators through the avoidance of fatigue; and
  - .3 maintaining an effective response to emergency situations or failures of systems.
- .4 The roles of all personnel as outlined in the Minimum Safe Manning Document (MSMD), should be clearly identified, defined and allocated.
- .5 The MSMD should define whether a particular capacity is to be fulfilled by onboard crew and/or remote operators.
- .6 Clear lines of authority and responsibility between onboard crew and/or remote operators should be established to ensure the safety and security of personnel and operations.
- .7 All personnel defined by the MSMD should be qualified, competent and capable of performing their function(s) at the appropriate level(s) of responsibility, regardless of the mode of operation.

- .8 The minimum level of safe manning should take into account the impacts of fatigue on all personnel defined within the MSMD.<sup>5</sup>
- .9 The minimum level of safe manning should provide for sufficient hours of rest, taking into account applicable requirements, the provisions set out in the 1978 STCW Convention and STCW Code and the provisions set out in IMO's principles of safe manning.
- .10 Regardless of the mode of operation, the master is responsible for the safe operation of the MASS at all times.
- .11 The master responsible for a MASS may be located physically on board or at a ROC.
- .12 If there are crew or persons on board, the master should be physically present on board to ensure the safety of personnel and operations.
- .13 Multiple masters may be operationally responsible for a MASS on a single voyage.
- .14 Only one master should be responsible for a MASS at any given time.
- .15 Where command is transferred to or within a ROC, or between ROCs, sufficient time, resources and procedures should be provided to ensure that the master can establish situational awareness and is fully familiar with the MASS and any ROC before assuming responsibility for the MASS.

#### **14.2.2 Safe manning for ROC(s)**

Where the levels of safe manning are to be met by the inclusion of remote operators:

- .1 they should be qualified and competent to a level not less than what is required under the 1978 STCW Convention and STCW Code, to undertake their assigned tasks, duties and responsibilities from a ROC, that is certified in accordance with this Code;
- .2 remote operators should not be assigned any task, duty or responsibility, which owing to the characteristics of a ROC or the MASS, cannot be discharged safely and effectively from the ROC, or has been determined by the Administration to be required to be carried out on board; and
- .3 where remote operators perform watchkeeping duties, there should be:
  - .1 a sufficient number of remote operators that meet the appropriate training and certification requirements to cover all watches, that are intended to be performed at a ROC; and
  - .2 sufficient time, resources, and procedures should be provided to ensure that they can establish situational awareness and are fully familiar with the MASS and any ROC before assuming responsibility for a watch.

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<sup>5</sup> Refer to MSC.1/Circ.1598 on *Guidelines on fatigue*.

### **14.3 Watchkeeping**

Watches should be carried out based on the following bridge, engine-room and ROC resource management principles:

- .1 remote operators may maintain a safe watch or watches at the ROC without being physically present on board the MASS;
- .2 an appropriate and effective watch or watches should be maintained for the purpose of safety of the MASS, which includes duties specific to a ROC;
- .3 watchkeeping may be shared between onboard crew and remote operators, provided that clear lines of authority and responsibility are established between all watchkeeping personnel to ensure the safety and security of personnel and operations; and
- .4 watchkeeping duties, tasks and functions should be designed to maintain operational attentiveness.

### **14.4 Training, familiarization and competence**

#### **14.4.1 Onboard crew**

In addition to being qualified as required by the 1978 STCW Convention and STCW Code, onboard crew should have completed training to attain the competencies that are appropriate to the capacity to be filled and so that their duties and responsibility can be taken up, including:

- .1 where the MASS operation includes the use of a ROC certified in accordance with this Code, training and drills for emergencies and failures of systems should be conducted between onboard crew and remote operators; and
- .2 with reference to the task allocation summary, onboard crew should receive relevant additional training related to technologies and systems applied on MASS, including evidence to verify that they have the capacity to operate MASS as required for their duties and responsibilities.

#### **14.4.2 Remote operators**

Remote operators at any level of responsibility should, at a minimum, be qualified to a level not less than that required by the 1978 STCW Convention and STCW Code and have completed training to attain the competencies that are appropriate to the capacity to be filled so that their duties and responsibility can be taken up, including:

- .1 demonstration of the capacity to perform necessary functions for their assigned level(s) of responsibility;
- .2 additional training in remote operations, and the associated demonstration of knowledge, understanding, proficiency and experience, along with its evaluation;
- .3 additional training in remote operations to enable understanding of the operation of ROC and MASS systems and their associated components in order to operate them safely;

- .4 on being assigned to a MASS, familiarization with their specific duties and with all ROC and MASS operations, arrangements, installations, equipment, procedures, documentation and characteristics that are relevant to their routine or emergency duties; and
- .5 as appropriate, training or drills required of MASS should be extended to any ROC(s) and remote operators undertaking duties for that MASS, including any specialized training required to safely operate a MASS remotely and respond to emergencies.

#### **14.4.3 Documents knowledge**

All onboard crew or remote operators should be knowledgeable of the type and purpose of documentation associated with autonomous and/or remote operations.

#### **14.5 Other Matters**

14.5.1 The Administration may consider evidence of remote operational experience as equivalent to approved sea-going service for those working within a ROC for revalidation of certificates.

14.5.2 The provisions on working language set out in SOLAS regulations V/14.3 and 14.4 should extend to any ROC(s) and remote operators.

### **CHAPTER 15 – MAINTENANCE**

15.1 The purpose of this chapter is to ensure that autonomous and remotely-operated systems can be safely maintained, tested and inspected to ensure their reliability.

15.2 Maintenance of autonomous or remotely-operated systems should not result in unsafe events. This should include:

- .1 systems should be able to be safely isolated and verified prior to commencing maintenance; and
- .2 systems should be able to be restarted safely following maintenance allowing time for rebooting or reconfiguring of systems.

15.3 Qualified and authorized persons should be available on board or remotely to monitor the system and equipment faults and abnormal conditions to verify their cause and implement corrective actions.

15.4 Technical, operating and maintenance manuals or information should be made accessible to authorized operating and maintenance personnel.

### **PART III**

#### **GOALS, FUNCTIONAL REQUIREMENTS AND EXPECTED PERFORMANCE APPLICABLE TO SPECIFIC MASS OPERATIONS AND FUNCTIONS**

##### **GENERAL**

Each chapter in this part consists of the Goal of the chapter and related Functional Requirements to fulfil the goal. Also included are, where appropriate, Expected Performances (EPs) associated with those functional requirements.

Chapters should be applied in full, but application of chapters in this part of the Code may be waived in agreement with the Administration as part of the approval process depending on the Concept of Operations and/or MASS functions implemented.

A MASS should be considered to meet a functional requirement set out in this part when either:

- .1 the MASS's design and arrangements meet all the expected performances associated with that functional requirement; or
- .2 part(s) or all of the MASS's relevant design and arrangements have been reviewed and confirmed to be in accordance with applicable provisions of IMO instruments, and any remaining parts of the MASS meet the relevant expected performance as outlined in this Code.

The functional requirements and associated expected performances should take into account the modes of operation of the MASS and any human presence on board.

#### **CHAPTER 16 – SAFETY OF NAVIGATION**

##### **16.1 Goal**

The goal of this chapter is to provide for safe navigation.

##### **16.2 Functional requirements**

To achieve the above-mentioned goal, a MASS should comply with all relevant requirements for safety of navigation in SOLAS, as supplemented by the functional requirements of this chapter, and the Convention on the International Regulations for Preventing Collisions at Sea, 1972, as amended (COLREG).

##### **16.3 General**

16.3.1 A MASS should comply with the following functional requirements for navigation in general.

16.3.2 Autonomous and remote navigation systems for MASS operations should be designed, constructed, and installed to maintain their functionality under the expected conditions in the Operational Envelope (OE).

- EP 1 An Autonomous Navigation System (ANS) or system for remote navigation should be installed enabling the functionalities described in the Concept of Operations (ConOps), other design documents and the task allocation summary.

- EP 2 The use of autonomous or remotely-operated systems for non-navigation functions or tasks should not endanger the safe operation of an ANS or system for remote navigation.
- EP 3 An ANS or system for remote navigation should effectively integrate and coordinate with other MASS systems to prevent conflicting operational commands.
- EP 4 In the event of a failure of an ANS or system for remote navigation, the MASS should be able to be operated safely by alternative means.

16.3.3 All data necessary for safe navigation should be available, in an appropriate format.

- EP 1 A MASS should meet the requirements of SOLAS regulations V/19.2.1.4 and 19.2.1.5 by electronic means.
- EP 2 Data used by, or for input into, an ANS or system for remote navigation should be in a machine-readable format.
- EP 3 The voyage plan should be accessible, at all locations where navigation tasks are executed.

#### **16.4 Sub-functions for MASS navigation**

Any or all of the navigation sub-functions below could be autonomous or remotely-operated, while having different modes of operation according to the ConOps:

- .1 Voyage planning: 16.4.1;
- .2 Situational awareness: 16.4.2;
- .3 Collision and grounding avoidance: 16.4.3; and
- .4 Route execution and monitoring: 16.4.4.

As such, a MASS should comply with the relevant sub-function related requirements only when that sub-function is planned to be autonomous or remotely-operated.

##### **16.4.1 Voyage planning**

16.4.1.1 An ANS or system for remote navigation that is provided with the voyage plan should have a means to ensure that the voyage plan is safe for navigation.

- EP 1 An ANS or system for remote navigation should provide a means to review and as necessary modify the voyage plan.
- EP 2 An ANS or system for remote navigation should be capable of confirming to the master that the voyage plan has been correctly received and is able to validate and implement the voyage plan received.
- EP 3 The use of the voyage plan, and any modification of the voyage plan, by the ANS or system for remote navigation should not be possible without an approval, including verification of its correctness, by the master.

16.4.1.2 An ANS or system for remote navigation that is capable of developing the voyage plan should have a means to ensure that the voyage plan is safe for navigation, taking into account the Guidance developed by the Organization.<sup>6</sup>

- EP 1 An ANS or system for remote navigation should be provided with access to all nautical and hydrographic data necessary to appraise and plan a voyage.
- EP 2 The voyage plan developed by an ANS or system for remote navigation should be presented in a form that allows the master to approve the plan.
- EP 3 The voyage plan should provide an ANS and/or system for remote navigation and the master with all information necessary to execute and monitor a voyage.
- EP 4 An ANS or system for remote navigation should provide a means to review and as necessary modify the voyage plan.

#### **16.4.2 *Situational awareness***

An ANS or system for remote navigation should maintain adequate situational awareness for the purpose of ensuring safe navigation.

- EP 1 An ANS or system for remote navigation should continuously monitor all information necessary for safe navigation, based on the OE.
- EP 2 An ANS or system for remote navigation should continuously analyse the current situation in order to perceive and process navigational and environmental elements and project or predict future statuses. This should be done while considering the operation goals and objectives, the system's capability, and the modes of operation.
- EP 3 An ANS or system for remote navigation should provide a means to make the information obtained and all analysis accessible as necessary.

#### **16.4.3 *Collision and grounding avoidance***

An ANS or system for remote navigation should ensure there is a means to take action in accordance with COLREG to prevent collisions, as well as allisions and groundings.

- EP 1 Planning and decisions to alter course and/or speed should be both timely and in accordance with safe operating limits.
- EP 2 Any action to avoid collisions, allisions or groundings should be based on an assessment of the risk and the action necessary to avoid the risk of a collision, allision or grounding.
- EP 3 Action to avoid collisions, allisions or groundings should not result in another situation which presents intolerable risk to the MASS, other ships or the marine environment.

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<sup>6</sup> Refer to the *Guidelines for voyage planning* (resolution A.893(21)).

#### **16.4.4 Route execution and monitoring**

An ANS or system for remote navigation should safely execute the voyage plan and appropriate monitoring should be provided.

- EP 1 An ANS or system for remote navigation should execute the planned route within the pre-defined limits of allowable deviation taking into account the factors listed in the Guidance developed by the Organization.<sup>7</sup>
- EP 2 An ANS or system for remote navigation should alert the master if the prevailing circumstances and conditions necessitate a deviation from the voyage plan.
- EP 3 An ANS or system for remote navigation should continuously monitor the progress of the MASS against the voyage plan and make the information available, as necessary.

#### **16.5 Override**

An ANS or system for remote navigation should be capable of being overridden from location(s) where control of navigation can be exercised.

- EP 1 Means for overriding operation of an ANS or system for remote navigation should be simple to operate, independent of the systems that they control and allow for control to be taken immediately.

### **CHAPTER 17 – CONNECTIVITY**

#### **17.1 Goal**

The goal of this chapter is to ensure that connectivity is maintained between the MASS and the Remote Operations Centre(s) (ROC(s)), and that it is sufficient for the effective monitoring and/or control of MASS functions.

#### **17.2 Functional requirements**

17.2.1 To achieve the above-mentioned goal, a MASS and ROC should meet the functional requirements of this chapter.

17.2.2 Connectivity between the MASS and ROC is essential for remote monitoring or control and should be ensured as described in the Concept of Operations (ConOps).

17.2.3 The infrastructure for connectivity should cover the operational context of a MASS and provide a quality of service and connectivity, adequate to ensure the safe operation of MASS, taking into account factors such as bandwidth, data integrity, reliability, resilience, and network latency.

17.2.4 Connectivity should be such as to operate the MASS safely, considering operational limitations of connectivity, such as meteorological and oceanographic conditions.

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<sup>7</sup> Refer to the *Guidelines for voyage planning* (resolution A.893(21)).

17.2.5 Connectivity should be maintained at capacity in the case of a single failure in the system.

17.2.6 Redundancy measures should be implemented based on the risk assessment.

17.2.7 The data exchanged should be categorized and prioritized according to a pre-defined prioritization scheme to enable data with higher priority to prevail on lower prioritized data in case of decrease in communication capacity. The pre-defined categorization and prioritization of exchange of data should be included in the ConOps.

17.2.8 Connectivity requirements of the MASS should be established for the different voyage phases and modes of operation.

17.2.9 Connectivity performance should be monitored against stated requirements and measures should be in place to address disconnection or performance degradation and to implement necessary actions including entering a fallback state when necessary.

17.2.10 Connectivity including Computer Based System (CBS)<sup>8</sup> on board MASS and ROCs should ensure the integrity of transmitted data, and that they are sent from authorized authenticated sources. At the same time, measures<sup>9</sup> should be taken to protect the security of transmitted data.

## CHAPTER 18 – REMOTE OPERATIONS

### 18.1 Goal

The goal of this chapter is to ensure the safe and secure remote operation of MASS systems or functions, when duties and responsibilities for safe operation are assigned to a Remote Operations Centre (ROC).

### 18.2 Functional Requirements

18.2.1 To achieve the above-mentioned goal, a MASS and ROC should meet the functional requirements of this chapter.

18.2.2 A ROC should be at a suitable location to enable the safe and secure remote operation.

EP 1 A ROC should have:

- .1 facilities that are secure and protected from unauthorized access;
- .2 means to enable reliable connectivity and communication between ROC(s) and the MASS, third parties and persons on board;
- .3 facilities to allow access to, and sharing of, certificates and other documents required to demonstrate that the MASS is compliant with applicable international, national and regional requirements;

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<sup>8</sup> Refer to IACS UR E22 on *Computer-based systems*, UR E26 on *Cyber resilience of ships* and UR E27 on *Cyber resilience of on-board systems and equipment*.

<sup>9</sup> Refer to MSC.1/Circ.1639 on *The guidelines on cyber security onboard ships* and MSC-FAL.1/Circ.3/Rev.3, as may be amended on *Guidelines on maritime cyber risk management*.

- .4 arrangements, such that the failure and subsequent recovery of the ROC would not result in an unsafe state or intolerable risk on or around the MASS in service;
- .5 verified and validated systems to support its operation;
- .6 sufficient and relevant qualified personnel to enable safe MASS operations; and
- .7 facilities to ensure data and information used, produced, sent or received is retained in reliable and tamper-proof storage, and at a suitable standard of data quality, and considering the SOLAS requirements for voyage data recorders.

18.2.3 A remote control station should be provided to ensure the safe and secure remote operation.

EP 1 A remote control station should:

- .1 have appropriate verified and validated systems;
- .2 have means to monitor the communication and information received, or transmitted, by the MASS and to communicate through the MASS in accordance with relevant communication requirements;
- .3 provide sufficient and accurate data and information to enable the remote operators to carry out their role(s) effectively;
- .4 be fully compatible with the MASS systems assigned to it;
- .5 be tested to ensure that when installing and updating system(s) that the related onboard equipment and devices have appropriate compatibility and interoperability;
- .6 ensure failure and recovery of the control station(s) would not result in an unsafe state or intolerable risk, on or around the MASS in service; and
- .7 be designed and operated in such a way that its location does not impact on its ability to control the MASS.

18.2.4 Verified and validated systems and interfaces between remote control station(s) and the MASS should be provided to ensure the remote operators can operate the MASS safely and securely.

EP 1 This should be accomplished by ensuring the remote operators are able to:

- .1 maintain a watch, as appropriate and applicable, and in a manner conforming to the principles of watchkeeping (as described in chapter 14 (Manning, training and watchkeeping));

- .2 send and receive sufficient, timely and accurate information/commands effectively and securely between the ROC, the MASS, third parties, and persons on board;
- .3 take all decisions necessary to ensure the safe remote operation of the MASS, including support for abandonment of the MASS;
- .4 know the status of the connectivity at the remote control station(s) with the MASS and, where relevant, with third parties;
- .5 know which systems can be controlled, and from where control is being exercised;
- .6 know when conditions on the MASS or at the ROC deviate from the Operational Envelope (OE); and
- .7 monitor the condition and operation of equipment and systems and take measures to mitigate risks.

18.2.5 The transfer of operation should be safe and secure.

EP 1 Safe transfer of operation of the MASS will be accomplished by ensuring that:

- .1 transfer and synchronization of all necessary information is possible between remote control station(s), ROC(s) and the MASS;
- .2 operation can be transferred safely and securely during failure and/or recovery or an emergency situation at the ROC or remote control station(s);
- .3 control cannot be exercised at multiple locations at the same time;
- .4 the present control location is clearly indicated both in ROC and on board the MASS; and
- .5 there is no loss of control of the MASS when the operation is transferred.

18.2.6 The software used for remote operation should be appropriately designed, managed and maintained to ensure the safe and secure operation.

EP 1 The software used should be:

- .1 designed in accordance with chapter 10 (Software principles), taking into account chapter 13 (Alert management);
- .2 integrated, managed, maintained and supported throughout its operational life;
- .3 able to receive, recognize and assist with the prioritization of emergency and non-emergency situations occurring on board the MASS, to enable the remote operators to carry out their role(s) effectively; and

- .4 presented in a form that allows the remote operators to be able to understand the information transmitted to the ROC.

## **CHAPTER 19 – STRUCTURE, SUBDIVISION, STABILITY AND WATERTIGHT INTEGRITY**

### **19.1 Goal**

The goal of this chapter is to ensure that the structure, subdivision, stability, and watertight integrity are within acceptable limits.

### **19.2 Functional Requirements**

19.2.1 To achieve the above-mentioned goal, a MASS should comply with all relevant SOLAS structural, stability, subdivision and watertight integrity requirements, as well as the International Convention on Load Lines, 1966 as amended by the 1988 Protocol, and the 2008 Intact Stability Code, as supplemented by the functional requirements of this chapter.

19.2.2 A stability control system (SCS) should be in place, capable of continuously assessing the intact stability of the MASS during its operation as well as supporting the assessment of the survivability of the MASS in case of damage.

- EP 1 To enable timely mitigation, the SCS should, including during fallback states, be able to:
  - .1 continuously assess the intact stability of the MASS; and
  - .2 identify when the stability of the MASS is outside the Operational Envelope (OE).
- EP 2 The SCS should be able to continuously monitor the loading conditions towards the longitudinal strength.
- EP 3 The SCS should be able to support the assessment of survivability of the MASS in case of damage by providing information on any internal flooding, compartments and spaces affected, draughts and attitude.
- EP 4 The SCS should have resilience to single points of failure.
- EP 5 The SCS should be able to detect existing or predictable stability failures and raise alerts.
- EP 6 The SCS should be able to suggest mitigation actions when the system has detected non-compliance with intact stability criteria.
- EP 7 The SCS should be able to transmit data to relevant systems and onboard crew or remote operators in an appropriate format.
- EP 8 The SCS should be able to be continuously supervised by an independent/supervising function, or human operator, capable of detecting failures or degraded performance.

19.2.3 Accurate and reliable data should be acquired to ensure that the stability, subdivision, weathertight and watertight integrity of the MASS can be maintained under all foreseeable conditions.

19.2.4 Means should be provided for the SCS to reduce the risk of excessive motions of the MASS in adverse sea conditions.

- EP 1 The SCS should be able to continuously measure amplitudes and accelerations of MASS motions.
- EP 2 The SCS should be able to detect when the motions of the MASS exceed predefined thresholds based on its OE, and trigger relevant alerts.
- EP 3 The SCS should be able to suggest adjusting speed and course, in response to the wave direction to ensure compliance with predefined limits for the MASS's motions.
- EP 4 The SCS should be able to suggest appropriate mitigation actions if the approved voyage plan may cause the MASS to exceed its stability thresholds.

## **CHAPTER 20 – FIRE PROTECTION, FIRE DETECTION AND FIRE EXTINCTION**

### **20.1 Goal**

The goal of this chapter is to ensure that fire-safety systems and equipment are effective.

### **20.2 Functional requirements**

20.2.1 To achieve the above-mentioned goal, a MASS should comply with all relevant SOLAS fire safety objectives and requirements, as supplemented by the functional requirements of this chapter.

20.2.2 A MASS should remain under control or enter a fallback state during and following a fire event in any single compartment that is directly linked to the control of the MASS.

20.2.3 A fire which is limited to a single compartment that does not have a direct link to the control of the MASS, should not cause a loss of control or lead to a fallback state.

20.2.4 Means should be provided to detect, confirm, and locate a fire incident.

- EP 1 The detection, confirmation and location of fire incidents should be routed to control station(s).
- EP 2 Means for timely detection of a fire should be provided in all spaces with a fire risk.
- EP 3 Onboard crew and remote operators should be made aware of the detection and location of a fire along with the status of, and any actions taken by, fire protection systems.
- EP 4 Means for detection and confirmation should be independent.

- EP 5 If alarm signals are not acknowledged, a secondary alarm should be automatically activated at control station(s) and throughout the MASS.
- EP 6 After detection and confirmation of the fire, means should be provided to locate the seat of fire, so that the most appropriate fire-extinguishing means may be activated.

20.2.5 Means should be provided to enable the appropriate use of fire-extinguishing systems, taking into account possible human presence.

- EP 1 Information and instructions in relation to fire safety should be provided to any personnel boarding the MASS.
- EP 2 Fire-extinguishing systems should be able to be safely isolated and verified prior to compartment access.
- EP 3 Fire-extinguishing systems should provide onboard indication and warning prior to, and during, activation.
- EP 4 The stability of the MASS should be monitored during any fire-fighting operation.

20.2.6 Means should be provided to monitor and assess fire growth and fire-fighting effectiveness during and after fire.

- EP 1 Means should be provided to assess any smoke development.
- EP 2 Means should be provided to assess the temperature development in spaces adjacent to the compartment affected by the fire.

20.2.7 Means should be provided to enable the remote and onboard control of all active fire protection measures, including containment measures.

- EP 1 All active fire protection measures should be individually controllable, allowing activation, deactivation, and status monitoring at control station(s).
- EP 2 Means should be available to detect fire protection systems-related faults and provide indication at control station(s).

20.2.8 Means should be provided to facilitate an intervention from external fire responders.

- EP 1 Procedures should be in place to transmit any relevant information and data to external fire responders during and following a fire incident.
- EP 2 Means of communication between the external fire responders and the MASS and Remote Operations Centre (ROC) should be ensured during and following a fire incident.

## CHAPTER 21 – SEARCH AND RESCUE

### 21.1 Goal

The goal of this chapter is to ensure that the duties and tasks regarding search and rescue are fulfilled.

### 21.2 Functional requirements

21.2.1 To achieve the above-mentioned goal, the master should comply with all relevant requirements in SOLAS for providing assistance to persons in distress, and as provided in the functional requirements of this chapter and applicable international law.

21.2.2 A MASS and its associated Remote Operations Centre(s) (ROC(s)) should be provided with a ship-specific plan and procedures which enable the master to provide assistance to persons in distress when obligated to do so.

21.2.3 Rescue equipment provided on board should be able to be safely used independently of the presence of crew.<sup>10</sup>

21.2.4 Persons retrieved on board should be able to be safely accommodated until such time as they can be delivered to a place of safety.

EP 1 Persons retrieved on board should be provided with information and arrangements to communicate with a ROC.

EP 2 Persons retrieved on board should be provided with access to any arrangements provided for their safety.

## CHAPTER 22 – CARRIAGE OF CARGOES

### 22.1 Goal

The goal of this chapter is to provide for the carriage of cargoes in a manner that ensures that the MASS, persons on board and the environment are safe.

### 22.2 Functional requirements

22.2.1 To achieve the above-mentioned goal, the MASS should comply with the requirements of SOLAS chapters VI and VII and relevant regulations relating to the carriage of cargoes, as supplemented by the functional requirements of this chapter.

22.2.2 Means should be provided to enable for the safe carriage of cargo involving autonomous or remotely-operated systems and functions.

EP 1 Consideration should be given to the need for any special arrangements regarding:

.1 transfer of cargo information;

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<sup>10</sup> According to SOLAS regulation III/17-1, MSC.1/Circ.1447 on *Guidelines for the development of plans and procedures for the recovery of persons from the water*, MSC.1/Circ.1182/Rev.1 on *Guide to recovery techniques* and MSC.1/Circ.1185/Rev.1 on *Guide for cold water survival*.

- .2 cargo handling, stowing and securing;
- .3 cargo monitoring; and
- .4 emergency response.

## **CHAPTER 23 – ANCHORING, TOWING AND MOORING**

### **23.1 Goal**

The goal of this chapter is to ensure safe and secure anchoring, towing and mooring operations.

### **23.2 Functional Requirements**

23.2.1 To achieve the above-mentioned goal, the MASS should comply with the functional requirements of this chapter. It should be noted that these functions may be treated independently from each other.

23.2.2 Autonomous or remotely-operated anchoring, towing and mooring arrangements should allow the safe conduct of these operations.

23.2.3 Where anchoring, towing and mooring operations involve a Remote Operations Centre (ROC), the remote operators should have sufficient information, oversight and control to enable safe and effective operations with due consideration to interactions with any third parties, infrastructure and/or involved personnel.

23.2.4 The emergency towing arrangements in SOLAS regulation II-1/3-4 should apply to all MASS, and means should be provided to enable remote or autonomous activation where no alternative means of rapid deployment are available.

23.2.5 Anchoring arrangements should be able to be activated autonomously or remotely during fallback states and in emergency situations.

## **CHAPTER 24 – MACHINERY AND ELECTRICAL INSTALLATIONS**

### **24.1 Goal**

The goal of this chapter is to provide for safe and reliable machinery and electrical installations.

### **24.2 Functional requirements**

24.2.1 To achieve the above-mentioned goal, the MASS should comply with the SOLAS requirements for machinery and electrical installations, as supplemented by the functional requirements of this chapter.

24.2.2 Machinery and electrical installations should ensure their availability, including backup functions.

24.2.3 Machinery and electrical installations should be sufficient for the autonomous and remotely-operated functions to be maintained during normal operation, fallback states and emergency situations.

24.2.4 Electrical power production and distribution should be capable of maintaining the MASS in normal operation and fallback states, and ensuring that essential systems remain operational in emergency situations for the period(s) specified by SOLAS.

24.2.5 Machinery and electrical installations should be able to support predefined fallback states, and be fault-tolerant to connectivity being lost or below an acceptable threshold.

24.2.6 Monitoring should be provided to assess system robustness, reliability and effectiveness.

24.2.7 Measures should be provided to prevent machinery or electrical systems being autonomously or remotely-activated when operated or serviced by authorized persons on board, and to ensure the safe reactivation upon completion.

24.2.8 Measures should be provided to detect machinery or electrical system malfunctions or failures to maintain safe operation in normal and emergency situations.

24.2.9 Measures should be provided to ensure availability and resilience according to the mode of operation to respond to machinery or electrical system malfunctions and failures.

## **APPENDIX**

### **FORMAT FOR CERTIFICATES AND RECORDS**

The objective of this appendix is to offer guidance for the development of the MASS and ROC certificates and records as required in chapter 5 (Surveys and certificates) of this Code.

Depending on the Concept of Operations (ConOps) of the respective MASS and associated ROC(s), not all of the elements in the templates proposed in this appendix need to be addressed by the Administration.

**Form of certificate for maritime autonomous surface ships**

**MARITIME AUTONOMOUS SURFACE SHIP SAFETY CERTIFICATE**

This Certificate should be supplemented by a Record of MASS for the Maritime Autonomous Surface Ship Safety Certificate (Form MASS).<sup>1</sup>

(official seal)

(State)

Issued under the provisions of the INTERNATIONAL CODE OF SAFETY FOR MARITIME AUTONOMOUS SURFACE SHIPS (MASS CODE), 2026, as adopted by  
RESOLUTION MSC.595(111)

under the authority of the Government of

---

(name of the State)

by

---

(person or organization authorized)

**Particulars of MASS<sup>2</sup>**

Name of MASS \_\_\_\_\_

Distinctive number or letters \_\_\_\_\_

Port of registry \_\_\_\_\_

Gross tonnage \_\_\_\_\_

IMO Number<sup>3</sup> \_\_\_\_\_

Date of application of the MASS Code<sup>4</sup> \_\_\_\_\_

Date of any major repairs, renewals or modifications of equipment, or systems related to autonomous or remotely-operated functions \_\_\_\_\_

**THIS IS TO CERTIFY:**

- 1 That the MASS has been surveyed in accordance with the provision of II/5.2 of the International Code of Safety for Maritime Autonomous Surface Ships.
- 2 That it has been shown that:
  - 2.1 the inspection, verification and testing of MASS functionality and connectivity with any associated ROCs were satisfactory;
  - 2.2 the autonomous and/or remotely-operated functions of the MASS have been demonstrated to be safe and their condition is in all respects satisfactory and that the MASS complied with the relevant provisions of the Code; and

---

<sup>1</sup> Please insert the version of the Record of MASS: Document no.[...], version no. [...], and issue date [dd/mm/yyyy].

<sup>2</sup> Alternatively, the particulars of the ship may be placed horizontally in boxes.

<sup>3</sup> In accordance with the *Integrated IMO Identification Number Scheme* (resolution A.1215(34)).

<sup>4</sup> Administrations may request the history of the application of the MASS Code.

- 2.3 the MASS complied with goals, functional requirements and expected performances in following chapters of the Code where the Administration deems that compliance with other applied instruments is impracticable or insufficient:

check box, if applicable:

- ☐ III/16 Safety of Navigation
- ☐ III/17 Connectivity
- ☐ III/18 Remote Operations
- ☐ III/19 Structure, Subdivision, Stability and Watertight Integrity
- ☐ III/20 Fire Protection, Fire Detection and Fire Extinction
- ☐ III/21 Search and Rescue
- ☐ III/22 Carriage of Cargoes
- ☐ III/23 Anchoring, Towing and Mooring
- ☐ III/24 Machinery and Electrical Installations

This certificate is valid until \_\_\_\_\_ subject  
to the annual/ intermediate surveys in accordance with II/5.2 of the Code.

Completion date of the survey on which this certificate is based  
\_\_\_\_\_ (dd/mm/yyyy)

Issued at \_\_\_\_\_  
(place of issue of the certificate)

\_\_\_\_\_  
(date of issue) (signature of authorized official issuing the certificate)

(seal or stamp of the issuing authority, as appropriate)

**Endorsement for annual and intermediate surveys**

THIS IS TO CERTIFY that, at a survey required by II/5.2 of the Code, the MASS was found to comply with the relevant requirements of the Code.

Annual survey  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
  
(seal or stamp of the authority, as appropriate)

Annual/Intermediate<sup>5</sup> survey  
\_\_\_\_\_  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
  
(seal or stamp of the authority, as appropriate)

Annual/Intermediate<sup>5</sup> survey  
\_\_\_\_\_  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
  
(seal or stamp of the authority, as appropriate)

Annual survey  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
  
(seal or stamp of the authority, as appropriate)

---

<sup>5</sup> Delete as appropriate

***Endorsement to extend the certificate if valid for less than five years in alignment with the provisions of regulation I/14(c) of the SOLAS Convention***

The MASS complies with the provisions of II/5.2 of the Code, and this certificate should, in alignment with the provisions of regulation I/14(c) of the SOLAS Convention, be accepted as valid until \_\_\_\_\_

Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_

(seal or stamp of the authority, as appropriate)

***Endorsement for renewal surveys years in alignment with the provisions of regulation I/14(d) of the SOLAS Convention***

THIS IS TO CERTIFY that, at a survey required by II/5.2.2.2 of the Code, the MASS was found to comply with the relevant provisions of the Code.

Renewal survey:

Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_

***Endorsement to extend the validity of the certificate until reaching the port of survey or for a period of grace in alignment with the provisions of regulations I/14(e) or I/14(f) of the SOLAS Convention***

The certificate should, in alignment with the provisions of regulation I/14(e)/I/14(f)<sup>5</sup> of the SOLAS Convention, be accepted as valid until \_\_\_\_\_

Signed \_\_\_\_\_  
(signature of authorized official)

Place \_\_\_\_\_

Date \_\_\_\_\_

(seal or stamp of the authority, as appropriate)

***Endorsement for advancement of anniversary date in alignment with the provisions of regulation I/14(h) of the SOLAS Convention***

In alignment with the provisions of regulation I/14(h) of the SOLAS Convention, the new anniversary date is \_\_\_\_\_

Signed \_\_\_\_\_  
(signature of authorized official)

Place \_\_\_\_\_

Date \_\_\_\_\_

(seal or stamp of the authority, as appropriate)

In alignment with the provisions of regulation I/14(h) of the Convention, the new anniversary date is \_\_\_\_\_

Signed \_\_\_\_\_  
(signature of authorized official)

Place \_\_\_\_\_

Date \_\_\_\_\_

(seal or stamp of the authority, as appropriate)

---

<sup>5</sup> Delete as appropriate.

**Form of certificate for maritime autonomous surface ships remote operations centre**

**MARITIME AUTONOMOUS SURFACE SHIPS  
REMOTE OPERATIONS CENTRE CERTIFICATE**

This Certificate should be supplemented by a Record of MASS Remote Operations Centre (ROC) for the MASS Remote Operations Centre Certificate (Form MASS-ROC).<sup>1</sup>

*(official seal)*

*(State)*

Issued under the provisions of the INTERNATIONAL CODE OF SAFETY FOR MARITIME  
AUTONOMOUS SURFACE SHIPS (MASS CODE), 2026, as adopted by  
RESOLUTION MSC.595(111)

under the authority of the Government of

\_\_\_\_\_  
*(name of the State)*

by

\_\_\_\_\_  
*(person or organization authorized)*

**Particulars of ROC<sup>2</sup>**

ROC identifier \_\_\_\_\_  
ROC Company Name \_\_\_\_\_  
ROC Company Address \_\_\_\_\_  
ROC location (Physical address or other) \_\_\_\_\_

Provide the above information as applicable.

**Particulars of the MASS operated by ROC<sup>3</sup>**

Name of MASS \_\_\_\_\_  
Distinctive number or letters \_\_\_\_\_  
Port of registry \_\_\_\_\_  
Gross tonnage \_\_\_\_\_  
IMO Number<sup>4</sup> \_\_\_\_\_

THIS IS TO CERTIFY:

---

<sup>1</sup> Please insert the version of the Record of MASS ROC: Document no.[...], version no. [...], and issue date [dd/mm/yyyy].

<sup>2</sup> Alternatively, the particulars of the ROC may be placed horizontally in boxes.

<sup>3</sup> Alternatively, the particulars of the ship may be placed horizontally in boxes.

<sup>4</sup> In accordance with the *Integrated IMO Identification Number Scheme* (resolution A.1215(34)).

- 1 That the ROC has been surveyed in accordance with the provisions of II/5.4 of the International Code of Safety for Maritime Autonomous Surface Ships.
- 2 That it has been shown that:
  - 2.1 the inspection, verification and testing of the ROC and MASS remote operation functionality were satisfactory;
  - 2.2 the ROC is demonstrated to have the ability to support the autonomous and/or remotely-operated functions of the MASS in compliance with the relevant provisions of the Code.
  - 2.3 the ROC complied with the requirements of III/17 and III/18 of the Code;
  - 2.4 the ROC complied with goals, functional requirements and expected performances in the following chapters of the Code where the Administration deems that compliance with other applied instruments is impracticable or insufficient:

check box, if applicable:

- ☐ III/16 Safety of Navigation
- ☐ III/19 Structure, Subdivision, Stability and Watertight Integrity
- ☐ III/20 Fire Protection, Fire Detection and Fire Extinction
- ☐ III/21 Search and Rescue
- ☐ III/22 Carriage of Cargoes
- ☐ III/23 Anchoring, Towing and Mooring
- ☐ III/24 Machinery and Electrical Installations

This certificate is valid until \_\_\_\_\_ subject to the annual/ intermediate surveys in accordance with II/5.4 of the Code.

Completion date of the survey on which this certificate is based \_\_\_\_\_  
(dd/mm/yyyy)

Issued at \_\_\_\_\_  
(place of issue of the certificate)

\_\_\_\_\_  
(date of issue)

\_\_\_\_\_  
(signature of duly authorized official issuing the certificate)

(seal or stamp of the issuing authority, as appropriate)

**Endorsement for annual and intermediate surveys**

THIS IS TO CERTIFY that, at a survey required by II/5.4 of the Code, the ROC was found to comply with the relevant requirements of the Code.

Annual survey  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
(seal or stamp of the authority, as appropriate)

Annual/Intermediate<sup>5</sup> survey  
\_\_\_\_\_  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
(seal or stamp of the authority, as appropriate)

Annual/Intermediate<sup>5</sup> survey  
\_\_\_\_\_  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
(seal or stamp of the authority, as appropriate)

Annual survey  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
(seal or stamp of the authority, as appropriate)

<sup>5</sup> Delete as appropriate.

***Endorsement to extend the certificate if valid for less than five years in alignment with the provisions of regulation I/14(c) of the SOLAS Convention***

The ROC complies with the provisions of II/5.4 of the Code, and this certificate should, in alignment with the provisions of regulation I/14(c) of the SOLAS Convention, be accepted as valid until \_\_\_\_\_

Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_

*(seal or stamp of the authority, as appropriate)*

***Endorsement for renewal surveys years in alignment with the provisions of regulation I/14(d) of the SOLAS Convention***

THIS IS TO CERTIFY that, at a survey required by II/5.4.2.2 of the Code, the ROC was found to comply with the relevant provisions of the Code.

Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_

*(seal or stamp of the authority, as appropriate)*

***Endorsement to extend the validity of the certificate until the MASS reaches the port of survey or for a period of grace in alignment with the provisions of regulations I/14(e) or I/14(f) of the SOLAS Convention***

The certificate should, in alignment with the provisions of regulation I/14(e)/I/14(f)<sup>5</sup> of the SOLAS Convention, be accepted as valid until \_\_\_\_\_

Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_

*(seal or stamp of the authority, as appropriate)*

***Endorsement for advancement of anniversary date in alignment with the provisions of regulation I/14(h) of the SOLAS Convention***

In alignment with the provisions of regulation I/14(h) of the SOLAS Convention, the new anniversary date is \_\_\_\_\_

Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_

*(seal or stamp of the authority, as appropriate)*

In alignment with the provisions of regulation I/14(h) of the SOLAS Convention, the new anniversary date is \_\_\_\_\_

Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_

*(seal or stamp of the authority, as appropriate)*

---

<sup>5</sup> Delete as appropriate.

**Form of provisional certificate for maritime autonomous surface ships**

**PROVISIONAL MARITIME AUTONOMOUS SURFACE SHIP SAFETY CERTIFICATE**

This provisional Certificate should be supplemented by a Record of MASS for the Maritime Autonomous Surface Ships Safety Certificate (Form MASS).<sup>1</sup>

*(official seal)*

*(State)*

Issued under the provisions of the INTERNATIONAL CODE OF SAFETY FOR MARITIME  
AUTONOMOUS SURFACE SHIPS (MASS CODE), 2026, as adopted by  
RESOLUTION MSC.595(111)

under the authority of the Government of

\_\_\_\_\_  
*(name of the State)*

by \_\_\_\_\_  
*(person or organization authorized)*

**Particulars of MASS<sup>2</sup>**

Name of MASS \_\_\_\_\_

Distinctive number or letters \_\_\_\_\_

Port of registry \_\_\_\_\_

Gross tonnage \_\_\_\_\_

IMO Number<sup>3</sup> \_\_\_\_\_

Date of application of the MASS Code<sup>4</sup> \_\_\_\_\_

Date of any major repairs, renewals or modifications of equipment, or systems related to  
autonomous or remotely-operated functions \_\_\_\_\_

---

<sup>1</sup> Please insert the version of the Record of MASS: Document no.[...], version no. [...], and issue date [dd/mm/yyyy].

<sup>2</sup> Alternatively, the particulars of the MASS may be placed horizontally in boxes.

<sup>3</sup> In accordance with the *Integrated IMO Identification Number Scheme* (resolution A.1215(34)).

<sup>4</sup> Administrations may request the history of the application of the MASS Code.

THIS IS TO CERTIFY:

- 1      That the MASS complied with the provision of II/5.5 of the International Code of Safety for Maritime Autonomous Surface Ships which enables initiation of operations during the testing and verification stage.
- 2      That individual MASS systems have been tested and verified, and results of ship simulation (if applicable) have been reviewed and accepted.
- 3      That all the design documents have been updated accordingly and approved according to the simulation and system testing results.
- 4      That the MASS period of testing is limited to (dd/mm/yyyy)\_\_\_\_\_
- 5      That the MASS area of testing is limited to\_\_\_\_\_
- 6      That an approved verification and validation plan is in place covering the management of safety and scope of testing to be completed.

This provisional certificate is valid until \_\_\_\_\_, subject to the annual/ intermediate surveys listed in II/5.2 of the Code, and any additional surveys covered by the verification and validation plan.

Completion date of the survey on which this certificate is based  
\_\_\_\_\_ (dd/mm/yyyy)

Issued at \_\_\_\_\_  
(place of issue of the certificate)

\_\_\_\_\_  
(date of issue) (signature of authorized official issuing the certificate)

(seal or stamp of the issuing authority, as appropriate)

**Endorsement for annual and intermediate surveys**

THIS IS TO CERTIFY that, at a survey required by II/5.2 of the Code, the MASS was found to comply with the relevant requirements of the Code.

Annual survey  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
  
(seal or stamp of the authority, as appropriate)

Annual/Intermediate<sup>5</sup> survey  
\_\_\_\_\_  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
  
(seal or stamp of the authority, as appropriate)

Annual/Intermediate<sup>5</sup> survey  
\_\_\_\_\_  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
  
(seal or stamp of the authority, as appropriate)

Annual survey  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
  
(seal or stamp of the authority, as appropriate)

---

<sup>5</sup> Delete as appropriate.

**Form of provisional certificate for maritime autonomous surface ships remote operations centre**

**PROVISIONAL MARITIME AUTONOMOUS SURFACE SHIPS  
REMOTE OPERATIONS CENTRE CERTIFICATE**

This provisional Certificate should be supplemented by a Record of MASS Remote Operations Centre (ROC) for the MASS Remote Operations Centre Certificate (Form MASS-ROC).<sup>1</sup>

(official seal)

(State)

Issued under the provisions of the INTERNATIONAL CODE OF SAFETY FOR MARITIME AUTONOMOUS SURFACE SHIPS (MASS CODE), 2026, as adopted by RESOLUTION MSC.595(111)

under the authority of the Government of

\_\_\_\_\_  
(name of the State)

by \_\_\_\_\_  
(person or organization authorized)

**Particulars of ROC<sup>2</sup>**

ROC Identifier \_\_\_\_\_  
ROC Company Name \_\_\_\_\_  
ROC Company Address \_\_\_\_\_  
ROC Location (Physical address or other) \_\_\_\_\_

**Particulars of the MASS operated by ROC<sup>3</sup>**

Name of MASS \_\_\_\_\_  
Distinctive number or letters \_\_\_\_\_  
Port of registry \_\_\_\_\_  
Gross tonnage \_\_\_\_\_  
IMO Number<sup>4</sup> \_\_\_\_\_

---

<sup>1</sup> Please insert the version of the Record of MASS ROC: Document no.[...], version no. [...], and issue date [dd/mm/yyyy].

<sup>2</sup> Alternatively, the particulars of the ROC may be placed horizontally in boxes.

<sup>3</sup> Alternatively, the particulars of the ship may be placed horizontally in boxes.

<sup>4</sup> In accordance with the *Integrated IMO Identification Number Scheme* (resolution A.1215(34)).

THIS IS TO CERTIFY:

- 1      That the ROC complied with the provision of II/5.5 of the International Code of Safety for Maritime Autonomous Surface Ships, which enables initiation of operations during the testing and verification stage.
- 2      That individual systems related to MASS remote operation functionality have been tested and verified and results of simulation (if applicable) have been reviewed and accepted.
- 3      That all the design documents have been updated accordingly and approved according to the simulation and system testing results.
- 4      That the MASS period of testing is limited to (dd/mm/yyyy)\_\_\_\_\_
- 5      That the MASS area of testing is limited to\_\_\_\_\_
- 6      That an approved verification and validation plan is in place covering the management of safety and scope of testing to be completed.

This provisional certificate is valid until \_\_\_\_\_, subject to the annual/ intermediate surveys listed in II/5.4 of the Code, and any additional surveys covered by the verification and validation plan.

Completion date of the survey on which this certificate is based  
\_\_\_\_\_ (dd/mm/yyyy)

Issued at \_\_\_\_\_  
(place of issue of the certificate)

\_\_\_\_\_  
(date of issue)                      \_\_\_\_\_  
(signature of duly authorized official issuing the certificate)

(seal or stamp of the issuing authority, as appropriate)

**Endorsement for annual and intermediate surveys**

THIS IS TO CERTIFY that, at a survey required by II/5.4 of the Code, the ROC was found to comply with the relevant requirements of the Code.

Annual survey  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
  
(seal or stamp of the authority, as appropriate)

Annual/Intermediate<sup>5</sup> survey  
\_\_\_\_\_  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
  
(seal or stamp of the authority, as appropriate)

Annual/Intermediate<sup>5</sup> survey  
\_\_\_\_\_  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
  
(seal or stamp of the authority, as appropriate)

Annual survey  
Signed \_\_\_\_\_  
(signature of authorized official)  
Place \_\_\_\_\_  
Date \_\_\_\_\_  
  
(seal or stamp of the authority, as appropriate)

---

<sup>5</sup> Delete as appropriate.

## Record of MASS for the Maritime Autonomous Surface Ship Safety Certificate (Form MASS)

This Record should be permanently attached to the Maritime Autonomous  
Surface Ship Safety Certificate

### RECORD OF MASS FOR COMPLIANCE WITH THE INTERNATIONAL CODE OF SAFETY FOR MARITIME AUTONOMOUS SURFACE SHIPS

## 1 DESCRIPTION OF THE CONCEPT OF OPERATIONS (CONOPS)

### 1.1 Particulars of MASS

|                               |  |
|-------------------------------|--|
| Name of MASS                  |  |
| Name of Company               |  |
| Distinctive number or letters |  |
| Port of registry              |  |
| Gross tonnage                 |  |
| IMO Number <sup>1</sup>       |  |

### 1.2 Overview of MASS and MASS functions

|                                                                                  |  |
|----------------------------------------------------------------------------------|--|
| General description of the scope of operations the MASS is authorized to perform |  |
| Brief description of autonomous functions                                        |  |
| Brief description of remote operation functions                                  |  |
| Other descriptions of MASS functions                                             |  |

### 1.3 Key systems

Description and list of key systems related to autonomous and/or remotely-operated functions.  
(Consistent function/system identifiers should be used throughout this Record)

| ID                                                                                                                                                                | Function | System | Description |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------|-------------|
| Systems essential to the safe and secure operation of the ship as required in <b>Part II of the MASS Code</b> : (for example, alert management, maintenance, etc) |          |        |             |
| 1                                                                                                                                                                 |          |        |             |
| 2                                                                                                                                                                 |          |        |             |
|                                                                                                                                                                   |          |        |             |
|                                                                                                                                                                   |          |        |             |
| Systems required as described in <b>Part III of the MASS Code</b> : (for example, navigation, stability, cargo handling, etc)                                     |          |        |             |
| 1                                                                                                                                                                 |          |        |             |
| 2                                                                                                                                                                 |          |        |             |
|                                                                                                                                                                   |          |        |             |
|                                                                                                                                                                   |          |        |             |

<sup>1</sup> In accordance with the *Integrated IMO Identification Number Scheme* (resolution A.1215(34)).

## 1.4 Operational Envelope

### 1.4.1 Modes of operation

Overview of configuration(s), as applicable, for the allocation of MASS functions and their supervision, taking into account different modes of operation during different voyage phases. Note that the Minimum Safe Manning Document (MSMD) should address each mode of operation. *(Consistent mode of operation identifiers should be used throughout this Record).*

| Voyage Phase A: |                   |                                |                        |
|-----------------|-------------------|--------------------------------|------------------------|
| MASS Function   | Mode of Operation | Function Allocation & Location | Supervision & Location |
| Function 1      | 1:                |                                |                        |
|                 | 2:                |                                |                        |
|                 | 3:                |                                |                        |
| Function 2      | 1:                |                                |                        |
|                 | 2:                |                                |                        |
|                 | 3:                |                                |                        |
| Function 3      | 1:                |                                |                        |
|                 | 2:                |                                |                        |
|                 | 3:                |                                |                        |
| Voyage Phase B: |                   |                                |                        |
| MASS Function   | Mode of Operation | Function Allocation & Location | Supervision & Location |
| Function 1      | 1:                |                                |                        |
|                 | 2:                |                                |                        |
|                 | 3:                |                                |                        |
| Function 2      | 1:                |                                |                        |
|                 | 2:                |                                |                        |
|                 | 3:                |                                |                        |
| Function 3      | 1:                |                                |                        |
|                 | 2:                |                                |                        |
|                 | 3:                |                                |                        |

#### 1.4.2 Limitations of autonomous and/or remote operation

Limitations under which the MASS can operate safely in all operating conditions, including all reasonably foreseeable degraded states.

| Category                                | Description of limitation(s) <i>(Variances applicable in different modes of operation and/or normal/degraded states should be clearly stated)</i> |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Environmental limitations</b>        |                                                                                                                                                   |
|                                         |                                                                                                                                                   |
|                                         |                                                                                                                                                   |
|                                         |                                                                                                                                                   |
| <b>Geographical limitations</b>         |                                                                                                                                                   |
|                                         |                                                                                                                                                   |
|                                         |                                                                                                                                                   |
|                                         |                                                                                                                                                   |
| <b>Operational limitations</b>          |                                                                                                                                                   |
|                                         |                                                                                                                                                   |
|                                         |                                                                                                                                                   |
|                                         |                                                                                                                                                   |
| <b>Other limitations, if applicable</b> |                                                                                                                                                   |
|                                         |                                                                                                                                                   |
|                                         |                                                                                                                                                   |

#### 1.5 Fallback State(s) and Contingency Plans

Fallback states and contingency plans for the MASS (as a whole, not individual functions or systems). *(Variances applicable in different modes of operation/voyage phase should be clearly stated. Where multiple fallback states are available, the application of any hierarchy to activation sequencing, should also be clearly stated).*

| Fallback state(s) |                     |                              |
|-------------------|---------------------|------------------------------|
| ID                | Conditions of entry | Predefined fallback response |
| 1                 |                     |                              |
| 2                 |                     |                              |
|                   |                     |                              |
|                   |                     |                              |

| Contingency Plans |                          |                    |
|-------------------|--------------------------|--------------------|
| ID                | Conditions of activation | Predefined actions |
| 1                 |                          |                    |
| 2                 |                          |                    |
|                   |                          |                    |
|                   |                          |                    |

## 2 SURVEY REQUIREMENTS ASSOCIATED WITH THE SYSTEMS TO WHICH THE MASS CODE IS APPLIED

|   | Systems (as in 1.3) | Survey Requirements |
|---|---------------------|---------------------|
| 1 |                     |                     |
| 2 |                     |                     |
|   |                     |                     |
|   |                     |                     |

## 3 TASK ALLOCATION SUMMARY

The document describing the distribution of functions and tasks between human and machine/systems in normal, abnormal and emergency situations, as approved by the Administration, should accompany this Record.

## 4 REGULATORY GAP ANALYSIS

Authorized MASS-related deviations from applicable rules and regulations.

|   | Affected rule or regulation | Description of deviation/alternative solutions |
|---|-----------------------------|------------------------------------------------|
| 1 |                             |                                                |
| 2 |                             |                                                |
|   |                             |                                                |
|   |                             |                                                |

## 5 LIST OF ROC(S) APPROVED FOR WORKING WITH THE MASS

Number of approved Remote Operations Centres: \_\_\_\_\_

| ID | ROC identifier | ROC location<br>(Physical address or other) | ROC Company Name | Description (including, for example, scope of remote operation, redundancy arrangements, communication configurations, transfer of control conditions) |
|----|----------------|---------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  |                |                                             |                  |                                                                                                                                                        |
| 2  |                |                                             |                  |                                                                                                                                                        |
|    |                |                                             |                  |                                                                                                                                                        |
|    |                |                                             |                  |                                                                                                                                                        |

Provide the above information as applicable.

THIS IS TO CERTIFY that this Record is correct in all respects.

Issued at \_\_\_\_\_  
*(place of issue of the Record)*

\_\_\_\_\_  
*(date of issue)*                      *(signature of duly authorized official issuing the Record)*

*(seal or stamp of the issuing authority, as appropriate)*

**Record of MASS ROC for MASS Remote Operations Centre Certificate  
(Form MASS-ROC)**

This Record should be permanently attached to MASS Remote Operations Centre Certificate

**RECORD OF MASS ROC FOR COMPLIANCE WITH THE INTERNATIONAL CODE OF  
SAFETY FOR MARITIME AUTONOMOUS SURFACE SHIPS**

**1 PARTICULARS OF ROC**

|                                          |  |
|------------------------------------------|--|
| ROC Identifier                           |  |
| ROC Company Name                         |  |
| ROC Location (Physical address or other) |  |
| Description                              |  |

**2 DESCRIPTION OF MASS CONCEPT OF OPERATIONS (CONOPS)**

A copy of the MASS Safety Certificate and MASS Record should accompany this document. A description of the Concept of Operations (ConOps) for the MASS can be found in its MASS Record.

**3 ROC OPERATIONAL LIMITATIONS**

| <b>Category</b> | <b>Description of limitation(s) (for example, geographical, human element, operational, number of control stations, etc.) (Variances applicable in different modes of operation and/or normal/degraded states should be clearly stated)</b> |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                 |                                                                                                                                                                                                                                             |
|                 |                                                                                                                                                                                                                                             |
|                 |                                                                                                                                                                                                                                             |
|                 |                                                                                                                                                                                                                                             |

**4 INFRASTRUCTURE FOR CONNECTIVITY**

|                                                                                                                                           |  |
|-------------------------------------------------------------------------------------------------------------------------------------------|--|
| Description and list of infrastructure for connectivity (for example, communications devices authorized for use to communicate with MASS) |  |
| 1                                                                                                                                         |  |
| 2                                                                                                                                         |  |
|                                                                                                                                           |  |
|                                                                                                                                           |  |
| Description of quality of service and performance (for example, bandwidth, network latency, data integrity, reliability etc)              |  |
|                                                                                                                                           |  |

## 5 OTHER SYSTEMS

|                                                                                                         |
|---------------------------------------------------------------------------------------------------------|
| Other systems at the ROC supporting remote operation <i>(for example, uninterruptable power supply)</i> |
|                                                                                                         |
|                                                                                                         |
|                                                                                                         |
|                                                                                                         |

THIS IS TO CERTIFY that this Record is correct in all respects.

Issued at \_\_\_\_\_  
*(place of issue of the Record)*

\_\_\_\_\_  
*(date of issue)*                      *(signature of duly authorized official issuing the Record)*

*(seal or stamp of the issuing authority, as appropriate)*

## ANNEX 1

### APPROVAL PROCESS

Table 1 provides additional guidance in relation to the approval steps that require relevant documentation.

#### 1 Preliminary design development

The following MASS specific documentation should be compiled and submitted:

- .1 Concept of Operations (ConOps); as described in II/8.2 of the Code.
- .2 Preliminary design documents; the initial set of preliminary documents should be submitted as deemed necessary to illustrate the main characteristics of the MASS and system arrangements, especially related to autonomous and remotely controlled functions.
- .3 High-level risk assessment report; the objective of the high-level risk assessment is to identify safety critical areas and functions at an early stage and to assist as far as practicable to the drafting of the initial approval basis.
- .4 Approval basis; should be submitted for approval by the Administration at the end of the preliminary design development. It should be highlighted that within the context of an iterative approval process, it is expected that this document will be modified significantly throughout the process.
- .5 Preliminary actions register; the necessary actions for the completion of the process should be drafted, while the early involvement of key stakeholders should be ensured for a clear understanding of roles and responsibilities in the approval process.

#### 2 Preliminary design approval

- .1 *Risk assessment report*; a risk assessment, as described in chapter 7 (Risk assessment) of the Code should be performed for all the functions affected by autonomous or remote operations. The level of detail of the risk assessment should be proportional to the complexity of the project.
- .2 *Preliminary design documents*; as the approval process is an iterative one, the purpose of the preliminary design documents is to further describe and illustrate the key elements of the project that prove the equivalence justification. At the end of this step and possibly after more than one iteration, the design parameters of the systems and system interaction in question should be clear enough to be able to determine appropriate performance criteria that could be verified through testing and other verification methods.

At the end of the step, there should be an alignment between the submitted documents and the risk assessment in terms of assumptions and philosophy, especially regarding mitigation measures. The preliminary design documents could be the following:

- .1 Safety philosophy;
  - .2 Design philosophy;
  - .3 Operation and maintenance philosophy;
  - .4 Emergency response philosophy;
  - .5 General arrangement;
  - .6 Systems and equipment matrix; and
  - .7 ConOps including Operational Envelope (OE) (updated).
- .3 *Drawings and information documents* (optional): while the iteration process of the project advances, it might be necessary for the approval process to also submit relevant drawings and information documents to clarify certain aspects of the design, especially on issues that are found to be safety critical (i.e. implying very high risk according to the risk analysis). It is expected that such issues that need to be demonstrated at a more detailed level are issues where redundancy, fault tolerance or fail-safe mechanisms need to be further explained.
- .4 *Task allocation summary*: a task and function allocation summary should be submitted describing the distribution of functions and tasks between human and machine/systems in both normal, abnormal and emergency situations. The task allocation summary should be aligned with the other design documents. There should be particular focus on the expected control actions performed, while especially in the case of human operators it should be made possible to evaluate their expected workload but also their cognitive support.
- .5 *Approval basis*: it is expected to be updated with each iteration, especially when design details and assumptions are decided and documented. At the end of this step the approval basis should be a significantly more detailed document than the one presented in paragraph 1.2 of the present annex.
- .6 *Regulatory gap analysis*: a regulatory gap analysis should be submitted to document any deviations from the applicable regulatory framework. At the end of the preliminary approval step, it is not expected that this document will cover all the applicable prescriptive provisions, however it would be beneficial for the detailed design approval to already introduce as much detail as possible. This should be demonstrated through a link between the risk analysis and justification on why design or operational solutions are justified as being equivalent.
- .7 *Verification and validation (V&V) plan*: the final step to the preliminary design approval is the detailed definition of how it is intended to perform V&V of the systems and the MASS as a whole. The objective of the V&V plan should be to describe how functionalities regarding autonomous and remote operations will be verified. A V&V plan should be submitted for approval considering the following:

- .1 high-risk functions and system components as they stem from the risk assessment;
- .2 boundary conditions and system safety requirements and constraints;
- .3 cybersecurity-related features upon which the protection of the safety-critical components is based;
- .4 incorrect and unexpected inputs and input sequences and timing;
- .5 reaction of the system-to-system faults and failures;
- .6 fail-safe modes and fallback states;
- .7 operational procedures for V&V; and
- .8 ensure that no additional hazards are introduced during V&V.

The V&V plan should also include a detailed time frame including intermediate deliverables and reports as deemed necessary. A periodic progress review by the Administration and any organization performing third-party verification should be considered. If the complexity of the project does not allow for a complete time frame to be set at this stage, an initial time frame may be accepted for a specific period to be agreed upon.

- .8 *Actions register*: the actions register, as described in paragraph 1.5 of the present annex, should be updated accordingly.

### **3 Testing, simulation and other verification methods**

3.1 Testing and verification should be conducted according to the defined V&V plan and the relevant reports submitted for information. According to the testing results, the design documents, as well as the approval basis, the actions register and the V&V plan may need to be updated accordingly. In the case that the V&V plan is reflecting an outdated time frame, it should be updated accordingly.

3.2 A high degree of transparency with the Administration and any organization conducting third-party verification is strongly recommended to facilitate this approval step.

3.3 Different testing and verification methods might be used upon request and should be approved by the Administration. Model tests or simulations are recommended to verify the control system before a full-scale test of the MASS is performed.

3.4 For tests to be conducted, the relevant procedure(s) should be submitted to the Administration in due time before testing. The test report should be submitted after testing, where a summary or test log should include how the test and its results are linked to the design documents and the V&V plan.

3.5 The testing of certain systems or parts of systems may include an element of simulation-based testing. Such testing should not replace full-scale testing.

## **4 Final approval**

4.1 This approval step should follow the approach from the *Guidelines for the approval of alternatives and equivalents as provided for in various IMO instruments* (MSC.1/Circ.1455). It is particularly important to correlate the different components and systems that constitute the MASS under consideration. In addition, this step should be used as a verification that the different steps leading to the final approval are consistent and can be easily verified.

4.2 Before the initial survey of the MASS, testing needs to have been completed to demonstrate the requirements in the approval basis have been met. This evidence would typically include the final design documents and the reports of activities undertaken, including a link to the related item of the V&V plan.

4.3 A summary of the equivalence justifications should be submitted. This summary should articulate the approach taken to demonstrating compliance with the approval basis and include the Submitter statement that compliance with the approval basis has been demonstrated.

4.4 The Submitter should propose any survey or inspection requirements associated with the system(s) in question. The operational requirements (e.g. training, maintenance) to address the innovative technology aspects should also be included in the in-service documentation. Focus should be put on any operational restrictions.

**Table 1 – Relevant documentation for approval steps**

|                                     | Preliminary design development | Preliminary design approval | Testing, simulation and other verification methods | Final approval | Operation |
|-------------------------------------|--------------------------------|-----------------------------|----------------------------------------------------|----------------|-----------|
| Preliminary design documents        | X*                             | X                           |                                                    |                |           |
| Drawings and information documents  |                                | X                           |                                                    | X              | X**       |
| Risk Assessment                     | X*                             | X                           |                                                    | X              | X**       |
| Task allocation summary             |                                | X                           |                                                    | X              | X**       |
| Approval basis and Actions register | X*                             | X                           | X                                                  | X              | X**       |
| Regulatory gap analysis             |                                | X                           |                                                    |                |           |
| Verification and validation plan    |                                | X                           |                                                    |                |           |
| Testing and verification reports    |                                |                             | X                                                  |                |           |

\* Preliminary and high level only

\*\* In case of changes in the approved concept, assumptions and conditions

## ANNEX 2

### FRAMEWORK FOR CONCEPT OF OPERATIONS

The objective of this framework is to offer clear guidance during the development of the Concept of Operations (ConOps) as required in chapter 8 (Operational context) of the MASS Code.

#### **1 INTRODUCTION**

ConOps is a high-level document that, in conjunction with other design documents, serves as a key source of information for the design, approval, and operation of a MASS. In this section, it should be clearly indicated which step in the approval process this document pertains to. The appropriate degree of detail within ConOps will depend on the development process and should be to the satisfaction of the Administration. Additionally, it should offer a high-level overview of the modifications made to the previous version, along with the reasons for these changes.

#### **2 OVERVIEW OF MASS FUNCTIONS**

This section provides an overall picture of the objective of the target MASS, including a general description of the scope and intent of autonomous and/or remotely-operated functions, its use cases and corresponding operation and voyage phases, etc.

#### **3 TECHNICAL CHARACTERISTICS OF MASS**

This section provides a general description of particulars and systems related to autonomous and/or remotely-operated functions.

##### **3.1 Particulars of the MASS**

This section provides general information on the MASS, including main dimensions, design/service speed, manoeuvrability, cargo type and deadweight, ballast/full load draft, ballast/full load displacement, steering capability, propulsion capacity, fuel/water storage (if applicable), energy storage, self-sustaining capacity, etc. These factors should be considered when designing/aligning autonomous and/or remotely-operated systems/functions.

##### **3.2 Key systems**

This section describes systems related to functions which are essential to the safe and secure operation of MASS as described in part II of the MASS Code, including security, alert management, maintenance, etc.

##### **3.3 Systems related to autonomous and/or remotely-operated functions**

This section describes systems related to autonomous and/or remotely-operated functions as described in part III of the MASS Code, including navigation, connectivity, remote operations, structure, subdivision, stability and watertight integrity, fire protection, fire detection and fire extinction, search and rescue, carriage of cargoes, anchoring, towing and mooring, and machinery and electrical installations. The inclusion of these systems depends on the specific modes of operation and the functionality being certified.

## **4 OPERATIONAL ENVELOPE**

This section describes MASS functions, conditions, limitations, modes of operation, as well as any other factors that significantly affect MASS operations.

### **4.1 Modes of operation**

This section describes how autonomous and/or remotely-operated functions are used and managed during different phases of voyage, including function overview and corresponding voyage phases, function allocation (human or software), function supervision (human and/or software), function and supervision location (on board or remote), conditions and procedures for mode switch, and other systems and other roles (personnel) involved in performing the control actions.

### **4.2 Limitations of autonomous and/or remote operation**

This section describes environmental, geographical, and operational limitations under which the MASS can operate safely in all operating conditions, including all reasonably foreseeable degraded states. The environmental limitations may include weather conditions (acceptable wind speed, sea state, visibility, water depth, adverse weather, day/night, etc.) and current conditions (acceptable current speed, direction, etc.). The geographical limitations may include coverage/connectivity (areas requiring connectivity, effective coverage of communication systems, redundancy and automatic switching, latency and bandwidth requirements, security, communication with other ships, Vessel Traffic Service, Marine Rescue Service, etc.) and traffic conditions (acceptable traffic density: e.g. no more than "X" ships within six nautical miles in certain scenarios). The operational limitations may indicate ship-specific limitations such as speed and range, and mode of operation.

## **5 FALLBACK STATE AND CONTINGENCY PLANS**

This section defines the conditions under which the MASS should enter a predefined fallback state across different voyage phases, as well as the conditions leading to the activation of contingency plans when the MASS deviates from the Operational Envelope (OE) beyond a predefined fallback state. Predefined fallback states and contingency plans should also be included.

## **6 REMOTE OPERATIONS CENTRE (IF APPLICABLE)**

### **6.1 Technical characteristics of a Remote Operations Centre**

This section describes essential systems installed in a Remote Operations Centre (ROC) that support remote operations.

### **6.2 Number and location of Remote Operations Centres, provision of redundancy**

This section describes the number and locations of ROCs and outlines redundancy provisions required to ensure continuous and reliable remote operations.

### **6.3 Means of communication and conditions for transferring control between different Remote Operations Centres**

This section establishes the conditions and procedures for transferring control between different ROCs to ensure safe and seamless operations.

## **7 HUMAN INVOLVEMENT**

This section describes how humans are involved in MASS functions, including on board and at the ROC. This includes the expected role of the person, the broader context in which they will work and how they will interact with third parties.

### **7.1 Minimum safe manning levels**

This section identifies the minimum safe manning levels for MASS operations, taking into account the principles as outlined in chapter 14 (Manning, training and watchkeeping) and II/5.9 (Minimum safe manning documents).

### **7.2 Task allocation**

This section describes which tasks are automated, and which tasks and responsibilities are allocated to onboard crew or remote operators.

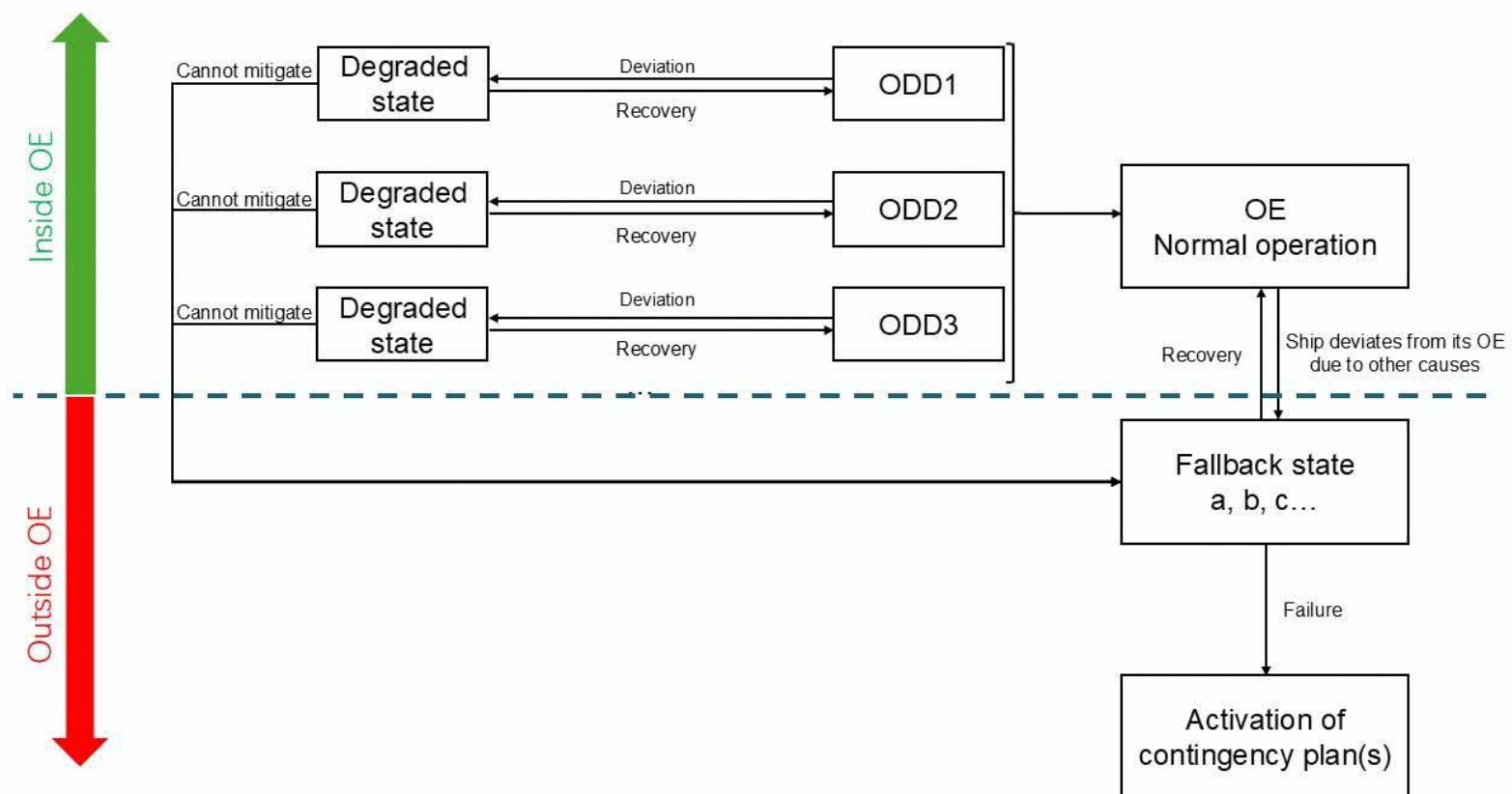
## **8 RULES AND REGULATIONS**

### **8.1 Applicable rules and regulations**

This section identifies the applicable rules and regulations, including special and local rules, such as international, national or industry-specific rules, and technical, safety and operational requirements and constraints in specific areas or regions, that the MASS should comply with, taking into account its operational area.

### **8.2 Regulatory gap**

This section identifies possible deviations from the applicable rules and regulations and provides justification of alternative solutions based on risk assessment.



**Figure 1: Illustration of the relationship between Operational Envelope, Operational Design Domain, Fallback State and Contingency Plans to support the application of chapter 8 (Operational Context)**

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## ANNEX 17

### REVISED ROAD MAP FOR DEVELOPING A GOAL-BASED CODE FOR MARITIME AUTONOMOUS SURFACE SHIPS (MASS)

