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FOREWORD

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Any comments may be sent by e-mail to rules@dnv.com

If any person suffers loss or damage which is proved to have been caused by any negligent act or omission of Det Norske Veritas, then Det Norske Veritas shall pay compensation to such person for his proved direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question, provided that the maximum compensation shall never exceed USD 2 million.

In this provision "Det Norske Veritas" shall mean the Foundation Det Norske Veritas as well as all its subsidiaries, directors, officers, employees, agents and any other acting on behalf of Det Norske Veritas.
CHANGES – CURRENT

General
This document supersedes DNV Statutory Interpretations, February 2013.

Text affected by the main changes in this edition is highlighted in red colour. However, if the changes involve a whole chapter, section or sub-section, normally only the title will be in red colour.

Main changes coming into force 1 March 2014

  — SOLAS II-2/10.6; Sub-title “Fire-extinguishing arrangements in control stations, accommodation and service spaces” has been added and first part of reg. 10.6.1 has been deleted in line with revised US Coast Guard requirements.

• FSS Code Ch.5 Fixed Gas Fire-extinguishing Systems
  — In “General requirements for CO₂ Fire-Extinguishing Systems”, two paragraphs have been added under FSS Code Ch.5.2.2.

• SOLAS Ch.III: Lifesaving Arrangement, LSA Code
  — In general the text has been edited in order to improve readability.
  — In SOLAS III/4&5 a) terminology and process for internal communication equipment not holding DNV type approval certificate have been modified.
  — In SOLAS III 6.4.1 the paragraph has been restructured and the text edited.
  — A new paragraph for integrated Public Address and General Alarm Systems has been included with interpretations on SOLAS III 6.4.2.
  — In SOLAS III 6.4.3 precautions towards failure in the General Alarm Systems and specification of Normal crew working space has been added.
  — New paragraphs dealing with public address systems in SOLAS 6.5.3.1 and 6.5.3.2 for special purpose ships > 60 persons and in MSC/Circ.808 have been added.

• SOLAS Ch.IV: Radio Communications Global Maritime Distress and Safety System (GMDSS)
  — In SOLAS IV/16 it has been clarified that 2 holders of general operators’ certificate with regard to GMDSS are required.

• Appendix A Test Program and Acceptance Criteria for Water Mist Sprinkler System Fitted in Accommodation and Service Spaces
  — In Part 5, the flowchart has been extended with a new textbox stating numbers of sprinklers to be tested in each section for Extended testing case i.

Editorial Corrections
In addition to the above stated main changes, editorial corrections may have been made.
Means of escape from ro-ro spaces ................................................................. 21
Additional requirements for ro-ro passenger ships .................................. 22
FSS Code Ch.13 Arrangements of means of escape ................................. 22
SOLAS II-2/14 Operational readiness and maintenance .......................... 22
  Operational Requirements ........................................................................... 22
SOLAS II-2/15 Instructions, Onboard Training and Drills ....................... 30
  Fire Control Plan ....................................................................................... 30
SOLAS II-2/18 Helicopter Facilities .......................................................... 30
  Structure ..................................................................................................... 30
  Fire-fighting appliances ........................................................................... 31
  Helicopter refuelling and hangar facilities ................................................ 31
SOLAS II-2/19 Carriage of Dangerous Goods ........................................... 31
  General ...................................................................................................... 31
  Ventilation ................................................................................................. 31
  Fans to be of a type that prevents the possibility of the ignition of flammable gas-air mixtures .............................. 31
  Wire mesh guard for ventilation openings .................................................. 31
  Equivalent protection to wire mesh guards may be spark arresting screens ......................................................... 31
  Portable fire extinguishers ...................................................................... 32
  Equivalent to dry powder ......................................................................... 32
  Document of Compliance ....................................................................... 32

The International Maritime Solid Bulk Cargoes (IMSBC) Code ........................................ 32
  Substances which may self-heat ................................................................. 32
  Substances which shall not be stowed on or adjacent to heated surfaces ................................................................. 32
SOLAS II-2/20 Protection of Vehicle, Special Category and Ro-Ro Spaces .................................... 32
  Precaution against ignition of flammable vapours in closed vehicle spaces, closed ro-ro spaces and special category spaces ................................................................................................................................. 32

SOLAS II-2/21 Casualty Threshold, Safe Return to Port and Safe Areas and SOLAS II-2/22 Design criteria for systems to remain operational after a fire casualty ................................................................................................................................. 33
  Application ............................................................................................... 33
  Navigational systems ............................................................................. 33
FSS Code Ch.5 Fixed Gas Fire-extinguishing Systems ............................... 33
  General requirements for all Gas Fire-extinguishing Systems ................ 33
  General requirements for CO₂ Fire-Extinguishing Systems ................. 35
  Fire-extinguishing systems for cargo holds .............................................. 36
    CO₂ high pressure fire-extinguishing systems for machinery spaces, cargo handling spaces and ro-ro spaces 36
    Low Pressure CO₂ Systems ................................................................. 37
    Equivalent Fixed Gas Fire Extinguishing Systems ............................. 38

FSS Code Ch.6 Fixed Foam Fire Extinguishing Systems ........................ 38
  General requirements to High Expansion and Inside Air Foam Systems ......................................................................................................................................................... 38

SOLAS Ch. III: Lifesaving Arrangement, LSA Code .................................. 42
  General ..................................................................................................... 42
  Documentation requirements .................................................................... 42
Passenger Ships and Cargo Ships .............................................................. 43
  SOLAS III/3 Definitions ........................................................................... 43
  SOLAS III/4 Evaluation, testing and approval of life-saving appliances and arrangements, and SOLAS III/5 Production tests ......................................................................................................................... 43
  SOLAS III/6 Communications ................................................................ 43
  SOLAS III/7 Personal life-saving appliances .......................................... 45
  SOLAS III/11 Survival craft muster and embarkation arrangements ........ 45
  SOLAS III/13 Stowage of survival craft ................................................... 45
  SOLAS III/16 Survival craft launching and recovery arrangements ........... 46
  SOLAS III/17 Rescue boat embarkation, launching and recovery arrangements ......................................................................................................................................................... 46
  SOLAS III/21 Survival craft and rescue boats .......................................... 46
  SOLAS III/22 Personal life-saving appliances ......................................... 46
  SOLAS III/26 Additional requirements for ro-ro passenger ships ............. 46
Cargo Ships (Additional Requirements) .................................................................................................................. 46
SOLAS III/31 Survival craft and rescue boats ........................................................................................................... 46
SOLAS III/32 Personal life-saving appliances ........................................................................................................... 47
SOLAS III/33 Survival craft embarkation and launching arrangements .................................................................. 47
Life-saving Appliances and Arrangements Requirements (LSA-Code) ........................................................................ 47
LSA-Code Ch.IV, Regulation 4.7 Free-fall lifeboats .................................................................................................. 47
LSA-Code Ch.VI Launching and embarkation appliances .......................................................................................... 47

SOLAS Ch. IV: Radio Communications
Global Maritime Distress and Safety System (GMDSS) ................................................................................................. 48
Document requirements .................................................................................................................................................. 48
SOLAS IV/6 - Radio Installations .................................................................................................................................. 48
SOLAS IV/7 - Radio equipment - General ...................................................................................................................... 48
SOLAS IV/13.3 - Sources of Energy ............................................................................................................................ 49
SOLAS IV/15 - Maintenance Requirements ................................................................................................................ 49
SOLAS IV/16 - Radio Personnel ...................................................................................................................................... 49

SOLAS Ch. V: Safety of Navigation .................................................................................................................................. 50
Documentation requirements ........................................................................................................................................ 50
SOLAS V/18 Approval, surveys and performance standards of navigational systems and equipment and voyage data recorder ............................................................................................................................. 50
SOLAS V/19 Carriage requirements for shipborne navigational systems and equipment ........................................ 50
SOLAS V/23 Pilot ladder arrangements ...................................................................................................................... 51
SOLAS V/28 Records of navigational activities and daily reporting ........................................................................ 51

SOLAS Ch. IX: Management for the Safe Operation of Ships, ISM Code ........................................................................ 52
5 Master's responsibility and authority ............................................................................................................................. 52
12 Company verification, review and evaluation ........................................................................................................... 52
3 The Certification Process ........................................................................................................................................... 52

SOLAS Ch. XI-2: Special Measures to Enhance Maritime Security .................................................................................. 53
SOLAS XI-2/6 Ship Security Alert System ..................................................................................................................... 53

App. A Test Program and Acceptance Criteria for Water Mist Sprinkler System Fitted in Accommodation and Service Spaces ................................................................. 54
A.1 Introduction .......................................................................................................................................................... 54
A.2 Basic testing .......................................................................................................................................................... 54
A.3 Extended testing ................................................................................................................................................... 54
Part 1 – acceptance criteria basic testing .................................................................................................................... 54
Part 2 – water samples .................................................................................................................................................. 55
Part 3 – acceptance criteria extended testing ................................................................................................................. 55
Part 4 – replacing of all sprinklers ......................................................................................................................... 55
Part 5 – flowchart to describe main items of the test procedure .............................................................................. 56

CHANGES – HISTORIC ................................................................................................................................................ 57
INTRODUCTION

1 General

1.1 Objective

1.1.1 This publication presents the Society's interpretations of international statutory instruments. Such interpretations may be on matters which are left to the satisfaction of the flag administration or are vaguely worded. Interpretations described in this publication, are given in those circumstances where IACS Unified Interpretations (UIs) or no other interpretations exist.

1.1.2 This publication covers only selected relevant topics and shall under no circumstances be taken as the Society's complete interpretations to international statutory instruments.

1.2 The Society

1.2.1 See DNV Rules for Classification of Ships (“the Rules”) Pt.1 Ch.1 Sec.1 A.

1.3 Statutory Certification

1.3.1 The Society undertakes statutory certification on behalf of flag administrations when and to the extent the Society has been authorised to do so by the individual flag administration. Statutory certification includes inter alia approval, survey and the issuance of statutory certificates. See further the Rules Pt.1 Ch.1 Sec.1 D.

1.3.2 When statutory certification is undertaken, the document requirements for approval and the survey requirements are based on IMO resolution A.997(25), Survey Guidelines under the Harmonized System of Survey and Certification, 2007, as amended, unless otherwise specified in this publication. The IMO guideline is also applied as applicable for the HSC Code and the MODU Code.

1.3.3 For general requirements to documentation, including definition of the Info codes, see the Rules Pt.0 Ch.3 Sec.1, and for a full definition of the documentation types, see the same rule chapter Sec.2.

1.4 Definitions

1.4.1 See the Rules Pt.1 Ch.1 Sec.1 A.

1.5 Restricted use

1.5.1 These Statutory Interpretations are under the sole ownership rights and copyrights of the Society. It is prohibited by anyone else than the Society to offer and/or perform classification, certification or verification services including issuance of certificates and/or declarations of conformity, wholly or partly, on the basis of and/or pursuant to these interpretations without the Society's prior written consent. The Society is not responsible for the consequences arising from any use of these interpretations by others.

2 Applicable Statutory Requirements

2.1 Application

2.1.1 When the Society acts on behalf of a flag administration, the Society follows international statutory instruments, IACS Unified Interpretations and DNV Statutory Interpretations, and generally follows guidance issued by IMO in Circulars etc. unless the flag administration has instructed the Society otherwise.

2.2 IACS Unified Interpretations (IACS UIs)

2.2.1 An overview and the text of all IACS UIs are given on IACS homepage, http://www.iacs.org.uk/ and in the IMO-Vega database that can be ordered through IMO or DNV.

2.3 Amendments and adoption

2.3.1 New and amended SI's shall be applied from 6 months after date of publishing, unless otherwise noted. Interpretations shall however only be applied for vessels where the relevant part of the convention or code is in force.
# SOLAS INTERPRETATIONS

## CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>II-1</td>
<td>Construction</td>
<td>9</td>
</tr>
<tr>
<td>III</td>
<td>Lifesaving Arrangement, LSA Code</td>
<td>42</td>
</tr>
<tr>
<td>IV</td>
<td>Radio Communications</td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>Safety of Navigation</td>
<td>50</td>
</tr>
<tr>
<td>IX</td>
<td>Management for the Safe Operation of Ships, ISM Code</td>
<td>52</td>
</tr>
<tr>
<td>XI-2</td>
<td>Special Measures to Enhance Maritime Security</td>
<td>53</td>
</tr>
<tr>
<td>A</td>
<td>Test Program and Acceptance Criteria for Water Mist Sprinkler System Fitted in Accommodation and Service Spaces</td>
<td>54</td>
</tr>
</tbody>
</table>
SOLAS CH. II-1: CONSTRUCTION

General

For non-propelled vessels or cargo vessels with a tonnage of less than 500 (length of less than 24 meters regarding load line), IACS Rec. No. 99 or national requirements may be applied for issuance of safety certificates. For such units, an MO will be issued identifying the standard applied.

Documentation Requirements

For cargo vessels of 500 gross tonnage and above when the government of the flag state has authorised the Society to issue the SOLAS safety construction certificate (CCC) on their behalf, documentation shall be submitted according to Table 1:

<table>
<thead>
<tr>
<th>Table 1 Documentation requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Object</strong></td>
</tr>
<tr>
<td>Accommodation ladder/</td>
</tr>
<tr>
<td>Gangway</td>
</tr>
</tbody>
</table>

SOLAS II-1/3-5 New installation of materials containing asbestos

DNV will apply IACS Unified Interpretation SC 249 and review declarations documenting that relevant new installations are asbestos-free as part of annual survey of the safety construction certificate (or equivalent certificate).

Missing declarations is not in itself considered a finding according to the convention, but if there is evidence that the procurement is not sufficiently controlled, DNV will notify the issuer of the Safety Management Certificate in accordance with IACS PR17.

SOLAS II-1/3-9 Means of Embarkation on and Disembarkation from Ships

MSC Circ.1331 shall be followed to obtain compliance with requirements in Regulation 3-9.

For Newbuildings, i.e. vessels constructed on or after 1 January 2010:

DNV product certificate is required for gangways and accommodation ladder including its winch.

Small freeboard:

Vessels with small freeboard may be exempted from carrying gangways or accommodation ladders. Exemptions will from case to case be based on decision made by the flag administration.

Boarding ramp:

A boarding ramp is a gangway with less than 2 meters length.
General

For non-propelled vessels or cargo vessels with a tonnage of less than 500, IACS Rec. No. 99 or national requirements may be applied for issuance of safety certificates. For such units, an MO will be issued identifying the standard applied.

Documentation Requirements

For cargo vessels of less than 500 gross tonnage assigned main class and which are in line with IACS IG2 for ships with unrestricted service, documentation shall be submitted according to Table 1:

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety general</td>
<td>G040 – Fire control plan</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Structural fire protection arrangements</td>
<td>G060 – Structural fire protection drawing</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>G061 – Penetration drawings</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Fire water system</td>
<td>S010 – Piping diagram (PD)</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S030 – Capacity analysis</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Z030 – Arrangement plan</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Fixed fire-extinguishing systems</td>
<td>G200 – Fixed fire extinguishing system documentation</td>
<td>All installed systems.</td>
<td>AP</td>
</tr>
<tr>
<td>Escape routes</td>
<td>G120 – Escape route drawing</td>
<td>AP</td>
<td></td>
</tr>
</tbody>
</table>

For fire safety component and systems, the following shall be submitted for approval or review:

— copies of the DNV type approval certificates, or
— fire test reports for the constructions and equipment which shall be used onboard, or
— type approval certificate issued by flag state (including MED as applicable).

For cargo vessels of 500 gross tonnage and above assigned main class, documentation shall be submitted according to Table 2:

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety general</td>
<td>G040 – Fire control plan</td>
<td>FI</td>
<td></td>
</tr>
</tbody>
</table>
For cargo vessels of 500 gross tonnage and above when the government of the flag state has authorised the Society to issue the Cargo Ship Safety Construction Certificate (CCC) and the Cargo Ship Safety Equipment Certificate (CEC) on their behalf, documentation shall be submitted according to Table 3:

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety general</td>
<td>G040 – Fire control plan</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Structural fire protection arrangements</td>
<td>G060 – Structural fire protection drawing</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>G061 – Penetration drawings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ventilation systems</td>
<td>S012 – Ducting diagram</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S061 – Duct routing sketch</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Fire detection and alarm system</td>
<td>I200 – Control and monitoring system</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Z030 – Arrangement plan</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Fire water system</td>
<td>S010 – Piping diagram (PD)</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S030 – Capacity analysis</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Z030 – Arrangement plan</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Fixed fire-extinguishing systems</td>
<td>G200 – Fixed fire extinguishing system</td>
<td>All installed systems</td>
<td>AP</td>
</tr>
<tr>
<td>Escape routes</td>
<td>G120 – Escape route drawing</td>
<td>AP</td>
<td></td>
</tr>
</tbody>
</table>

For constructions and equipment required by SOLAS to be tested in accordance with the Fire Test Procedure Code, the following applies:

— copies of the certificates of approval and fire test reports for the equipment that shall be used onboard, but which have not been approved by the Society or the government of the flag state, shall be submitted for approval.

For passenger vessels of 500 gross tonnage and above when the government of the flag state has authorised the Society to issue the Passenger Ship Safety Certificate (PSSC) on their behalf, documentation shall be submitted according to Table 4:

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safety general</td>
<td>G040 – Fire control plan</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Fire resisting and non-combustible materials</td>
<td>M020 – Material specification, fire related properties</td>
<td>Surface materials, insulation materials, primary deck coverings, textiles, furniture and bedding.</td>
<td>AP</td>
</tr>
<tr>
<td>Structural fire protection arrangements</td>
<td>G060 – Structural fire protection drawing</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>G061 – Penetration drawings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire doors control and monitoring system</td>
<td>I200 – Control and monitoring system</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Fire detection and alarm system</td>
<td>I200 – Control and monitoring system</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Z030 – Arrangement plan</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Fire water system</td>
<td>S010 – Piping diagram (PD)</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S030 – Capacity analysis</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Z030 – Arrangement plan</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Fixed fire-extinguishing systems</td>
<td>G200 – Fixed fire extinguishing system</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Emergency escape</td>
<td>G100 – Escape and evacuation study</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Escape routes</td>
<td>G120 – Escape route drawing</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Ventilation systems</td>
<td>S012 – Ducting diagram</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>S061 – Duct routing sketch</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td>Low location lights</td>
<td>E190 – Lighting description</td>
<td>AP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Z030 – Arrangement plan</td>
<td>AP</td>
<td></td>
</tr>
</tbody>
</table>
For passenger vessels that shall comply with SOLAS II-2/21 and 22 regarding Safe Return to Port (SRtP), documentation shall be submitted according to Table 5:

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water ingress alarm system</td>
<td>I200 – Control and monitoring system documentation</td>
<td>Flooding detection system.</td>
<td>AP</td>
</tr>
<tr>
<td>Propulsion and steering</td>
<td>Z100 – Specification</td>
<td>Including control systems.</td>
<td>AP</td>
</tr>
<tr>
<td>Safe return to port capability</td>
<td>Z030 – Arrangement plan</td>
<td>Casualty cases demonstrating that the essential systems will remain operational in case of fire.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z030 – Arrangement plan</td>
<td>Casualty cases demonstrating that the essential systems will remain operational in case of flooding.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z030 – Arrangement plan</td>
<td>Essential systems as defined in SOLAS Ch.II-2 Reg.21. Including connections between the systems.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z100 – Specification</td>
<td>Vessels description and principle decisions as location of safe areas, intended area of operation (speed versus weather and sea conditions including distance to safe port), power supply for the essential systems, project specific set of interpretations etc.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z220 – Vessel operation manual</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z243 – Assessment report</td>
<td>Detailed assessment of critical systems identified by the overall assessment.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z243 – Assessment report</td>
<td>Final report providing summary of the SRtP documentation and including all assumptions and limitations for the vessel, operational area, manual actions to be taken to restore operation of systems, if any, test program, maintenance plan and references.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z243 – Assessment report</td>
<td>Overall assessment of the casualty cases, with the purpose of identifying possible critical systems.</td>
<td>AP</td>
</tr>
<tr>
<td>Muster station / safe area</td>
<td>Z100 – Specification</td>
<td>Documenting services of sanitation, water, food, medical facilities, shelter, heating, ventilation, air conditioning and lighting.</td>
<td>AP</td>
</tr>
</tbody>
</table>

For constructions and equipment required by SOLAS to be tested in accordance with the Fire Test Procedure Code (FTP Code), the following applies:

— copies of the certificates of approval and fire test reports for the equipment that shall be used onboard, but which have not been approved by the Society or the government of the flag state, shall be submitted for approval.
Documents for all cargo vessels and passenger vessels when the government of the flag state has authorized the Society to issue the SOLAS Document of Compliance for the carriage of dangerous goods (IDG, IDG-B and IDG-P) on their behalf, shall be submitted for approval according to Table 6:

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous areas</td>
<td>G080 – Hazardous area classification drawing</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td>Electrical equipment in hazardous areas</td>
<td>E090 – Table of Ex-installation</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td>Structural fire protection</td>
<td>G060 – Structural fire protection drawing</td>
<td>Bulkheads and decks separating cargo spaces from machinery spaces and accommodation.</td>
<td>AP</td>
</tr>
<tr>
<td>Fire water supply and distribution system</td>
<td>S010 – Piping diagram (PD)</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>S030 – Capacity analysis</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z030 – Arrangement plan</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td>Fixed fire extinguishing system in cargo holds</td>
<td>G200 – Fixed fire extinguishing system documentation</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td>Cargo handling arrangements</td>
<td>Z330 – Cargo list</td>
<td></td>
<td>FI</td>
</tr>
<tr>
<td>Ventilation system</td>
<td>S012 – Ducting diagram</td>
<td>Cargo holds, cargo handling spaces and spaces having openings into those spaces.</td>
<td>AP</td>
</tr>
<tr>
<td>Bilge handling system</td>
<td>S010 – Piping Diagram (PD)</td>
<td></td>
<td>AP</td>
</tr>
</tbody>
</table>

**SOLAS II-2/3 Definitions**

**Regulation 3.1**

Induction cooking tops with power output up to 5 kW (called “induction heaters” in IMO MSC/Circ.1120, 3.1 sub item 1) are allowed used in pantries and dining rooms.

**Regulation 3.31**

A space that cannot be entered independently of machinery spaces of category A shall also be regarded as a machinery space of category A.

**SOLAS II-2/5 Fire Growth Potential**

**Control of air supply and flammable liquid to the space**

**Regulation 5.2.1.2**

This applies to all ventilation fans (circulation fans included).
Fire protection materials

Regulation 5.3.1

Neither combustible nor oil-absorbing materials shall be used as flooring, bulkhead lining, ceiling or deck in the engine control room, machinery spaces, shaft tunnel or rooms where oil tanks are located.

SOLAS II-2/6 Smoke Generation Potential and Toxicity

Paints, varnishes and other finishes, primary deck coverings

Regulation 6.2 and 5.3

The first footnote to the table on page 29 in MSC/Circ.1120 is explaining that the term “exposed surfaces” used in regulation II-2/5.3.2.4.1.1 to include the floor coverings. Thus, the requirement for low flame-spread in column (D) in the table will apply to the floor coverings in corridors and stairways and not to the floor coverings in cabins and public spaces.

The term “exposed interior surfaces” in regulation 6.2 is normally interpreted to have the same meaning as “exposed surfaces” mentioned above. However, since the footnote is not indicated for the requirement for smoke and toxic products in column (E) in the table, the smoke and toxicity test for floor coverings in cabins and public spaces are not required.

SOLAS II-2/7 Detection and Alarm

Regulation 7.7

When corridors have two exits to open deck, one manually operated call point is required at each of the exits. Additional manually operated call point at the internal exit to e.g. stairway is not required as long as the 20 m distance requirement is not exceeded.

Requirements of the FSS Code Ch.9 Fixed fire detection and fire alarm systems

FSS Code Ch.9.2.1.1

When it is intended that a particular section or detector shall be temporarily switched off, this state shall be clearly indicated. Reactivation of the section or detector shall be performed automatically after a preset time.

FSS Code Ch.9.2.3.1

When fire detectors are provided with the means to adjust their sensitivity, necessary arrangements shall be ensured to fix and identify the set point.

SOLAS II-2/8 Control of Smoke Spread

Protection of control stations outside machinery spaces

Regulation 8.2

As equally effective means, in case of ventilators these shall be fitted with steel dampers which shall be easily closed within the control station in order to maintain the absence of smoke in the event of fire.

SOLAS II-2/9 Containment of Fire

Thermal and structural boundaries

Regulation 9.2.2.3.2.2

In addition to electrical distribution boards, PA/audio-racks/DVD-players and similar electronic equipment may also be located behind panels/lining within accommodation subject to the following:

— If located in an identifiable space having a deck area of less than 4 m², this space is to be categorized as (7) and be protected by smoke detectors and sprinklers. An identifiable space will normally be an enclosure which can be walked into, with equipment accessed from inside the space.

— If not located in an identifiable space but in an extended enclosure behind panels/lining, served from the panel side, this enclosure is to be protected by smoke detectors. This should be the typical situation for audio/video racks and distribution boards arranged in the open behind panels/lining.
Regulation 9.2.2.3.2.2

If two areas shall be treated as a common space the opening between these spaces shall be at least 30% and the openings shall be communicating openings and permanent. Windows/glass is not considered to be communicating openings which contribute to the 30% open requirement.

(5) Storage of petrol (e.g. for marinas and water-scooter) is accepted on open decks.

(8) Steam Rooms: If the amount of combustible materials exceeds what is specified in SOLAS II-2/5.3.2 the steam rooms to be treated as sauna with respect to fire protection.

Slop chest like a normal shop where crew go in, grab what they want and pay on the way out.

(9) steam power pack/systems less than 5kW less and located inside the steam room.

(11) Cold Stores/refrigerated spaces shall have a temperature below +5°C.

(13) steam power pack exceeding 5 kW

Slop chest of a “store type” where there is a counter where crew ask what they want and the keeper takes the item(s) from the shells and bring it (them) to the “customer”, like in the hotel stores or machinery stores etc.

(14) Class I and class II liquids according to NFPA Fire Protection Handbook, shall be considered as flammable liquids. Class I liquids have flash points below 100°F (37.8°C) and vapour pressures not exceeding 40 psia at 100°F (37.8°C). Class II liquids have flash points at or above 100°F (37.8°C) and below 140°F (60°C).

(14) For not portable fuel tanks the requirements in II-2/18.7 of SOLAS shall be applied.

Table 9.2

It is not considered reasonable to apply the superscript “a” relaxation for the deck between two galleys. Therefore a C-class deck will not be accepted between two galleys. Either the deck shall be of class “A-30” according to Table 9.2 or the deck shall be (at least 30%) open to provide one galley space on two deck levels.

Regulation 9.2.3.3.2

(1) Navigation equipment room (radio transmitter). Battery rooms. (Requirements for location of the emergency source of electrical power are further given in the Rules Pt.4 Ch.8 Sec.2 C.)

(5) Provision chambers shall be treated as store rooms. Refrigerated provision chambers are considered as category (5) service spaces if thermally insulated with non-combustible materials.

(7) Electrical equipment rooms (auto telephone exchange, air conditioning duct spaces).

(10) Open deck are those spaces which have permanent openings towards open deck of not less than 30% of the area of the greatest length of the space or 10% of the area of all vertical sides, whichever is greatest.

The space shall be naturally ventilated by permanent openings, which may be part of the calculated openings above, to ensure that smoke are not accumulated.

1. When calculating 30% permanent openings against open deck the following procedure is to be used:

1.1. The greatest length of the room shall be considered as basis for calculating the required size of the opening(s), this is not necessarily a bulkhead adjacent to the open deck.

1.2. If the permanent opening(s) are not located in the bulkhead of greatest length, openings may be located in one of the shorter bulkheads. In addition, at least 20% of the required size of openings shall then be installed in the bulkhead opposite to the bulkhead where the main openings are installed, or in the side bulkheads. Openings located in the side bulkheads shall then be located such that they are closer to the opposite bulkhead than to the bulkhead where the main opening(s) are provided. Preferably the additional openings shall be located as close to the opposite bulkhead as possible.

1.3. Openings should be located as high in the bulkheads as possible.

1.4. In a room where only one of the shorter bulkheads are provided with permanent openings, and it is not possible to install at least 20% of the required openings in opposite or side bulkheads as required above, the room can not be considered as open deck and have to be assigned a category other than 10.

Table 9.5

Footnote d):
A galley next to a provision room requires an “A-0” bulkhead.

Table 9.5 to 9.8

Footnote *

DNV interprets the requirements to openings in way of emergency generator room to apply to both air intakes and outlets.
**Protection of openings in fire-resisting divisions**

**Regulation 9.4.1.2**
Light fixtures inserted in class B-15 ceiling panels shall in general be made of metal. Plastic materials or other combustible materials are not accepted. In general, any opening shall be arranged to maintain the class B-15 integrity and insulation. This will imply that class B-15 “boxes” shall be made to cover any holes and openings for light fixtures. Smaller openings, e.g. for single spotlights with diameter of 80 mm or less, may be accepted without the B-15 box.

**Regulation 9.4.2.2**
Hold back arrangements with remote release are not accepted in engine room boundaries.

**Regulation 9.4.2.4**
Watertight doors in fire-resisting divisions shall be made of steel.

**Protection of openings in machinery space boundaries**

**Regulation 9.5**
Hatches giving access to the engine room for the transport of goods shall be weather-tight. Where remote control for closing of the hatch is not provided, a signboard to the effect that the hatch-cover shall be closed at all times, except during transfer of goods, shall be posted.

**Ventilation systems**

**Regulation 9.7.1.2.2**
The regulation should be practised with “or equivalent” at the end of the sentence. One equivalent solution is joining of 200/900 mm long steel sleeves of 3 mm thickness through “A” class divisions to Spiro ducts by means of inserting short linings/nipples into each end of the steel sleeves onto which the Spiro ducts are drawn, and with the connection sealed with aluminium tape to make it air tight, shall be accepted by DNV as equivalent to tested ventilation duct penetrations if the Spiro ducts are adequately supported with solid clamps/hangers/supports, which will ensure that the linings/nipples and Spiro ducts can not be dislocated.

**Regulation 9.7.3.1.2**
The fire dampers should be easily accessible as well as prominently and permanently marked. Where they are placed behind ceilings or linings, these latter should be provided with an inspection door on which a plate reporting the identification number of the fire damper. Such plate and identification number should be placed also on any remote control required.

The indicator may be located behind panel. The indication should be “true indication”.

**Regulation 9.7.3.2**
Thin steel ducts will be accepted without additional steel sleeve. If a steel sleeve is installed, the sleeve may be of thin steel sheet of thickness not less than 0.5 mm.

**Regulation 9.7.5.1**
The requirements applies to any exhaust duct serving open galley equipment from which grease can be expected to enter the exhaust, e.g. galley ranges, fryers, deep-fat cooking equipment. Non-greasy branches which are branched from the greasy exhaust shall be provided with a fire damper. The duct part between the damper and the connection to the greasy duct shall have fixed means of extinguishing and construction and insulation according to Regulation 9.7.2.1.2.1 and 9.7.2.1.2.2.

**Regulation 9.7.5.1.1**
As there is no available IMO documentation which provide guidance to “alternative approved grease removal system” per today, the system will be evaluated on a case-by-case basis based on the manufacturers recommendations and specification e.g. UV filters and steam system.

**SOLAS II-2/10 Fire Fighting**

**Water supply systems**

**Regulation 10.2.1.5.1**
When calculating the number of hydrants, the length of the water jet shall be taken as maximum 7 m.

**Regulation 10.2.1.6**
Pressure at hydrant to include static pressure drop at highest hydrant and estimated dynamic pressure loss.
Regulation 10.2.2.3.2.2
Guidance note:
See the Rules Pt.4 Ch.8 Sec.2 for requirements for cables to remain operable during a fire condition.
---end---of---Guidance---note---

Portable fire extinguishers
Regulation 10.3.2.1
In vessels of less than 1000 gross tonnage, at least three portable fire extinguishers shall be provided.

Regulation 10.5
50 kg dry powder or 45 kg CO₂ is considered as equivalent to 135 l foam liquid.
25 kg dry powder or 20 kg CO₂ is considered as equivalent to 45 l foam liquid.

FSS Code Ch.4.3 Engineering specifications
The fire-extinguishing medium in the extinguishers shall be suitable for the potential fire hazards in the protected spaces.

Fixed fire-extinguishing systems
Regulation 10.4
On completion, the system shall be function tested. Detailed requirement for high pressure CO₂ systems and high-expansion foam system can be found in Sec.2 and Sec.3.

Regulation 10.4.1
— For specific interpretations and clarifications for fixed gas fire-extinguishing systems see Sec.2.
— For specific interpretations and clarifications for fixed high-expansion foam fire-extinguishing systems and equivalent systems (inside air foam) see Sec.3.

Fire-extinguishing arrangements in machinery spaces
Regulation 10.5.1.1
Oil fired machinery other than boilers, such as fired inert gas generators, incinerators and waste disposal units shall be considered the same as boilers which requires one of the total fixed fire-extinguishing system required by regulation 10.4.1.1.

Regulation 10.5.2.1
45 l foam extinguisher and foam applicator shall be provided in machinery spaces containing internal combustion machinery, the subject requirement applies only to machinery spaces containing internal combustion machinery used for main propulsion and machinery spaces of category A having more than one platform level.

Fire-extinguishing arrangements in control stations, accommodation and service spaces
Regulation 10.6.1
Sprinkler systems in Store room:
Maker’s recommendations to be followed, in addition this applies: Sprinklers should preferably be located in aisles (walkway between shelves), then an air gap of about 100 mm between stored items and deck head is accepted. In case the sprinklers are located above shelves, there should be a 500 mm void below sprinklers (entire area) and this maximum storage height shall be properly marked on bulkheads. For hi-fog nozzles this distance is 300 mm.

Regulation 10.6.4
Deep fat cooking equipment to be any type of fixed cooking appliance that is capable of, and intended to, being filled up with cooking oil.
Tilting frying pans, small portable deep fat fryers (home use type) or traditional electrical galley ranges with flat cooking surfaces are not required to comply with SOLAS Ch. II-2 Regulation 10.6.4.
If small portable deep fat fryers are used, they shall be of a type with lid, with max. capacity 2.5 l and max. power 2.0 kW. These units are only to be used inside the galley boundaries.

Regulation 10.6.4.3
The deep fat fryer shall have permanent disconnection upon activation of the extinguishing system.
Fire-extinguishing arrangements in cargo spaces

Regulation 10.7

Cable reels in enclosed spaces (less than 10% openings in sides + ceiling) shall be provided with a fixed fire extinguishing system. This can be a fire gas extinguishing system if the space can be sealed off in case of a fire or a water spray system designed with 10 litre/minute/m² of exposed cable reels area for spaces that are not reasonably gas tight. (Cable reels being handled or stored on open decks or spaces with more than 10% openings in sides and ceiling need not be provided with a fixed fire extinguishing systems.)

Regulation 10.7

Seismic cables containing liquid with flashpoint below 60°C shall be protected by a fixed fire extinguishing system covering the areas where they are stored and handled.

Guidance note:
A suitable fixed fire extinguishing system is a low expansion foam system with the following capacity:

- 3 litre/minute/m² of streamer deck area
- 10 litre/minute/m² of cable reels area.

Foam concentrate should be provided for at least 20 minutes of foam generation.

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Fire-fighter’s outfits

Regulation 10.10.3

Spare charges for breathing apparatus shall be stored in the same location as the breathing apparatus.

SOLAS II-2/13 Means of Escape

Means of escape from control stations, accommodation spaces and service spaces

Regulation 13.3.2

When a room is located inside another room and the escape is into this other room, we have a room-in-room arrangement. Such escape arrangements shall normally be avoided, but may be accepted for small rooms inside galleys (chef's office, bell-box), bedrooms in cabin suites, for casino offices, pantries etc. An additional fire alarm (room-in-room alarm) is to sound inside such isolated rooms upon fire detection in the room outside. A separate drawing should be made by the yard which clearly identifies all room-in-room arrangements.

Regulation 13.3.2

AC rooms are considered only temporarily employed. Hence, two escape ways are required if:

1) The room is more than 50 m².
2) The room span over two or more decks. At least one escape is required on each deck level.

Regulation 13.3.2

A minimum of two escape routes are required for public spaces and spaces normally manned if the area is 28 m² or more.

Regulation 13.3.2

Crew working spaces facing open decks which are not normally manned (e.g. AC rooms, deck stores, emergency generator room, lift machinery rooms and similar rooms at upper decks) are accepted to have primary escapes to open decks cat.(5).

Panties and galleys shall normally have primary escapes directly to corridors and stairways. If part of a primary escape has to cross an open deck, this escape way shall be cat. (4), incl. emergency lighting and anti-slip, minimum width = 1800 mm.

Two escape routes as widely separated as possible to be required from all sun decks and passenger spaces on open decks.

Regulation 13.3.2.1.1

This regulation shall also apply to the means of escape from spaces above the bulkhead deck. At least one means of escape shall be arranged as independent of watertight doors which are assumed closed in order to maintain the weathertight and watertight integrity in the damage stability calculations.
**Regulation 13.3.2.4**
Designer doors (decorative doors):
- not to interfere physically with fire doors,
- hinged type designer doors are to swing open in escape direction and to have hinge system for staying open when swung to the bulkhead,
- sliding type designer doors with electrical door drive systems shall go to open position and stay in open position upon loss of power, el. fault condition and “close fire doors” status from bridge, if located in escape ways,
- sliding type designer doors with electrical door drive systems shall go to open or neutral (manual) position upon loss of power, el. fault condition and “close fire doors” status from bridge, if not located in escape ways.

The sliding doors from stairways to open deck should comply with the last item meaning that it shall be possible to open these doors manually if power is off.

**Regulation 13.3.2.4.1**
A means of escape required to provide “continuous fire shelter” shall comply with all the requirements applicable for stairways, not only insulation requirements. It applies for all vertical stairways as well as horizontal parts (“horizontal stairways”) of the escape route all the way to the muster/assembly station, being it an indoor or outdoor muster/assembly station.

**Regulation 13.3.2.4.2**
“protected internal routes” to be understood to be the route from the muster/assembly station to the embarkation area/station deck when the passengers/crew are guided in controlled groups.

**Regulation 13.3.2.4.5**
FSS Code Ch.13.2.3.1 “doorways and corridors...included in the means of escape shall be sized in the same manner as stairways” does not apply to cabin doors.

**Regulation 13.3.3.1**
Restricted space or group of spaces in the accommodation:
A Restricted space in the accommodation is understood as a normally employed space within an other space, e.g. a smoker's room at the back of a dining area. For such group of spaces minimum two escape routes are required, see figure 1. Equivalent arrangements will be considered.

![Figure 1](image.png)

**Figure 1**
*Minimum two escape routes required*

Storage spaces and similar spaces entered only occasionally are in this context not considered to be normally employed. For such group of spaces minimum one escape route is required, see figure 2.
Cabins consisting of more than one space need also not be provided with more than one escape route.

**Regulation 13.3.3.2**

The term “lowest open deck” shall be understood as the lowest fire category 10 area (regulation 9.2.3.3.2). This applies regardless of position of accommodation and position of this open deck (forward / aft). Areas of open deck of insignificant area (mooring stations, etc.) can be disregarded.

**Regulation 13.3.3.3 and 4**

For spaces above the lowest open deck, DNV may on a case by case basis accept trunk or ladders to deck above as means of escape from corridors that otherwise would be considered dead end corridors. This is, however, only accepted if two other means of escape according to Regulation 13.3.3.3 is arranged from one end of such corridor. A window is however not accepted in this regard.

**Regulation 13.3.3.4**

A dead end corridor is defined as a corridor or part of a corridor from which there is only one escape route.

**Means of escape from machinery spaces**

**Regulation 13.4.2.1**

Two means of escape is only required from the lowest part of the engine room, not from each level.

**Guidance note:**

Where the lower part of the engine room is a space with a height lower than 2.3 m (standard deck height for L > 125), the two means of escape may apply to the first deck with standard deck height. The two means of escape do not apply to spaces below the machinery floor plating, regardless of height.

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**Regulation 13.4.2.1.1**

A space is considered a safe position outside the machinery space of category A if it is not contiguous to the boundaries of the machinery space of category A or if the common bulkhead between the two spaces is insulated to class A-60.

**Regulation 13.4.2.1.2**

If the escape route in the lower part of the space is provided with doors and stairs of adequate size throughout the route, the route will normally be regarded as sufficient. However when the escape route depends on one or more hatches to reach the open deck, one of these hatches will have to comply with the minimum internal dimensions of at least 800 mm × 800 mm that would apply to the trunk/hatch solution that can be accepted in 13.4.2.1.1. Emergency lighting provisions in accordance with SOLAS II-1/43 to be provided along the escape routes.

**Regulation 13.4.2.3**

For machinery spaces other than those of category A, a single escape route can be accepted if the space is entered only occasionally or if the travel distance from main working and operating positions to door is 5 meters or less.
Emergency Escape Breathing Devices (EEBD)

Regulation 13.4.2

The minimum number of EEBDs shall be kept within accommodation—

— dining room
— smoking room
— storage space.

Spaces shall be as follows:

— for cargo ships: two (2) EEBDs and one (1) spare EEBD;
— for passenger ships carrying not more than 36 passengers:
  two (2) EEBDs for each main vertical zone, except those defined in the regulation 13.3.4.5, and a total of two (2) spare EEBDs; and
— for passenger ships carrying more than 36 passengers:
  four (4) EEBDs for each main vertical zone, except those defined in the regulation 13.3.4.5, and a total of two (2) spare EEBDs.

Regulation 13.4.3

1) This interpretation applies to machinery spaces where crew are normally employed or may be present on a routine basis.

2) In machinery spaces for category A containing internal combustion machinery used for main propulsion, EEBDs shall be positioned as follows:

— one (1) EEBD in the engine control room, if located within the machinery space;
— one (1) EEBD in workshop areas if not arranged with a direct access to an escape way; and
— one (1) EEBD on each deck or platform level near the escape ladder constituting the second means of escape from the machinery space (the other means being an enclosed escape trunk or watertight door at the lower level of the space).

Alternatively, different number or location may be determined by the Society taking into consideration the layout and dimensions or the normal manning of the space.

3) For machinery spaces of category A other than those containing internal combustion machinery used for main propulsion, and having more than one platform level, one (1) EEBD shall, as a minimum, be provided on each deck or platform level near the escape ladder constituting the second means of escape from the space (the other means being an enclosed escape trunk or watertight door at the lower level of the space).

4) For other machinery spaces, the number and location of EEBDs are to be determined by the Society.

Regulation 13.4.2.3

Some of the 4 EEBDs within each main fire zone are accepted to be fitted in service spaces within accommodation.

Means of escape from ro-ro spaces

Regulation 13.6

The fore and aft end of the ro-ro space is considered as the area being within the distance equal to the breadth (b) of the cargo space from the most forward and aftermost point of the cargo space, see figure 3.

![Figure 3: Fore and aft end of ro-ro space](image)
Additional requirements for ro-ro passenger ships

Regulation 13.7

Not more than 2 deck between muster station and embarkation deck will be accepted.

FSS Code Ch.13 Arrangements of means of escape

2.2.2 Alignment of stairways

For transverse stairways, the stairway enclosure (stairway and landings) shall be sized for max 90 persons with no persons taking temporary refuge at the landings (P = 0).

2.2.4 Landings

“Persons provided for” is N=Z−P=the number of persons directly entering the stairway flow from a given deck.

SOLAS II-2/14 Operational readiness and maintenance

Operational Requirements

Regulation 14.2.1 Operational readiness

2.1.1.1 A full flow test of minimum 2 sprinklers shall be carried out each year, according to Appendix A and the relevant type approval certificate. The test is in general required for systems designed according to IMO res. A.800(19), as amended, and may be exempted for conventional sprinkler systems.

Regulation 14.2.2 Maintenance, testing and inspections

The ship's fire protection systems and fire fighting systems and appliances shall be subject to periodical testing, inspection and surveys as follows:

1 Cargo and Passenger Ships (CEC, CCC, PSSC certificates)

1.1 Introduction, scope and summary of reports

1.1.1 Application

1.1.1.1 Where the Society is authorised to carry out periodical surveys the requirements in this section shall be applied. In case the flag state has issued instructions to the Society on some of these issues, these instructions will prevail.

1.1.1.2 The survey requirements are applicable for cargo ships with SOLAS CEC and CCC certificates cargo and passenger ships with SOLAS PSSC certificate.

Non-convention ships will follow the same scope, except that some of the surveys shall be regarded as not applicable when a specific system is not installed on board and not required to be fitted.

1.1.1.3 Some of the surveys shall be carried out by a service supplier, some with a surveyor present, others can be carried out by a competent crew member and recorded in the maintenance system. The owner shall in their own ISM system decide who is a competent crew member.

1.1.1.4 Systems need only comply with the regulation applicable when the ship was keel laid and any retroactive requirements. Relevant rule references for systems addressed by this section are as follows:

— for SOLAS 2004 consolidated edition and later editions use SOLAS II-2 regulations 5-13, 15.2.4 and relevant parts of regulations 17-20

— for SOLAS 2001 consolidated edition and earlier editions use SOLAS II-2 regulations 4-14, regulations 16-53, regulations 57-63 and relevant parts of regulations 54-56

— for retroactive requirement see for instance the 2000 Amendments to SOLAS II-2 regulations 1.2.

1.1.2 Survey, scope

1.1.2.1 The annual, intermediate and renewal survey is in all cases to cover:

— fixed fire extinguishing system for engine rooms

— fixed local application fire extinguishing system for engine rooms, as applicable

— fixed fire extinguishing system for cargo spaces

— fire pumps, fire mains, hydrants, hoses etc. of water fire fighting system and international shore connection

— non-portable and portable fire extinguishers and portable foam applicators

— fireman's outfit
— fire detection systems
— fire doors
— fire dampers and dampers in ventilation ducts
— escape routes.

The annual survey will in general be carried out on a spot check basis whereas the renewal survey will be more extensive.

For passenger ships, the following systems will also be covered by the annual survey:
— automatic sprinkler system for accommodation and service spaces
— low location lighting system
— atrium smoke extraction system, as applicable.

1.1.2.2 The owner shall prior to the survey inform the attending surveyor if alterations have been made to any fire safety systems or if other systems that require changes to fire safety systems have been installed since the previous survey. In case of alterations or new installations, the surveyor shall ensure that these are plan approved and surveyed as required.

1.1.2.3 At the discretion of the attending surveyor, record of tests and inspections carried out by the crew or service suppliers prior to surveys can for some of these items be credited in lieu of testing witnessed by the surveyor.

1.1.3 Summary of Reports and Documentation

1.1.3.1 Reports from applicable survey and testing shall be available on board with expiry date not before date of survey. Detailed requirements for these tests and inspections can be found under the specific sub-chapters.

1.1.3.2 The following systems have components requiring hydrostatic testing (typically every 10th year):
— CO₂ cylinders
— cylinders for other gas systems and water mist systems (as applicable)
— portable extinguishers
— EEBDs (every 5th year)
— air cylinders in fire fighters outfit (every 5th year).

1.1.3.3 The following systems shall be inspected by a service supplier:
— CO₂ systems (every 2nd year)
— other gas systems (every 2nd year)
— dry powder for LNG and LPG carriers (every 2nd year)
— portable extinguishers (every 5th year)
— transportable extinguishers (every 5th year).

The service supplier shall be approved according to the Rules Pt.1 Ch.1 Sec.1, D200.

1.1.3.4 The foam concentrates of the following systems shall be tested at a service supplier / test laboratory (typically after 3 years and then annually):
— deck foam system (tankers)
— high expansion and inside air foam systems (protecting engine rooms, enclosed cargos spaces, etc.)
— Additives in water mist systems
— Other systems, for instance foam system for protection of helidecks.

Special requirements apply to protein based, alcohol-resistant foam on chemical tankers, see 1.5.1.3 and the Rules Pt.7 Ch.1 Sec.2, C200.

1.2 General Requirements

1.2.1 All systems

1.2.1.1 The necessary and required operation instructions, marking of main and essential components and warning signs (for instance gas release) shall be in good and readable condition and available in a relevant language.
1.2.2 Gas systems

1.2.2.1 The agent cylinders or tanks shall be refilled if the losses for any CO₂ high pressure cylinder exceed 10%. For low pressure CO₂ tanks, Halon cylinders or tanks and other gases the cylinder or tanks shall be refilled if the losses exceed 5%.

1.2.2.2 Section valves (the term “control valves” is also used by IMO) of fixed gas fire-fighting systems shall be internally inspected (MSC/Circ.850, 8.2).

1.2.3 Foam concentrates

1.2.3.1 These requirements address foam concentrates used in any system, including those used for fixed fire fighting in engine room or cargo deck and portable equipment.

1.2.3.2 The content of the foam tank shall in general never be below the defined minimum level as determined in the approved documentation. It is recommended that this minimum level is indicated on the tank.

1.2.3.3 The requirement for periodic testing of foam concentrates will in general apply to concentrates stored on tanks provided for fixed fire fighting systems.

Foam in sealed transport containers (for topping up of storage tank or use with portable foam applicators) can normally be accepted without periodic testing if not more than 10 years old.

Protein based foam concentrate containers shall though be checked on a spot basis if more than 5 years old and testing or renewal to be required if the condition is not satisfactory. The same applies to non-sealed containers and containers where production data can not be documented.

1.2.3.4 Topping up of foam tanks shall only be done with a foam concentrate being identical to that already stored on the tank (same brand and type). If this is not possible a foam concentrate recommended by the maker of the original foam and case by case approved by the Society may be used.

1.2.3.5 If the foam concentrate is replaced by a new type the following shall be verified:
— the tank shall be emptied and clean properly before refilled with the new foam concentrate
— the foam concentrate shall have the same mixing ration (for instance 1%, 3% or 6%)
— the foam concentrate shall have equivalent approvals (approved as regular, alcohol resistant or multi-purpose foam concentrate, as applicable)
— the new foam concentrate shall have similar viscosity as the previous foam (otherwise new foam pumps may be needed and foam mixing unit may need adjusted and verified)
— only foam concentrate approved according to MSC.1/Circ.1312 shall be used for tanks refilled after 1st July 2012.

If it is not possible to comply with the requirements the owner shall submit documentation for a case by case approval by the Society.

1.3 Fixed fire extinguishing system for engine rooms

1.3.1 High pressure CO₂ systems

1.3.1.1 The tests and surveys shall be based on MSC.1/Circ.1318 with the below amendments and exemptions.

Replacement of flexible hoses for the CO₂ system need not follow MSC.1/Circ.1318, but the following minimum requirements shall be applied. Replacement shall:
— follow maker’s recommendation, or
— be done after 10 years if the maker recommendation is not available.

1.3.1.2 CO₂ pipes shall be blown through annually to ensure that they are free from debris and not clogged. Test or record of the test shall be presented to the attending surveyor.

1.3.1.3 At biennial (every 24 months) for passenger ships and at each intermediate, periodical or renewal survey for cargo ships, an inspection is to be carried out by an approved service supplier. The record from this inspection is to be filed onboard.

1.3.1.4 High pressure CO₂ cylinders are to be subject to periodical hydrostatic testing at maximum intervals of 10 years. Testing is required for not less than 10% of the cylinders every 10 years. If one or more cylinders fail, a total of 50% of the onboard cylinders shall be tested. If further cylinders fail, all cylinders shall be tested.
1.3.1.5 Safety pins preventing release from release station(s) shall be removed according to maker’s instructions. Such safety pins are typically used to securing the CO₂ cylinder valves during transportation.

1.3.1.6 The general items for gas systems in 1.2.2 shall also be verified.

1.3.2 Low pressure CO₂ systems

1.3.2.1 The test and surveys shall be based on MSC.1/Circ.1318 with the below amendments and exemptions.

1.3.2.2 CO₂ pipes shall be blow through annually to ensure that they are free from debris and not clogged. Test or record of the test shall be presented to the attending surveyor.

1.3.2.3 At biennial (every 24 months) for passenger ships and at each intermediate, periodical or renewal survey for cargo ships, an inspection is to be carried out by an approved service supplier. The record from this inspection is to be filed onboard.

1.3.2.4 The annual external inspection of insulated containers is to include spot check of the outer surface beneath the insulation and all connections and equipment fitted to the tank.

1.3.2.5 Low pressure CO₂ bulk containers are to be internally surveyed if the content has been released and the container is more than 5 years old. Depending on the result of the survey, hydrostatic testing may be required at the surveyor's discretion.

1.3.2.6 The general items for gas systems in 1.2.2 shall also be verified.

1.3.3 Equivalent gas system

1.3.3.1 Equivalent gas systems are those installed and approved according to MSC/Circ.848 or MSC.1/Circ.1267. Examples of such systems are:

— Inergen
— FM200
— NOVEC 1230.

1.3.3.2 At biennial (every 24 months) for passenger ships and at each intermediate, periodical or renewal survey for cargo ships, an inspection is to be carried out by an approved service supplier. The record from this inspection is to be filed onboard.

1.3.3.3 The gas cylinders are to be subject to periodical hydrostatic testing at maximum intervals of 10 years. Testing is required for not less than 10% of the cylinders every 10 years. If one or more cylinders fail, a total of 50% of the onboard cylinders shall be tested. If further cylinders fail, all cylinders shall be tested.

1.3.3.4 The survey will follow the requirements for CO₂ high-pressure systems, adjusted to the applicable pressure. The chemical agents (FM200 and NOVEC 1230) will typically have a design pressure of 25 – 40 bar, whereas the inert gases (Inergen) will typically have a design pressure of 200 – 300 bar on the closed section side and 50-70 bar on the open piping side.

1.3.3.5 System with cylinders installed inside the protected space (MSC/Circ.848, 11 or MSC.1/Circ.1267, 11) shall in addition be check as follows:

— integrity of double release lines inside protected space to be surveyed
— release cabinet to be checked, including alarms on low pressure, as applicable.

1.3.3.6 The general items for gas systems in 1.2.2 shall also be verified.

1.3.4 Halon systems

1.3.4.1 Halon systems are prohibited on ships built after 1994. Some flag state (including all EU and EEA flag states) have required phase out of these systems on all ships flying their flag.

1.3.4.2 Hydrostatic pressure testing of Halon cylinders is no longer required if an external inspection of the cylinders and thickness measurements of lower end confirms that any corrosion and indents are insignificant. The position of the flag administration shall however always be checked for this particular case.

1.3.4.3 At biennial (every 24 months) for passenger ships and at each intermediate, periodical or renewal survey for cargo ships, an inspection is to be carried out by an approved service supplier. The record from this inspection is to be filed onboard.
1.3.4.4 The survey will, except for the testing of cylinders, follow the requirements for equivalent gas system, adjusted to the applicable pressure (typically 30-40 bar for the Halon cylinders). The general items for gas systems in 1.2.2 shall also be verified.

1.3.5 High Expansion foam systems (outside air foam systems)

1.3.5.1 Testing of quality of foam concentrate is to be carried out periodically not later than 3 years after manufacture and annually thereafter. Testing is to be carried out by the manufacturer or an approved service supplier or at a recognised test laboratory.

1.3.5.2 Start of water pumps, foam concentrate pump and fans shall be tested and inspected at the annual survey. It is important that the foam concentrate lines are properly flushed with fresh water after this test. The foam concentrate pump may be tested with water if there are problems with disposal of foam concentrate used in the test.

1.3.5.3 The foam tank shall be checked to confirm that the amount of concentrate is above the minimum required quantity.

1.3.5.4 Distribution pipes for foam solution up to foam generators shall be blow through with air annually and nozzles inspected for debris. Corrective action shall be taken if more than insignificant debris is found. Test or record of the test shall be presented to the attending surveyor.

1.3.5.5 At renewal survey distribution pipes shall be flushed properly with fresh water and inspected to ensure that they are free from debris and not clogged.

1.3.5.6 Distribution ducts for foam shall be inspected for damage.

1.3.5.7 The general items for foam systems in 1.2.3 shall also be verified.

1.3.6 Inside air foam system

1.3.6.1 Inside air foam systems are those installed and approved according to DNV type approval programme for such system or MSC.1/Circ.1271. Examples of trade name for such systems are:

— HotFoam
— HiFoam.

1.3.6.2 Testing of quality of foam concentrate is to be carried out periodically not later than 3 years after manufacture and annually thereafter. Testing is to be carried out by the manufacturer or an approved service supplier or at a recognised test laboratory.

1.3.6.3 Start of water pumps and foam concentrate pump shall be tested and inspected at the annual survey. It is important that the foam concentrate lines are properly flushed with fresh water after this test.

1.3.6.4 The foam tank shall be checked to confirm that the amount of concentrate is above the minimum required quantity.

Conditions of generators inside the protected space shall be assessed on a spot checked basis.

1.3.6.5 Distribution pipes shall be blow through with air annually and nozzles inspected for debris. Corrective action shall be taken if more than insignificant debris is found. Test or record of the test shall be presented to the attending surveyor.

1.3.6.6 At renewal survey distribution pipes shall be flushed properly with fresh water and inspected to ensure that they are free from debris and not clogged.

1.3.6.7 The general items for foam systems in 1.2.3 shall also be verified.

1.3.7 Water mist systems

1.3.7.1 Water mist systems are those installed and approved according MSC/Circ’s.668/728 or MSC/Circ.1165.

1.3.7.2 A full flow test is to be carried out each year for one section. Test or record of the test shall be presented to the attending surveyor.

Other tests and inspections as per maker’s recommendation and the Society’s type approval certificate shall be carried out annually.
1.3.7.3 Some systems (in particular high pressure system having nozzles and system components with small orifices) have restrictions with respect to water quality (shall in some case be potable quality with max 50 ppm chlorides and particles below 0.1 mm). Record of water quality testing shall in these cases be inspected.

1.3.7.4 Some water mist systems (including all systems installed according to MSC/Circ’s 668/728) have gas cylinders (nitrogen or air) and water cylinders or tank. Some also have a cylinder with foam concentrate. The gas, water and foam cylinders shall be tested and inspected as for the high pressure gas systems (see 1.3.1), whereas any water tank shall be inspected internally and externally every 5th year. It is recommended that also the water and foam cylinders are inspected internally every 5th year, the attending surveyor shall consider this based on general condition of the system.

1.4 Fixed local application fire extinguishing system for engine rooms

1.4.1.1 A fixed local application fire extinguishing system is only required for machinery spaces of category A above 500 m³ on ships with keel laid after 1st July 2002, and for all existing passenger ships of 2000 GT and above built before 1st July 2002.

1.4.1.2 Tests and inspections as per maker’s recommendation and the Society’s type approval certificate shall be carried out annually.

1.4.1.3 At renewal surveys, full flow test of one section and spot check of fire detection / automatic release system shall be carried out (automatic release is not applicable for continuously manned engine rooms).

1.5 Fixed fire extinguishing system for cargo areas / cargo spaces

1.5.1 Deck foam system on tankers

1.5.1.1 MSC.1/Circ.1312 shall be followed for all inspections done after 1st July 2012.

1.5.1.2 Testing of quality of foam-forming liquids is to be carried out periodically not later than 3 years after manufacture and annually thereafter. Testing is to be carried out by the manufacturer, an approved service supplier or a recognised test laboratory.

1.5.1.3 For alcohol resistant fluorine protein based foam concentrates for chemical tankers see the requirements of the Rules Pt.7 Ch.1 Sec.2, C200.

1.5.1.4 The general items for foam systems in 1.2.3 shall also be verified.

1.5.2 Gas systems for enclosed cargo space / holds and cargo handling rooms

1.5.2.1 Examples of such systems are: enclosed ro-ro spaces, general cargo holds (except those having exemption certificate).

1.5.2.2 The survey shall follow relevant requirements for fixed gas fire extinguishing systems for engine rooms, as applicable.

1.5.2.3 The general items for gas systems in 1.2.2 shall also be verified.

1.5.3 Deluge and water mist systems for ro-ro spaces

1.5.3.1 At annual survey, check condition and operation of pumps and valves. Signboards and instructions shall be available in readable condition.

1.5.3.2 Distribution pipes shall be blown through with air annually and nozzles inspected for debris. Corrective action shall be taken if more than insignificant debris is found. Test or record of the test shall be presented to the attending surveyor.

1.5.3.3 At renewal survey distribution pipes in one section shall be flushed properly with fresh water and nozzles inspected after this flushing to ensure that they are free from debris and not clogged (most of the nozzles can be blinded during this test). Further testing shall be carried out if result is negative.

1.5.4 Dry powder system for LNG and LPG carriers

1.5.4.1 At each intermediate, periodical or renewal survey for cargo ships, an inspection is to be carried out by an approved service supplier. The record from this inspection is to be filed onboard.

1.5.4.2 The gas cylinders and pressure tanks are to be subject to periodical hydrostatic testing at maximum intervals of 10 years. Testing is required for not less than 10% of the cylinders and at least 50% of the tanks
every 10 years.

1.5.4.3 The annual survey shall follow maker’s service instructions and in addition if not specified:
— inspection of dry chemical powder for caking and moisture
— check of monitors, including movement and lock in position mechanism
— check of all flexible hoses including dry powder hose in hose station for damage
— external survey of control valve
— blow through of lines (or review record for this).

1.6 Fire Main System

1.6.1.1 The annual survey shall include:
— full flow test of main fire pumps and emergency fire pump (normally with two hoses with min. 2.5 / 2.7 bar at nozzle)
— check condition of hydrants, fire hoses and verify annual hydrostatic test
— check condition of fire main isolation valve(s)
— hydrostatic test fire hoses as found necessary (flushing with freshwater after test is recommended)
— inspect anti-freeze section of the fire main system, if applicable.

1.7 Other fire fighting equipment

1.7.1 Portable extinguishers

1.7.1.1 Survey and testing of fire extinguishers are to be carried out periodically at the following intervals:
— annual inspection or maintenance by competent person or ship’s responsible safety officer, in accordance with manufacturer’s instructions
— every five years examined and refilled by an approved firm
— every ten years from date of manufacture overhauled and subjected to hydrostatic test to 1,35 times maximum working pressure, by manufacturer or approved firm.

1.7.1.2 The MSC/Circ.951, Improved Guidelines for Marine Portable Fire Extinguishers, may be used as a non-mandatory guidance.

1.7.2 Transportable extinguishers

1.7.2.1 Examples of such devices are the 45 litre and 135 litre foam or 25 kg and 50 kg powder transportable extinguishers.

1.7.2.2 Survey and testing of transportable extinguisher are to be carried out periodically at the following intervals:
— annual inspection or maintenance by competent person or ship’s responsible safety officer, in accordance with manufacturer's instructions
— every five years examined and refilled by an approved firm
— every ten years from date of manufacture overhauled and subjected to hydrostatic test to 1,35 times maximum working pressure, by manufacturer or approved firm.

1.7.2.3 The general condition of these items is to be assessed (corrosion, indents, pressure, etc.) annually by the crew and at the renewal survey by the surveyor.

1.7.3 Foam applicators

1.7.3.1 The general condition of these items is to be assessed annually by the crew and at the renewal survey by the surveyor.

1.7.3.2 The general items for foam systems in 1.2.3 shall also be verified.

1.7.4 Fireman's outfit and air compressors

1.7.4.1 Condition of fireman's outfit to be checked.

1.7.4.2 All air cylinders for the self contained breathing apparatus are to be subject to hydrostatic testing at maximum intervals of 5 years.
1.7.4.3 The air quality of any air compressor for the air cylinders for the self contained breathing apparatus shall be tested annually, see MSC/Circ.850, 7.11. Record to be presented to the surveyor.

1.7.5 EEBDs

1.7.5.1 Survey and testing of EEBDs are to be carried out periodically at the following intervals:

— annual inspection or maintenance by competent person or ship's responsible safety officer, in accordance with manufacturer’s instructions
— the sets shall normally be overhauled and pressure tested to 1.35 times maximum working pressure every 5 years by manufacturer or approved firm unless specified for other intervals by the manufacturer pressure test is normally not required for pure oxygen types.

1.7.6 Protection of Deep fat fryers

1.7.6.1 A fixed fire extinguishing system with alarms and shutdowns is only required on ships keel laid after 1st July 2002 and for new deep fat fryer installations for ships built prior to this date.

1.7.6.2 Tests and inspections as per maker’s recommendation and the Society’s type approval certificate shall be carried out annually. As a minimum the general condition of the system shall be assessed.

1.7.6.3 At renewal surveys the following items shall be checked:

— expiry date of any additives
— alarms and shut-down function
— function test, if practicable
— every ten years from date of manufacture samples of pressure vessels shall be overhauled and subjected to hydrostatic test to 1.35 times maximum working pressure, by manufacturer or approved firm.

1.7.7 Protection of Galley Ducts

1.7.7.1 A fixed fire extinguishing system is required for exhaust ducts from galley ranges if these ducts pass through other rooms.

1.7.7.2 Tests and inspections as per maker’s recommendation shall be carried out annually. As a minimum the general condition of the system shall be assessed.

1.7.7.3 At renewal surveys the following items shall be checked:

— expiry date of any additives
— function test for water based systems, if practicable
— every ten years from date of manufacture samples of pressure vessels shall be overhauled and subjected to hydrostatic test to 1.35 times maximum working pressure, by manufacturer or approved firm.

1.7.8 Helideck foam systems

1.7.8.1 Testing of quality of foam-forming liquids is to be carried out periodically not later than 3 years after manufacture and annually thereafter. Testing is to be carried out by the manufacturer, an approved service supplier or a recognised test laboratory.

1.7.8.2 The general items for foam systems in 1.2.3 shall also be verified.

1.8 Fire Detection System

1.8.1.1 The general condition of these items is to be assessed and proper operation is to be tested.

1.8.1.2 At renewal surveys a more extensive test of power supplies, including back-up, fault alarms, etc. shall be carried out.
1.9 Ventilation and fire doors

1.9.1.1 The general condition of self-closing doors and fire dampers are to be assessed and proper operation is to be tested.

2 Additional requirements for Passenger Ships (PSSC certificates)

2.1 Automatic sprinkler systems

2.1.1.1 A full flow test of minimum 2 sprinklers shall be carried out each year, according to Appendix A and the relevant type approval certificate. The test is in general required for systems designed according to IMO res. A.800(19), as amended, and may be exempted for conventional sprinkler systems.

2.1.1.2 Some systems (in particular high pressure system having nozzles and system components with small orifices) have restrictions with respect to water quality (shall in some case be potable quality with max 50 ppm chlorides and particles below 0.1 mm). Record of water quality testing shall in these cases be inspected.

2.1.1.3 Sprinkler systems have gas cylinders (nitrogen or air) and water cylinders or tank. The gas and water and foam cylinders shall be tested and inspected as for the high pressure gas systems (see 1.3.2), whereas any water tank shall be inspected internally and externally every 5th year. It is recommended that also the water cylinders are inspected internally every 5th year, the attending surveyor shall consider this based on general condition of the system.

2.2 Low location lighting (LLL) systems

2.2.1.1 The LLL systems are either photoluminescent or electrical systems and are installed in corridors and stairways to show the direction to the muster stations.

2.2.1.2 The function of the LLL system shall be tested. Any damaged or missing sections shall be repaired or replaced.

2.2.1.3 All LLL systems shall have their luminance tested at least once every five years by a recognized test laboratory or approved service supplier.

Records from both the weekly inspection by crew and the 5-yearly testing are to be available onboard.

2.3 Smoke extraction systems

2.3.1.1 Atriums in passenger ships with keel laid after 1994-01-01 shall be fitted with smoke extraction systems.

2.3.1.2 The function of a smoke extraction system shall be tested at the annual survey (activated manually or by the smoke detection system).

SOLAS II-2/15 Instructions, Onboard Training and Drills

Fire Control Plan

Regulation 15.2.4.2

For Passenger Ships, an approved copy of the Fire Control Plan shall be available onboard the ship at all times.

SOLAS II-2/18 Helicopter Facilities

Structure

Regulation 18.3.2.1 and 2

The additional requirements in regulation 18.3.2.1 and 2 will only apply if the aluminium “is not made equivalent to steel”. There is no available IMO document which provides guidance on how a helideck in aluminium can be documented to be equivalent to a helideck in steel. DNV has in previous cases given the following opinions:

— the definition of “steel or other equivalent material” in regulation 3.43 is not applicable for a helideck which is elevated above the ship structure.

Guidance note:
If accepted by the flag administration, an un-insulated aluminium helicopter deck may be considered as equivalent to steel if the deck construction is tested for a pool fire for at least 10 minutes.
The deck should during the test show no signs of leakage of fuel and the structure should be maintained without any deformations.

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Fire-fighting appliances

*Regulation 18.5.1.3*

In addition to the pop-up spray system, a portable foam applicator shall be provided for flexibility in fire fighting operations. This may apply one of the hydrants / hoses required by Regulation 18.5.5. The portable foam applicator shall comply with IMO FSS Code Ch.4.3.2 (1.5 m³ foam / minute) or with Ch.4.3.2 as amended (200 l premix / minute).

Helicopter refuelling and hangar facilities

*Regulation 18.7.11*

Where a water spray system is installed as the fire-extinguishing system in a hangar, the arrangement shall be in accordance with the Rules Pt.6 Ch.1 Sec.2 G300.

A section of fire detectors covering a helicopter hangar, shall not include fire detectors or manual call points covering machinery spaces of category A.

SOLAS II-2/19 Carriage of Dangerous Goods

General

Requirements are included in the Rules Pt.5 Ch.11.

Ventilation

*Regulation 19.3.4.2*

**Fans to be of a type that prevents the possibility of the ignition of flammable gas-air mixtures**

According to the recommendations published by the International Electrotechnical Commission (IEC), a “standard” to which SOLAS is referring to, fan motors may be installed within the vent. duct provided that they are certified in compliance with the requirements required for the hazardous zone they are mounted in.

According to the IMSBC Code and the entries for some substances; e.g. Ferrosilicon, it is stated that: “The cargo spaces shall be ventilated by at least two separate fans which shall be explosion-proof and arranged so that the escaping gas flow is separated from electrical cables and components. The total......”

Due to this mismatch between SOLAS/IEC and the IMSBC Code, DNV interprets that SOLAS, and therefore IEC too, overrule the IMSBC Code when there are inconsistencies between them, because the IMSBC Code is an instrument under the SOLAS convention.

Therefore: As long as the fans are certified in compliance with the requirements required for the hazardous zone they are mounted in, they are also fulfilling the requirements in the IMSBC Code even if they are mounted with their motor inside the vent. duct.

**Wire mesh guard for ventilation openings**

The wire mesh guard is for preventing foreign objects to enter the cargo holds. According to IACS SC52 the mesh should be maximum 13 ×13 mm. Equivalent protection are considered.

**Equivalent protection to wire mesh guards may be spark arresting screens**

US Coast Guard recommendation for flame screen is:

— one screen with 30 × 30 threads going orthogonal per square inch

or

— two screens with 20 × 20 threads going orthogonal per square inch fitted in series with distance between screens of not less than ½ inch and not more than 1 ½ inch.
Portable fire extinguishers

Regulation 19.3.7

The requirement of 2 portable dry powder fire extinguishers having a capacity of not less than 6 kg each or equivalent, when dangerous goods is carried on weather deck, in open ro-ro cargo spaces, in vehicle spaces and in cargo spaces as appropriate is a requirement independent of the number of cargo spaces.

Equivalencies to dry powder

The equivalent size of medium for fire-extinguishers to follow the FSS Code Ch. 4.3.1.1.

As a “Rule of Thumb” the following comparisons can be used:

CO₂: 1 kg of Dry Powder = 1 kg of CO₂.
Foam: 1 kg of Dry Powder = 1.8 litres of Foam.

Document of Compliance

Regulation 19.4

Mandatory Codes:

— The International Maritime Solid Bulk Cargoes (IMSBC) Code

The required document of compliance will be issued as either:

— IDG: Document of Compliance for the Carriage of Dangerous Goods, compliance with the IMSBC Code and the IMDG Code
— IDG-B: Document of Compliance for the Carriage of Dangerous Goods - Bulk Cargo, compliance with the IMSBC Code

The International Maritime Solid Bulk Cargoes (IMSBC) Code

Substances which may self-heat

Detection of the temperature inside the bulk cargo shall be possible. Lowering portable thermometers down sounding pipes or equivalent is accepted.

Substances which shall not be stowed on or adjacent to heated surfaces

For vessels not complying with the temperature detection requirement in the fuel oil tanks adjacent to the cargo holds will have the following footnote for the relevant cargoes on the DOC:

“Any tank containing Fuel oil adjacent to cargo hold shall NOT be heated above the temperature limit specified in the IMSBC Code, as amended.”

SOLAS II-2/20 Protection of Vehicle, Special Category and Ro-Ro Spaces

Precaution against ignition of flammable vapours in closed vehicle spaces, closed ro-ro spaces and special category spaces

Regulation 20.3.2

All electrical circuits terminating in the cargo holds, that are not of certified safe type suitable for zone 1, shall be provided with multipole linked isolating switches situated outside the cargo holds, and accessible only to authorized personnel. Provision shall be made for isolation, and for locking in the off position, of the means of control of such circuits. Emergency consumers are not allowed to be disconnected.

If electrical circuits of the gas detection system are located in the cargo hold, the system shall be of the certified safe type (see Ch.8).

“No smoking” notices shall be posted in way of all accesses to these compartments.
SOLAS II-2/21 Casualty Threshold, Safe Return to Port and Safe Areas and SOLAS II-2/22 Design criteria for systems to remain operational after a fire casualty

Application

MSC.1/Circ.1369 “Interim Explanatory Notes for the assessment of passenger ship Systems’ capabilities after a fire or flooding casualty” is the currently available guidance document from IMO.

The status of this document to be decided by Flag Administration for each new building case.

Safe Return to Port arrangements on the vessel will be accepted based on Owner & Yard project specific interpretation document.

The ship system's capabilities for the three casualty cases required by SOLAS II-1/8-1, II-2/21 and II-2/22 should be documented in three steps:

1) “Initial concept report” containing ship description and principle decisions as location of Safe Areas, intended area of operation (speed versus weather and sea conditions incl. distance to safe port), power supply for the essential systems, project specific set of interpretations etc.

“System Description” drawings/documents describing location, arrangement and connection of essential systems.

“Casualty Cases” based on list of spaces considered having negligible fire risk, MVZ boundaries, class “A” boundaries and spaces arranged with fixed fire-extinguishing systems including watertight subdivision plan.

2) An “Overall Assessment” where the input is a combination of results from System Description and Casualty Cases, e.g part of systems that are involved in each specific casualty scenarios for the given ship design.

A “Detailed Assessment of critical systems”, if any.

Ordinary class system drawings

3) “SRtP Assessment report”, final report providing summary of the above and including all assumptions and limitations for the ship, operational area, manual actions to be taken to restore operation of systems, if any, test program, maintenance plan and references.

The outcome of the whole process shall be documented in the SiO phase.

Navigational systems

Regulation 21.4.3

In case of fire casualty affecting the navigating bridge, the following navigation equipment (portable or fixed) should be available in another location:

a) Compass (magnetic)
b) GPS
c) X-Band radar display with electronic charts
d) Whistle
e) Navigation lights
f) Internal communications with engine control room and steering gear.

FSS Code Ch.5 Fixed Gas Fire-extinguishing Systems

General requirements for all Gas Fire-extinguishing Systems

FSS Code Ch. 5.2.1.1.3

Arrangement of bottles shall be such as to provide access for the necessary checking of fire-extinguishing medium in the containers.

FSS Code Ch. 5.2.1.1.4

Unless otherwise specified, the maximum ambient temperature shall be understood as 55°C. Certification of the bottles shall be carried out according to the Rules Pt.4 Ch.7 Sec.1 D as for CO2 bottles.

FSS Code Ch. 5.2.1.3.2

For CO2 systems, an automatic time delay unit for the release of the extinguishing medium shall be fitted. The time delay unit shall be equipped with an override and signboard describing emergency bypass operating instructions. In the case of an electric time delay, a dedicated battery (UPS) may be accepted as an alternative to the override function.
Equivalent gas systems (systems designed according to IMO MSC/Circ.848) need not be provided with a time delay unit, when the protected space has a gas concentration being below the defined LOAEL level of the agent in question (for this purpose 52% can be applied for inert gas systems).

**IMO Code on Alarms and Indicators**

The alarm shall be both audible and visual and shall be so located as to be audible and visual throughout the protected space with any machinery operating. The audible alarm should be distinguished from other alarms by adjustment of sound pressure or sound patterns. The visual alarm shall be red as per ISO 2412. Cargo handling spaces (cargo pump room and gas compressor rooms) need not to be fitted with visual alarm.

Any alarm components installed inside cargo pump room, cargo compressor rooms, paint lockers, battery room (as applicable) and similar gas hazardous spaces shall be certified safe according to the hazardous area classification in question.

Alarms shall be pneumatically or electrically operated. If electrically operated, the alarm shall be supplied with power from the main and emergency source of electrical power. If pneumatically operated the alarm shall not be driven by CO₂ (nor any other agent used as fire extinguishing media). The pneumatic source shall be available even with a fire in any protected space. Any stop valve fitted in the air supply line shall be sealed in open position.

The requirement for the release controls applies also in the case where the CO₂ room is installed aft of cargo area and accommodation is provided forward of cargo area.

Warning signs shall be provided outside each entrance to all spaces protected with a gas fire extinguishing system.

**FSS Code Ch.5.2.2.1**

Protected spaces can be divided into sections when such spaces are divided by divisions of A0 class and when the spaces have independent or adequately separated ventilation systems. Spaces without such divisions and separation shall for the purpose of determining quantity of extinguishing agent be considered as one section.

**Regulation 10.4.3/FSS Code Ch.5.2**

Small local systems, like for instance extinguishing systems for galley exhaust ducts, small switchboard rooms and paint lockers can be exempted from some of the requirements pertaining to fire extinguishing gas systems. Systems are in this context considered as small local systems if the total amount of agent is limited (this may for instance be one small CO₂ cylinder for a standard galley or six 45 kg CO₂ cylinders inside a large engine room) and there is in general a short distance between area where the agent is stored, position of release controls and entry to the protected space.

Small local systems can be stored in position that does not comply with regulation 10.4.3 when the amount of gas is small compared to the volume of the storage space. The case where the gas due to an accident is released into the space where it is stored shall be calculated and the gas concentration should in general not exceed 8% CO₂ or the NOAEL specification for the gas in question. Calculations are not required for cabinets located on open deck. The space shall be provided with mechanical ventilation if located inside accommodation while natural ventilation is accepted where the storage space has direct entrance from open deck. Storage inside corridors and staircases shall be avoided.

Time delays are not required for small local systems. The requirement for discharge alarm and two release controls can be waived for small local systems when the system is covering spaces that are normally unmanned (stores, etc.) and when the release control is located immediately outside the entrance to the protected space. Discharge alarm and two release controls are in any case not required for concealed spaces (ventilation ducts, scavenge belt, etc.)

Piping through accommodation and service spaces will be considered in each case for small local systems (see FSS Code Ch.5.2.1.3).

Special considerations will be made for systems not required to be fitted by the regulations.

Pipes serving gas hazardous spaces such as cargo pump room or cargo compressor rooms can be routed through other enclosed spaces (machinery spaces, etc.) if the pipes inside the enclosed spaces are:

- connected with full penetration butt welds (flanges or threaded connections are not accepted for this part)
- the pipe penetration(s) into the gas hazardous space is welded from both sides
- the pipes inside the enclosed spaces are tightness tested at approximately 7 bar. Flanges shall be provided outside the enclosed space(s) at locations suitable for testing

For pipes routed though gas hazardous spaces without serving these, the number of couplings shall be limited and the piping shall be tightness tested.
General requirements for CO₂ Fire-Extinguishing Systems

FSS Code Ch. 5.2.2

Calculations according to a recognised standard (NFPA 12, 2005 edition, ISO 6183, 1990 edition or equivalent) shall be performed.

Opening of the valves to the pilot cylinders is not regarded as one separate control. There shall be a release box for each protected space in which personnel normally work or to which they have access. The space served shall be identified at the release box. These requirements apply for all CO₂-systems.

The pilot cylinders shall have capacity to operate the system three times even under unfavourable temperature conditions.

The number of nozzles shall be sufficient to provide an even distribution of CO₂ gas throughout the space.

In cases where the CO₂ room is readily accessible, one release station may be acceptable. One section valve ("control valves" as per FSS Code) for each of the protected spaces shall be fitted to the piping system of the total flooding system. The operation of those valves shall be controlled from the position where the CO₂ system is released.

This shall be arranged, if possible, by interlocking devices on the control handles, so that any fault in the sequence of operation does not prevent the release of CO₂ gas. The section valve shall be manually operable even with maximum CO₂ pressure acting on it.

The CO₂ bottle valves shall be of a type which makes it possible to close the bottles after testing the release system without emptying the CO₂ content.

Bottles shall not contain more than 45 kg of CO₂ and the ratio of charge shall not exceed 0.67 kg/litre. The company charging the bottles shall issue a certificate for the ratio of charge. Bottles of sizes up to 53.3 kg (80 litre) may be approved case by case based on satisfactory handling arrangements. All bottles shall be of the same size. Each CO₂ bottle shall be delivered with DNV product certificate according to the Rules Pt.4 Ch.7 Sec.1.

The connection between the bottle-valve and the manifold for the CO₂ battery is normally to be flexible high pressure hose of approved type. Other types of connections which are considered equivalent (stainless steel tubes) may be accepted.

Non-return valves shall be fitted between the separate bottles and the manifold, in order that a bottle, if necessary, can be disconnected from the battery without putting the whole installation out of action. The non-return valve shall be fitted to the manifold. If the non-return valve is fitted in the upper portion of the bottle valve, a notice shall be posted, which clearly to the manifold, even if the appropriate bottle has been temporarily removed.

The maximum design pressure for the CO₂ bottles and bottle valves shall be 190 bar. All other components, including couplings and flanges, in the high pressure side of the system (upstream of section valve) shall be designed to a pressure of minimum 100 bar (PN 100), whereas all components downstream of section valve shall have a pressure rating of minimum 40 bar (PN40). Minor deviations (+/- 10%) can be accepted when other recognised standards are applied.

Couplings, welded joints and flanges shall be designed and tested in compliance with Rules for Classification of Ships Pt.4 Ch.6. In addition to these requirements restrictions will apply to welded and threaded joints as socket and slip-on sleeve welded joints are only accepted downstream of the section valve (the open ended side) whereas threaded joints are only accepted for pipes located inside the protected spaces (all dimensions) and pipes with external diameter below 20 mm (both upstream and downstream of the section valve).

The CO₂ manifold (piping connecting the CO₂ cylinders to the section valves) shall be made of steel, or equivalent material, with the wall thickness of which shall be at least as given in Table 6. The CO₂ manifold shall comply with the requirements specified in the Rules Pt.2 Ch.1 or other recognised standard (DIN 2448, ISO 9329 part 1 and 2, ISO 9330 part 1 and 2), and shall be certified by the Society.

In piping sections where valve arrangements introduce sections of closed piping, such sections shall be fitted with a pressure relief valve and the outlet of the valve shall be led to open deck.

All discharge piping, fittings and nozzles in the protected spaces shall be constructed of materials having a melting temperature which exceeds 925°C. The piping and associated equipment shall be adequately supported.

The section valves shall be of steel or equivalent material and shall comply with PN 100 (nominal pressure). Valves above 31 mm (1¼ inch) shall be of flanged type.

The wall thickness of CO₂ pipes fitted between valves and nozzles is at least to comply with Table 7. Fittings used to join this part of the CO₂ pipes may be of malleable cast iron or nodular cast iron.
The portion of the piping fitted outside the protected space shall be protected externally and internally against corrosion.

In order to reduce the pipe resistance, the pipes shall be laid as straight as possible and to follow the shortest way to the nozzles. Connecting pieces shall not be fitted in such a way that the pipe threads are exposed to corrosion. All pipes intended to carry CO2 shall be free from debris, rust and scale.

The CO2 piping system shall have a blowing-through connection for drying, ventilation and checking purposes. A gauge shall be fitted to the CO2 manifold.

Regarding manufacture, workmanship, inspection and testing of pipes, see the Rules Pt.4 Ch.6 Sec.7. For CO2-manifolds the hydrostatic test pressure may be accepted as 1.25 times design pressure.

The CO2 manifold shall be hydrostatically pressure tested to at least 1.25 times the relief valve setting, or minimum 125 bar prior to installation. The set pressure for the relief valve shall in any case be minimum 100 bar. After installation, the CO2 manifold with all associated components including any release line incorporated in the system shall be pressure tested to at least 50 bar. All piping from section valves to nozzles shall be tightness tested and inspected with a blow through test.

A function test of the system shall be carried out to verify correct operating of release controls and alarms. The part of the gas distribution piping that runs through accommodation spaces shall be designed and tested in accordance with FSS Code Ch. 5.2.1.3.1. All other piping shall be tested to ensure that it is free from obstructions. As far as practicable, the function testing shall be performed in the most realistic manner.

### Fire-extinguishing systems for cargo holds

The internal diameter of the pipes shall not be less than 19 mm. Branch pipes leading to the various nozzles may have an internal diameter of 13 mm. At suitable points, the pipeline shall have facilities for drainage and cleaning.

All CO2 piping shall be led such that they are as visible and accessible. The piping to cargo holds are as far as practicable to be fitted below the weather deck and shall be laid as straight as possible. Branch pipes leading to the various nozzles shall be symmetrically installed. All piping shall be properly clamped and, where necessary, protected against external damage. The number of joints shall be kept to a minimum and all joints shall be of welded or flanged design.

### CO2 high pressure fire-extinguishing systems for machinery spaces, cargo handling spaces and ro-ro spaces

The diameter of CO2 pipes shall be based on the quantity of CO2 they are intended to carry. The maximum quantity of CO2 which may be carried through any pipeline is given in Table 8. The total sectional area of the nozzles in protected space shall not be greater than 85% or less than 50% of the total sectional area of the CO2 bottle valves intended for the respective rooms. Deviations from the requirements for pipe diameters and section area of nozzles table may be accepted when documented by calculations.

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**Table 7 Minimum wall thickness for steel pipes for fire-extinguishing CO2 pipes**

<table>
<thead>
<tr>
<th>External diameter D (mm)</th>
<th>From CO2 bottles to valves (mm)</th>
<th>From valves to nozzles (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.3 – 26.9</td>
<td>3.2</td>
<td>2.6</td>
</tr>
<tr>
<td>30.0 – 48.3</td>
<td>4.0</td>
<td>3.2</td>
</tr>
<tr>
<td>51.0 – 60.3</td>
<td>4.5</td>
<td>3.6</td>
</tr>
<tr>
<td>63.5 – 76.1</td>
<td>5.0</td>
<td>3.6</td>
</tr>
<tr>
<td>82.5 – 88.9</td>
<td>5.6</td>
<td>4.0</td>
</tr>
<tr>
<td>101.6</td>
<td>6.3</td>
<td>4.0</td>
</tr>
<tr>
<td>108.0 – 114.3</td>
<td>7.1</td>
<td>4.5</td>
</tr>
<tr>
<td>127.0</td>
<td>8.0</td>
<td>4.5</td>
</tr>
<tr>
<td>133.0 – 139.7</td>
<td>8.0</td>
<td>5.0</td>
</tr>
<tr>
<td>152.4 – 168.3</td>
<td>8.8</td>
<td>5.6</td>
</tr>
</tbody>
</table>

Remarks to the table:

1) The external diameter and thicknesses are in accordance with ISO Recommendations R 336 for welded and seamless steel pipes. For pipes covered by other standards, thickness slightly less may be accepted.

2) The minimum wall thickness for larger diameters will be subject to special consideration.

3) In general, the minimum wall thickness is the nominal wall thickness, and no allowance need be made for negative tolerance and reduction in thickness due to bending.

4) The minimum wall thickness for threaded pipes shall be measured at the bottom of the thread.
The following CO₂ gas concentration should be provided for cargo spaces and cargo handling spaces (calculated at the entire gross volume):

- 35% for cargo pump rooms in oil carriers (regulation 10.9)
- 45% for cargo pump rooms in chemicals carriers (IBC Code)
- 45% for ro-ro spaces (regulation 20.6)
- 45% for cargo compressor and cargo pump rooms on liquefied gas carriers (IGC Code).

### Low Pressure CO₂ Systems

**General**

The vessel(s) is to be designed, constructed and tested in accordance with the requirements of the Society for liquefied gas vessels under pressure, see the Rules Pt.5 Ch.5. For this purpose the design pressure is to be taken not less than the relief valve setting. Besides, provision is to be made for:

- pressure gauge
- high pressure alarm at 22 bar
- low pressure alarm at 18 bar
- diaphragm bleed valve
- branch pipes with stop valves for filling the vessel
- discharge pipes
- liquid CO₂ level indicator, fitted on the vessel(s), and remote level indicator located in the fire extinguishing station
- two safety relief valves arranged so that either valve can be shut off while the other is connected to the vessel.

The setting of the relief valves is to be not less than 22 bar.

The capacity of each valve is to be such to discharge, with not more than 20% rising pressure above the setting pressure, the vapours generated under fire condition. The fire exposure factor “F” to be taken as 0.2 (see the Rules Pt.5 Ch.5 Sec.9 C301). The discharge from the safety valves is to be led to the open.

Audible and visual alarms should be given in a continuously manned control station.

The refrigerating plant shall comply with the requirements given in the Rules Pt.5 Ch.10 to the extent these are applicable.

The refrigerating capacity and the automatic control of each unit, shall be so as to maintain the required temperature under conditions of continuous operation during 24 hours at the sea temperature up to 32°C and ambient air temperature up to 45°C.

In the event of failure of either one of the refrigerating units, the other shall be actuated automatically. Provision shall be made for local manual control of the refrigerating plant.

The pipes, valves and fittings shall be in accordance with the requirements of the Society, for a design pressure not less than the design pressure of the CO₂ vessels.
Testing

The pipes, valves and fittings and assembled systems, shall be tested to the satisfaction of the Society.

In particular, the pipes from the vessel(s) to the release valves on the distribution manifold, shall be submitted to hydraulic test at pressure 1.5 times the design pressure.

All piping, after having been assembled on board, shall be tested for tightness and free flow of the CO₂.

The refrigerating plant, after having been fitted on board, shall be checked for its proper operation.

Equivalent Fixed Gas Fire Extinguishing Systems

General requirements

Equivalent fixed fire extinguishing system shall comply with IMO MSC/Circ.848, as amended in addition to part A and B of this appendix.

Equivalent fixed gas fire extinguishing systems may be accepted for use in other spaces, like switchboard rooms and cargo handling spaces. A higher gas concentration will in general be required for cargo handling spaces, in particular those handling methane.

For the purpose of calculating the quantity of extinguishing agent and the actual concentration based on net volume (for NOAEL and LOAEL verification), an ambient temperature for the protected space of 20°C may be applied.

Components of the gas extinguishing system shall comply with the Rules Pt.4 Ch.1 to Pt.4 Ch.10 with pressure rating according to design pressure documented by maker. However, the NFPA 2001 may be applied as design standard for piping and couplings inside the protected space.

Cylinders (agent containers) shall not contain more than 81 Litre of agent. Larger cylinders may be approved case by case based on satisfactory handling arrangements. All bottles shall be of the same size. Each cylinder shall be delivered with DNV product certificate according to the Rules Pt.4 Ch.7 Sec.1.

FSS Code Ch.6 Fixed Foam Fire Extinguishing Systems

General requirements to High Expansion and Inside Air Foam Systems

Application

Any fixed foam fire-extinguishing system shall comply with the requirements of IMO FSS Code Ch.6. Systems for machinery spaces and cargo pump rooms shall also comply with the following parts of this chapter Application, Definitions, Water and foam concentrate supply systems, Foam generating components and foam generator room, System arrangement, Arrangement for machinery spaces and cargo pump rooms, whereas systems for ro-ro spaces shall in addition to the FSS Code comply with the following parts of this chapter Application, Definitions, Water and foam concentrate supply systems, Foam generating components and foam generator room, System arrangement and Arrangement for ro-ro spaces.

Air intakes and sea water intakes, shall comply with applicable requirements for load line. Approvals for foam concentrate, foam filling rate and capacity, operation of dampers and similar are defined by the FSS Code.

An operation manual, describing standard release procedures as well as procedures in case of failure of essential components shall be available on board. The manual shall also identify which hatches, dampers and similar devices that are required to be opened when the system is operating. Release procedures (standard and failure) shall be listed on signboards at the release stations.

Manuals defining in detail maker’s recommended maintenance and test procedures shall be available on board.

All systems not complying with FSS Code requirements for location and accessibility of foam generators, are for the purpose of these rules defined as inside air foam systems. These systems can also be approved under these rules on a case by case basis. Any inside air foam system shall be type approved by the Society. The foam production rate, total foam liquid capacity and location of generators are subject to special considerations, see the system’s type approval certificate.

Definitions

Foam: the extinguishing medium produced when foam solution passes through a foam generator and is mixed with air.

Foam solution (premix): a solution of foam concentrate and water.

Foam concentrate: the liquid which, when mixed with water in the appropriate concentration forms a foam solution.

Foam generators: discharge devices or assemblies through which foam solution is aerated to form foam that is discharged directly into the protected space, typically consisting of a nozzle or set of nozzles and a casing. The
Casing is typically made of perforated steel / stainless steel plates shaped into a box that enclose the nozzle(s).

**Foam inductor:** mixing unit which does not need a dedicated foam pump in order to mix the foam concentrate into the water (typically within +30% / -0% of nominal mixing rate).

**Foam proportioner:** mixing unit which need a foam pump in order to mix the foam concentrate into the water (typically within +30% / -0% of nominal mixing rate).

**Water and foam concentrate supply systems**

The water supply pump shall be of self priming type unless the water is supplied from a tank with a guaranteed quantity corresponding to the maximum required foam production. The emergency fire pump can be used as supply pump provided that 25 m³/h at required pressure is dedicated for fire hose purposes and thus not included in the foam production capacity calculations.

The foam concentrate shall be stored in a special tank and fed to the foam generator by a suitable system, which shall be permanently adjusted for consumption of seawater or freshwater, as applicable. The tank for the foam concentrate shall be protected against inside corrosion and shall be suitable for storage of the intended foam concentrate. Means of measuring liquid level shall be provided.

Pressure gauges shall be fitted at both inlets (water supply and foam concentrations) and the outlet of the foam proportioner.

Piping and components coming into direct contact with the foam concentrate shall be made of corrosion resistant materials such as CuNi, stainless steel or marine bronze. Galvanised steel or equivalent is accepted for other piping.

For testing and drying purposes the piping system shall be fitted with connection for blowing through with compressed air.

The water supply pumps (regardless of size) and foam concentrate pumps with capacity exceeding 25 m³/h (measured at 10 bar) shall be delivered with DNV product certificate. Foam concentrate pumps with lower capacity shall be delivered with certificate issued by the maker (work certificate).

**Foam generating components and foam generator room**

The high-expansion foam generating components (nozzles, mesh and any fans, etc.) shall be of approved type, based on a realistic full scale test.

The foam concentrate shall be type approved by the Society in addition to being mentioned on the type approval certificate for the high expansion or inside air foam system in question. The foam proportioner / inductor shall be type approved by the Society.

The foam concentrate shall in general be supplied through foam pump(s) and foam proportioner(s). Foam inductors will only be accepted when it can be documented that the entire system can work at a wide range of foam concentrate mixing ratios.

All components in the foam generating system, shall be made of corrosion resistant materials such as CuNi or marine bronze. Stainless steel may be accepted for parts exposed to foam or seawater only when the system is operating, provided that a suitable flushing system is installed. The material and coating (if applicable) of the foam concentrate storage tank shall comply with the limitation stated in the type approval certificate issued by the Society and maker’s specification for this particular concentrate.

The foam generating nozzles or meshes shall be made of a durable, non-shrinking material that is rot- and heat-resistant. These foam nozzles or meshes are also to have as large openings as possible. The nozzles shall be so constructed that they have the least possible chance of getting clogged.

All electrical components in connection with the foam generating components shall have at least IP54 rating.

The foam generator shall be supplied with a special air intake dimensioned according to the air consumption of the generator.

All foam generators shall be fitted with a damper as specified by the FSS Code Ch.6, 2.2.2.2. The damper shall, in addition to protection of the generator, prevent malfunction of the generator due to updraft of fumes in the distribution ducts from a fire in protected space. A manual release of the damper is also to be arranged.

The arrangement of the foam generator shall permit testing of the foam production without leading the expanded foam to the rooms to be protected, e.g. by providing means that permit foam to pass overboard or to open deck.

For both high expansion and inside air systems, two test valves capable of being connected to fire hoses, shall be installed on the distribution piping downstream the proportioner / inductor. One valve is for connecting a foam generator in an alternative location, for the purpose of testing satisfactory foam production. The other valve shall be used in order to maintain realistic pressure and flow through the proportioner during testing. Both valves may be used to direct water to outside the protected space when function testing the proportioner.

The foam generating components shall be so constructed and assembled that maintenance and replacement of essential parts, can easily be effected. The system shall be so arranged that nozzles and pipes can easily be rinsed and drained.
The foam generating components shall be placed in a special room, which is separated from all the rooms to be protected. Safe and readily available access to this foam generator room and to the water and foam pumps, shall be ensured even in case of fire in any of the protected spaces.

The foam generator room shall have a heating system which can keep the room permanently free from frost and mechanical ventilation for overpressure.

Bulkheads and decks in the foam generator room that are contiguous to the rooms to be protected, shall have A-60 rating.

System arrangement
All components in the foam system shall be permanently installed and ready for immediate use.

The ducts leading from the generators to the rooms that are protected, shall be made of steel, or equivalent fire resistant materials. They shall be dimensioned, stiffened and fastened such that they can withstand the normal mechanical and thermal strain they may be exposed to. Requirements for duct arrangement are given under the subsection for machinery spaces and cargo pump rooms and the subsection for ro-rose spaces.

The arrangement of the protected spaces shall be such that any possible overpressure in the space (caused by fire) can be relieved as the room is being filled with foam.

The sources of power supply for the foam generating components, including water and foam pumps, etc. shall be supplied independently of any machinery or electrical installations located in the rooms to be protected.

Failure of single components, except emergency generator, water and foam pumps and piping, shall not prevent operation of the system. All valves shall be accessible and of a type that can be operated also manually (directly on stem or equivalent). Dampers need not to be readily accessible, if the control arrangement is of a robust design (dedicated accumulators needed for pneumatic systems) and several independent dampers and foam generators serve that space. A space shall normally not be served by only one generator. All components shall be able to operate even in case the control system fails.

The system shall be designed to produce foam at required rate within 1 minute from release (time to start emergency generator need not to be included in the 1 minute test).

The system may be divided into sections that may be released in sequence. The capacity and design of the entire system shall be based on the protected space demanding the greatest volume of foam. Two protected spaces need not to be served simultaneously when the boundaries between these spaces are of A-class standard.

Arrangement for machinery spaces and cargo pump rooms
The high expansion foam shall be distributed to the respective rooms by means of ducts. The ducts shall be dimensioned according to the size of the foam generator's outlet, and shall be so located that an even distribution of foam is obtained throughout the room to be protected.

As a minimum, the ducts shall for the main engine rooms be led to the lower part of the casing and shall provide unobstructed access to the main and auxiliary engines from the duct outlet. Adjacent spaces being fully or partially separated from the engine room (workshop, separator room, etc.) shall have separate ducts.

A one meter per minute discharge rate is defined by the FSS Code. This shall be calculated with respect to maximum horizontal area of the room, without reduction for engines, boilers, loose tanks, etc.

The foam production capacity is also to be sufficient to fill the whole room (entire volume enclosed by A-class boundaries) to the level of the main deck in the course of maximum 10 minutes.

The system shall also cover the lower part of the casing and in all cases the highest risk object in casing (for instance boiler).

Where a cargo pump room is covered by a foam system, the foam concentrate shall be approved for use with the cargo being carried.

Arrangement for ro-rose spaces
The high expansion foam shall be distributed to the respective rooms by means of ducts. The ducts shall be dimensioned according to the size of the foam generator's outlet, and shall be so located that an even distribution of foam is obtained throughout the room to be protected.

The layout shall take into consideration obstructions that can be expected when cargo are on board. As a minimum, duct shall be led to every second deck, including movable decks. The horizontal spacing of ducts shall ensure rapid supply of foam to all parts of the protected space. This will be considered case by case based on any full scale test undertaken by the manufacturer.

The foam production capacity shall be sufficient to fill the whole room (entire volume enclosed by A-class boundaries) in the course of maximum 10 minutes.

Testing of high expansion and inside air system
The pipes, valves and fittings and assembled systems shall be tested to the satisfaction of the Society.
All distribution piping shall be blown through with air to ensure that the piping is free from obstructions. Function testing of the foam proportioner / inductor shall be performed. The mixing ratio shall be measured and be within the nominal mixing ratio defined by the type approval certificates (typically +30%/-0%). For foam proportioners using foam concentrates of Newtonian type with kinematic viscosity equal to or less than 100 cSt @ 0°C and density equal to or less than 1.1 kg/dm³ this test can be performed with water instead of foam concentrate. In case of non-Newtonian foam concentrates and concentrates with kinematic viscosity exceeding 100 cSt @ 0°C or density above 1.1 kg/dm³ the function test shall be performed with the actual foam concentrate. All foam inductors shall be function tested with the actual foam concentrate, regardless of foam type.

Function testing of at least one foam generator using foam concentrate mixed to water or seawater shall be performed. The system's ability to produce foam of acceptable quality shall be verified in the most realistic manner being practicable. This test can be done either inside the protected space or by moving one of the generators to an alternative location (e.g., open deck). The test flow should be higher than the minimum accepted flow for the foam proportioner / inductor. Test valves may be used. This requirement may only be waived when an exception is specifically stated on the system's type approval certificate issued by the Society (based on extensive documentation, prototype testing and measurements on each ship).

Function testing of the power and control systems, water pump(s), foam pump(s), valves, remote and local releases stations and alarms shall also be performed.
SOLAS CH. III: LIFESAVING ARRANGEMENT, LSA CODE

General

For non-propelled vessels or cargo vessels with a tonnage of less than 500, IACS Rec. No. 99 or national requirements may be applied for issuance of safety certificates. For such units, an MO will be issued identifying the standard applied.

Documentation requirements

For cargo vessels of 500 gross tonnage and above when the government of the flag state has authorised the Society to issue the Cargo Ship Safety Construction Certificate (CCC) and Cargo Ship Safety Equipment Certificate (CEC) on their behalf, and for passenger vessels and special purpose ships with more than 60 persons when the government of the flag state has authorised the Society to issue the Passenger Ship Safety Certificate (PSSC) and Special Purpose Ship Safety Certificate (SPSSC) on their behalf, documentation shall be submitted according to Table 1:

<table>
<thead>
<tr>
<th>Table 1 Documentation requirements</th>
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<tbody>
<tr>
<td><strong>Object</strong></td>
</tr>
<tr>
<td>Safety, general</td>
</tr>
<tr>
<td>Lifesaving arrangements</td>
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<tr>
<td>Pilot transfer arrangement</td>
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<td>Two-way voice internal communication systems</td>
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<td>Public address system</td>
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<td>General alarm system</td>
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For passenger vessels and special purpose ships with more than 60 persons when the government of the flag state has authorised the Society to issue the SOLAS passenger ship safety certificate (PSSC) and special purpose ship safety certificate (SPSSC) on their behalf, additional documentation shall be submitted for approval according to Table 2:

<table>
<thead>
<tr>
<th>Table 2 Additional documentation requirements for passenger vessels and special purpose ships</th>
</tr>
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<tbody>
<tr>
<td><strong>Object</strong></td>
</tr>
<tr>
<td>Lifesaving arrangements</td>
</tr>
</tbody>
</table>
Passenger Ships and Cargo Ships

SOLAS III/3 Definitions

_Suez Canal crew_ is considered as transit crew on a domestic voyage, and shall not be included in the total number of persons on board for which lifesaving appliances are provided.

*Internal communication systems* are defined as all types of two-way voice communication systems and public address system and general alarm system.

**SOLAS III/4 Evaluation, testing and approval of life-saving appliances and arrangements, and SOLAS III/5 Production tests**

Approval of all mandatory internal communication systems shall be either, by:

a) certification, based on assessment of the following criteria:

1. Identification of the relevant functional, technical, operational and installation requirements according to the applicable class notation(s). This will require submission of the relevant manuals and drawings.
2. A test report from a recognised test laboratory showing compliance with the environmental and EMC requirements according to DNV Standard for Certification 2.4 or IEC 60945.

**Guidance note 1:**

Compliance with IMO Res.1021(26) - [Code on Alerts and Indicators] is recommended.

**Guidance note 2:**

Any non-type-approved equipment is to be certified in accordance with the systematic of DNV Ship Rules Pt.4 Sec.9 for verification of compliance with appropriate international standards.

**Guidance note 3:**

Provision of a certificate issued by another IACS class society, showing that the equipment has been tested against IEC 60945, may be considered as an equivalent to a test report.

Or

b) by following the procedure for type approval, in accordance with DNV Standard for Certification No. 1.2. For passenger ships, the public address system shall be subject to type approval.

**SOLAS III/6 Communications**

**Two-way communication equipment**

*Regulation 6.4.1*

In rooms and compartments with high ambient noise level, the equipment used for compliance with the mandatory two-way voice communication requirements shall have facilities for efficient communication in noisy environments.

Portable two-way voice communication equipment, with charger arrangement, may be used for compliance with the requirements of SOLAS III/6.4.1 provided that there is sufficient radio communication coverage in the specified locations.

If portable two-way voice communication equipment is used for compliance with the two-way voice communication requirements, then the following additional requirements apply:

- chargeable batteries, with a capacity to operate the equipment continuously for at least 5 hours, to be provided for each unit at the required position
- Power supply for chargers shall be in accordance with: SOLAS II-1/42 (passenger ships) and II-1/43 (cargo ships).

**General Emergency Alarm - Requirements for cargo ships and passenger ships**

*Regulation 6.4.2.3.4*

Audibility requirements shall include the following areas:

a) vehicle decks on all types of ship that carry vehicles.

*Regulation 6.4.2/LSA Code 7.2.1.1*
Definition

Strategic positions: Are taken to mean those locations, other than the navigating bridge, from where emergency situations are intended to be controlled and the general alarm can be activated. The minimum number of required places from where a general emergency alarm system should be capable of being operated is at least two. A fire control station or a cargo control station should normally be regarded as strategic positions. [MSC/Circ.887]

Regulation 6.4.3

The General Emergency Alarm system shall be arranged with closed loop(s) or with fuses/breakers at each deck, such that failure in any one loop does not affect other loops or the central unit.

Definition

Normal crew working space: Includes spaces where routine maintenance tasks and local control of machinery operated at sea are undertaken.

Guidance note:
The following rooms will normally be included in the above definition for normal crew working space: engine room, emergency generator room, steering gear room and thruster room.

---e-n-d---of---G-u-i-d-a-n-c-e---n-o-t-e---

Integrated Public Address and General Alarm Systems - Requirements

Regulation 6.4.2.

It is acceptable to integrate the Public Address and General Alarms functions within the same system, or with the Fire Alarm system, subject to the following:

— Compliance with Paragraph 5.8 of IMO Res.1021(26) [Code on Alerts and Indicators].
— The integrated system shall be type approved or case-by-case approved, according to provision defined under SOLAS III/4 and III/5.
— The integrated system shall be arranged to minimise single failure, which implies provision of:

i) System central with redundant design i.e. duplication of signal generator, amplifiers, central control unit and any other essential part of the system.

Guidance note:
For passenger vessels, the required provision of two separate racks/centrals is considered to satisfy the above duplication requirement. For cargo vessels a single rack arrangement is acceptable.

---e-n-d---of---G-u-i-d-a-n-c-e---n-o-t-e---

ii) At least two separated and segregated cable routes, one from each amplifier. The segregation of the cable loops shall be such that in case of failure of one loop in one area, the general/fire alarm and public address announcements shall continue to be audible in that area.

Guidance note:
The audibility requirements defined by LSA Code 7.2.1.2/3 are considered applicable for the normal case, i.e. with both/all loudspeaker loops functional. Hence, in the case of failure of one or more loops, reduced audibility (when compared to LSA Code 7.2.1.2/3.) is accepted.

---e-n-d---of---G-u-i-d-a-n-c-e---n-o-t-e---

Public Address System - Requirements for passenger ships

Regulation 6.5

Audibility requirements shall include the following area:

a) passenger ship vehicle decks.

Regulation 6.5.2/LSA Code 7.2.2.1

Definition

Spaces where crew members or passengers or both are normally present: Includes all accommodation areas and all public spaces.

Regulation 6.5.3.2 / MSC/Circ.808

As special purpose ships with more than 60 persons are considered passenger vessels, MSC/Circ.808 is applicable for the PA system implementation.

Regulation 6.5.3.1 / MSC/Circ.808 (Cabling for Public Address and alarm systems, paragraphs 2.5 & 3.1)

At least two separate and fully independent PA racks/centrals shall be provided, with each rack being located in separate fire zones, or separated to provide the maximum level of redundancy.
Guidance note:
Locating both racks in the same compartment or room should be avoided, but may be accepted subject to special precautions such as separation by fire-proof A60 bulk-heads.

---e-n-d---of---G-u-i-d-a-n-c-e---n-o-t-e---

SOLAS III/7 Personal life-saving appliances

The number of lifejackets for people on watch shall be minimum 2 in the engine control room and 2 in the wheelhouse.

On each side of the ship, there shall be a minimum of one lifebuoy with an attached line. No lifebuoy light or lifebuoy smoke signal shall be attached to this lifebuoy. These lifebuoys may be part of the total amount of life-saving appliances as described in regulation 22 and 32.

The three immersion suits for the rescue boat crew may be regarded as part of the number of suits provided for the total number of persons on board, for which lifesaving appliances is provided. This provided that the rescue boat crew are able to meet the requirement for 5 minutes preparation time, including to pick up the suits from where they are stowed. Immersion suits in locked cabins are considered not applicable for this purpose.

All immersion suits approved to be worn with approved lifejacket shall be stowed together with a lifejacket.

Guidance note:
For free-fall lifeboats inflatable lifejackets is strongly recommended.

---e-n-d---of---G-u-i-d-a-n-c-e---n-o-t-e---

Warm climates are considered between 30° North and 30° South, or according to MSC/Circ.1046.

SOLAS III/11 Survival craft muster and embarkation arrangements

If the embarkation ladders are not installed adjacent to any non-davit launched liferaft, means shall be provided to ensure that the liferaft painter can be easily transferred from the stowage location to the embarkation position.

For passenger vessels, descent units are accepted as replacement for embarkation ladders provided that:

a) The number of descent units is the same as for embarkation ladders. Embarkation ladder or descent-unit shall be provided at each launching station or at every two adjacent embarkation stations. At least one embarkation ladder shall be provided on each side of the vessel in addition to the descent units.

b) The descent units are able to reach the waterline from the deck at a trim of up to 10°, and a list of up to 20° either way in the lightest seagoing condition.

c) There are openings in the rails (70 - 80 cm wide) to avoid that persons need to climb over the rail before descending.

d) The fixing of the eyebolt is found acceptable by the attending surveyor.

e) The various components transferring the load e.g. support arms, hooks, links, shackles, wires etc. shall be made according to recognised standards, with a minimum safety factor of at least 6, and are delivered with documentation for grade of material and testing. The units shall be stamped with SWL.

f) The support arms have sufficient structural support in the pillars.

g) Adequate onboard testing is carried out in the presence of attending DNV surveyor and the testing is to his/her satisfaction.

h) One embarkation ladder is provided on each side of the vessel in addition to the descent units.

For liferafts required in regulation 31.4 (distance to nearest survival craft >100 m) a knotted rope or descent unit is acceptable as ‘other means of embarkation’. A knotted rope is not acceptable for launching deck above 10 m in the lightest seagoing condition.

For vessels contracted on or after 1 January 2008 an embarkation ladder or other means of embarkation enabling descent to the water in a controlled manner as per SOLAS III/17 to be provided. For these vessels a knotted rope is not acceptable.

Note:
Some Flags have made this requirement retro-active.

---e-n-d---of---N-o-t-e---

SOLAS III/13 Stowage of survival craft

On cargo vessels of 80 m in length and upwards but less than 120 m in length, the aft part of each davit launched liferaft shall be minimum 4 m forward of the vessel’s propeller. On cargo vessels of 120 m in length and upwards and passenger vessels of 80 m in length and upwards, the aft part of each davit launched liferaft shall be minimum 6 m forward of the vessel’s propeller.
Liferafts shall not be stowed directly above any embarkation station.

**SOLAS III/16 Survival craft launching and recovery arrangements**

The launching arrangement shall be designed so that the survival craft can be launched without having to be pushed outside the deck edge when the vessel is unfavourably heeled 20°.

Lifelines for partially enclosed lifeboats shall be of 20 mm to 24 mm diameter good quality manila rope or synthetic rope of equivalent strength. Property of grip is essential and care shall be taken to ensure that the ropes are suitable for the purpose. Grip properties of synthetic rope, if used, shall be comparable with manila.

**SOLAS III/17 Rescue boat embarkation, launching and recovery arrangements**

The launching arrangement shall be designed so that the rescue boat can be launched without having to be pushed outside the deck edge when the vessel is unfavourably heeled 20°.

The aft part of the rescue boat shall be minimum 4 m forward of the vessel’s propeller.

Securing point shall be provided for the painter necessary to enabling launching of the rescue boats when the vessel is at 5 knots headway. The location of such securing points shall be suitable to assure an angle less than 45° between painter and horizontal and to avoid disturbance from bow-wave.

When hull shape, painter securing point, davit type and rescue boat type is identical on sister vessels, documentation of the testing according to IMO Res.81(70), Part 2, 5.4 may be based on the first vessel in the series.

Foul weather recovery strops shall be dimensioned with a safety factor of 6 for the weight of fully loaded and equipped rescue boat.

**Passenger Ships (Additional Requirements)**

**SOLAS III/21 Survival craft and rescue boats**

More than four davit launched liferafts assigned to one davit are in general not acceptable on passenger ships. However, if the installation test in IMO Res. MSC.81(70), part 2, item 6.2.6 shows that more than 4 life rafts are possible to launch within the 30 minutes evacuation time, more rafts are acceptable.

**SOLAS III/22 Personal life-saving appliances**

Lifebuoys located inside, or at pilot stations shall not be included in minimum required number nor in the number of lifebuoys with light.

For vessels where lifejackets are stowed in cabins more than two decks below or above the muster stations, additional lifejackets shall be provided corresponding to the number of persons berthed within the most populated main vertical zone (MVZ). However, if the number of passengers berthed on decks more than two decks below or above the muster stations are more than the number within the most populated MVZ, then additional lifejackets corresponding to this number must be provided.

**SOLAS III/26 Additional requirements for ro-ro passenger ships**

In Ro-Ro passenger vessels every fourth life raft shall contain a Search And Rescue Transponder (SART). That means, if the vessel has 1-4 rafts, 1 SART is required. If the vessel has 5-8 rafts, it will require 2 SARTs and further. In this respect the spare rafts are included.

The SART referred to above shall be kept inside the raft equipment pack.

The rafts referred to above shall have fastening device for the SART including antenna at least 1 m above water level.

The SART referred to above shall be mounted and serviced by a specialist firm. SARTs in wheel-marked rafts shall also be wheel-marked.

**Cargo Ships (Additional Requirements)**

**SOLAS III/31 Survival craft and rescue boats**

A liferaft is considered easy side-to-side transferable only on a single open deck level on a flat surface without obstructions. Such liferaft shall have a weight less than 185 kg and not be certified for more than 25 persons. Transfer via stairs, doors or a corridor is not considered easy.

A davit used for both the rescue boat and the survival craft, is only acceptable if the crew members normally assigned to the life raft stations demonstrate that:

- the different requirements for the release hooks for the survival craft and for the rescue boat are met
- the stowage requirements of regulation 13.1.1, 13.1.3, 14.1, 14.3 and 31.1.5 are met
— all survival craft and rescue boat the launching appliance is intending to serve can be launched by gravity or stored mechanical power

**Guidance note:**
The release hook requirement may for instance be met by the use of two hooks in a triangle suspension.

More than two davit launched liferafts assigned to one davit are not acceptable on cargo vessels. However, if the installation test in IMO Res. MSC.81(70), part 2, item 6.2.6 shows that more than two life rafts are possible to launch within the 10 minutes evacuation time, more than two rafts are acceptable.

A free-fall lifeboat shall not be accepted as rescue boat.

Arrangement according to regulation 31.1.3 is not acceptable for well stimulation vessels.

**SOLAS III/32 Personal life-saving appliances**
The number of lifejackets and immersion suits for people on watch shall be minimum 2 in the engine control room and 2 in the wheelhouse and 2 close to remotely located survival craft.

Lifebuoys located inside, or at pilot stations shall not be included in the minimum required number nor in the number of lifebuoys with light.

**SOLAS III/33 Survival craft embarkation and launching arrangements**
Securing point shall be provided for the painter necessary to enabling launching of the lifeboats on board vessels with GT 20 000 and upwards when the vessel is at 5 knots headway speed. The location of such securing points shall be suitable to assure an angle less than 45° between painter and horizontal and to avoid disturbance from bow-wave.

**Life-saving Appliances and Arrangements Requirements (LSA-Code)**

**LSA-Code Ch.IV, Regulation 4.7 Free-fall lifeboats**
The free-fall certification height is generally considered as the height from the still water surface to the lowest point of the lifeboat in its launched configuration when the vessel is in its lightest seagoing condition without list or trim. However, for oil tankers, chemical tankers and gas carriers, item 4.7.3.2 of the LSA Code will apply.

**LSA-Code Ch.VI Launching and embarkation appliances**
The efficient hand gear for launching appliance for rescue boat shall be dimensioned for recovery of the rescue boat with full complement of persons and equipment.
SOLAS CH. IV: RADIO COMMUNICATIONS
GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS)

Documents shall be submitted in accordance with Table 1:

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
</tr>
</thead>
<tbody>
<tr>
<td>External communication systems</td>
<td>T030 – Antennae arrangement plan</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>T040 – Cable diagram</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z090 – Equipment list</td>
<td>Including portable equipment.</td>
</tr>
<tr>
<td>Navigation bridge</td>
<td>Z030 – Arrangement plan</td>
<td>Including all communication equipment, batteries and portable equipment.</td>
</tr>
</tbody>
</table>

SOLAS IV/6 - Radio Installations

Regulation 6.2.1 / 6.2.2

— The MF/HF transmitting antenna, feeder cable and tuner shall be according to COMSAR/Circ.32 5.3.6 and 5.4. The antenna tuner should be located externally (outdoors) and as close to the antenna as possible, and so that the down lead wire/cable from the antenna is as vertical as possible, and not less than 45° towards the horizontal plane.

— The siting of all mandatory GMDSS Inmarsat-C antennae shall comply with IMO Res. A.807(19) Section 6.1. In addition, at least one mandatory GMDSS Inmarsat-C antenna shall comply with COMSAR/Circ.32 5. Consideration should also be given to the manufacturers’ installation specifications with regard to interference.

— SART installation shall be in accordance with COMSAR/Circ.32 4.11.1, [SOLAS III Reg.6.2.2 and SOLAS IV Reg.7.3]. The search and rescue radar transponders should be placed on both sides of the ship and be visible from the navigation bridge. A visible location inside the navigation bridge, close to the outer doors, is recommended. In cases where the navigation bridge is completely enclosed, or when there is only one exit door, then alternative arrangements at exits close to life boat stations should be considered.

— All incoming DSC messages on all GMDSS equipment shall be clearly audible everywhere on the navigation bridge.

— Control of radio telephony and radio telex for all GMDSS equipment shall be available in the navigation bridge.

SOLAS IV/7 - Radio equipment - General

Regulation 7.1

Continuous watch on VHF channel 70.

1) If only one watch receiver antenna exists, then no single VHF transmitter shall affect the operational capability of this antennae. Use performance standard (IMO Res. A.803(19), and spurious noise from neighbouring channels as clearly stated in IEC test standard for VHF to calculate/estimate the distance [IEC 1097-7 Performance Standard for Shipborne VHF Sec.4.3.2, 4.3.8 and 4.4.1]. Additionally, COMSAR/Circ.32 5.1 and 5.2. give guidance. As a minimum, no VHF transmitting antennae shall be closer than 5 meters to this watch receiver antenna.

2) If the duplicated VHF/DSC also has a watch receiver antenna, then no single VHF transmitter shall affect the operational capability of both watch receivers at the same time, (meaning that the distance from any single VHF transmitter to any one of the VHF/DSC watch receiver antennae, can be less than calculated, provided that the operational capability of the other VHF/DSC watch receiver is not affected.

Regulation 7.2

Unless otherwise required by the flag, either portable or fixed aeronautical VHF is accepted. COMSAR Circ.32 / 4.14.2.
Regulation 7.6

EPIRB installation shall be in accordance with COMSAR/Circ.32 4.10, [Reg.7.6, 10.1.4.1 and 10.2.3.1].

1) If the float-free EPIRB is not used as the secondary means of alerting, then it may be installed on top of the navigation bridge, provided that it is accessible by a stairway.

2) If the float-free EPIRB is installed on top of the navigational bridge, accessible by vertical ladder only, or if the EPIRB is used as the secondary means of alerting and installed on top of the navigational bridge, then compliance shall be ensured by either:
   — remote activation from the navigation bridge,
   — or by providing a manual EPIRB in the navigation bridge,
   — alternatively, the float-free EPIRB may be located in the vicinity of the navigation bridge exit door.

SOLAS IV/13.3 - Sources of Energy

— The GMDSS reserve source of energy shall be used for GMDSS equipment only. Any system not identified in SOLAS IV/ Reg.13.2, 13.4, 13.5 and 13.8 shall not be supplied by the GMDSS reserve source of energy, except for any ship's navigational or other equipment that provides input to the GMDSS installation, which is needed to ensure its proper performance.

— Protection of circuits for GMDSS batteries [COMSAR/Circ. 32 7.8]
   — Battery circuits (i.e. the cables from the battery) should be protected against short-circuit and overload. The protection device is to be installed as near as possible to the batteries.
   — When conductors from the batteries are not protected against short-circuit and overload, they are to be installed so as to be proof against short circuit and earth faults. The requirements for short-circuit protection also apply to charge current circuits.

— Generally, the Rules Pt.4 Ch.8 shall apply for all electrical requirements related to the GMDSS installation. Specifically:
   — Battery capacity calculation.
   — Battery location - siting and marking.
   — Location and marking of GMDSS fuse boxes.
   — Electrical separation of main and duplicated equipment.
   — No single failure shall render both the main and duplicated equipment inoperative.
   — Fuse/breakers shall be provided at all distribution points, both AC and DC.

SOLAS IV/15 - Maintenance Requirements

Regulation 15.4

Tools and spare parts required for minimum service shall be according to the manufacturers' specifications, or as required by COMSAR Circ.32, Annex 1.5.

Regulation 15.7

— The ship shall comply with requirements of IMO Res.A.702(17) - Maintenance criteria for sea areas A3 and A4.
— The duplicated VHF/DSC does not need to have continuous watch on channel 70, but it does need to have a capability to receive DSC alerts.

SOLAS IV/16 - Radio Personnel

Regulation 16.1

Unless required otherwise by the flag, there shall be at least two (2) holders of General Operators’ Certificate (GOC) on every ship.

Guidance note:
The underlying reasoning is that the captain is assumed to hold a GOC, but as the captain is not expected to take the primary responsibility for radio communications during distress incidents, a second GOC holder is required.
SOLAS CH. V: SAFETY OF NAVIGATION

Documentation requirements

Documents shall be submitted as required by Table 1:

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigation bridge</td>
<td>N010 Bridge design drawing</td>
<td>Including navigation equipment located outside bridge area if related to primary bridge functions.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>N020 Vertical field of vision</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>N030 Horizontal field of vision</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td>Navigation lights, shapes and signalling devices</td>
<td>Z030 Arrangement plan</td>
<td>Including details of lanterns and their horizontal- and vertical locations</td>
<td>AP</td>
</tr>
<tr>
<td>Navigational systems</td>
<td>Z090 Equipment list</td>
<td></td>
<td>AP</td>
</tr>
</tbody>
</table>

SOLAS V/18 Approval, surveys and performance standards of navigational systems and equipment and voyage data recorder

Regulation 18.1

For all navigation equipment required by regulation 19, DNV will ask for valid type approval certificate. Long-Range Identification and Tracking of Ships (LRIT) is exempted from this requirement unless the flag administration have specified differently.

Regulation 18.2

Performance standards for navigation and communication equipment frequently use the term: “installed on or after (a specific date is given)”. The installation date is equivalent to the date the equipment is mounted in its final position.

It is recommended that the installation date for the equipment in this category is documented by an installation report or a written statement from the responsible installation company or yard.

This is applicable if no other requirements are given by the administration. All other cases regarding the installation status are to be clarified with the administration.

SOLAS V/19 Carriage requirements for shipborne navigational systems and equipment

Regulation 19.2.1.8

Sound reception system is required installed on all ships with totally enclosed bridges constructed on or after 1 July 2002.

A ships bridge is considered totally enclosed, unless it is provided with open bridge wings.

An open bridge wing, in this context, is an outdoor area adjacent to the enclosed wheelhouse which is:

- easily accessible for the officer of the navigational watch
- designed in such way that lookout (by sight and hearing) can be posted in various weather and sea conditions
- enabling efficient communication between the lookout and the officer of the navigational watch.

Traditional offshore vessel designs often call for installation of sound reception system.

A catwalk surrounding the bridge, only being accessible from the bridge via doors in the aft of the bridge, is not consider as open bridge wings in accordance with above interpretation.

Exemption from the requirement of installing sound reception system may only be given on the basis of acceptance by the Flag Administration.
**Regulation 19.2.9.2**

The device for measuring speed and distance over the ground, as required for ships of 50 000 gross tonnage and upwards, shall have a valid type approval certificate confirming compliance with relevant parts of the IMO performance standards for Speed and Distance Measuring Device (SDME).

**Regulation 19.6**

This clause applies to integrated systems installed on or after 2009-07-01 on ships constructed on or after 2002-07-01.

In case of failure in any part of the integrated navigation system all other parts of the integrated system shall maintain normal operation, except parts being directly dependant of the failing part (e.g. a heading control system is directly dependent on data from the heading sensor). Likewise, a failure in one navigation equipment or system shall not render any other navigation equipment or systems inoperable, except equipment or systems being directly dependent of the failing equipment/system.

Navigational equipment and systems only interfaced through networks (two or more networks) shall have a fail-safe-mode *). Subsequent to failure of both (all) networks the fall-back topology shall at least provide the following functionality:

- Ships of more than 10 000 gross tonnage, shall have one operational ARPA radar provided with heading data from a heading measuring system (gyro or THD) and speed data from a speed measuring system (speed log).
- Ships of more than 3 000 but less than 10 000 gross tonnage shall have one operational ATA or ARPA radar provided with heading data from a heading measuring system (gyro or THD) and speed data from a speed measuring system (speed log).
- Ships of more than 300 but less than 3 000 gross tonnage, shall have one operational EPA, ATA or ARPA radar provided with heading data from a heading measuring system (gyro or THD) and speed data from a speed measuring system (speed log).
- Unless paper navigational charts are carried and used, the ECDIS or the ECDIS back-up shall be operational with position data from a GNSS receiver.

*) If the manufacturer can document that the network systems used are fully independent (e.g. different make / type of hardware/software platform), this requirement does not apply.

**SOLAS V/23 Pilot ladder arrangements**

See SOLAS Regulation II-1/3-9 for requirements to accommodation ladders.

**SOLAS V/28 Records of navigational activities and daily reporting**

Records of navigational activities- DNV will follow Resolution A.916(22) - Guidelines for the recording of events related to navigation.
5 Master's responsibility and authority

5.1.1
The master’s review of the safety management system shall be carried out at least annually and documented.

12 Company verification, review and evaluation

12.1
Companies claiming to be unable to carry out internal audit within the 12 month period, should properly document the reason why the audit was carried out outside the required time frame, and present these records for verification at annual company audit and relevant ship board audit. The acceptability of any exceptional circumstances will be considered by the auditor at the external audit. Some flag states requires acceptance by the Recognised Organisation or by the flag state prior to postponement of the internal audit. The Company is responsible for identifying and complying with such flag state requirements. In all cases, there shall not be less than five internal audits of any ship and office during the five year validity of certification.

12.2
Management review shall be carried out at least annually and documented.


3 The Certification Process
3.2 Initial verification
3.2.3
The company shall have satisfactorily completed the initial audit and possess a DOC (not interim) issued on behalf of the relevant flag state applicable for the vessel type, before an initial audit on that vessel type can be carried out.
SOLAS CH. XI-2: SPECIAL MEASURES TO ENHANCE MARITIME SECURITY

SOLAS XI-2/6 Ship Security Alert System

All SSAS (Ship Security Alert System) installations shall be either type or case approved. Onboard verification shall not be replaced by an approval or acceptance document, especially with regard to the subsequent installation and operational performance features of the onboard system.
APPENDIX A

TEST PROGRAM AND ACCEPTANCE CRITERIA FOR WATER MIST SPRINKLER SYSTEM FITTED IN ACCOMMODATION AND SERVICE SPACES

A.1 Introduction

This Appendix defines the basic and extended test programme for fire extinguishing systems fitted in accommodation and service spaces on board of passenger ships carrying more than 36 passengers. The test programs described herein aim at early detection of possible activation failures for certain sprinkler systems, detected after a series of surveys and tests recently conducted. Subject to the tests and acceptance criteria in this Appendix are:

1) ships where one or two nozzles fail full-flow testing as described in DNV Statutory Interpretations SOLAS Ch. II-2 Reg. 14 2.1.1.1.
2) ships being more than 5 years old at the annual passenger ship safety renewal survey.

A.2 Basic testing

The purpose of the basic testing is to determine the general condition of the sprinkler system on board of the vessel in question and consists of testing of a limited number of sprinklers and water samples. A minimum of two sprinklers in at least 10 sprinkler sections (20 sprinklers in total) shall be annually tested on board of each ship. The test samples shall be taken from different areas of the ship. For consistency it is important that at least two sprinkler tests are recorded and documented from any tested section.

The test results should be recorded and compared to the acceptance criteria defined in Part 1. It is also recommended that water samples are taken in accordance with Part 2.

A.3 Extended testing

The purpose of the extended testing is to determine in more detail either the general condition of the sprinkler system on board the vessel in question (systems with a failure rate of 10-20% after basic testing) or the condition of each sprinkler section (systems with a failure rate above 20% after basic testing), based on which the decision is made whether sections can be left as is or a replacement with approved sprinklers is needed.

If the acceptance criteria from the basic testing programme are not met, further testing of an increased number of representative sprinklers shall be conducted. Based on the results from the basic testing we recommend that the following extended test programme is implemented:

<table>
<thead>
<tr>
<th>Case</th>
<th>Failure rate from basic testing</th>
<th>Additional number of sprinklers to be tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>10.1-20.0%</td>
<td>Minimum 2 sprinklers to be tested from sprinkler sections selected as follows: if number of sections &lt; 20, test all sections if number of sections is between 20 and 40, test 20 sections if number of sections &gt; 40, test 50% of the sections</td>
</tr>
<tr>
<td>ii.</td>
<td>20.1% and above</td>
<td>Minimum 7 sprinklers from each sprinkler section. All sprinkler sections to be tested except for sections where the owner prefers to replace all sprinklers at this stage.</td>
</tr>
</tbody>
</table>

It is recommended that the basic and extended tests, if any, are carried out within 3 months. The test results should be recorded and checked with regard to the acceptance criteria in Part 3. It is suggested that the test results be shared with DNV as well as the system manufacturer.

Part 1 – acceptance criteria basic testing

If 0, 1 or 2 sprinklers (≤10%) fail to operate at the minimum operating pressure (pilot pressure), no actions are needed, and the situation will be monitored by new tests at the next annual survey. However, in the special case of 2 sprinklers from the same sprinkler section failing, it should be ensured that the remaining sprinklers in the same section are not impaired. Typically, an additional 10 sprinklers shall be tested in the same section of
which 9 shall pass the test. If 2 or more of the additional sprinklers fail the test, the section is deemed contaminated and all sprinklers within that section shall be replaced.

If three or more sprinklers out of a total of 20 sprinklers fail (>10%) an extended test programme in accordance with A.3 above shall be initiated for the vessel in question.

Part 2 – water samples

It is recommended that water samples are taken from the sprinkler tank, pump unit and relevant sections (as close as practical to the sprinkler head as this represents the water in the branch pipe). If only a basic testing is required the samples can be taken and analysed by the crew. If the extended testing is required, we recommend that a test laboratory is involved, at least for the analysis of the water samples.

The simplified initial testing of water samples should as a minimum address pH, Chlorides and conductivity of the water. This provides a good indication of water quality used in the system. However, it must be remembered that the water may have been exchanged and that the system may have been charged with better or worse water in the past.

If water samples of certain areas are found not to be complying with the manufacturer’s recommendations for water quality, replenishing of the water in the tanks and thorough flushing of all pipes in the affected sections shall be conducted. The importance to follow the manufacturer’s water specifications can not be stressed enough, as it may prevent progressive damage to sprinklers.

Part 3 – acceptance criteria extended testing

The test assessment criteria below are guidelines, a case by case review should always be carried out taking into account the failure rate at the minimum operating pressure (pilot pressure), the working pressure, number of sprinklers within the protected spaces in question (only 1 sprinkler installed being more critical than 20), number and percentage of sprinkler tested in the section in question and water quality.

Case i. (minimum 2 sprinklers in extended number of sections)

If ≤10% of all sprinklers tested fail to operate at the minimum operating pressure (pilot pressure), no actions are needed, and the situation will be monitored by new tests at the next annual survey. However, in the special case where both sprinklers in a single section are failing it should be ensured that the remaining sprinklers in this section are not impaired. Typically, another 10 sprinklers shall be tested in that section of which 9 of these shall pass. If 2 or more of these additional sprinklers fail the test, the section is deemed contaminated and all sprinklers within that section shall be replaced.

If >10% of all sprinklers tested fail to operate at the minimum operating pressure (pilot pressure) the test programme shall be extended to comply with case ii.

Case ii. (minimum 7 sprinklers in all sections)

Each section is assessed and for sections with a failure rate at or below 15% no actions are needed (the situation will be monitored by new tests at the next annual survey).

For sections with a failure rate being above 15% all sprinklers within that section shall be replaced. Alternatively, if the number of sprinklers tested in that particular section represent less than 10% of all sprinklers installed in this section, further testing limited to 30% of the total number of sprinklers in that section may be carried out, and the results can be reassessed with all sprinklers tested in that section being considered (acceptance criterion still being 15%).

Part 4 – replacing of all sprinklers

If it is required to replace all sprinklers in a section care should be taken to ensure that all contaminated water is drained from the piping. Sprinklers shall be removed from all branch piping and all piping shall be blown through with air or flushed properly with water complying with manufacturer’s recommendations.
Part 5 – Flowchart to describe main items of the test procedure

Inform vessel Manager about expected scope for sprinkler testing in due time before annual survey.

**Basic testing:**
2 sprinklers to be tested per section, minimum 10 sections.
Calculate failure rate and inform the section for Safety Systems, TSGNO861.

- **Is failure rate at or below 10%?**
  - Yes
    - (see also note 1)
  - No
    - **Is failure rate 10.1 - 20.0%?**
      - Yes
      - Extended testing – case i:
        Minimum 2 sprinklers to be tested from sprinkler sections selected as follows:
        - if number of sections < 20, test all sections
        - if number of sections is between 20 and 40, test 20 sections
        - if number of sections > 40, test 50% of the sections
        Calculate failure rate.
      - No
        - Failure rate is above 20.0%
          - Total number of sprinklers tested in each section to be 7, i.e. if 2 sprinklers have already been tested in the basic testing. Then this section is covered.

- **Is failure rate at or below 10%?**
  - Yes (see also note 2)
  - No
    - All sprinklers within the sections in question shall be replaced.
      - See also note 3.

Record results and report to the section for Safety Systems, TSGNO861.

**Note 1.**
In the special case of 2 sprinklers from the same sprinkler section failing, it should be ensured that the remaining sprinklers in the same section are not impaired. Typically, an additional 10 sprinklers shall be tested in the same section of which 9 shall pass the test. If 2 or more of the additional sprinklers fail the test, the section is deemed contaminated and all sprinklers within that section shall be replaced.

**Note 2.**
In the special case where both sprinklers in a single section are failing it should be ensured that the remaining sprinklers in this section are not impaired. Typically, another 10 sprinklers shall be tested in that section of which 9 shall pass the test. If 2 or more of these additional sprinklers fail the test, the section is deemed contaminated and all sprinklers within that section shall be replaced.

**Note 3**
Alternatively, if the number of sprinklers tested in that particular section represent less than 10% of all sprinklers installed in this section, further testing limited to 30% of the total number of sprinklers in that section may be carried out, and the results can be reassessed with all sprinklers tested in that section being considered (acceptance criterion still being 15%).
Note that historic changes older than the editions shown below have not been included. Older historic changes (if any) may be retrieved through http://www.dnv.com.

February 2013 edition

  - “SOLAS II-2/3 Definitions” has been amended by adding Regulation 3.31.
  - “SOLAS II-2/14 Operational readiness and maintenance” has been amended by adding Regulation 14.2.1 “Operational readiness”.
  - “FSS Code Ch.5 Fixed Gas Fire-extinguishing Systems - Low Pressure CO₂ Systems” has been extended.
- Appendix A - Test Program and Acceptance Criteria for Water Mist Sprinkler System Fitted in Accommodation and Service Spaces
  - This Appendix is new.