RULES

PUBLICATION 90/P

SAFE RETURN TO PORT AND ORDERLY EVACUATION AND ABANDONMENT OF THE SHIP

July
2022

Publications P (Additional Rule Requirements) issued by Polski Rejestr Statków complete or extend the Rules and are mandatory where applicable.

GDAŃSK

Publication 90/P – Safe return to port and orderly evacuation and abandonment of the ship – July 2022 is an extension of the requirements contained in *Part I – Classification Regulations* of the *Rules for the Classification and Construction of Sea-Going Ships*.

This Publication was approved by PRS Board on 10 June 2022 and enters into force on 1 July 2022.

This Publication also applies to other PRS regulations if it is mentioned there.

* *Polish Register of Shipping means Polski Rejestr Statków S.A., seated in Gdańsk, al. gen. Józefa Hallera 126, 80-416 Gdańsk, Poland,* registered in the Register of Entrepreneurs of the National Court Register, under entry number 0000019880. Polish Register of Shipping, its affiliates and subsidiaries, their respective officers, employees or agents are, individually and collectively, referred to as Polish Register of Shipping or as PRS for short.

PRS/RP, 06/2022

CONTENTS

Page

1 GENERAL

1.1 Introduction

This *Publication* is based on the SOLAS Convention, Regulations II-1/8-1, II-2/21 and II-2/22, and IMO circulars MSC.1/Circ.1369/Add.1, MSC.1/Circ.1437, MSC.1/Circ.1532/Rev.1, MSC.1/Circ.1539/Rev.1.

1.2 Scope of application

This *Publication* applies to passenger ships with a length, as defined in SOLAS regulation II-1/2.5, of 120 m or more, or having three or more main vertical zones (MVZ)*.

* Interpretations:
Horizontal Fire Zones (special category and ro-ro spaces) should not be included in the count of the number of the Main Vertical Zones.. (MSC.1/Circ.1369, Int. 1)

Where electrical or machinery installation, fire safety, or lifesaving appliances of a ship have been approved following the methodology of SOLAS regulations II-1/55, II-2/17 or III/38 respectively (Alternative design and arrangements), the effect on the ship essential system capability should be explicitly included in the analysis required by the above regulations.
Special attention is to be given to the determination and assignment of Safe Areas and compliance with the requirements of SOLAS regulation II-2/22. (MSC.1/Circ.1369, Int.2)

1.3 Definitions and abbreviations

For the purposes of *this Publication*-, the following definitions apply.

1.3.1 ***Assessment*** it is structured analysis of the possible consequences any incident of fire or flooding may have for the systems required to remain operational, covering all possible scenarios within the casualty threshold

1.3.2 ***Casualty threshold*** it is the maximum physical extent of casualty where the ship will be capable of return to port, in accordance with SOLAS regulation II-2/21 (see paragraph 2.2).

1.3.3 ***Critical systems*** are essential systems that were identified in the overall assessment of essential systems to have a possibility to fail to operate adequately as a consequence of one or more fire casualty case, each not exceeding the fire casualty threshold, or as a consequence of one or more flooding case, each not exceeding a single WT compartment. The failure of the system may be caused by a failure of the whole system, of one component or of a connection between system components or by any other failure causing unsatisfactory operation of the essential system under consideration.

1.3.4 ***Essential systems*** are all systems and those sections of systems in spaces not directly affected by the casualty that need to remain operational after a fire or flooding casualty, according to SOLAS regulations II-2/21.4 and II-2/22.3, and as referred to in SOLAS regulation II-1/8-1.2.

1.3.5 ***Fire casualty*** is any possible fire case on board the ship under consideration. Fire casualties may or may not exceed the casualty threshold stipulated in SOLAS regulation II-2/21.3.

1.3.6 ***Flooding casualty*** is any possible flooding case~~s~~ on board the ship under consideration. Flooding casualties may not exceed a single watertight (WT) compartment flooding as stated in SOLAS regulation II-1/8-1.2.

1.3.7 ***Manual actions*** it is manual intervention by the crew that may be necessary to restore and maintain functionality of the systems after casualty.

1.3.8 ***Passenger ship systems' capabilities after a fire or flooding casualty*** (short: ship systems' capabilities) are those required for passenger ships according to SOLAS regulations II-1/8-1, II-2/21 and II-2/22. The ship systems' capabilities are addressing:

.1 availability of essential systems after a flooding casualty, according to SOLAS regulation II-1/8-1;

.2 availability of essential systems to support a ship's safe return to port under its own propulsion after a fire casualty, according to SOLAS regulation II-2/21.4 (including functional requirements for safe areas according to SOLAS regulation II-2/21.5); and

.3 availability of essential systems to support a ship's evacuation and abandonment after a fire casualty, according to SOLAS regulation II-2/22.

1.3.9 ***Passenger ship systems' design*** (short: ship systems' design) is a design description of systems intended to be installed, including all essential information showing how to achieve the ship systems' capabilities after a fire or flooding casualty according to SOLAS regulations II-1/8-1, II-2/21 and II-2/22.

1.3.10 ***Passenger ship systems' functionality*** (short: ship systems' functionality) is part of the passenger ship systems' design and defines how the onboard systems achieve the functional requirements defined in SOLAS regulations II-2/21 and II-2/22.

1.3.11 ***Remain operational*** it is a general term denoting the situation after casualty where the systems shall be able to continue its function for the voyage back to port, outside the casualty threshold.

1.3.12 ***Safe areas*** in the context of a casualty is, from the perspective of habitability, any area(s) which is not flooded or which is outside the main vertical zone(s) in which a fire has occurred such that it can safely accommodate all persons onboard to protect them from hazards to life or health and provide them with basic services.

For the purposes of this *Publication,* the following abbreviations apply.

1.3.13 ***SRtP*** – Safe Return to Port.

1.3.14 ***MVZ*** – Main Vertical Fire Zone.

1.3.15 ***LSA*** – Life Saving Appliances.

1.4 Class mark

Ships constructed in accordance with the requirements of this *Publication,* which have been successfully tested, will be assigned an additional class notation **SRP**.

1.5 Documentation

1.5.1 Design of ship and ship's systems

Different design criteria may be followed in the design of the ship and in the design of the ship's systems and arrangements to achieve the passenger ship systems' capabilities after a fire or flooding casualty and to comply with the requirements. The chosen design criteria should be well documented. This is to form the basis for the preparation of all ship's operational procedures to be adopted by the crew for the case of any such casualty.

1.5.2 Documentation for future design changes

The documentation to be presented for approval is described in detail in the paragraphs below. Such documentation should also be referred to in case design changes to the ship are proposed and may also be used as evidence of compliance should the ship transfers to the flag of another State.

1.5.3 Documentation of the assessment of required ship systems' capabilities for approval

The documentation of the assessment to be presented for approval should include the design criteria followed to reach ship systems' capabilities and summarize the whole process of assessment including methods and assumptions.

Design documentation should cover the following four subject groups and should provide the information listed below:

.1 Safe return to port capability

Documentation should include:

- Ship description/ design philosophy, with a description of the basic design criteria for each essential system or group of essential systems in order to achieve the assumed capabilities (e.g. split, duplicate, protection, or a combination of the above);
- The area of operation of the ship, planned operational activities, range/ distance of return to the port, assumed weather and sea conditions;
- A list of all essential systems, which are to be subject to assessment;
- An arrangement plan showing segregated areas for duplicate machine systems (in particular propulsion, steering and power generation), including any areas and decks containing auxiliary or supporting systems/ components/ cables.
- Casualty threshold plan, outlining the range of different casualty thresholds throughout the ship, showing low fire risk spaces, all "A-class" divisions, main vertical zones (MVZ) and watertight compartments;
- Structural fire protection plan;
- Plan of spaces protected by fixed fire extinguishing systems;
- Test program listing the end-of-line tests deemed necessary to demonstrate compliance with safe return to port requirements;
- Calculation report summarizing the hydrodynamic capacity of the ship in the worst case of the safe return to port scenario, taking into account the speed of the ship and the duration of the voyage in environmental conditions;
- Electric load balance, including calculated design values for power consumption;
- Plan of safe areas, including the adopted criteria for selecting safe areas and designated locations, with a description of the arrangement, calculations and presentation of fulfillment of all required functions for safe areas.

.2 Essential systems for the purpose of return to port

Documentation, including the requirements for each of the essential systems, should include:

- Description of the intended system design and capability to remain operational after accidents, including system arrangement, major equipment location, post-accident system capabilities - performance criteria, level of automation and manual intervention needed to restore system performance, power and energy distribution;

- An arrangement plan showing the location, arrangement and connection of the essential systems (including all their components), including pipeline routes;
- Cable routing drawing showing the routes of power, control and alarm cables, including location of devices;
- piping and instrumentation diagram (P & ID), showing all system functions;
- A system test program (both for construction and applicable see trials), which should include the test methods and applicable test equipment;
- Overall assessment report of the relevant systems (see paragraphs 5.2.2.1 and 5.3);
- Critical systems assessment report (see paragraphs 5.2.2.2 and 5.4) if any critical system has been identified;
- List of manual actions taken (see paragraph 5.3.2.3);
- A description of the power source for each of the essential systems;
- Any additional design details to ensure or support the capability of the ship's systems.

.3 Systems for handling safe areas

Documentation containing the requirements for each of the systems should include:

- An arrangement plan, showing location of the system components;
- A cable routing drawing showing the routing of the power cables from the power source to the loads, and the control and communication cables that support the system;
- Piping diagram, showing drinking water and sanitary sewage installations;
- An assessment report that identifies tests to demonstrate system compliance with requirements.

.4 Essential systems to support the safe evacuation and abandon ship

Documentation containing the requirements for each of the systems should include:

- An arrangement plan showing the location of the system components;
- A cable routing drawing showing the routing of the power cables from the power source to the receivers, and the control and communication cables supporting the system, passing through the MVZ;
- Piping diagram showing the function of systems and piping routing;
- Diagram of lighting for escape routes, assembly stations and lifesaving appliances stations;
- An assessment report that identifies tests to demonstrate system compliance with regulatory requirements.

1.5.4 Onboard documentation

The following documentation should be available on board, which should include:

- A set of design documentation, mentioned in paragraph 1.5.1, 1.5.2 and 1.5.3;
- Operational manuals for fire and flooding casualty, for a safe return to port, detailing any manual actions required to ensure the operation of all essential systems, the availability of safe areas, including the provision of essential system operation functions (e.g. closing/ opening valves, shutdown/ switching devices/ fans, etc.);
- Description of the functioning of essential systems after fire accident exceeding the casualty threshold;
- List of spaces considered to have a little fire risk;
- Plan of periodic inspections and tests;
- A maintenance plan that includes instructions for the maintenance of essential systems. (MSC.1/Circ.1369, p. 7.4)

1.6 Certificates and documents of compliance

Equipment, systems and components covered by the requirements of this *Publication* should be certified in accordance with the requirements for a passenger ship.

1.7 Operation tests on the ship

1.7.1 All systems essential to the operation of the ship during the return to port should be subjected to operation tests for each fire and flooding accident scenario when the accident does not exceed the assumed casualty threshold.

1.7.2 All systems serving safe areas during the ship's return to port should be performance tested for each fire and flooding accident scenario.

1.7.3 All systems supporting evacuation and abandon ship should be subjected to operation tests for each scenario of exceeding the casualty threshold and excluding each MVZ zone.

1.7.4 Essential systems requiring manual action to recover their operational after a fire or flooding accident should be verified, whether such operation will be feasible in conditions simulating a fire.

1.8 Sea trials

During sea trials, the operational capability of one engine room and the corresponding propulsion and steering systems as well as the stable operation of all auxiliary systems, with the specified power demand, under assumed environmental conditions, shall be verified.

1.9 Design intention

1.9.1 The overall intention of the safe return to port requirements is to ensure that essential systems are designed and deployed with adequate redundancy and separation so that the system will operate with limited operator intervention.

1.9.2 However, if such arrangement and separation is not possible, alternative means may be used to meet the intention, such as:

- manual actions to restore system operational capability on the return journey to port;
- criteria for assuming the survival of components, cables and pipes within the accident threshold, as specified in paragraph 3.2..

1.10 Manual actions

1.10.1 The following manual actions to restore the system operational and keep the system operational after casualty are considered satisfactory:

- repair and temporary recovery of system, i.e. manual intervention beyond normal system operation and procedures;
- monitoring the maintenance of system efficiency during the return voyage to the port, i.e. observing and adjusting system operating parameters.

1.10.2 Manual actions in this context are mainly those that have to be performed locally on or near the equipment (e.g. valves, pumps, indicators, switches, etc.).

1.10.3 If the system relies on manual action to repair and monitoring its operation, the place for manual intervention should be located outside the casualty threshold, i.e. outside the space exposed to fire or flooding.

2 SAFE RETURN TO PORT CAPABILITY

2.1 Purpose

The purpose of this chapter is to establish design criteria for a ship' s safe return to port under its own propulsion after a casualty that does not exceed the casualty threshold stipulated in paragraph 2.2*.

* Interpretation:
For the purpose of assessing the ship systems' capabilities, fire casualties and flooding casualties may be considered as not occurring at the same time. (MSC.1/Circ.1369, Int.. 3)

2.2 Casualty threshold

The term "casualty threshold" describes the maximum extent of a fire or flooding accident within which the ship should remain operational and continue to operate.

2.2.1 Casualty threshold – fire*

2.2.1.1 The casualty threshold, in the context of a fire, includes:

.1 loss of space of origin up to the nearest "A" class boundaries, which may be a part of the space of origin, if the space of origin is protected by a fixed fire extinguishing system; or

.2 loss of the space of origin and adjacent spaces up to the nearest "A" class boundaries, which are not part of the space of origin (if the space of origin is not protected by a fixed fire extinguishing system).

The divisions restricting/ surrounding the space of fire origin or the adjacent spaces, constitute the boundaries of the casualty threshold that cannot be exceeded by the fire.

* *Interpretations:*
"A" class boundaries refers to both bulkheads and decks.. (MSC.1/Circ.1369, Int. 4)

The rating of "A" class boundaries does not affect the application of this regulation. However, a trunk closed at all boundaries constructed to "A-60" standard and containing ducts, cabling and/or piping is considered operational when passing through a space of origin. (MSC.1/Circ.1369, Int. 5)

The lay-out of special category and ro-ro spaces, normally extending for more than the length of one MVZ, does not properly fit with the casualty threshold. However, during the assessment of the ship systems' capabilities it has to be verified that a casualty in such spaces would not compromise the operation of the essential systems in the remaining fire zones of the ship. (MSC.1/Circ.1369, Int. 6)

Where a space of origin is not protected by a fixed fire-extinguishing system, for determining the "nearest "A" class boundaries, which are not part of the space of origin":
a) only the spaces within the same Main Vertical Zone need to be considered; and
b) casualty threshold includes spaces one deck upwards. (MSC.1/Circ.1369, Int. 7)

Spaces in which the risk of a fire originating is negligible[1)] need not be considered as spaces of origin of a fire.
[1)] Note: A fire/risk assessment may be requested (refer to paragraphs 1.6.4 of the Interim Explanatory Notes), to determine whether a space other than those listed in the above can be considered as being "space in which the risk of a fire originating is negligible". Different factors should be taken into account while performing the assessment such as:
a) presence of combustible material, flammable liquids and/or flammable gases;
b) presence of electrical switchboards and relevant power;
c) statistics on fire within spaces having the same purpose;
d) intended service of equipment/machinery installed; and
e) other factors considered appropriate for the space under consideration.
Examples of such spaces include but may not be limited to:
a) spaces with restricted accessibility for inspection and/or maintenance only, such as:

.1 void spaces;
.2 trunks closed at all boundaries only containing pipes and/or electrical cables; and
.3 cofferdams;

b) tanks;
c) chain lockers;
d) ventilation trunks except those containing ducts presenting fire hazard such as galley range exhaust ducts, laundry exhaust ducts, category "A" machinery spaces ducts, special category and ro-ro spaces ducts;
e) cross flooding ducts connecting void spaces. In the case where connected spaces are not with a negligible fire risk, ducts should be separated from those spaces by non-watertight fire resistant boundaries to be considered as a space where fire risk is negligible;
f) vertical escape trunks from machinery spaces, service spaces, control stations and other crew accommodation spaces;
g) store rooms for gaseous fixed fire-extinguishing systems;
h) busbars enclosed in "A" class divisions;
i) "A" class enclosures within spaces of Category 1, 2 or 4 only containing isolation valves or section valves forming part of the fixed fire-extinguishing system for the protection of accommodation spaces, service spaces and control stations; and
j) shaft tunnels only used for this purpose, i.e. no storage is allowed. (MSC.1/ Circ.1369, Int. 8)

Concealed spaces (spaces above ceilings, behind bulkheads linings) are considered as part of the space of origin. Lack of a fixed fire-extinguishing system above ceilings or behind linings need not be considered when determining the casualty threshold, in paragraph 2.2.1.1.2 (SOLAS reg. II-2/21.3.2). (MSC.1/Circ.1369, Int. 9)

In case of manual actions, equipment and systems the controls of which cannot be reached without accessing the space affected by the casualty should not be considered operational. (MSC.1/Circ.1369, Int. 10)

For passenger ships carrying not more than 36 passengers space of origin is any space bounded by "A" class boundaries or divisions of steel or equivalent material. Where the deck between two spaces is constructed of steel or equivalent material it should be considered to form part of the "A" class boundary provided all penetrations are tight to prevent the passage of flame or smoke. (MSC.1/Circ.1369, Int. 11)

2.2.1.2 Within the fire casualty threshold, all equipment, components, cables and pipelines are considered lost, except when post-fire survivability* is assured.

---

* *Interpretations:*
Steel pipes other than those carrying flammable liquids and passing through (not serving) spaces affected by a fire casualty may be considered to remain operational provided they are of substantial thickness (reference can be made to ICLL 66 regulation 22(3), as interpreted by IACS UI LL36/Rev. 2 paragraph (b)) or "A-60" insulated ("A-60" class insulation approved in accordance with resolution A.754(18) for bulkheads or decks may be used for this purpose). In both cases the pipes should be adequately supported.
In order to be considered as remaining operational after a fire casualty, steel pipes should be joined by welding otherwise mechanical joints should be tested according to IACS UR P2.11.5.5.6 fire test or equivalent to the satisfaction of the Administration.
Temperature increase of liquids carried may need to be considered, and measures taken where necessary, so that the performance and purpose of the affected systems can be maintained as intended after the casualty has occurred.
Plastic pipes can be considered to remain operational after a fire casualty if tested to resolution A.753(18), Level 1. (MSC.1/Circ.1369, Int.12)

Fire-resistant cables complying with standards IEC 60331-1 and IEC 60331-2 (see also IACS UR E15) passing through (not serving) spaces may be considered to remain operational after a fire casualty provided they have no connections, joints and equipment connected to them, etc., within the space affected by the casualty.
Installation of these cables should be made to support their survival in a fire casualty and during fire-fighting efforts. (MSC.1/Circ.1369, Int.13)

2.2.1.3 Valves in the piping system are considered lost within the fire casualty threshold, thus opening the end of the piping.

2.2.2 Casualty threshold – flooding*

2.2.2.1 A passenger ship shall be designed so that the systems specified in paragraph 2.3 remain operational when the ship is subject to flooding of any single watertight compartment.

2.2.2.2 For the purpose of providing operational information to the master for safe return to port after a flooding casualty, passenger ships, as specified in paragraph 2.2.2.1, shall have:

.1 an onboard stability computer; or
.2 shore-based support,

based on the guidelines developed by IMO*

* *See Revised Guidelines on operational information for masters of passenger ships for safe return to port. (MSC.1/Circ.1532/Rev.1)*

2.2.2.3 The casualty threshold includes each individual watertight compartment below the bulkhead deck.

2.2.2.4 Within the flooding casualty threshold, all equipment, components, piping, ventilation ducts and cables are considered lost, except when their operational is ensured after flooding*.

* *Interpretations:*
All pipes and vent ducts passing through (not serving) a compartment affected by a flooding casualty are considered to remain operational provided they, together with relevant fittings, are capable of withstanding the head of water expected at their location. (MSC.1/Circ.1437)

Electrical cables complying with standard IEC 60092-359 may be considered to remain operational in a space affected by a flooding casualty, provided they have no connections, no joints, no equipment connected to them, etc., within such space or such connections, joints and devices have a degree of protection IPX8 in accordance with standard IEC 60529 (head of water expected at their location for a period not inferior to that estimated for the safe return to port). (MSC.1/Circ.1437)

2.3 Essential systems for safe return to port*

2.3.1 When the damage caused by fire or flooding does not exceed the casualty threshold specified in paragraph 2.2, the ship shall be capable of returning to port while providing a safe area (s) as defined in paragraph 1.3.12. To be deemed capable of returning to port, the following essential systems shall remain operational in the remaining part of the ship not affected by fire or flooding:

.1 propulsion;
.2 steering systems and steering-control systems;
.3 navigational systems;
.4 systems for fill, transfer and service of fuel oil;
.5 internal communication between the bridge, engineering spaces, safety centre, fire-fighting and damage control teams, and as required for passenger and crew notification and mustering;
.6 external communication;
.7 fire main system;
.8 fixed fire-extinguishing systems;
.9 fire and smoke detection system;
.10 bilge and ballast system;
.11 power-operated watertight and semi-watertight doors;
.12 systems intended to support "safe areas" as indicated in paragraph 3.15.4;
.13 flooding detection systems; and
.14 other systems determined by the Administration to be vital to damage control efforts.

* *Interpretations:*
An electrical balance should be submitted for each of the following return to port scenarios:
a) minimum electrical-generating capacity available; and
b) any other scenario of reduced power that would cause any essential system to run at reduced capacity due to lack of electrical generating capacity.
In connection with the above, all essential systems and their auxiliaries and systems needed to support safe areas should be accounted according to their use in these particular conditions. (MSC.1/Circ.1369, Int.14)

Emergency generator, fitted for compliance with SOLAS regulation II-1/42, may be used to meet the requirements on safe return to port and ship's orderly evacuation and abandonment providing that its ability to supply emergency services as referred to in SOLAS regulation II-1/42.2, is not impaired (e.g., the availability of fuel needed for providing those services listed in regulation II-1/42 should be maintained). In the evaluation of the emergency generator capacity, the most demanding condition between regulations II-1/42, II-2/21 and 22 may be considered. (MSC.1/Circ.1369, Int.15)

Electrical power should be available and sustainable for all essential services specified in SOLAS regulations II-2/21.4 and II-2/21.5.1.2, with due regard being paid to such services as may be operated simultaneously. The application of regulation II-2/21.4 requires that other systems (e.g., engine-room ventilation, lighting of spaces outside safe areas not affected by the casualty, etc.) remain operational to support the functionalities listed therein. (MSC.1/Circ.1369, Int.16)

2.3.2 Essential systems should be designed to be able to restore their intended operational capability after any casualty within one hour.

3 REQUIREMENTS FOR ESSENTIAL SYSTEMS TO THE RETURN TO PORT

This chapter specifies design criteria for each of the essential systems listed in 2.3.1 that must remain operational and be capable of ensuring the safe return of the ship to port when the flood or fire incident does not exceed the casualty threshold, and also specifies functional requirements and performance standards for safe areas.

3.1 Propulsion

3.1.1 The ship's propulsion is deemed to be operational* when, after each casualty, at least one thruster with all necessary auxiliary equipment and support systems is operational for the duration of the return voyage to port.

* *Interpretations:*
Propulsion machinery and auxiliary machinery essential for the propulsion of the ship should remain operable. (MSC.1/Circ.1369, Int.17)

Following a fire casualty within the threshold, the ship should be able to maintain an adequate speed for sufficient time to permit the ship's planned safe return to port in sea and wind conditions acceptable to the Administration taking into account the intended area of operation. A minimum speed of 6 knots while heading into Beaufort 8 weather and corresponding sea conditions is recommended. Configuration for power generation and propulsion in the worst case scenario in terms of casualty cases should be verified during normal sea trials. (MSC.1/Circ.1369, Int.18)

A steel shaft line including relevant bearings passing through a space affected by a flooding or a fire casualty (see also interpretation 11 in MSC.1/Circ.1369), may be considered operational if it is enclosed in a watertight and "A" class tunnel or alternatively if:
a) in the flooding case it can be shown that it can operate under water; and
b) in the fire case it is protected by a dedicated water spray system capable of delivering not less than 5 l/m²/min on the protected area or equivalent. (MSC.1/Circ.1369, Int.19)

Manual control at local positions can be accepted provided adequate communication and emergency lighting are arranged and it is demonstrated that the loss of any control and monitoring system does not prevent or impair any such manual/local control of the propulsion and electrical power generation systems (including, but may not be limited to, engines, electric motors, fuel system, etc.). Consideration should be given to the provision of machinery alarms when operating in that manner. (MSC.1/Circ.1369, Int.20)

3.1.2 The ship's propulsion function shall be performed by installing at least two independent and separate propulsion systems. Propulsion systems should be located and installed in such a way that they will not be affected by the same accident.

3.1.3 All auxiliary systems serving each propulsion function shall be arranged as independent and separate for duplicate propulsion systems.

3.2 Steering systems and steering-control systems

3.2.1 Ship's steering system are deemed to remain operational* when, after any accident, it provides the necessary steering capabilities on the return voyage to port.

* *Interpretation:*
When documenting that steering system is operable the following should be taken into consideration:
a) local control of remaining steering system is acceptable provided adequate communication and emergency lighting are arranged;
b) emergency means of steering, e.g., azimuth thrusters, pump jets, rudder, propellers, may be considered; and
c) in general, tunnel thrusters should not be considered adequate for emergency steering. (MSC.1/Circ.1369, Int.21)

3.2.2 The ship steering system is to be designed with at least two independent and separate steering machinery, e.g. two rudders or two azimuth thrusters. Both steering machinery shall be arranged in such a way that they will not be affected by the same accident.

3.3 Navigational systems

3.3.1 Navigation systems are deemed to remain operational when, after any accident, the functions essential for navigation are available on the main navigation bridge or other manned location.

* *Interpretation:*
Equipment essential for navigation, position fixing and detection of risk of collision should be available. The following equipment should be available as a minimum:
a) a properly adjusted standard magnetic compass
b) a Receiver for a global navigation satellite system or a terrestrial radionavigation system
c) a 9 GHz radar
d) Electronic Chart Display and Information System (ECDIS) or an appropriate folio of paper nautical charts and publications
e) Whistle
f) navigation lights
g) internal communications with engine control room and steering gear
h) a pelorus or Compass bearing device to take bearings
j) means of correcting heading and bearings to true at all times
The ship should be capable of displaying the proper light configuration in compliance with the International Regulations for Preventing Collisions at Sea COLREG, in force. (MSC.1/Circ.1369/Add.1, Int.22)

3.4 Systems for fill, transfer and service of fuel oil

3.4.1 The fuel oil filling, transfer and handling system is deemed to remain operational* if, after each accident, it is capable of supplying the oil fuel needed for all other internal combustion engines required to power propulsion and power generating equipment on the return voyage to port.

* *Interpretations:*
Systems for internal fill transfer and service of fuel oil should be capable of fuel transfer to active propulsion and power generation equipment. (MSC.1/Circ.1369, Int.23)

Systems for internal fill, transfer and service of:
a) fuel;
b) other flammable hydrocarbons; or

c) any fluid that may be flammable or dangerous if heated to a very high temperature (both within the pipe and ongoing through pumps, orifices or other equipment),
should not be considered operational within spaces affected by a fire casualty. (MSC.1/Circ.1369, Int.24)

Systems listed above should be established as being capable of remaining operational when crossing flooded watertight compartments, considering in particular consequences of low seawater temperature on liquids behaviour. (MSC.1/Circ.1437)

3.5 Internal communication

3.5.1 Internal communication systems* are deemed to remain operational when two-way voice communications addressed to the following recipients are available for communication between them after any accident:

.1 bridge;
.2 engineering spaces;
.3 safety centre;
.4 fire-fighting and damage control teams;
.5 communication center required for passenger and crew notification and mustering.

* *Interpretations:*
Internal communications should be achieved by any effective portable or fixed means of communications. However, portable equipment may be accepted provided that repeater system or equivalent remains operational after the casualty and charging capability is available in more than one MVZ. (MSC.1/Circ.1369, Int.25)

PA systems, arranged as general alarm systems, should remain operational in the MVZs not affected by the casualty. (MSC.1/Circ.1369, Int.26)

3.6 External communication

3.6.1 External communication systems are deemed to remain operational* when communication via GMDSS or emergency frequencies in the VHF marine and air bands is available after any accident on the navigation bridge or other manned location.

* *Interpretations:*
The ship should be capable of communicating via the GMDSS or the VHF Marine and Air Band distress frequencies, even if the main GMDSS equipment is lost.. (MSC.1/Circ.1369/Add.1, Int.27)

For the purposes of this requirement:
.1 portable radiocommunication equipment might be accepted; and
.2 charging capability for any portable devices should be available in more than one main vertical zone (MVZ). (MSC.1/Circ.1437)

3.7 Fire main system

3.7.1 The water fire main system is deemed to remain operational* when, after each accident, the system requirements given in SOLAS II-2/10.2.1.5.1 are met in all MVZs other than the expose to accident.

* *Interpretations:*
Automatic start of remaining pumps may not be necessarily required (manual local start may be accepted after a casualty). The system should be so arranged that SOLAS regulation II-2/10.2.1.5.1 is fulfilled in all other Main Vertical Zones of the ship not affected by the casualty. Isolating valves should be arranged as appropriate. The remaining part of the affected deck in a Main Vertical Zone may be served from hydrants of adjacent zone or water tight compartment. Fire hoses may be extended for fire-fighting within the affected Main Vertical Zone; however, for complying with this requirement, two lengths of hoses from each hydrant may be accepted (MSC.1/Circ.1369, Int.28)

3.8 Fixed fire-extinguishing systems

3.8.1 A fixed fire-extinguishing system is deemed to remain operational* when, after any accident, all relevant SOLAS II-2 requirements for the system are met in all spaces beyond the casualty threshold.

---

* *Interpretations:*

When a gaseous based system located outside the protected space is the sole fixed fire-extinguishing system as defined in SOLAS regulations II-2/10.4.1 and 10.7.1 and it is designed to protect more than one space:

a) there should be enough capacity to protect the two largest spaces;

b) where the application of the fire casualty threshold leads to the loss of the storage room due to fire in an adjacent space, there should be two rooms, not being lost by the result of the same casualty, each holding a quantity of gas, capable of protecting the largest space; and

c) the system should be so arranged that a casualty in one protected space does not impair the operation of the system in another protected space.

When a gaseous based system located outside the protected space is the sole fixed fire-extinguishing system as defined in SOLAS regulations II-2/10.4.1 and 10.7.1 and it is designed to protect a single space, where the application of the fire casualty threshold leads to the loss of the storage room due to fire in an adjacent space, there should be two rooms, not being lost by the result of the same casualty, each holding the quantity of gas required for the protected space. (MSC.1/Circ.1369, int.29)

Sprinkler or equivalent fixed fire-extinguishing systems may be considered to be lost only in spaces directly affected by the fire casualty and in other spaces that are protected by the same section (i.e. are controlled by the same section valve) provided each section should not serve more than one deck area in one MVZ. However, all levels of a stairway enclosure may be protected by the same section. (MSC.1/Circ.1369, int.30)

Section valves (as referred to in FSS Code, chapter 8, paragraph 2.4.2.2) located within the space affected by the fire casualty should be considered to be not operational unless they are suitably fire rated or fire protected (e.g., contained within a solely dedicated enclosure having "A" class boundaries, or protected by a water nozzle, etc.). (MSC.1/Circ.1369, int.31)

---

*Equivalent water based fire-extinguishing systems intended for the protection of machinery spaces (total flooding, as referred to in MSC/Circ.1165, as amended) should be so designed that in case of loss of any section valve it would still be possible to supply the entire system at the required performance, except where another fixed fire-extinguishing system is provided for the protection of such spaces (e.g., gaseous based systems). Duplication, fire protection of valves (e.g., contained within a solely dedicated enclosure having "A" class boundaries, or protected by a water nozzle, etc.), fire rated valves** or location of valves in spaces as identified by interpretation 11 may be considered. (MSC.1/Circ.1369, int.32)*

*** Reference may be made to IACS UR P2.11.5.5.6..*

Indication of activated sections in the continuously manned central control station for sprinkler or equivalent fixed fire-extinguishing systems, located outside the Main Vertical Zone, where the space affected by the casualty is located, should continue to function after a fire or flooding casualty. (MSC.1/Circ.1369, int.33)

Arrangement of piping distribution for sprinkler systems or equivalent, or for water based fixed fire-extinguishing systems for machinery spaces, may include isolation valves, to ensure the system can be reconfigured as to remain operational after a casualty, which should be kept to a minimum, clearly marked and easily accessible. Valves whose uncorrected status may jeopardize the operation of the system under normal condition should be provided with status indication in the continuously manned control station.. (MSC.1/Circ.1369, int.34)

When sprinkler or equivalent water based fixed fire-extinguishing systems include one or more emergency feed, risers, connection, or other emergency means to comply with this regulation, then hydraulic calculations (as referred to in the FSS Code, chapter 8, paragraph 2.3.3.2) should take this into account.. (MSC.1/Circ.1369, int.35)

Local application systems need not to remain operational following a casualty unless they form part of a system for the protection of machinery spaces (total flooding, as referred to in MSC/Circ.1165, as amended). (MSC.1/Circ.1369, int.36)

3.9 Fire and smoke detection system

3.9.1 The fire detection and fire alarm system is deemed to remain operational* when it is arranged to meet the requirements of SOLAS regulation II-2/7 in all spaces beyond the casualty threshold.

* *Interpretation:*
Fire and smoke detection systems may be considered to be lost only in spaces directly affected by the fire casualty and in other spaces on the same deck that are part of the same section, as defined by the FSS Code, chapter 9, paragraph 2.4.1, provided that all other detectors remain operational in any other decks served by that section.. (MSC.1/Circ.1369, int.37)

3.10 Bilge and ballast system

3.10.1 The bilge system is deemed to remain operational* when, after any accident of flooding, all spaces served by the bilge system may be drained, and when, after any accident of fire, all spaces served by the bilge system beyond the casualty threshold may be drained.

3.10.2 The ballast system is deemed to be operational* when, after any accident, all ballast tanks outside the MVZ involved in the accident can be served by the remainder part of the ballast system.

* *Interpretation:*
The bilge and ballast pumping systems and all associated essential equipment should be operational in all spaces served by the systems and not directly affected by the casualty. Manual control at local positions may be accepted provided fixed or portable means of communication are available from those positions to the Safety Centre or the Engine Control room. (MSC.1/Circ.1369, Int.38)

3.11 Power-operated watertight and semi-watertight doors

3.11.1 The watertight door system is deemed to remain operational* when, after any flooding accident, the bridge door indication remains operational for all doors, and after any fire accident, the bridge door indication remains operational for all doors except the casualty threshold, and after any bridge accident, door indication is available to all doors in other manning location.

* *Interpretation:*
Indication to show whether each door is open or closed should be provided for any fire casualty not exceeding the casualty threshold except for those doors in the boundary of spaces directly affected by the casualty. (MSC.1/Circ.1369, Int.39)

3.12 Systems intended to support "safe areas"

3.12.1 The systems serving the safe areas, specified in paragraph 3.15, are deemed to remain operational while, on the return voyage to the port, at all times remain functional outside the MVZ affected by the accident.

3.13 Flooding detection systems*

**See Guidelines for flooding detection systems on passenger ships (MSC.1/Circ.1291).*

3.13.1 Flooding detection system is deemed to remain operational* when, after any flooding accident, the bridge flooding alarms remain operational for all watertight compartments, and when, after any fire accident, the bridge flooding alarms remain operational for all watertight compartments from except for the watertight compartment containing the fire accident, and when, after bridge accident, the flood detection alarms remain operational for all watertight compartments in other manning location.

* *Interpretations:*
Flooding detection systems may be considered to be lost only in spaces directly affected by the fire casualty and in other spaces in the same compartment that are part of the same section provided that all other detectors remain operational in any other compartment served by that section.. (MSC.1/Circ.1369, int.40)

For passenger ships carrying 36 or more persons and subject to SOLAS regulation II-1/8-1, the Safe Return To Port (SRTP) requirements of SOLAS regulation II-2/21.4 apply to both:

.1 the flooding detection systems in the spaces as defined in paragraph 6 of MSC.1/Circ.1291; and

.2 the liquid level monitoring systems, which are used as, or replace, the flooding detection systems, as specified in paragraph 7 of MSC.1/Circ.1291.

Therefore, for systems noted in sub-paragraph .2 above, the phrase "excluded from these requirements" in paragraph 7 of MSC.1/Circ.1291 is not an exclusion from the general provision in SOLAS regulation II-2/21.4.13 (remain operational in the event of fire). This exclusion pertains only to the detailed provisions in MSC.1/Circ.1291. (MSC.1/Circ.1539/Rev.1)

3.14 Other systems determined by the Administration to be vital to damage control efforts

3.14.1 Systems determined by the Administration to be vital for damage control activities are deemed to remain operational* when, after each accident, they retain their operating functions in the spaces outside the casualty threshold.

* *Interpretation:*
This includes any system that the Administration determines is vital to damage control pertaining to fire or flooding.. (MSC.1/Circ.1369, int.50)

3.15 Safe area(s)

3.15.1 The safe area (s) shall be designed to provide all passengers and crew with safe accommodation and suitable conditions for the duration of the return voyage to port.

3.15.2 It is considered that the safe area (s) remain operational* when, after each casualty, all functions listed in 3.15.4 are available in a designated safe area (s) in other MVZ areas than the one in which the accident occurred.

* *Interpretation:*
When considering a fire casualty in a certain MVZ, only spaces within the casualty threshold are to be considered lost. Food, water and equipment for the support of the basic services to the safe areas, stored in spaces not directly affected by the fire casualty and belonging to the same MVZ, could be considered still available. (MSC.1/Circ.1369, Int.41)

3.15.3 The safe area(s)* shall generally be internal space(s); however, the use of an external space as a safe area may be allowed by the Administration taking into account any restriction due to the area of operation and relevant expected environmental conditions.

* *Interpretation:*
Safe areas could be a number of spaces distributed on board and should preferably be arranged in accommodation spaces. Sizing of safe areas where persons are accommodated could be based on the time needed for safe return to port operation. For safe return to port operations longer than 12 h a minimum space of 2 m^2 per person, calculated on the basis of the gross deck surface of the space(s) being considered, should be provided. For safe return to port operations shorter than 12 h a minimum space of 1 m^2 per person should be provided. MSC.1/Circ.1369, Int.42)

3.15.4 The safe area(s) shall provide all occupants with the following basic services to ensure that the health of passengers and crew is maintained:

.1 sanitation*;

* As a minimum one toilet for every 50 persons or fraction should remain operational. Grey and black water can be disposed of into the sea, allowed by MARPOL (reference MARPOL Annex IV, regulation 3). (MSC.1/Circ.1369, Int.43)

.2 water*;

* *As a minimum 3 liters per person per day drinking water should be available. Additional water for food preparation and hygiene may need to be provided. (MSC.1/1369, Int.44)*

.3 food*;

* *Food could be of any kind including dry food. Storage of food should be distributed as necessary, so that an access route is available from the safe areas. (MSC.1/Circ.1369, Int.45)*

.4 alternate space for medical care*;

* *In addition to the ship's hospital or medical centre one or more locations on the ship should be provided which should:*
a) be in a different Fire Zone (from the hospital or primary medical centre);
b) be easily accessible; and
c) have lighting and power supply on the main and emergency source of electrical power.
Reference should also be made to MSC/Circ.1129. (MSC.1/1369, Int.46)

.5 shelter from the weather;

.6 means of preventing heat stress and hypothermia*;

* *Definition of means for protection against heat stress and hypothermia should take into account external weather conditions, which may depend on area(s) of operation of the vessel. Casualty scenarios for which there is a reduction in ventilation or heating capacity should be identified and consequences assessed. The temperature within the internal safe areas should be maintained in the range of 10 to 30°, consideration being paid to the external temperature during expected operations. (MSC.1/Circ.1369, Int.47)*

.7 light*;

* *Portable rechargeable battery operated lighting may be acceptable for use in spaces which are not covered by the ship's emergency lighting system. Adequate charging capability should be available for these lights. Supplementary lighting complying with regulation II-1/42-1 is also acceptable.. (MSC.1/Circ.1369, Int.48)*

.8 ventilation*.

* *Ventilation volume should be available as a minimum of 4.5 m^3/h per person. (MSC.1/Circ.1369, Int.49)*

3.15.5 Ventilation design shall reduce the risk that smoke and hot gases could affect the use of the safe area(s).

3.15.6 Means of access* to life-saving appliances (LSA) shall be provided from each area identified or used as a safe area, taking into account that a main vertical zone may not be available for internal transit.

* *Means of access from safe areas to life-saving appliances should be provided from all safe areas in case of any casualty, either internally through areas unaffected by the fire or via external routes. External routes are considered to remain available also in the portion of the ship containing the MVZ where the casualty had occurred. (MSC.1/Circ.1369, Int.51)*

3.16 Alternate space for medical care

Alternate space for medical care shall conform to a standard acceptable to the Administration.*

* Refer to *Guidance on the establishment of medical and sanitation related programs for passenger ships (MSC/Circ.1129).*

4 ORDERLY EVACUATION AND ABANDONMENT OF A SHIP, WHEN AN ACCIDENT EXCEEDS THE ASSUMED CASUALTY THRESHOLD

4.1 Purpose

The purpose of this chapter is to provide design criteria for systems required to remain operational for supporting the orderly evacuation and abandonment of a ship, if the casualty threshold, as defined in paragraph 2.2, is exceeded.

4.2 Design assumptions

It is assumed that in the event of a fire exceeding the casualty threshold, the fire will spread to the entire MVZ, which will be unserviceable and passengers will be evacuated to other zones.

4.3 Systems supporting the evacuation and abandonment of the ship

4.3.1 In case any one main vertical zone (MVZ) is unserviceable due to fire, the following systems* shall be so arranged and segregated as to remain operational:

* *Electrical power should be available for the abandonment of the ship, including life-saving appliances and arrangements and the systems referred to in SOLAS regulation II-2/22.3.1, with due regard being paid to such services as may be operated simultaneously. (MSC.1/Circ.1369, Int.52)*

.1 water fire main*;

* *The fire main should remain operational in all main vertical zones not directly affected by the casualty. Water for fire-fighting purposes should be available to all areas of the ship. (MSC.1/Circ.1369, Int.53)*

.2 internal communications* (in support of fire-fighting as required for passenger and crew notification and evacuation);

* *A means should be available for communicating orders to fire-fighting and damage control teams and personnel in charge of evacuation and abandonment. (MSC.1/Circ.1369, Int.54)*

.3 means of external communications *;

* *The ship should be capable of communicating via the GMDSS or the VHF Marine and Air Band distress frequencies even if the main GMDSS equipment is lost. (MSC.1/Circ.1369, Int.55)*

.4 bilge systems* for removal of fire-fighting water;

* *The bilge pumping system and all associated equipment essential for its operation should be available in all spaces not directly affected by the casualty. (MSC.1/Circ.1369, Int.56)*

.5 lighting along escape routes, at assembly stations and at embarkation stations of life-saving appliances; and

.6 guidance systems for evacuation shall be available.

4.3.2 The above systems shall be capable of operation for at least 3 h based on the assumption of no damage outside the unserviceable main vertical zone. These systems are not required to remain operational within the unserviceable main vertical zones.

4.3.3 Cabling and piping within a trunk constructed to an "A-60" standard shall be deemed to remain intact and serviceable while passing through the unserviceable main vertical zone for the purposes of paragraph 4.3.2. An equivalent degree of protection for cabling and piping may be approved by the Administration.

5 GUIDELINES FOR VERIFICATION AND APPROVAL OF SHIP DESIGN

5.1 Purpose

5.1.1 These Guidelines are intended to outline the process of verification and of approval of a ship's design by the Administration, as well as to provide the necessary documentation required, when requirements relevant to safe return to port (regulations II-1/8-1, II-2/21 and 22 of the 1974 SOLAS Convention, as amended) are applied.

5.1.2 These Guidelines is also intended to support safe engineering design with guidance on all three scenarios for the operational capability of ship's systems following an accident, as outlined in 1.3.8, which shall be considered in the light of the above-mentioned regulations.

5.1.3 The outcome of these assessments (ship design verification and approval process) should confirm that the ship is designed and constructed to provide the capabilities required by SOLAS regulations II-1/8-1, II-2/21 and 22.

5.1.4 Within these Guidelines, a system-based approach is primarily intended to be performed. Where the system-based approach outlines potential weaknesses, a compartment or space-by-space based approach may also be applied. In the latter case, part of or all the spaces subject to individual consideration may be subject to operational restrictions on access, use and installations as one element of the overall system of protection. All such spaces and their restrictions should be identified on drawings or in manuals as appropriate, mentioned in paragraph 1.5.3. For the successful application of the Guidelines, all relevant parties, including the Administration or its designated representative, owners, operators, designers and PRS, should remain in continuous communication from the onset of a specific proposal to utilize these *Guidelines.*

5.1.5 A pre-requisite and starting point for this assessment (ship design verification and approval process) is that the owner of the ship has defined the operating pattern or patterns of the ship (for instance, worldwide liner/cruise ship or point-to-point ferry operations, maximum number of passengers and crew for required routes, foreseeable area of operation and routes, etc.). The capabilities that will be needed to be built into the ship will depend on the above.

5.1.6 The Administration may (as per SOLAS regulation II-2/21.4.14) determine any system to remain operational after a casualty in addition to those identified.

5.2 Assessment of required ship systems' capabilities

5.2.1 The assessment of ship systems' capabilities should follow the process described in these *Guidelines* and shown in the diagram in Appendix No. 2 to MSC.1/Circ.1369. The assessment should be based on structured methods and should document the intended essential systems functionality after a fire or flooding casualty defined by SOLAS regulations II-1/8-1, II-2/21 and II-2/22. An example of the development of an assessment is given in Appendix to this *Publication*.

5.2.2 Each assessment should be divided in two steps.

5.2.2.1 The first step is an overall systems' assessment. The systems' assessment is addressing all essential systems and functional requirements mentioned in SOLAS regulations II-2/21 and II-2/22. This step should include a structured assessment of all essential systems after a fire or flooding casualty, as defined in SOLAS regulations II-1/8-1.2, II-2/21.4 or II-2/22.3.1. Propulsion and steering systems are required to remain in operational and may not be identified as "critical systems". However, manual intervention may be accepted in order to make these systems available in the minimum possible time.

5.2.2.2 The second step is a detailed assessment of critical systems identified in the systems' assessment. The detailed assessment is only required if any critical system was identified in the previous systems' assessment.

5.2.3 SOLAS regulations II-1/8-1, II-2/21 and II-2/22 do not include reference to quantities or performance limits. The ability of the ship to return to port should be linked to the area and conditions of operation. The capability available for each system in the worst case (e.g., minimum propulsion power for return to port, electrical generating capacity, heating capacity, ventilation capacity, food and water storage/availability, etc.) should be included in the onboard documentation as a part of the assessment report.

5.3 Overall assessment of essential systems

5.3.1 Assessment of all essential systems

5.3.1.1 A structured assessment of all essential systems should be conducted. The systems' assessment can be performed in qualitative terms. Quantitative analysis may be required as part of the detailed systems' assessment as described in paragraph 5.4. A systems' assessment report should be prepared according to paragraph 1.5.

5.3.2 Identification of critical systems

5.3.2.1 Essential systems identified to be fully redundant for all fire and flooding casualty cases not exceeding the threshold (e.g., when runs of cables, pipes and equipment are duplicated and adequately separated), need not be further analyzed as described in paragraph 5.4.

5.3.2.2 For the arrangement of equipment, components or connections reference may be made to relevant interpretations contained in chapters 2, 3 and 4. Where other solutions are adopted, equipment, components or connections should be further analyzed as described in paragraph 5.4.

5.3.2.3 Manual action by the crew, to provide ship systems' capabilities, may also be possible but should be assessed in detail taking into account that:

- **.1** manual action should only be acceptable by the Administration in connection with an agreed defined number of fire and flooding casualties and should be clearly described in the documentation that should be prepared as per paragraph 1.5;
- **.2** compliance with the return to port criteria should be based on the assumption that any manual action that may be required for the ship to return to port, or for any essential system to remain operational, following a casualty:
  - **.1** is pre-planned, pre-set and instructions as well as necessary materials are available on board;
  - **.2** is performed on systems designed to ensure that the required manual action can be completed within one hour from the time the action started; and;
  - **.3** emergency lighting and a means of communication is demonstrated available in the area where manual actions are to be taken; and
- **.3** in general, feasibility of manual actions should be demonstrated by tests or drills, as applicable.

5.3.2.4 Performance requirements applicable to any essential system may be analysed and documented separately; however, any relevant information should be included in the overall assessment of essential systems' report.

5.3.3 Results of overall assessment

5.3.3.1 Should no critical systems be identified, the overall assessment can be considered acceptable without the need for a detailed systems' assessment to be carried out. The systems' assessment report can be used for the preparation of documentation and approval submission, as referred to in paragraph 1.5.

5.4 Detailed assessment of critical systems

5.4.1 When performing a detailed assessment of critical systems, additional information may be necessary. The ship's description, described in paragraph 1.5, should be supplemented, for each identified critical system, with the following, as applicable

- **.1** details of pipes, cables or other devices connecting the components of the critical system, or connecting different critical systems including their location within the affected area;
- **.2** details of any manual action providing the required ship systems' functionality (see also paragraph 5.3.3); and
- **.3** details of any operational solution forming part of the design criteria.

5.4.2 Where acceptable to the Administration, a quantitative analysis can be carried out as a part of the detailed assessment of all critical systems. As an example, the following may be performed:

- **.1** quantitative analysis of fire risk within a space, supplemented by fire engineering analysis and/or fire testing where necessary (e.g., to assess consequences of a fire casualty on a system or system component);
- **.2** Failure Mode Effect Analysis (FMEA) of a system or system component analyses in accordance with standard IEC 60812, Analysis techniques for system reliability – Procedure for failure mode and effects analysis (FMEA) or resolution MSC.36(63), annex 4 (Procedures for Failure Mode and Effects Analysis), would be acceptable; and
- **.3** detailed analysis of possibility of flooding of internal watertight compartments and of consequences of flooding on system components, given the location of the compartment and arrangement of piping within the compartment.

5.4.3 Record of ship systems' capabilities

The ship systems' capabilities should be included in the list of operational limitations issued to passenger ships (reference SOLAS regulation V/30). The ship's safety management manual should describe in detail the quantities, arrangements and procedures that are to be applied in each particular case. (For example, food/ drink/ fuel carriage requirements may be different for a ship cruising in the Aegean to one cruising in the Antarctic.) Example of wording concept for this purpose may be as follows:

"Safe return to port voyage planning should be based on:

- **.1** habitable conditions for passengers and crew is provided according to "Owners document xyz" dated yyyy-mm-dd (the operational area will determine maximum possible distance to a safe location and the maximum numbers of persons that can be supported during the safe return voyage).
- **.2** the ship systems' capabilities of returning to port following a fire casulaty is contingent upon the conditions/assumptions given in onboard document xyz, yyyy-mm-dd.
- **.3** ships "port/aft/main" propulsion and steering system is capable of x knots in Beaufort x with a consumption of x tonnes of fuel.
- **.4** ships "starboard"/forward/emergency propulsion and steering system is capable of x knots in Beaufort x with a consumption of x tonnes of fuel."

ATTACHMENT

An example of the evaluation of the operational capability of essential systems after the fire exceeds the casualty threshold (exclusion of one main vertical zone)

(refers to an assessment for SOLAS regulation II-2/22)

Note: The example represents one way to do the assessment, other approaches may be equally effective.

The assessment is developed adopting the following steps:

Step 1 – Identification of all essential systems and any required auxiliaries and support systems.

Step 2 – For each deck of each MVZ, determination of which essential systems are present.

Step 3 – For each essential system that is located in the MVZ under analysis, verification of the availability of an alternative in another location.

Step 4 – Essential systems without a suitable alternative in another location must be protected from a fire/flooding casualty.

Step 5 – For each critical system, determination of how the cables, pipes, components will be protected. A hierarchy for protecting critical systems is proposed as follows:

1. First solution – Provide an alternative in a MVZ not affected by the casualty

Example: A main power cable for the GMDSS system passes through the MVZ on deck 3. In a fire this cable could be damaged. An emergency power cable is routed from a different direction to the navigation bridge that does not pass through this area. The conclusion is that further analysis is not needed. Damage to the power cable does not affect the ship's safe return to port capability.

2. Second solution – Protect the essential system within the MVZ under analysis

Example: In the case of the a.m. power cable, it is determined that only a short length of cable passes through the MVZ under consideration, located 5 m above the deck. An A-60 trunk is installed to protect the cable to preclude fire damage.

3. Third solution – Provide a repair or manual action to compensate for loss of the system

Example: Another essential system cable is analysed, and it is determined that the cable is routed throughout the MVZ at various levels and construction of an A-60 trunk is not practicable. Instead, a repair cable is prepared and staged with necessary tools at a protected location. If the cable is damaged from a fire in the MVZ under analysis, the crew is able to temporarily re-route power from another location using the repair cable.

List of amendments effective from 1 July 2022

Item	*Title/Subject*	*Source*
1 ÷ 5	The content of the requirements of the SOLAS Convention, regulation II-1/8-1, II-2/21 and II-2/22, as well as the interpretations included in the IMO circulars have been implemented	MSC.1/Circ.1369/Add.1, MSC.1/Circ.1437, MSC.1/Circ.1532/Rev.1 MSC.1/Circ.1539/Rev.1
6	The requirements on qualitative failure analysis for propulsion and steering have been removed	IACS UR M69- deleted

---