Polski Rejestr Statków

RULES

PUBLICATION NO. 90/P

GUIDANCE FOR SAFE RETURN TO PORT AND ORDERLY EVACUATION AND ABANDONMENT OF PASSENGER SHIP

2017
July

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

GDAŃSK

Publication No.90/P – Guidance for Safe Return to Port and Orderly Evacuation and Abandonment of Passenger Ship – July 2017 was approved by the PRS Board 20 June 2017 and enters into force on 1 July 2017.

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PRS/OP, 06/2017

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1 GENERAL PROVISIONS

1.1 Introduction

1.1.1 Safe Return to Port refers to SOLAS regulations intended to increase vessel's performance and ability to return to port after casualty of water ingress or fire. These requirements are applicable to passenger ships built on 1 July 2010 or after, and having a length of 120 m or more, or having 3 or more main vertical zones. As per these regulations, a passenger ship shall be designed so that the 13 systems specified in SOLAS II-2/21.4 remain operational after a fire casualty which does not exceed casualty threshold or after a flooding of any single watertight compartment thus enabling the ship to proceed to a safe port under its own power. During this Safe Return to Port period, all ship occupants (passengers and crew) shall be accommodated in a safe areas.

In case the fire casualty exceeds the specified threshold and any one of the main vertical zones is unserviceable due to fire, 6 ship systems specified in SOLAS II-2/23.1 shall be capable of operation in all other main vertical zones, to allow the safe orderly evacuation and abandonment of the ship.

1.2 SOLAS regulations and reference IMO documents

1.2.1 The following SOLAS regulations are applicable:
SOLAS II-1, Regulation 8-1 and II-2, Regulations 21and 22.

1.2.2 According to SOLAS II-1/8-1.2 passenger ships built on 1 July 2010 or after shall be designed so that the systems specified in regulation II-2/21.4 remain operational when the ship is subject to flooding of any single watertight compartment.

1.2.3 According to SOLAS II-1/8-1.3 passenger ships built on 1 July 2014 or after shall be provided with:

- onboard stability computer; or
- shore-based support shall be available to provide the master, in case of flooding, with operational informations necessary to safe return to port.

Guidelines on implementation of these requirements are given in Chapter 7 of PRS *Publication No. 66/P – Onboard Computers for Stability Calculations*.

1.2.4 The purpose of SOLAS II-2/21 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 1.2.5 and also provides functional requirements and performance standards for safety areas. When fire damage does not exceed the casualty threshold, the ship shall be capable of returning to port providing a safe area for passengers and crew acc. to II-2/21.5.

1.2.5 According to SOLAS II-2/21.3 the casualty threshold in the context of fire includes*:*

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

.2 loss of space of origin and adjacent spaces up to the nearest A class boundaries, which are not part of the space of origin.

1.2.6 To be deemed capable of returning to port acc. to SOLAS II-2/21.4, the following systems shall remain operational in the remaining part of the ship not affected by the fire:

.1 propulsion;
.2 steering systems and steering control systems;
.3 navigational systems;
.4 systems to fill, transfer and service of oil fuel;
.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 systems;
.8 fixed fire-extinguishing systems;

.9 fire and smoke detection systems;
.10 bilge and ballast system;
.11 power operated watertight and semi-watertight doors;
.12 systems intended to support safe areas;
.13 flooding detection systems; and
.14 other systems determined by PRS to be vital to damage control efforts.

1.2.7 The purpose of SOLAS II-2/22 is to provide design criteria for systems required to remain operational for supporting orderly evacuation and abandonment of a ship, if the casualty threshold, as defined in paragraph 1.2.5 is exceeded.

1.2.8 According to SOLAS II-2/22.3 in case any one main vertical zone is unserviceable due to fire, 6 ship systems shall remain available in all other main vertical zones, to allow the safe orderly evacuation and abandonment the ship. The systems shall be capable to remain operational for at least three hours based on the assumption of no damage outside the unserviceable main vertical zone.

The following systems shall be so arranged and segregated to remain available and operational:

1. fire main;
2. internal communication (in support of fire-fighting as required for passenger and crew notification and evacuation);
3. means of external communication;
4. bilge systems for removal of fire fighting water;
5. lighting along escape routes, at assembly stations and at embarkation stations of life-saving appliances; and
6. guidance systems for evacuation.

1.2.9 Interpretations to SOLAS II-2/21 and II-2/22 regulations are given in Appendix 1 to MSC.1/Circ.1369.

1.2.10 The following source documents are applicable:

1. MSC.1/Circ.1437: *Unified interpretations of SOLAS regulation II-2/21.4.*
2. MSC.1/Circ.1369: *Interim explanatory notes for the assessment of passenger ship system capabilities after a fire or flooding casualty.*
3. MSC.1/Circ.1369/Add.1: *Revisions to interpretations Nos.22 and 27 of Appendix 1 of MSC.1/Circ.1369.*
4. IACS UR M69 – *Qualitative failure analysis for propulsion and steering on passenger ships.*

1.3 Definitions

SRP – Safe Return to Port in the context of SOLAS regulations II-1/8-1, II-2/21 and II-2/22.

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.

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.

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

Flooding casualty – is any possible flooding case on board the ship under consideration. Flooding casualties may or may not exceed a single watertight (WT) compartment stipulated in SOLAS regulation II-1/8-1.2.

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.

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, of one component or a connection between systems components or by other failure causing unsatisfactory operation of the essential system under consideration.

1.4 Safe Return to Port – Functional Requirements

The SRP regulations are made on a functional level, in particular that the different ships systems necessary to ensure the safe return to port shall remain operational after casualty. SOLAS does not specify the level of performance requirements, neither it is specified in the MSC.1/Circ.1369. Therefore, for each of the 13 systems remaining to be operational the intended level of performance requirements to be defined and specified in the project.

Where a system approach will outline potential weaknesses, a compartment or space-by-space based approach may be applied. In the latter case, part of or all the spaces subject to individual consideration may by subject to operational restriction on access, use and installations as one element of the overall system of protection. All such spaces and their restrictions shall be indentified on drawings or manuals as appropriate (see para. 7.3, 7.4).

The overall intention of functional requirements is to provide the following capabilities after casualty of fire or flooding:

– ensure propulsion, steering, manoeuvring and navigational capabilities;
– ensure necessary service of the safety systems (fire safety and watertight integrity) in the remaining part of the ship that is not directly affected by the casualty;
– support of safe areas for passenger and crew for the voyage duration return to port.

1.5 Restoration of Capabilities after Casualty

According to MSC.1/Circ.1369 the systems shall be restored within 1 hour following the casualty, and a limited set of manual actions may be allowed in order to restore system operation and remain operational for the safety return to port.

The restoration time of up to 1 hour refer primarily to the systems needed for propelling and manoeuvring the ship back to port. However, the systems needed to fight and mitigate the casualty (fire or flooding) can not be unavailable for an hour and shall be quickly restored after occurrence of a casualty (in range of minutes). If manual actions are needed to recover functionality of these systems (e.g. isolating the origin/location of the casualty or the relevant MVZ), the extent of these actions shall be very limited and part of necessary operational procedures.

The systems listed in SOLAS II-1/22, are required to remain operational in a period of at least 3 hours to support an orderly evacuation and abandonment the ship.

In this scenario, it is assumed that any full main vertical zone (MVZ) is lost, and the systems shall remain operational in all other main vertical zones. This means that each system must be designed such that any casualty in one main vertical zone does not impair the continued operation for at least 3 hours in another main vertical zone.

2 ADDITIONAL MARK SRP IN THE SYMBOL OF CLASS

2.1 Where the requirements of this *Publication* are fulfilled, the passenger ship is assigned with additional mark **SRP** put after the main symbol of class.

3 SHIP DESCRIPTION

3.1 For the purpose of the ship description, any necessary information regarding the design of the ship shall be provided along with description of ship essential systems design and functionality following a fire or flooding casualty. As a minimum such information and description shall include:

- **.1** the design criteria for each individual essential system or group of essential systems, to achieve compliance (e.g. separation, duplication, redundancy, protection, or combination of the above);
- **.2** the basic layout of the vessel including boundaries of compartments subject to the casualty (watertight or "A" class boundaries), e.g. in the form of plan views and cross-sections, including but not limited to: general arrangement plan, capacity plan, watertight subdivision plan, space fire categorization plan (or structural fire protection plan), plan of spaces protected by fixed fire-extinguishing systems, etc.;
- **.3** criteria adopted for the selection of safe areas and intended locations;
- **.4** a list of all systems that are intended to be submitted for assessment. It shall be noted that although such a list would include, in the first instance and as minimum, all essential systems referred to SOLAS regulations II-2/21.4 and 22.3, their actual number and identification may vary depending on the size and type of the ship, arrangements, design (e.g. propulsion systems: shafts or podded propulsion units, etc.);
- **.5** drawings/documents describing the location, arrangements and connections of essential systems (including any of their components) mentioned in SOLAS regulations II-2/21 or II-2/22;
- **.6** the description of the power supply for the essential systems;
- **.7** data regarding the minimum speed vs. weather and sea conditions (e.g. results of model tests in sea keeping conditions including consideration of wind forces); and
- **.8** any additional design detail intended to ensure or support the ship systems capabilities.

3.2 Additional information about the intended area of operation, the operating pattern or patterns (which may be used to define any intended speed/maximum distance to safe return to port) shall be included in the ship's description.

3.3 Interpretations contained in par.1 of appendix 1 to MSC.1/Circ.1369 may be used when completing the ship description.

4 ASSESSMENT OF REQUIRED SHIP SYSTEMS CAPABILITIES

4.1 The assessment of ship systems capabilities shall follow the process outlined in Appendix 2 of MSC.1/Circ.1369. The assessment shall be based on structured methods and shall 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 3 of the above circular.

4.2 Each assessment shall be divided in two steps.

4.2.1 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 shall include a structured assessment of the 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 operational and may not be identified as critical systems. Manual intervention may, however, be accepted in order to make these systems available in the minimum possible time.

4.2.2 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.

4.3 SOLAS regulations II-1/8-1, II-2/21 and 22 do not include reference to quantities or performance limits. The ability of the ship to return to port shall 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.) shall be included in the onboard documentation as part of the assessment report.

5 OVERAL ASSESSMENT OF ESSENTIAL SYSTEMS

5.1 Assessment of All Essential Systems

5.1.1 A structured assessment of all essential systems shall be conducted. The systems' assessment can be performed in qualitative terms. Quantitative analysis may be required as part of the detailed systems assessments as described in Chapter 6. A system assessment report shall be prepared according to Chapter 7.

5.2 Identification of Critical Systems

5.2.1 Essential systems identified to be fully redundant for the 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 analysed as described in section 6.

5.2.2 For the arrangement of equipment, components or connections reference may be made to relevant interpretations contained in paragraph 2 of Appendix 1 to MSC.1/Circ.1369. Where other solutions are adopted, equipment, components or connections shall be further analysed as described in section 6.

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

- **.1** manual action are only acceptable in connection with an agreed defined number of fire and flooding casualties to be clearly described in the documentation prepared as per Chapter 7;
- **.2** compliance with the return to port criteria shall 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 the 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 shall be demonstrated by tests or drills, as applicable.

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

5.3 Overall Assessment Results

5.3.1 Shall no critical systems be identified, the overall assessment can be considered acceptable without the need for a detailed systems' assessment to be performed. The systems' assessment report can be used for the preparation of documentation and approval submission, as referred in Chapter 7.

6 DETAILED ASSESSMENT OF CRITICAL SYSTEMS

6.1 When performing a detailed assessment of critical systems, additional information may be necessary. The ship description described in Chapter 2 shall 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 system's functionality (see also par. 5.2.3); and
- **.3** details of any operational solution forming part of the design criteria.

6.2 Where acceptable to PRS, a quantitative analysis can be performed 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), and

.3 detailed analysis of possibility of flooding of internal watertight compartments and of consequences of flooding on system components, given the location the compartment and arrangement of piping within the compartment.

7 DOCUMENTATION

7.1 Design of Ship and Ship's Systems

7.1.1 Different design criteria may be followed in the design of the ship and in the design of 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 shall be well documented and shall 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.

7.2 Documentation for Future Design Changes

7.2.1 The documentation to be presented for approval by PRS is described in detail in paragraphs below. Such documentation shall 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.

7.3 Documentation of the assessment of required ships systems capabilities for approval

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

7.3.2 The following information shall be provided for approval of ship systems capabilities:

.1 ship description (see Chapter 3);

.2 overall assessment of essential systems report (see paragraph 4.2.1 and Chapter 5);

.3 detailed assessment of critical systems report (see paragraph 4.2.2 and Chapter 6), if any critical system is identified; and

.4 additional information:

- **.1** list of manual actions (see paragraph 5.2.3);
- **.2** test programme (for both testing during construction and sea trials as applicable) which shall include methods of testing and test facilities provided, where applicable;
- **.3** maintenance plan; and
- .**4** references.

7.4 Onboard Documentation

The onboard documentation demonstrating the ship system capabilities shall include:

.1 documentation, as per paragraphs 7.3.1.1, 7.3.1.2, 7.3.1.3 above;

.2 operational manuals for fire and flooding casualty cases and safe return to port operation, including details of any manual action required to ensure operation of essential systems, availability of safe areas including provision of basic services therein (e.g., closing/opening of valves, shutting down/start of equipment/fans, etc.);

.3 description of operation of essential systems after a fire casualty exceeding the casualty threshold;

.4 list of spaces considered having negligible fire risk, if any; and

.5 test, inspection, and maintenance plan.

7.5 Record of ship systems capabilities

7.5.1 The ship systems capabilities shall be included in the list of operational limitations issued to passenger ship (reference SOLAS regulation V/30). The ships management manual shall 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 shall 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 number of persons that can be supported during the safe return voyage);

.2 the ship systems capabilities of returning to port following a fire casualty is contingent upon the conditions/assumptions given in onboard, document xyz, yyyy-mm-dd.

.3 ships propulsion and steering system is capable of x knots in Beaufort x with a consumption of x tonnes of fuel"

8 QUALITATIVE FAILURE ANALYSIS

8.1 For ships having at least two independent means of propulsion and steering to comply with SOLAS requirements for a safe return to port, sub-paragraphs .1 and .2 below apply:

.1 providing knowledge of the effects of failure in all the equipment and systems due to fire in any space, or flooding of any watertight compartment that could affect the availability of the propulsion and steering;

.2 providing solutions to ensure the availability of propulsion and steering upon such failures as mentioned in **.1**.

8.2 Ships not required to satisfy the safe return concept will require the analysis of failure in single equipment and fire in any space to provide knowledge and possible solutions for enhancing availability of propulsion and steering.

9 SYSTEMS/INSTALLATIONS/EQUIPMENT TO BE CONSIDERED

9.1 Qualitative failure analysis shall consider the propulsion and steering equipment and all associated systems which might impair the availability of propulsion and steering.

9.2 Qualitative failure analysis shall include:

.1 propulsion and electrical power prime movers, e.g.,
- diesel engines,
- electrical motors.

.2 power transmission systems, e.g.,
- shafting,
- bearings,
- power converters,
- transformers,
- slip ring systems.

.3 steering gear
- rudder actuator or equivalent for azimuthing propulsor,
- rudder stock with bearings and seals,
- rudder,
- power unit and control gear,
- local control systems and indicators,
- remote control systems and indicators,
- communication equipment.

.4 Propulsors, e.g.,
- propeller,
- azimuthing thruster,
- water jet.

.5 Main power supply systems, e.g.,
- electrical generators and distribution systems,
- cable runs,
- hydraulic,
- pneumatic.

.6 Essential auxiliary systems, e.g.,
- compressed air,
- oil fuel,
- lubricating oil,
- cooling water,
- ventilation,
- fuel storage and supply systems.

.7 Control and monitoring systems, e.g.,
- electrical auxiliary circuits,
- power supplies,
- protective safety systems,
- power managements systems,
- automation and control systems.

.8 Support systems, e.g.,
- lighting,
- ventilation.

9.3 To consider the effects of fire or flooding in a single compartment, the analysis shall address the location and layout of equipment and systems.

10 FAILURE CRITERIA

10.1 Failures are deviations from normal operating conditions such as loss or malfunction of a component or system such that it cannot perform an intended or required function.

10.2 Qualitative failure analysis shall be based on single failure criteria (not two independent failures occurring simultaneously).

10.3 Where a single failure cause results in failure of more than one component in the system (common cause failure), all the resulting failures shall be considered together.

10.4 Where the occurrence of a failure leads directly to further failures, all those failures shall be considered together.

11 VERIFICATION OF SOLUTIONS

11.1 Shipyard shall submit a report to PRS that identifies how the objectives have been addressed. The report shall include information regarding the following issues:

.1 identification of standards used for the design analysis,

.2 identification of the objectives' analysis,

.3 identification of any assumptions made in the analysis,

.4 identification of the equipment, system or sub-system, mode of operation of the equipment,

.5 identification of the probable failure modes and acceptable deviations from the intended or required function,

.6 evaluation of the local effects (e.g. fuel injection failure) and the effects on the system as a whole (e.g. loss of propulsion power) of each failure mode as applicable.

.7 identification of trials and testing necessary to prove conclusions.

Note: All stakeholders (e.g. PRS, owners, shipyard and manufacturers) shall, as far as possible, be involved in the development of the report.

11.2 The report shall be submitted prior to approval of detail design plans. The report may be submitted in two parts:

.1 preliminary analysis as soon as the initial arrangements of different compartments and propulsion plant are known which can form the basis of discussion. This shall include a structured assessment of all essential systems supporting the propulsion plant after a failure in equipment, fire or flooding in any compartment casualty,

.2 final report detailing the final design with a detailed assessment of any critical system identified in the preliminary report.

11.3 Verification of the report findings shall be agreed between the PRS and the shipyard.

List of amendments effective as of 1 July 2017

Item	*Title/Subject*	*Source*
1-7	Safety return of passenger ship to port after a fire or flooding casualty	IMO MSC 216(82) (SOLAS II-1/Reg.8-1 SOLAS II-2/Reg.21 i 22) MSC.1/Circ.1369
