GUIDANCE NOTES
GD 05-2019

INTERNATIONAL SHIP CLASSIFICATION

GUIDELINES FOR IMPLEMENTATION OF IMO REQUIREMENTS FOR SAFE RETURN TO PORT AND ORDERLY EVACUATION

2019

Effective from 1 March 2019

Contents

CHAPTER 1 GENERAL

1.1 Purpose and application

1.1.1 The Guidelines apply to the following ships:

(1) passenger ships of 120 m or more in load line length or having three or more main vertical zones;

(2) special purpose ships with more than 240 persons carried onboard the ship, and of 120 m or more in load line length or having three or more main vertical zones.

1.1.2 The Guidelines are intended to provide guidance for the implementation of the requirements for safe return to port① and orderly evacuation and abandonment (hereinafter referred to as 'orderly evacuation') as specified in Chapter II-1 and Chapter II-2 of the 1974 SOLAS Convention, as amended by resolution MSC.216(82).

1.1.3 The Guidelines provide details for and serve as supplement to relevant conventions, regulations, circulars and rules in 1.2 of this Chapter and cannot fully take the place of any conventions, regulations, circulars or rules.

1.2 Reference standards

1.2.1 The Guidelines are developed on the basis of the following conventions and circulars:

(1) Amendments to 1974 SOLAS as adopted by resolution MSC.216(82) involving regulation II-1/8-1 and regulations II-2/21 and 22②;

(2) MSC.1/Circ.1369 on Interim Explanatory Notes for the Assessment of Passenger Ship Systems' Capabilities after a Fire or Flooding Casualty and MSC.1/Circ.1369/Add.1;

(3) MSC.1/Circ.1437 on Unified Interpretation to SOLAS regulation II-2/21.4 (Amendments to MSC.1/Circ.1369);

(4) MSC.1/Circ.1400 on Guidelines on Operational Information for Masters of Passenger Ships for Safe Return to Port by Own Power or under Tow and MSC.1/Circ.1532 on Revised Guidelines on Operational Information for Masters of Passenger Ships for Safe Return to Port;

(5) Amendments to 1974 SOLAS as adopted by resolution MSC.325(90) involving regulation II-1/8-1;

(6) Amendments to 1974 SOLAS as adopted by resolution MSC.421(98) involving chapters II-1, II-2 and III;

(7) Amendments to 1974 SOLAS as adopted by resolution MSC.429(98) involving explanatory notes to Chapter II-1 subdivision and damage stability regulations.

1.3 Terms and definitions

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① Safe return to port means ship's safe return to port under its own propulsion, and the port may be the departure port, port of destination or intermediate ports of call.

② MSC.1/Circ.1214 quoted by regulations II-2/21 and 22 in the form of footnote has been superseded by MSC.1/Circ.1369.

1.3.1 The terms and definitions of the Guidelines are as follows:

(1) Casualty threshold, defined according to fire and flooding respectively as follows:

① The casualty threshold, in the context of a fire, includes:

a. 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

b. 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.

② In the context of a flooding, the casualty threshold refers to single watertight compartment below any bulkhead deck.

(2) Safe area 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 on board to protect them from hazards to life or health and provide them with basic services.

(3) Essential systems are all systems and those sections of systems (e.g. cables, piping, components etc.) in spaces not directly affected by the casualty that need to remain operational after a fire casualty, according to SOLAS regulations II-2/21.4 and II-2/22.3.

(4) 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. 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. Simply put, essential systems having a possibility to fail to operate as a consequence of a casualty. Considering that the ultimate goal of capability assessment is to eliminate critical systems, they are simply the systems described in the process.

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

① availability of essential systems to support a ship's safe return to port under its own propulsion after a casualty, according to SOLAS regulations II-1/8-1 and II-2/21.4 (including functional requirements for safe areas according to SOLAS regulation II-2/21.5); and

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

1.3.2 Except for 1.3.1 of this Chapter, other terms and definitions used in the Guidelines are the same as those in the conventions, regulations, circulars and rules concerned.

1.4 Plans and documents

1.4.1 The plans and documents mentioned in the Guidelines refer to basic plans in relation to assessment of capabilities of safe return to port and orderly evacuation.

1.4.2 An assessment document is to be submitted to ISC for review, which is to:

(1) cover the requirements of MSC.1/Circ.1369 and MSC.1/Circ.1437;

(2) include capability specifications and design plans of sections of systems 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;

(3) include the overview (including methods and assumptions) of the design criteria followed for the purpose of achieving ship's system capabilities and the whole assessment process, at least to include the following items:

① Ship's descriptions, including:

a. the design criteria for each individual essential system or group of essential systems, to achieve compliance (e.g., separation, duplication, redundancy, protection, or a combination of the above);

b. 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 may not be 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 and list of spaces considered having negligible fire risk etc.;

c. descriptions of safe areas and intended locations;

d. a list of all systems that are intended to be submitted for assessment. It is to be noted that although such a list would include, in the first instance and as a minimum, all essential systems referred to in SOLAS regulations II-2/21.4 and 22.3, their actual number and identification may vary depending on the size, type, arrangements, design, etc., (e.g., propulsion systems: shaft or podded propulsion units, etc.) of the ship;

e. drawings/documents describing the location, arrangement and connections of essential systems (including any of their components) mentioned in SOLAS regulation II-2/21 or II-2/22;

f. the description of the power supply for the essential systems;

g. data regarding the minimum speed vs. weather and sea conditions (e.g., results of model tank tests in sea keeping conditions including consideration of wind forces);

h. any additional design detail intended to ensure or support the ship systems' capabilities;

i. additional information about the intended area of operation, the operating pattern or patterns.

② overall assessment of essential systems;

③ detailed assessment of critical systems (where applicable);

④ additional information:

a. list of manual actions;

b. test programme (for both testing during construction, and sea trials, as applicable) which is to include methods of testing, and test facilities provided, where applicable;

c. maintenance plan; and

d. references.

1.4.3 For the purposes of assessment, the following plans and information are to be provided together with capability assessment documents:

(1) basic plans in relation to safe return to port include:

① propulsion systems (including information regarding the arrangement, principle and control of propulsion system etc.);

② steering systems and steering-control systems (including information regarding principle of steering systems and steering control etc.);

③ systems for fill, transfer and service of fuel (including diagram of fuel piping of main engine, auxiliary engine and boilers, control system of quick-closing valve of fuel oil and lubricate oil tanks);

④ arrangement of water fire-extinguishing systems;

⑤ fixed fire-extinguishing systems (including automatic water sprinkler systems and equivalent systems, fixed gas fire-extinguishing systems, fixed foam fire-extinguishing systems, fixed pressure water-spraying fire-extinguishing systems, fixed dry powder fire-extinguishing systems and other approved equivalent fire-extinguishing systems installed in various spaces onboard the ship as referred to in the FSS Code);

⑥ bilge systems;

⑦ ballast water systems;

⑧ arrangement of safe areas;

The following systems provide basic life service support for personnel onboard the ship within safe areas:

a. drainage systems of sewage in compartment (including black and grey water) and sewage treatment units;

b. drinking water and daily freshwater supply systems;

c. ventilation and air conditioning systems.

⑨ power system diagram and power load calculations;

⑩ single line diagram of switchboards;

⑪ system diagram and arrangement of internal communications (including broadcasting system, general alarm system and telephone system);

⑫ navigational equipment system diagram and arrangement;

⑬ radio system diagram and arrangement (external communications system);

⑭ CO_2 release pre-alarm system and arrangement;

⑮ fixed fire detection and fire alarm system diagram and arrangement;

⑯ electrical system diagram and arrangement of watertight doors;

⑰ flooding detection system diagram and arrangement (including liquid level monitoring system in lieu of flooding detection system in the tank);

⑱ lighting system diagram and arrangement;

⑲ The following plans are also to be provided in the assessment of the capabilities of safe return to port:

a. arrangement of engine room;

b. arrangement of steering gear compartment;

c. arrangement of propulsion machinery room;

d. engine room ventilation system;

e. cooling systems of main and auxiliary engines;

f. lubricating oil systems of main and auxiliary engines;

g. starting air systems;

h. hydraulic systems (e.g. watertight doors, remote control valves for essential systems);

i. other systems determined to be vital to the capabilities of safe return to port.

(2) Basic plans in relation to orderly evacuation include:

① arrangement of water fire-extinguishing systems;

② bilge systems;

③ system diagram and arrangement of internal communications (including broadcasting system, general alarm system and telephone system);

④ radio system diagram and arrangement (external communications system);

⑤ lighting system diagram and arrangement;

⑥ guidance system for evacuation.

1.5 Types of casualties

1.5.1 According to chapters II-1 and II-2 of SOLAS, the following types of casualties are to be considered by following the single casualty principle. No cause of casualty is required to be considered, and the results are only based on the assumption.

(1) flooding occurs in a single watertight compartment below any bulkhead deck;

(2) fire, in any space, not exceeding the casualty threshold;

(3) fire, in any space, exceeding the casualty threshold but not exceeding one main vertical zone.

1.5.2 Examples of fire threshold

(1) The casualty threshold is to be interpreted as follows:

① For space protected by fixed fire-extinguishing systems, fire within "A" class boundaries is within casualty threshold, otherwise it is beyond the threshold;

② For space not protected by fixed fire-extinguishing systems, in case of fire, the threshold may extend to the nearest"A" class boundaries, but not exceeding one main vertical zone. Fire within the boundary is within casualty threshold, otherwise it is beyond casualty threshold.

(2) Spaces within the same deck:

① protected by fixed fire-extinguishing system, see Figure 1.5.2(2)a;

② not protected by fixed fire-extinguishing system, see Figure 1.5.2(2)b.

(3) Spaces between different decks:

① protected by fixed fire-extinguishing system, see Figure 1.5.2(3)a;

② not protected by fixed fire-extinguishing system, see Figure 1.5.2(3)b.

(4) For main vertical zone, see Figure 1.5.2(4).

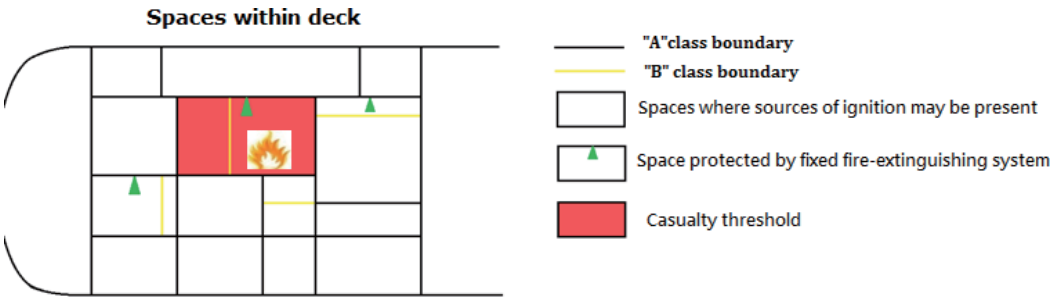

Figure 1.5.2(2)a Protected by fixed fire-extinguishing system

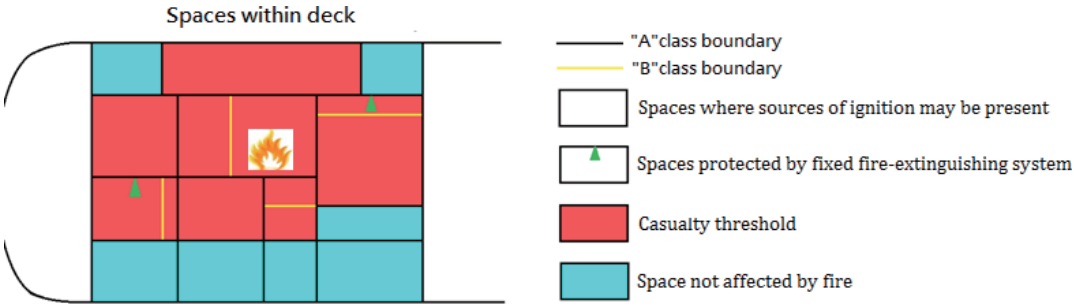

Figure 1.5.2(2)b Not protected by fixed fire-extinguishing system

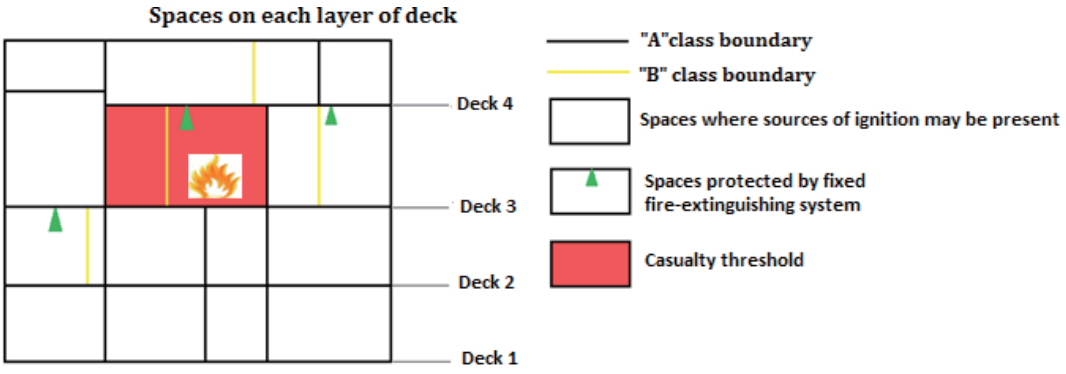

Figure 1.5.2(3)a Protected by fixed fire-extinguishing system

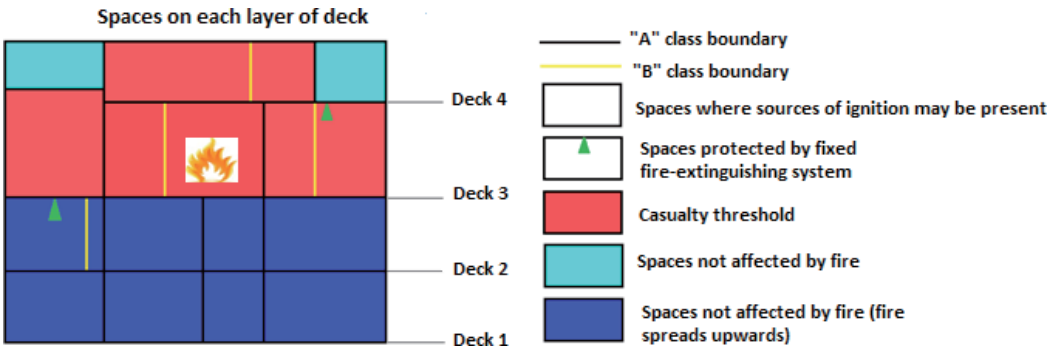

Figure 1.5.2(3)b Not protected by fixed fire-extinguishing system

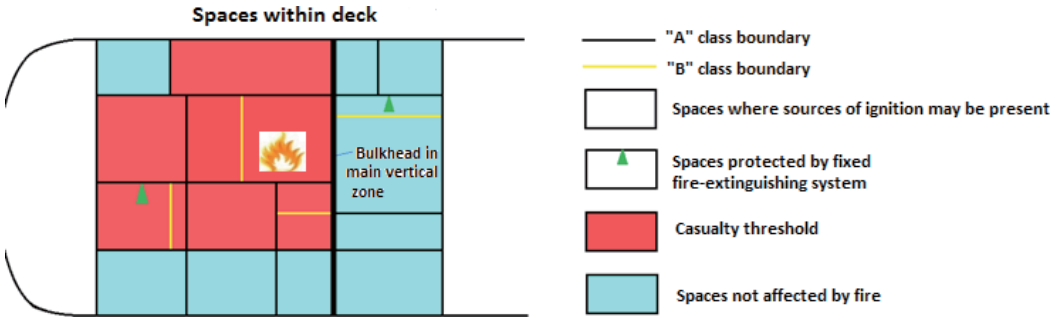

Figure 1.5.2(4) Not protected by fixed fire-extinguishing system (main vertical zone)

1.5.3 Design criteria

According to the types of casualties, the required design criteria are shown in Figure 1.5.3 below:

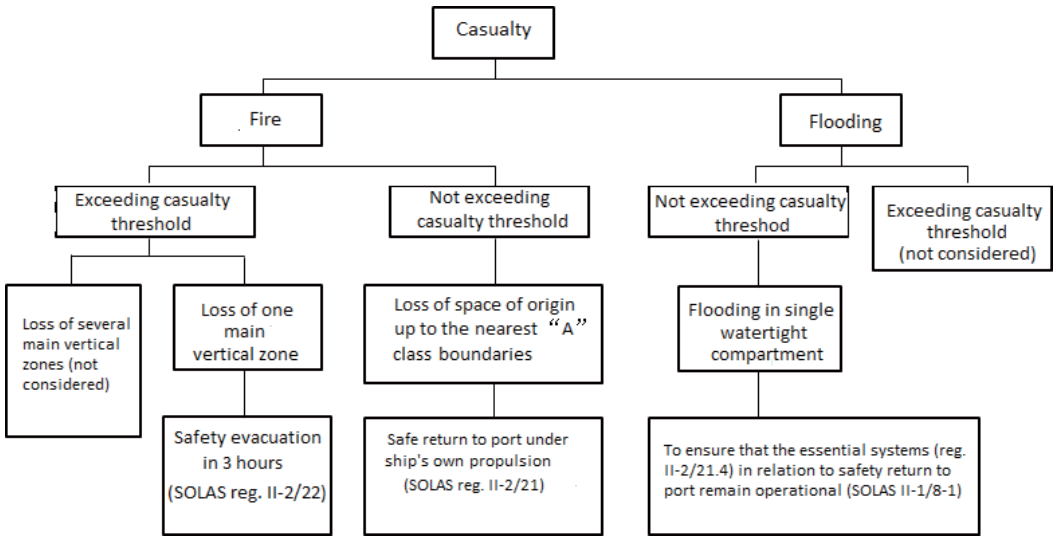

Figure 1.5.3 Design criteria required according to type of casualties

CHAPTER 2 REQUIREMENTS FOR SAFE RETURN TO PORT

2.1 General requirements

2.1.1 Where a fire casualty not exceeding the casualty threshold occurs, the essential systems supporting safe return to port under ship's own propulsion are to comply with SOLAS regulation II-2/21. Where the flooding not exceeding the casualty threshold occurs, relevant essential systems are to comply with SOLAS regulation II-2/21.4. The assessment of these essential systems is to comply with relevant requirements of Chapter 5 of the Guidelines.

2.1.2 In addition to complying with Chapter 1, requirements of this Chapter are to be complied with.

2.2 Design requirements

2.2.1 Propulsion system

(1) At least 2 sets of propulsion systems are to be fitted, with propulsion machinery arranged in different compartments. Where the systems are arranged in adjacent space, the adjacent bulkhead is to be the watertight bulkhead of"A" class division.

(2) Following a fire casualty within the casualty threshold, the ship is to be capable of safely returning to port in sea and wind conditions 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.

(3) Where the two sets of propulsion systems are fitted in spaces of origin of a fire and adjacent arrangement is adopted, these spaces are to be protected by fixed fire-extinguishing systems.

(4) A steel shaft line including relevant bearings passing through a space affected by a flooding casualty may be considered operational if in the flooding case it can be shown that it can operate under water.

(5) A steel shaft line including relevant bearings passing through a space affected by a fire casualty may be considered operational if it is protected by a dedicated water spray system capable of delivering not less than 5 l/m^2/min on the protected area or equivalent.

(6) In case of loss of remote control function of propulsion system, 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 is to be given to the provision of machinery alarms when operating in that manner.

2.2.2 Steering systems and steering-control systems

(1) At least 2 sets of steering systems and steering-control systems are to be fitted, with the necessary steering machinery, steering gears, the power equipment of steering gears and steering-control systems arranged in different compartments. Where they are arranged in adjacent space, the adjacent bulkhead is to be the watertight bulkhead of"A" class division.

(2) Where 2 sets of steering systems and steering-control systems are located in spaces arranged adjacently, these spaces are to be protected by fixed fire-extinguishing systems.

(3) Where the remote control function of steering gear is lost, local control of remaining steering system is acceptable provided adequate communication and emergency lighting are arranged.

2.2.3 Navigational systems

(1) Where a fire casualty not exceeding the casualty threshold occurs and in the course of safe return to port, equipment essential for navigation, position fixing and detection of risk of collision is to be available. At least the following equipment is to be operational:

① standard magnetic compass or gyro-compass or gyro-compass repeater (main compass is not to be affected by fire casualty in the navigation bridge);

② global navigation and positioning system;

③ 9 GHz radar;

④ electronic nautical charts or paper charts or publications;

⑤ foghorn controller;

⑥ control panel of navigation lights as required by the International Regulations for Preventing Collisions at Sea;

⑦ internal communication equipment with engine control room and steering gear compartment;

⑧ a pelorus or compass bearing device;

⑨ means of correcting heading and bearings to true at all times;

⑩ external communication equipment (GMDSS or VHF and air VHF);

⑪ automatic identification system (AIS).

2.2.4 Oil fuel systems

(1) For oil fuel systems of oil-fired equipment (e.g. main engine, diesel generator etc.) essential to propulsion, they are to be so arranged as to ensure that the remaining oil fuel systems are to be available for continuous supply of satisfactory fuel oil for equipment when a fire or flooding casualty not exceeding the casualty threshold occurs.

(2) The total capacity of satisfactory fuel oil is at least to meet the needs for maximum return voyage and relevant protective measures are to be provided by means of dedicated daily service oil fuel tanks for safe return to port or setting low-level alarm for daily service oil fuel tanks to meet the needs for maximum return voyage or providing sufficient oil fuel purifiers.

(3) Oil fuel systems within spaces affected by a fire casualty are not to be considered as operational.

(4) Air pipes of fuel oil tank, sounding pipes and fuel oil drain pipes within spaces affected by a fire casualty are not to be considered as operational.

(5) Closed fuel oil pipes within spaces affected by a flooding casualty will be considered as operational where the control and operation of the valves and fittings are not affected by the flooding casualty.

(6) Open fuel oil drain pipes within spaces affected by a flooding casualty are not to be considered as operational.

(7) The related air pipes of fuel oil tank, overflow pipes and fuel oil drainage system of each engine room are to be independent of those of other engine rooms.

2.2.5 Internal communication system

(1) Internal communication between the bridge, engine room, safety centre, fire-fighting and damage control teams, and as required for passenger and crew notification and mustering are to remain operational during the safe return to port.

(2) At least one set of effective portable communication equipment is to be provided for internal communication. Portable equipment is to remain operational after the casualty and charging capability is available in more than one MVZ.

(3) Internal communication as required for passenger and crew notification and mustering is to be arranged as general alarm system and broadcasting system as the supplement to general alarm system. The above two systems are to remain operational in the MVZs not affected by the casualty.

2.2.6 External communication system

(1) The ship is to be capable of communicating via the GMDSS or the VHF Marine and Air Band distress frequencies during safe return to port, even if the main GMDSS equipment is lost.

(2) The above external communication equipment may be achieved by additional fixed means or portable means installed in the same area as the navigational equipment specified in 2.2.3.

(3) External communication equipment as specified in 2.2.6(1) is to be provided taking into account the sea areas passed during the safe return to port.

2.2.7 Fire main system

(1) Fire pumps are to be arranged in different compartments. Where these pumps are arranged in adjacent spaces, the adjacent bulkheads are to be watertight bulkheads and“A” class divisions.

(2) Where the spaces where fire pumps are fitted are arranged adjacently, the spaces are to be protected by fixed fire-extinguishing systems, unless satisfactory fire pumps fitted in other spaces not affected by a fire casualty are usable.

(3) After a fire or flooding casualty, automatic start of remaining pumps may not be necessarily required (manual local start may be accepted after a casualty). However, the location of manual local start is to be easily accessible and not affected by a fire or flooding casualty.

(4) After a fire or flooding casualty, the system is to 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.

(5) After a fire or flooding casualty, the remaining part of the affected deck in a Main Vertical Zone may be served from hydrants of adjacent zone or watertight compartment.

(6) After a fire or flooding casualty, fire hoses may be extended for fire-fighting within the affected Main Vertical Zone; however, for assessing the arrangement of fire hydrant, two lengths of hoses from each hydrant may be accepted.

2.2.8 Fixed fire-extinguishing system

(1) Except for spaces where fixed fire-extinguishing system is required according to SOLAS chapter II-2, fire in other spaces may be controlled within the "A" class boundaries of the space by provision of fixed fire-extinguishing system.

(2) The system is to be so arranged that a fire or flooding casualty within the casualty threshold does not render the whole fixed fire-extinguishing system inoperable.

(3) When a gaseous based system (e.g. CO_2 fire-extinguishing system) located outside the protected space is the sole fixed fire-extinguishing system as defined in regulations II-2/10.4.1 and 10.7.1 and it is designed to protect more than one space: there is to be enough capacity to protect the two largest spaces; where the application of the fire casualty threshold leads to the loss of the storage room using fixed fire-extinguishing system (e.g. CO_2 fire-extinguishing system) due to fire in an adjacent space, there are to 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 the fixed fire-extinguishing system (e.g. CO_2 fire-extinguishing system) is to be so arranged that a casualty in one protected space does not impair the operation of the system in another protected space.

(4) Automatic sprinkler fire-extinguishing systems may be considered to be lost only in spaces directly affected by the fire casualty. Section valves located within the space affected by the fire casualty are to 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.).

(5) Each section of automatic sprinkler fire-extinguishing system is not to serve more than one deck area in one MVZ. However, all levels of a stairway enclosure may be protected by the same section. 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, is to continue to function after a fire or flooding casualty.

(6) The fire or flooding casualty within the casualty threshold is not to render the fixed pressure water-spraying fire-extinguishing system inoperable.

(7) Fixed pressure water-spraying fire-extinguishing system or 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.) may be considered.

(8) Arrangement of piping distribution for automatic sprinkler fire-extinguishing system or fixed pressure water-spraying fire-extinguishing system, may include isolating valves, to ensure the system can be reconfigured as to remain operational after a casualty, which is to be kept to a minimum, clearly marked and easily accessible. Valves whose uncorrected status may jeopardize the operation of the system under normal condition are to be provided with status indication in the continuously manned control station.

(9) Fixed local application fire-extinguishing systems (e.g.: water-based local application fire-fighting systems in engine room) need not to remain operational following a casualty.

(10) 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, is to continue to function after a fire or flooding casualty. For example, if the main indication device is located in the bridge, another indication device is to be fitted in another continuously manned central control station within the "A" class boundary different from that of the bridge.

2.2.9 Fire and smoke detection systems

(1) In case of a fire casualty not exceeding the casualty threshold, 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, provided that all other detectors remain operational in any other decks served by that section.

(2) Fire alarm indication devices are to be provided respectively in the bridge and another continuously manned central control station belonging to the casualty threshold different from that of the bridge. The indication device is to comply with requirements of 2.5.1 of Chapter 9 of FSS Code.

2.2.10 Bilge and ballast systems

(1) Bilge pumps are to be arranged in different compartments. Where the pumps are arranged in adjacent spaces, the adjacent bulkheads are to be watertight bulkheads of "A" class division.

(2) If spaces where bilge pumps are located are arranged adjacently, these spaces are to be protected by fixed fire-extinguishing systems, unless satisfactory bilge pumps available for areas not affected by the fire casualty are provided in other non-adjacent spaces.

(3) Ballast pumps are to be arranged in different compartments. Where the pumps are arranged in adjacent spaces, the adjacent bulkheads are to be watertight bulkheads of "A" class division.

(4) If spaces where ballast pumps are located are arranged adjacently, these spaces are to be protected by fixed fire-extinguishing systems, unless satisfactory ballast pumps available for areas not affected by the fire casualty are provided in other non-adjacent spaces.

(5) The bilge and ballast pumping systems and all associated essential equipment are to 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.

2.2.11 Power-operated watertight and semi-watertight doors

(1) Indication to show whether each door is open or closed is to 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.

2.2.12 Flooding detection systems

(1) 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.

(2) Flooding casualty in a single watertight compartment is not to lead to the failure of flooding detection systems in other watertight compartments.

(3) Liquid level monitoring system with an indicator panel or other means of monitoring at the navigation bridge and the safety centre, fitted in the watertight spaces (e.g. freshwater tank, ballast tank, oil tank) as referred to in paragraph 7 of MSC.1/Circ.1291 on Guidelines for Flooding Detection Systems on Passenger Ships, if taken as the substitution of flooding detection system, is to comply with the requirements of (1) and (2) above.

2.2.13 Arrangement of piping

(1) 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. In both cases the pipes are to be adequately supported. In order to be considered as remaining operational after a fire casualty, steel pipes are to be joined by welding otherwise mechanical joints are to be tested according to IACS UR P2.11.5.5.6 fire test or equivalent.

(2) Plastic pipes can be considered to remain operational after a fire casualty if tested to resolution A.753(18), Level 1.

(3) Effect of fire casualty may not be considered for pipes arranged within spaces where no source of fire is present.

(4) Pipes arranged within spaces where no source of fire is present, if used for transfer of flammable and explosive media, are not to be provided with dismountable joints.

(5) Pipes for transfer of fuel oil, lubrication oil, other flammable hydrocarbons or any fluid that may be flammable or dangerous if heated to a very high temperature (both within the pipe and when passing through pumps, orifices or other equipment), are not to be considered operational within spaces affected by a fire casualty.

(6) Closed pipes within spaces affected by a flooding casualty may be considered operational.

2.2.14 Isolating valve

(1) In order to ensure the operation of pipes outside spaces affected by a fire casualty, isolating valves are to be fitted on pipes to achieve effective isolating between pipes within and outside spaces affected by a fire casualty.

(2) For open pipes within spaces affected by a flooding casualty, if relevant systems necessary for safe return to port are unable to remain operational due to flooding in pipes, isolating valves are to be fitted to achieve effective isolating between open pipes within and outside spaces affected by a flooding casualty.

(3) Isolating valves are to be located outside spaces affected by a fire or flooding casualty and easy to operate. Indication to show whether the valve is open or closed is to be provided.

2.2.15 Capacity of power station

(1) For the flooding casualty mentioned in SOLAS regulation II-1/8-1 and the fire casualty mentioned in SOLAS regulation II-2/21, an electrical balance is to include minimum electrical-generating capacity available after a casualty not exceeding the casualty threshold and 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.

(2) 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. For the use of emergency generator during safe return to port, direct supply to the main power grid is to be avoided as far as possible or assessment material, approved by the Administration, demonstrating that emergency service capability will not be affected, is to be provided.

(3) Electrical power is to 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.

2.2.16 Arrangement of cables and connection box

(1) 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 is to be made to support their survival in a fire casualty and during fire-fighting efforts.

(2) 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.

(3) For a system required to meet the requirements for safe return to port, where its single equipment of a single system is located in a void tank or other spaces with a negligible fire risk as specified in Interpretation 8 of MSC.1/Circ.1369, it may be considered as not affected by a fire casualty, provided assessment material is submitted to demonstrate that the compartment will not be affected by fire in other spaces and no other flammable elements exist in the compartment.

2.2.17 Distribution system

(1) As an essential auxiliary system for safe return to port, the provision of distribution systems is to ensure that the systems depending on an electrical source for their operation as specified in SOLAS regulation II-2/21.4 remain operational when a fire or flooding casualty not exceeding the casualty threshold occurs.

(2) At least 2 sets of main switchboards are to be arranged within different spaces divided by “A” class divisions and watertight subdivisions respectively.

(3) For systems depending on an electrical source for their operation as specified in SOLAS regulation II-2/21.4, feeders are to be so arranged as to ensure that the above systems will remain operational in case one main switchboard fails due to the occurrence of a fire or flooding casualty not exceeding the casualty threshold.

(4) Several main generators arranged in different engine rooms divided by A class divisions and watertight subdivisions respectively are to be provided. The generators in engine rooms are to be so provided as to ensure that following a fire or flooding casualty within the threshold, the ship is to be able to maintain an adequate speed for sufficient time to permit the ship’s planned safe return to port. A minimum speed of 6 knots while heading into Beaufort 8 weather and corresponding sea conditions is recommended.

(5) The emergency shutdown of the oil in different engine rooms as redundant arrangements is to be independent of each other.

(6) Where a generator driven by the ship’s main propulsion machinery is used as part of the ship’s main source of electrical power for safe return to port, requirements of 2.1.2.1 of Chapter 2, PART FOUR of ISC Rules for Classification of Sea-Going Steel Ships are to be complied with.

(7) Where an emergency switchboard is used as part of the power supply system for safe return to port, interconnection switches and feeder cables may be fitted from each main switchboard to the emergency switchboard and interlocks are to be provided to ensure power supply to the emergency switchboard at different time.

(8) Where onboard stability computer is provided according to SOLAS regulation II-1/8-1/3.1, requirements of MSC.1/Circ.1532 on Revised Guidelines on Operational Information for Masters of Passenger Ships for Safe Return to Port are to be complied with. At least two independent stability computers are to be available at all times (either two onboard, or two through shore-based support, or one each), which are capable of receiving and processing the data necessary to provide operational information to the master. The onboard system is to have an uninterruptible power supply (UPS) connected to both main and emergency switchboards.

2.2.18 Other relevant systems

(1) Lubrication oil system

① Lubrication oil system necessary for propulsion is to be so arranged as to take into account the fact that after the fire or flooding casualty within the casualty threshold, the remaining lubrication oil systems are to continuously supply the equipment with satisfactory lubrication oil.

② Lubrication oil systems within spaces affected by a fire casualty are not to be considered as operational.

③ Air pipes of fuel oil tank, sounding pipes and lubrication oil drain pipes within spaces affected by a fire casualty are not to be considered as operational.

④ Closed lubrication oil pipes within spaces affected by a flooding casualty will be considered as operational where the control and operation of the valves and fittings are not affected by the flooding casualty.

⑤ Open lubrication oil drain pipes within spaces affected by a flooding casualty are not to be considered as operational.

⑥ The related air pipes of lubrication oil tank, overflow pipes and lubrication oil drainage system of each engine room are to be independent of those of other engine rooms.

(2) Cooling water system

① Cooling water systems necessary for propulsion are to be so arranged as to taken into account the fact that after the fire or flooding casualty within the casualty threshold, the remaining cooling water systems are to maintain the normal operation of propulsion system.

② Closed cooling water pipes within spaces affected by a flooding casualty will be considered as operational where the control and operation of the valves and fittings are not affected by the flooding casualty.

(3) Steam heating system

① Steam heating systems of fuel oil pipes necessary for propulsion are to be so arranged as to take into account the fact that after the fire or flooding casualty within the casualty threshold, the remaining steam heating systems are to be capable of supplying sufficient heat for fuel oil pipes used for safe return to port.

② The steam heating systems within spaces affected by a flooding casualty will be considered as operational where the control and operation of the valves and fittings are not affected by the flooding casualty.

(4) Compressed air system

① Compressed air systems necessary for propulsion are to be so arranged as to take into account the fact that after the fire or flooding casualty within the casualty threshold, the remaining compressed air systems are to be capable of supplying sufficient starting air for main engine and diesel generators to ensure their normal start necessary for the safe return to port.

② After the fire or flooding casualty within the casualty threshold, the remaining compressed air systems are to be capable of supplying sufficient control air to main engines, diesel generators and other essential systems and equipment necessary for safe return to port, except for those with local manual control.

③ The compressed air systems within spaces affected by a flooding casualty will be considered as operational where the control and operation of the valves and fittings are not affected by the flooding casualty.

(5) Ventilation system

Ventilation systems of spaces where propulsion systems, steering systems and relevant equipment are arranged in different compartments due to safe return to port are to be independent of each other, and passing through the same space of fire origin is to be avoided as far as possible. If not avoidable, measures, e.g. A-60 insulation, are to be provided to prevent ventilation systems passing through the same space of fire origin from being inoperable.

(6) Exhaust system

Exhaust systems of main engines, diesel generators and boilers arranged in different compartments due to safe return to port are to be independent of each other, and passing through the same space of fire origin is to be avoided as far as possible. If not avoidable, measures, e.g. A-60 insulation, are to be provided to prevent exhaust systems passing through same space of fire origin from being inoperable.

(7) Tank anti-freezing system

① For ships assigned ice service notations, the anti-freezing systems of tanks necessary for safe return to port above the waterline are to be so arranged as to take into account the fact that after a fire or flooding casualty within casualty threshold occurs, the remaining tank anti-freezing systems are to be capable of preventing the freezing of tanks necessary for safe return to port above the waterline.

② The tank anti-freezing pipes within spaces affected by a flooding casualty will be considered as operational where the control and operation of the valves and fittings are not affected by the flooding casualty.

(8) Hydraulic system

① Where controllable-pitch propellers are adopted as propulsion system, at least 2 sets of controllable-pitch propeller hydraulic systems independent of each other are to be provided and arranged in different compartments; if they are arranged in adjacent spaces, the adjacent bulkheads are to be watertight bulkheads of A class divisions.

② Where the two sets of controllable-pitch propeller hydraulic systems are provided in adjacent spaces, these spaces are to be protected by fixed fire-extinguishing systems.

CHAPTER 3 REQUIREMENTS FOR SAFE AREAS

3.1 General requirements

3.1.1 Basic services as specified in SOLAS regulations II-2/21.5 are to be provided for all onboard personnel in safe areas so as to ensure that the health of onboard personnel is maintained during safe return to port.

3.1.2 Means of access to life-saving appliances are to be provided from safe areas, taking into account that a main vertical zone may not be available for internal transit.

3.1.3 In addition to the requirements of Chapter 1, the requirements of this Chapter are to be complied with.

3.2 Design requirements

3.2.1 Arrangement principles

(1) Safe areas are generally to be arranged in accommodation space, excluding sanitary, lavatories, and not to be arranged in service spaces or machinery spaces as far as possible.

(2) Internal spaces with shelter from the weather are to be selected as safe areas and external spaces such as open deck are generally not selected as safe areas, unless an equivalent degree of personnel protection as that in internal spaces is achieved by ship's service area and environmental conditions.

3.2.2 Areas

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, is to be provided. For safe return to port operations shorter than 12 h, a minimum space of 1 m^2 per person is to be provided. Sanitary, lavatories, furniture and other locations not suitable for personnel placement are not to be included in the safe area.

3.2.3 Sanitation

(1) For sanitation required in the safe area, as a minimum one toilet for every 50 persons or fraction is to remain operational.

(2) Sewage systems in safe areas are to remain operational after a fire or flooding casualty within casualty threshold. In this case, grey and black water from the safe area are allowed to be disposed of into the sea.

3.2.4 Water

(1) As a minimum 3 litres per person per day drinking water are to be available in the safe area. Bottled water is to be within the period of validity.

(2) If drinking water supply system is adopted, after the a fire or flooding casualty within casualty threshold, the remaining drinking water systems are to be capable of supplying at least 3 litres per person per day in safe areas.

(3) Supply of sanitation water in safe areas (e.g. urinal flushing) is to be maintained after a fire or flooding casualty within casualty threshold.

(4) Supply of water for cooking necessary for safe return to port is to be maintained after a fire or flooding casualty within casualty threshold.

3.2.5 Food

(1) Necessary food is to be provided in safe areas based on the number of persons and operation duration of safe return to port. The amount of food supplied for each person may refer to the standard provision of food for lifeboat occupants specified in LSA Code. Food could be of any kind.

(2) Storage of food for safe areas is to be distributed as necessary, so that an access route is available from the safe areas.

3.2.6 Alternate space for medical care

(1) These spaces are to be in a different Fire Zone (from the hospital or primary medical centre) and easily accessible. Space where the medicine locker is present in the safe area may be taken as the alternate space for medical care. It is to be ensured that the medicine is within the period of validity.

(2) Alternate space for medical care is to have lighting and power supply on the main and emergency source of electrical power.

3.2.7 Means of preventing heat stress and hypothermia

(1) Definition of means for protection against heat stress and hypothermia is to take into account the area(s) of operation of the vessel.

(2) The temperature within the internal safe areas is to be maintained in the range of 10 to 30°.

(3) Air conditioning system is to be so arranged as to taken into account the fact that the remaining air conditioning systems are to be capable of maintaining the necessary temperature in safe areas after a fire or flooding casualty within casualty threshold.

3.2.8 Light

(1) Lights are to be provided in safe areas and emergency lighting may be acceptable.

(2) 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 is to be available for these lights. Supplementary lighting complying with regulation II-1/42-1 is also acceptable for ro-ro passenger ship.

3.2.9 Ventilation

(1) Ventilation is to be provided in safe areas and ventilation volume is to be available as a minimum of 4.5 m^3/h per person. Ventilation design is to reduce the possible risk posed by smoke and hot gases for the use of the safe area(s), e.g.: ventilation inlets of safe areas to be far away from the ventilation outlets of other spaces, as far as possible.

(2) Ventilation systems may be common to the safe area and other areas provided that the system will not be affected by those in spaces where a fire or flooding casualty occurs.

CHAPTER 4 REQUIREMENTS FOR ORDERLY EVACUATION

4.1 General requirements

4.1.1 Where the fire casualty in applicable ship exceeds the casualty threshold, essential systems necessary for supporting orderly evacuation are to comply with the requirements of SOLAS regulation II-2/22. The assessment of these essential systems is to comply with the requirements of Chapter 5 of the Guidelines.

4.1.2 In addition to Chapter 1, requirements of this Chapter are to be complied with.

4.2 Design requirements

4.2.1 In order to remain operational for supporting the orderly evacuation and abandonment of a ship, if the casualty threshold, as defined in SOLAS regulation II-2/21.3, is exceeded, relevant systems are to comply with the following requirements:

(1) fire main;

① The fire main is to remain operational in all main vertical zones not directly affected by the casualty.

② All fire pumps and their power supply systems are generally not to be arranged in the same main vertical zone.

(2) Bilge systems for removal of fire-fighting water

① The bilge pumping system and all associated equipment essential for its operation are to be available in all spaces not directly affected by the casualty.

② All bilge pumps and their power supply systems are generally not to be arranged in the same main vertical zone.

(3) Cabling and piping within a trunk constructed to an “A-60” standard are to be deemed to remain intact and serviceable while passing through the unserviceable main vertical zone.

(4) Internal communication

A means is to be available for communicating orders to fire-fighting and damage control teams and personnel in charge of evacuation and abandonment in case any one main vertical zone is unserviceable due to fire. If portable equipment is used, charging devices are to be provided in different main vertical zones.

(5) External communication

① The ship is to be capable of communicating via the GMDSS or the VHF Marine and Air Band distress frequencies even if the main GMDSS equipment is lost.

② The above means of external communication may be fixed or portable and not to be arranged together with main GMDSS in the same MVZ.

③ The means of external communication specified in ① above are to be provided according to the sea areas to be passed in the intended voyage.

(6) Lighting

In case any one main vertical zone is unserviceable due to fire, lighting along escape routes, at assembly stations and at embarkation stations of life-saving appliances is to be capable of operation for at least 3 h based on the assumption of no damage outside the unserviceable main vertical zone.

(7) Guidance systems for evacuation

If guidance systems for evacuation are available, they are to be capable of operation for at least 3h in the main vertical zone not affected by casualty. Where powered low-location lighting system is available, the system is to be capable of operation for at least 3 h in the main vertical zone not affected by casualty.

(8) Source of power

① In case any one main vertical zone is unserviceable due to fire, systems supporting the orderly evacuation are to 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 in unserviceable main vertical zones.

② Emergency generators or accumulator batteries may be used as source of power to comply with the requirements of 4.2.1(8) ①, however, the emergency generators or accumulator batteries are not to be arranged together with the main power station in the same main vertical zone.

CHAPTER 5 ASSESSMENT OF SYSTEM CAPABILITY

5.1 General requirements

5.1.1 In order to ensure the applicable ship has both the capability of safe return to port as required in SOLAS regulation II-2/21 and capability of system operation for at least 3 h to ensure orderly evacuation as required in SOLAS regulation II-2/22 (see Figure 5.1.2), capability assessment is to be carried out in accordance with MSC.1/Circ.1369.

5.1.2 The assessment is to be carried out based on whether the fire or flooding casualty exceeds the casualty threshold and the process of assessment is to be carried out separately.

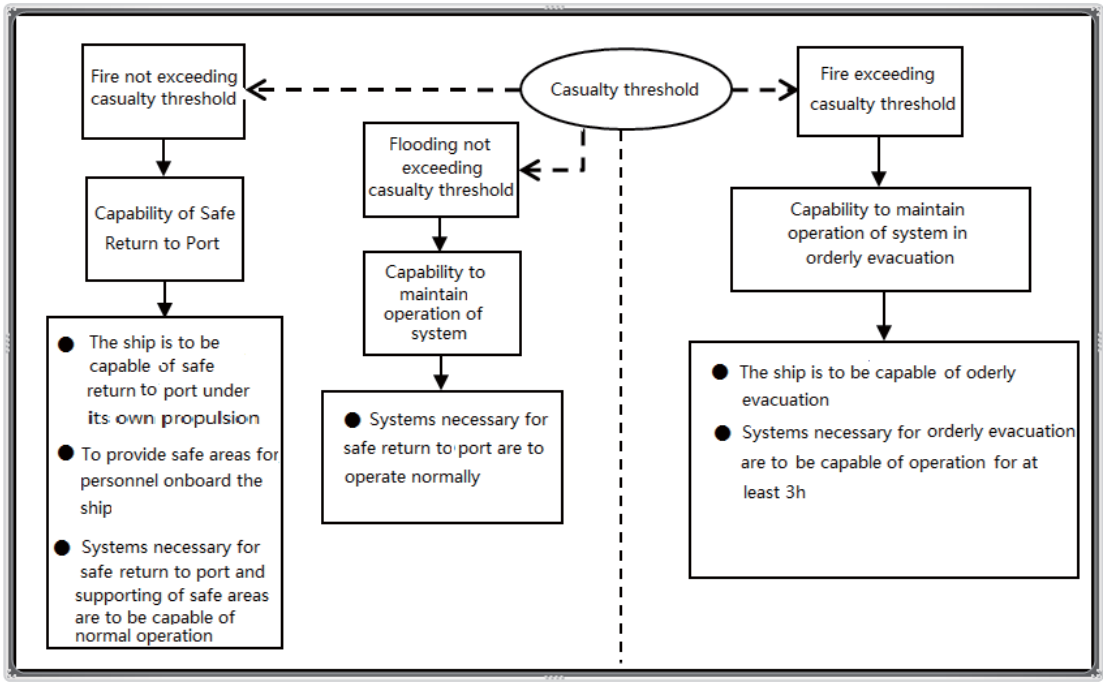

Figure 5.1.2 The two systems' capabilities of applicable ship

5.1.3 In order to assess the ship systems' capabilities, the fire and flooding casualties are deemed not to occur simultaneously.

5.1.4 Assessment basis:

(1) MSC.1/Circ.1369 on Interim Explanatory Notes for the Assessment of Passenger Ship Systems' Capabilities after a Fire or Flooding Casualty and MSC.1/Circ.1437 on Amendments to MSC.1/ Circ.1369;

(2) MSC.1/Circ.1369/Add.1.

5.2 Assessment procedures

5.2.1 Preparation

(1) Prior to the assessment, the designer is to get information on the ship's description prepared, such information is at least to include:

① design criteria for essential systems (e.g., separation, duplication, redundancy, protection);

② the basic layout of the vessel including boundaries of compartments subject to the casualty (watertight or "A" class boundaries);

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;

⑤ drawings/documents describing the location, arrangement and connections of essential systems;

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 tank tests in sea keeping conditions including consideration of wind forces);

⑧ any additional design detail intended to ensure or support the ship systems' capabilities;

⑨ additional information about the intended area of operation, the operating pattern or patterns, e.g. global liner or point-to-point ferry operation, the maximum number of persons on board for the required route (which may be used to define any intended speed/maximum distance for safe return to port).

(2) Prior to the assessment, spaces with fire risk on board are to be determined first (There are various spaces enclosed by A class divisions, such as engine rooms, galleys, store rooms for flammable liquid, shops, ro-ro spaces and special spaces, cabins, cargo spaces, etc.). Examples for spaces without fire risk are referred to in Interpretation 8 of Appendix 1 of MSC.1/Circ.1369.

5.2.2 Assessment methods

(1) The assessment of the applicable ship systems' capabilities is carried out with the system-based analysis method. First of all, all essential systems are to be listed, and the analysis of the effect by a fire or flooding casualty (examples may be referred to in Appendix 1 of this Chapter) will be carried out focusing on a certain essential system and its auxiliary equipment and supporting systems (e.g. propulsion system and its fuel oil, lubrication oil, cooling water and auxiliary supporting system such as control system).

(2) If potential risks may be listed by the method above, method based on compartments or spaces may be used. In the latter situation, parts or all of the spaces considered separately may be taken as an element of the whole protection system due to operation restrictions on entry, usage and installation. Therefore, all spaces of this kind and their restrictions are to be marked in the drawing or manual as the case may be.

5.2.3 Assessment procedures

(1) Each assessment is to be divided in two steps.

① The first step is an overall assessment for systems required by regulations 21.4 and 22.3 and identity the essential systems with potential risks.

Essential systems identified to be fully redundant (e.g., when auxiliary supporting systems and equipment are duplicated and adequately separated), detailed assessment for critical systems in step two is not required (see Figure 2 of Appendix 2 of this Chapter).

If not redundant, detailed assessment for critical systems in step two is to be carried out and other measures are to be taken to prevent the effect of a fire or flooding casualty.

② The second step is a detailed assessment of critical systems identified in the systems' assessment. For each critical system, measures taken to protect runs of cables, pipes and components from the effects of a fire or flooding casualty are to be guaranteed.

Manual action by the crew, to provide ship systems' capabilities, may also be possible but is to be assessed in detail taking into account that the action is pre-planned, pre-set and instructions as well as necessary materials are available on board and is performed on systems designed to ensure that the required manual action can be completed within one hour from the time the action started, emergency lighting and a means of communication is demonstrated available in the area where manual actions are to be taken.

(2) Risks of critical systems are to be finally eliminated based on the assessment of the above two steps, especially by taking various measures in the second step (e.g., separation, duplication, redundancy, enhanced protection). The whole assessment process is shown in Figure 5.2.3.

5.2.4 Assessment report

(1) An assessment report including the results of assessment is to be provided after the assessment, see 7.3 of Annex to MSC.1/Circ.1369 for detailed requirements.

(2) The assessment report includes but not limited to:

① Part 1: General (basic condition of the ship);

② Part 2: Ship's description (see 5.2.1);

③ Part 3: Principles for safe return to port and orderly evacuation (including casualty threshold, safe area etc.);

④ Part 4: Assessment process including overall assessment of essential systems' report and detailed assessment of critical systems' report;

⑤ Part 5: Conclusions;

⑥ Part 6: Additional information (including list of manual actions, test programme, maintenance plan, references) and appendixes.

5.2.5 Onboard documentation

The onboard documentation demonstrating the ship system capabilities is to include documentation, as per paragraph 7.4 of annex to MSC.1/Circ.1369, especially operational manual for fire and flooding casualty cases and safe return to port operation.

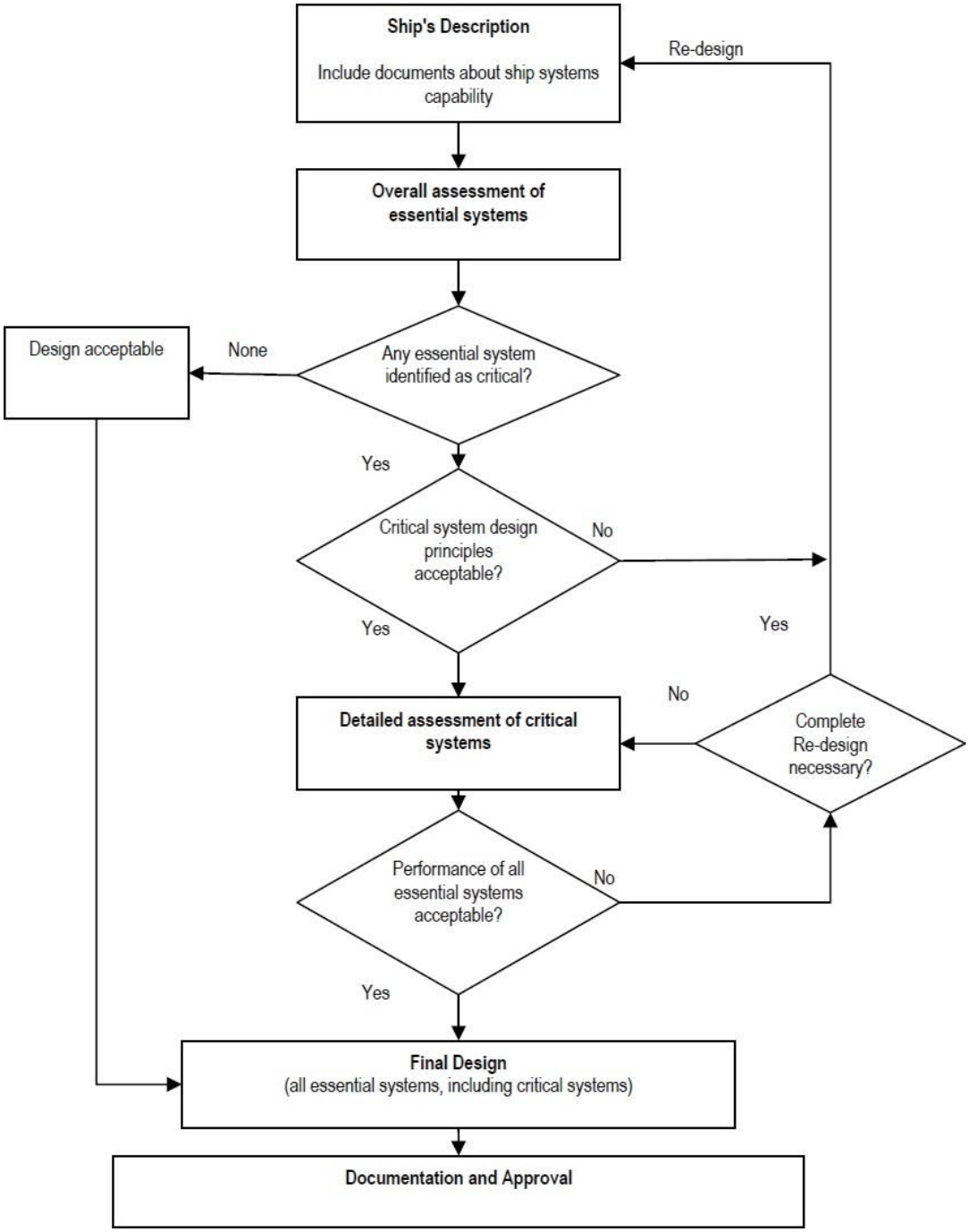

Figure 5.2.3 Assessment process flowchart

Appendix 1 EXAMPLE FOR ASSESSMENT OF CAPABILITY OF SAFE RETURN TO PORT

Example for assessment of capability of safe return to port on the basis of essential systems

To list all essential systems (refer to SOLAS regulations II-2/21.4 and II-2/22.3 for the list) on the basis of system, namely to carry out analysis starting from essential systems of the ship; to describe the design principles and performance criteria of essential systems of the ship, analyze the layout of each system and the spaces enclosed by casualty boundaries through which the system passes and, on this basis, to analyze the effect of fire in any space on the system, analyze potential weakness, identify critical systems, propose the improvement measures (e.g. separation, duplication, redundancy, protection or a combination of the above) so as to achieve the conformity.

The assessment of a large passenger ship's capability of safe return to port is carried out by taking its steering-control system among critical systems as an example. The flowchart is shown in the Figure below.

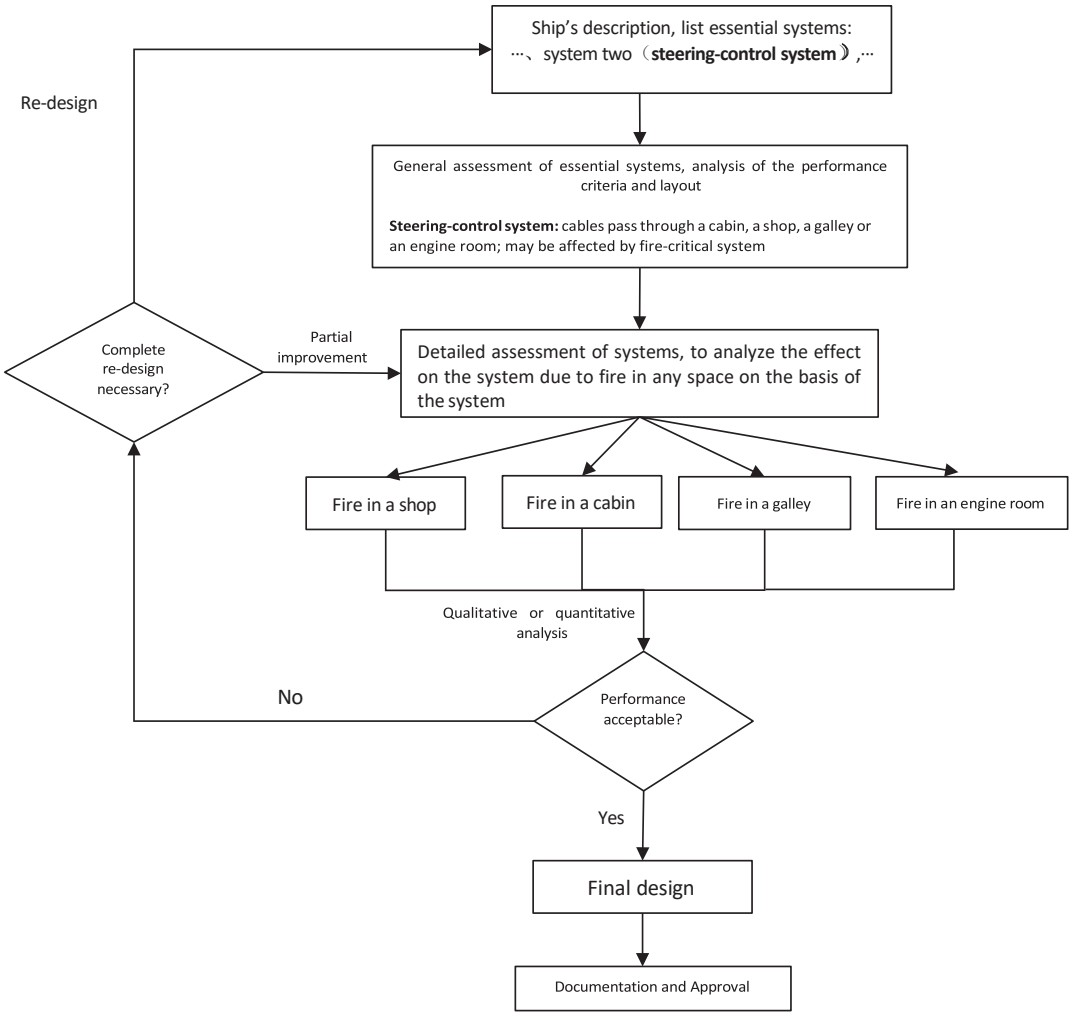

Figure 1 Example of the flowchart of system-based assessment of capability of safe return to port

Appendix 2 IDENTIFICATION OF CRITICAL SYSTEMS

1 Each essential system is to be assessed whether it is to be identified as a critical system. If fully redundant, assessment of critical system is not required.

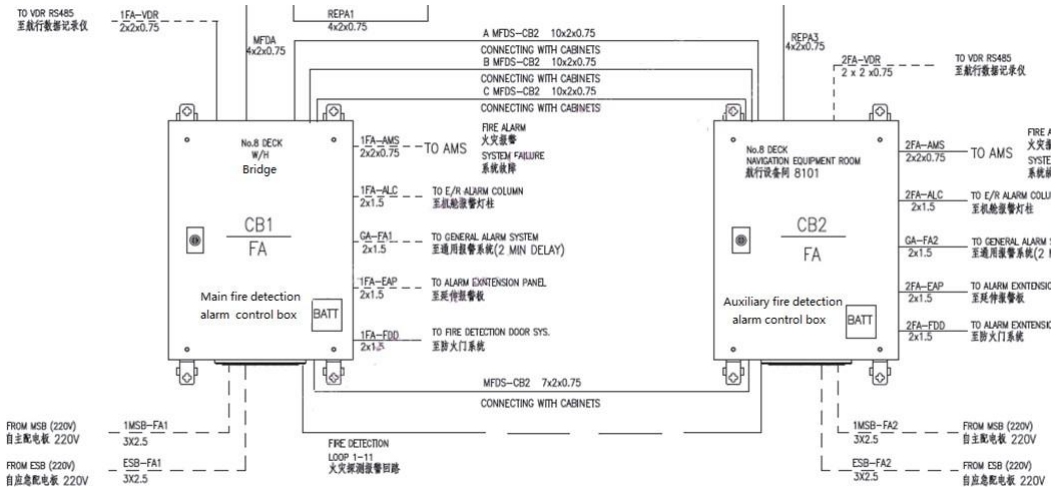

Figure 2 Smoke and fire detection system (redundancy)

2 If identified as critical system by means of assessment, for each critical system, determination of how the cables, pipes, components will be protected. There are multiple solutions such as duplication, redundancy, enhanced protection and manual action, etc.

Example: A main power cable for the GMDSS system passes through the MVZ on deck 3. In a fire this cable could be damaged.

First solution: An emergency power cable is routed from a different direction to the navigation bridge that does not pass through this area.

Second solution: An A-60 trunk is installed to protect the cable to preclude fire damage.

Third solution: Instead, a repair cable is prepared and staged with necessary tools at a protected location. If the cable is damaged by a fire in the MVZ under analysis, the crew is able to temporarily re-route power from another location using the repair cable.

CHAPTER 6 SURVEYS AND TESTS

6.1 General requirements

6.1.1 Essential systems as required in Chapters 2, 3 and 4 of the Guidelines are to be installed in accordance with the approved assessment report and drawings.

6.1.2 The above essential systems are to be verified through mooring test and sea trials after installation onboard the ship so as to meet the requirements for safe turn to port and orderly evacuation.

6.2 Survey key points and requirements

6.2.1 The following systems are to be surveyed in construction phase:

(1) Propulsion system

① Shafting is to be installed in accordance with the approved plans and procedures.

② In the case that the shafting of fore engine room passes through the after engine room (if any), it is generally to be so designed as to be protected by a dedicated water spray system capable of delivering not less than 5 $l/m^2/min$ on the protected area or equivalent. The pump capacity, type of nozzle, and the arrangement of nozzle are to be surveyed and efficiency test is to be carried out for the water spay system.

(2) Internal communication, navigation and radio systems

① Fire in the navigation bridge is simulated by cutting the power of distribution box of bridge console, radio and aids to navigation to check whether magnetic compass or gyro-compass (if fitted) or gyro-compass repeater (if fitted), GPS, 9GHz radar, ECDIS (if fitted), automatic identification system, fog horn, control panel of navigation light in space within the casualty threshold different from that of the bridge are in normal operation condition and to check whether the internal communication equipment (e.g. Sound-powered telephone, portable communication equipment and its charging device), GMDSS including air VHF arranged in different main vertical zones are in normal operation condition.

② Fire-resistant cables complying with standards IEC 60331-1 and IEC 60331-2 are to be used as cables passing through (not serving) a space of origin.

(3) Fuel oil system

① The consistency of real ship's fuel oil tank capacity for safe return to port with the design plan is to be checked and the low level alarm oil level fitted in fuel oil tank for safe return to port is to meet the requirements for the maximum return voyage.

② Isolating valves are to be fitted on boundaries of source of fire if there are pipes passing through (not serving) spaces of origin during installation of pipes. It is to be ensured that the fuel oil systems remain operational after the shutoff of isolating valves. Isolating valves of fuel systems of different engine rooms are to be installed as close to the engine room bulkhead as possible.

(4) Internal communication system

① Circuit failure of PA systems, general alarm systems in a MVZ is to be simulated as to check whether the PA systems, general alarm systems in other MVZs remain operational.

② The charging devices of portable communication equipment in each MVZ are to be surveyed.

③ Fire-resistant cables complying with standards IEC 60331-1 and IEC 60331-2 are to be used as cables passing through (not serving) a space of origin.

(5) Fire-fighting system

① Pipes passing through (not serving) spaces of origin are to be of substantial thickness and joined by welding, or of normal thickness and "A-60" insulated and joined by welding. Where pipes are joined by mechanical joints, the joints are to be tested according to IACS UR P2.11.5.5.6 fire test or equivalent.

② The installation of isolating valves from fire pumps to fire main and those from fire main to each MVZ is to be surveyed.

③ Efficiency tests of fire-fighting system are to be carried out after installation of pipes by closing the isolating valves from each fire pump to fire main so as to test whether the pressure of other fire pumps complies with the requirements of SOLAS regulation II-2/10.2.1.6. The loss of a certain MVZ is to be simulated and the isolating valves from fire main to the MVZ are to be closed to test the efficiency of fire pipes in other MVZs.

(6) Fixed fire-extinguishing system

① Pipes passing through (not serving) spaces of origin, as required in the plan, are to be checked specifically during installation, and are to be of substantial thickness and joined by welding, or of normal thickness and "A-60" insulated and joined by welding. Where pipes are joined by mechanical joints, the joints are to be tested according to IACS UR P2.11.5.5.6 fire test or equivalent.

② The release control devices of main and spare CO_2 bottles are to comply with relevant requirements of Chapter 5 of FSS Code.

③ Efficiency tests of CO_2 system are to be carried out respectively from different control positions after the installation of CO_2 pipes and tightness test.

④ It is to be noted that the isolating valves in each protection area are to be installed outside the protection area during the installation of pipes of sprinkler system of the compartment. The efficiency of the sprinkler systems in other protected areas are to be tested by simulating the loss of one protected area and closing the isolating valves from the sprinkler main to the protected area.

(7) Fire detection and alarm system

① The source of power of fire detection and alarm control panel in the navigation bridge or fire control station is to be cut off to check whether the fire alarm control panel and circuit arranged in other spaces are in normal operation condition.

② A circuit failure of the fire detection and alarm system in a main vertical zone is to be simulated to check whether the fire detection and alarm circuit in other layers of deck within the branch circuit is in normal operation condition.

③ Fire-resistant cables complying with standards IEC 60331-1 and IEC 60331-2 are to be used as cables passing through (not serving) a space of origin, as required in the plans.

(8) Bilge and ballast systems

① Pipes passing through (not serving) spaces of origin, as required in the plans, are to be checked during installation of pipes and these pipes are to be of substantial thickness and joined by welding, or of normal thickness and "A-60" insulated and joined by welding. Where pipes are joined by mechanical joints, the joints are to be tested according to IACS UR P2.11.5.5.6 fire test or equivalent.

② Efficiency tests are to be carried out for bilge system and ballast system after the installation of pipes. The availability of each bilge pump and ballast pump for the bilge and ballast systems of the whole ship is to be verified in the efficiency tests.

(9) Power operated watertight door

① The operating handle (or operating button) of watertight doors is to be provided at a minimum height of 1.6 m above the floor.

② The efficiency test is to comply with the relevant requirements of SOLAS regulation II-1/13.

(10) Supporting system of safe area

① Water, food: Sufficient water and food are to be provided as required in report of safe return to port prior to the delivery of ship.

② Alternate space for medical care: Grey water and black water in spare medical room are to be separately discharged into sewage treatment facilities and one-way valves are to be fitted on ventilation pipes.

③ Ventilation system: The ventilator is generally to be so arranged as to keep the ducts leading to various spaces in the same main vertical zone.

④ Lighting system: Distribution box of normal and emergency lighting serving a certain main vertical zone is to be cut off so as to confirm that the lighting along escape routes, at assembly stations and at embarkation stations of life-saving appliances is to be capable of operation for at least 3h and the lighting fixtures are to be so arranged as to cover the whole safe area.

(11) It is to be confirmed that the documents and information as required by 7.4 of Annex to MSC.1/ Circ.1369 are provided onboard the ship.

6.3 Test requirements

6.3.1 Requirements for preparation of test program for safe return to port

The test program for safe return to port is to be prepared by the shipyard prior to the test and the program is to be confirmed by ISC. The program is at least to include the following test items:

(1) Water fire-extinguishing systems: the availability of fire-extinguishing systems in other MVZs is verified by simulating losses of MVZs respectively and closing the isolating valves of the MVZ.

(2) Sprinkler system of compartment: the availability of sprinkler systems in other MVZs is verified by simulating losses of protection areas respectively and closing the isolating valves of the protection area.

(3) Fixed CO_2 system: a fire or flooding in a CO_2 release control location is simulated and simulated release and alarm test are carried out in CO_2 protection areas with another set of control system.

(4) Steering gear efficiency test: The availability of steering gears in other steering gear compartments is tested by simulating loss of a certain steering gear compartment respectively.

(5) Residual power operation test: the loss of a certain engine room is to be simulated respectively and the main engine of the engine room not affected by casualty is started to ensure the requirements for safe return to port and orderly evacuation are met.

(6) Test for the effectiveness of manual control: generally the manual operation is conducted by selecting a typical test item. It is recommended that manual control test is adopted for a certain loss of engine room, namely the personnel is to bring another engine room equipment into normal operation condition by manual operation in one hour.

(7) Efficiency test of power distribution system: the loss of a certain engine room is to be simulated respectively and the main generating sets of the engine room not affected by casualty are started to ensure the capacity of power station of the ship is to supply for the essential equipment necessary for safe return to port and orderly evacuation.

(8) Internal communication system: the branch circuit of main control boxes of general alarm and public address system is to be cut off and fire in a certain engine room or MVZ is simulated to check whether the internal communication system in area not affected by casualty is in normal operation condition.

(9) Fire alarm system: the branch circuit of main control boxes of fire alarm system is to be cut off and fire in a certain engine room or MVZ is simulated to check whether the fire alarm system in area not affected by casualty is in normal operation condition.

(10) Operation test for equipment of navigation and radio systems: a fire is simulated in the navigation bridge to verify whether the equipment provided in spaces with casualty threshold different from the navigation bridge is capable of being reliably switched and operating normally.

(11) Sea trials: turning test is run with singe engine room and fuel consumption is measured.

6.3.2 Mooring test

(1) Mooring test for safe return to port may be carried out in conjunction with regular test items according to actual situations.

(2) Efficiency test of engine room for safe return to port: to simulate the loss of any engine room due to fire or flooding, close the isolating valves of fuel oil system, sea water system, compressed air system in the engine room and to operate each equipment for 1 to 2 hours according to the conditions specified in the assessment report and examine the operation of main propulsion system, distribution system, lighting system, ventilation system, internal communication system, fire detection system and flooding alarm system.

6.3.3 Sea trials

The test is to verify respectively that the following tests may be completed by simulating with only one set of propulsion system:

(1) Turning test: to check the turning capability of the ship with only one set of propulsion system. The turning test is carried out with the speed as required for safe return to port. The results are to be recorded and kept onboard the ship.

(2) Measurement of fuel oil consumption

The fuel oil consumption of main engines, auxiliary engines and boilers is to be measured respectively according to the speed and conditions as required for safe return to port and the actual fuel consumption rate is to be calculated to verify whether the requirements for safe return to port may be met.

ANNEX TYPICAL DESIGN CASES

Explanations: Cases given in the Annex provided ideas and one or more solutions for meeting the requirements for safe return to port. The solution is not the only choice and is taken for reference.

1 Arrangement of propulsion system

Fore and aft engine rooms (two in all) are arranged as shown in Figure 1. The adjacent bulkheads are watertight and A class bulkheads. Propulsion systems meeting the requirements for safe return to port are fitted in both fore and aft engine rooms and are independent of each other. Fixed fire-extinguishing systems are fitted in fore and aft engine rooms so as to ensure that the fire occurring in one engine room will not spread to another engine room.

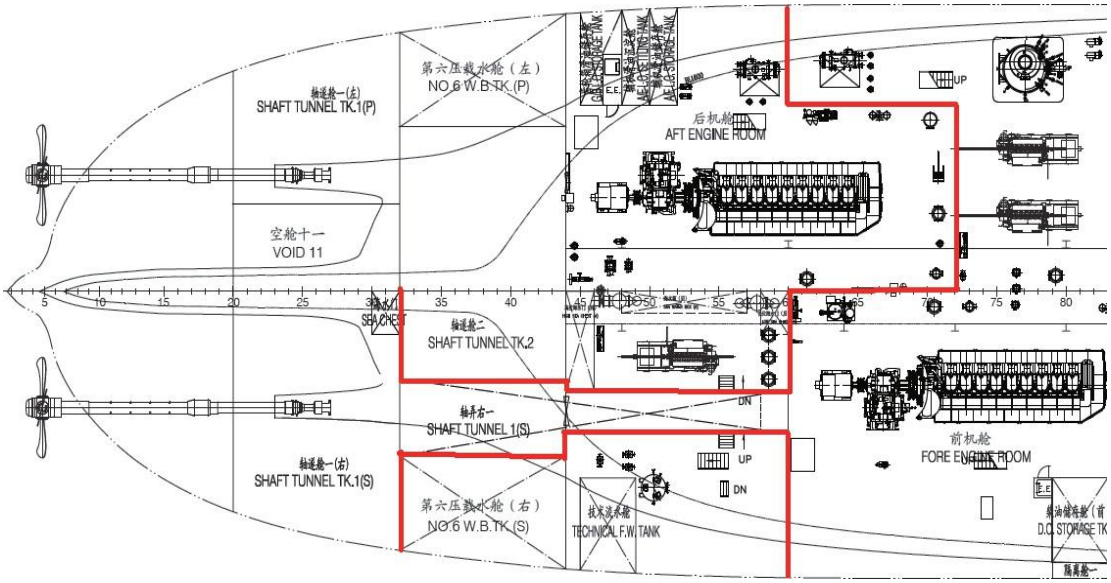

Figure 1 Arrangement of fore and aft engine rooms

The steel shaft line of fore engine room passing through part of the aft engine room may be enclosed in a watertight and “A” class tunnel (as the shaft tunnel (s) in Figure 1) or alternatively be protected by a dedicated water spray system capable of delivering not less than 5 l/m^2/min (as shown in Figure 2), in this case, the shaft line may not be required to be enclosed in a watertight and “A” class tunnel.

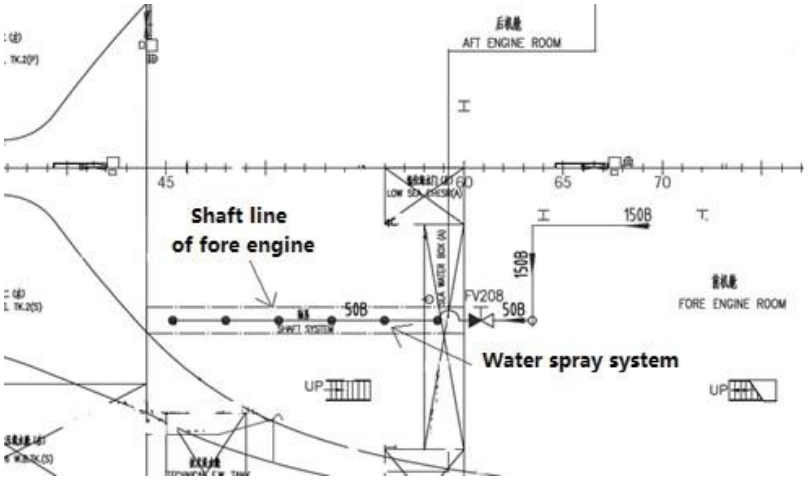

Figure 2 Steel Shaft Line Protected by Dedicated Water Spray System or Equivalent System

2 Arrangement of steering gear room

Port and starboard steering gear rooms (two in all) are arranged as shown in Figure 3. The adjacent bulkheads are watertight and A class bulkheads. Steering systems meeting the requirements for safe return to port are fitted in both port and starboard steering gear rooms and are independent of each other. Fixed fire-extinguishing systems are fitted in port and starboard steering gear rooms so as to ensure that the fire occurring in one steering gear room will not spread to another steering gear room.

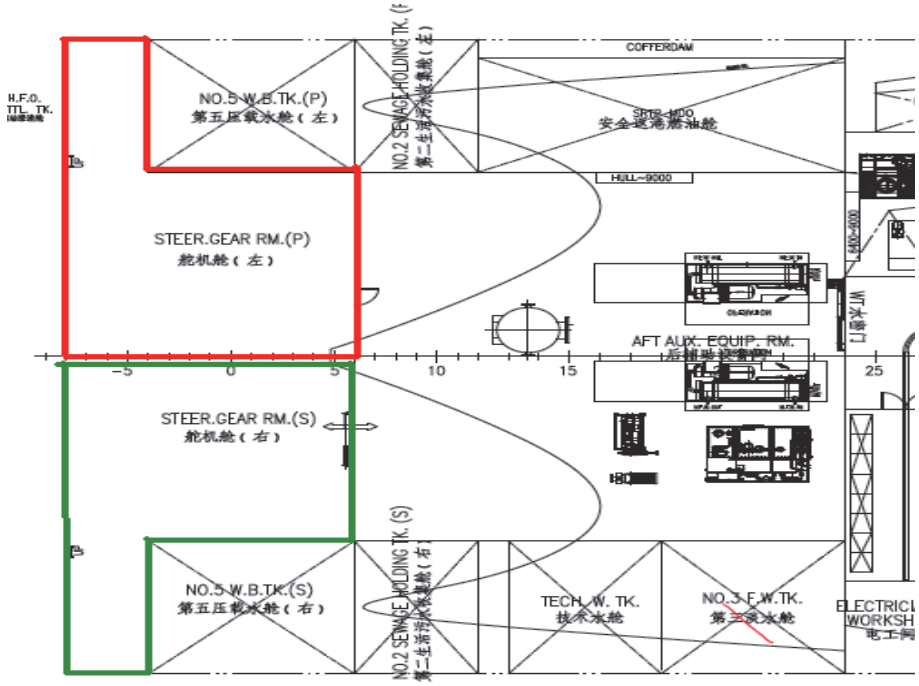

Figure 3 Arrangement of port and starboard steering gear rooms

3 Arrangement of fuel oil system

Daily service diesel tanks, daily service fuel oil tanks and diesel tanks for safe return to port and fuel oil supply units are fitted in fore and aft engine rooms (as shown in Figure 4). The capacity of diesel tanks for safe return to port is to meet the needs for maximum voyage of safe return to port. The fuel oil service system in fore and aft engine rooms are to be independent of each other and effectively isolated so as to ensure the fuel oil service system in another engine room will remain operational after a fire or flooding casualty within the casualty threshold occurs in one engine room.

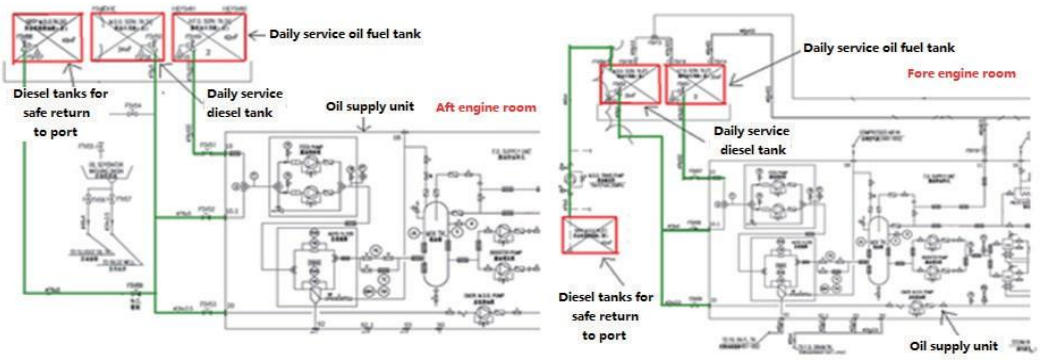

Figure 4 Arrangement of fuel oil systems

4 Arrangement of piping

Ballast pipes, from fore engine room, passing through the aft engine room (as shown in Figure 5) are to be joined by welding and A-60 insulated. The ballast pipes may be considered as operational when a fire casualty occurs in the aft engine room. Similarly, ballast pipes, from aft engine room, passing through the fore engine room are to be joined by welding and A-60 insulated. The ballast pipes may be considered as operational when a fire casualty occurs in the fore engine room. A-60 insulation may be substituted by the pipes of substantial thickness in ICLL 66 regulation 22(3), as interpreted by IACS UI LL36/Rev. 2 paragraph (b)).

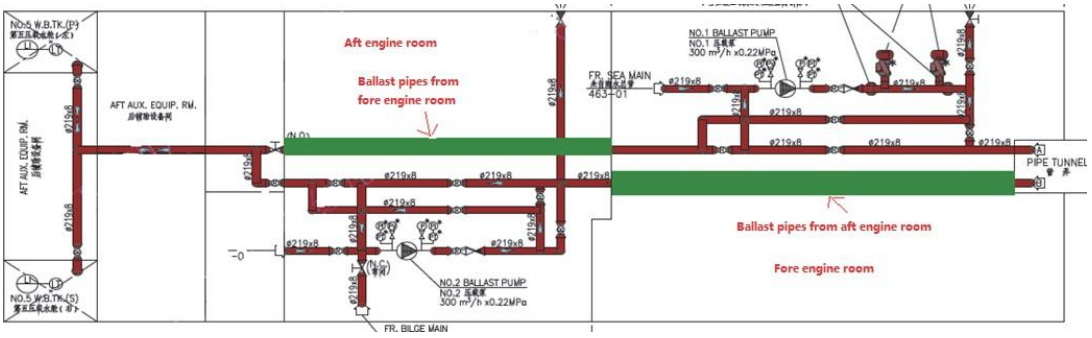

Figure 5 Section of ballast pipes passing through space affected by a fire casualty

5 Arrangement of isolating valves

In order to ensure that the piping system outside spaces affected by fire casualty is not affected by pipes within spaces affected by fire casualty, isolating valves easy to operate are generally to be provided to effectively isolate the piping system within spaces affected by fire casualty from the pipes outside spaces affected by fire casualty. As shown in Figure 6, fire mains are arranged in pipe tunnels in MVZs and isolating valves are fitted on fire hoses on each layer of deck and isolating valves are arranged in pipe tunnels easy to be accessible and not affected by fire casualty. When the fire-fighting water system is inoperable due to a fire on a certain layer of deck, the isolating valves of this layer may be closed to ensure the fire-fighting water systems in other areas remain operational.

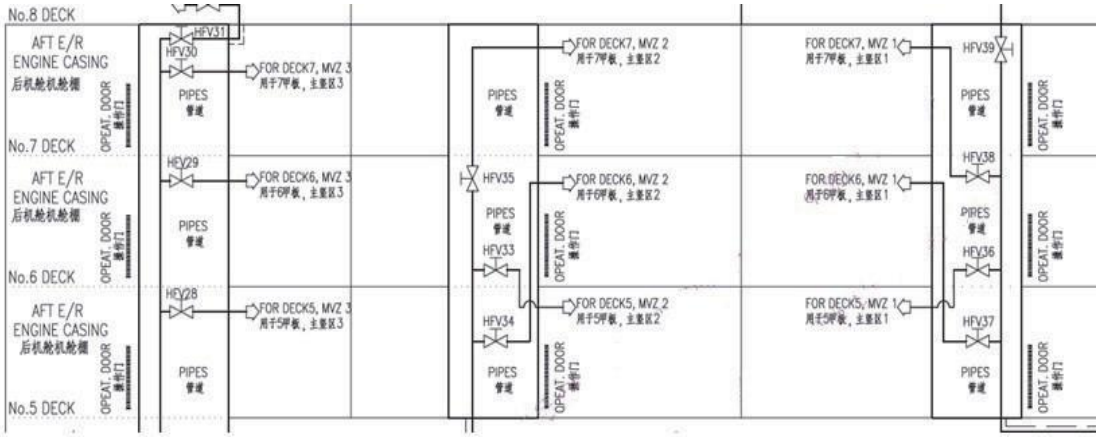

Figure 6 Arrangement of isolating valves

6 Provision of fixed fire-extinguishing system

The port and starboard steering gear rooms and spare parts rooms are arranged adjacently (as shown in Figure 7) and the adjacent bulkheads are to be watertight and A class bulkheads. Although fixed fire-extinguishing systems are not required to be provided in steering gear rooms and spare parts rooms by the Convention, however, since these rooms are adjacent and when fire occurs in any room, the loss of space of fire origin and adjacent spaces will be deemed to be up to the nearest A class boundary which is not a part of the space of fire origin if no fixed fire-extinguishing system is provided, and thus the other two rooms will be deemed as damaged. Therefore, in order to control the fire casualty within the space of origin, fixed fire-extinguishing systems are to be provided in port and starboard steering gear rooms and spare parts rooms.

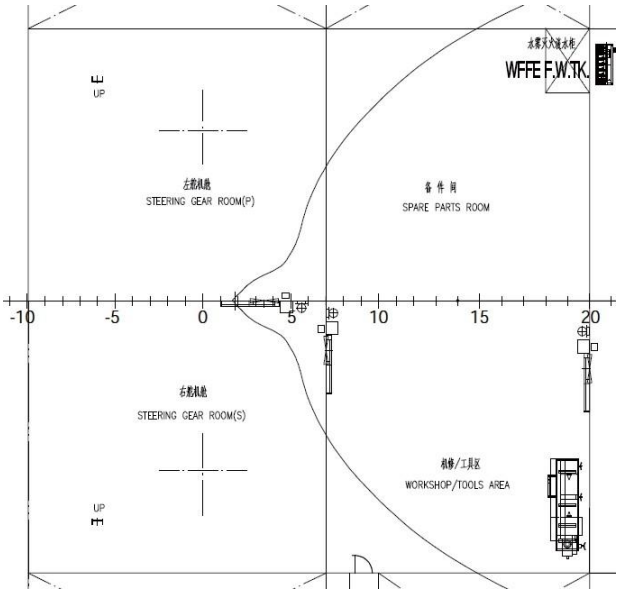

Figure 7 Provision of fixed fire-extinguishing systems

7 Fixed fire detection and alarm system

As shown in Figure 8, an alarm control box of fire detection and alarm system is provided respectively in different spaces enclosed by A class fire resistant division. Each control box is powered by independent feeder lines from main and emergency switchboards and may be switched automatically. And accumulator battery is provided inside each alarm control box as the interim emergency source of power which may support the operation of box for 0.5h. Each detector and manually operated call point is to be connected to the two alarm control boxes. Signal transmission lines are provided among alarm control boxes so as to form loop to meet the requirements of 2.1.6 of Chapter 9 of FSS Code that any fault (e.g. power break, short circuit, earth, etc.) occurring in the section will not affect the constant and individual identification of other detectors connected in the section and also to meet the requirement for safe return to port that the detectors in spaces not affected by casualty are to remain operational. External transmission signal to general alarm system, engine room alarm extensive panel is to be transmitted by the two alarm control boxes with independent signal lines respectively.

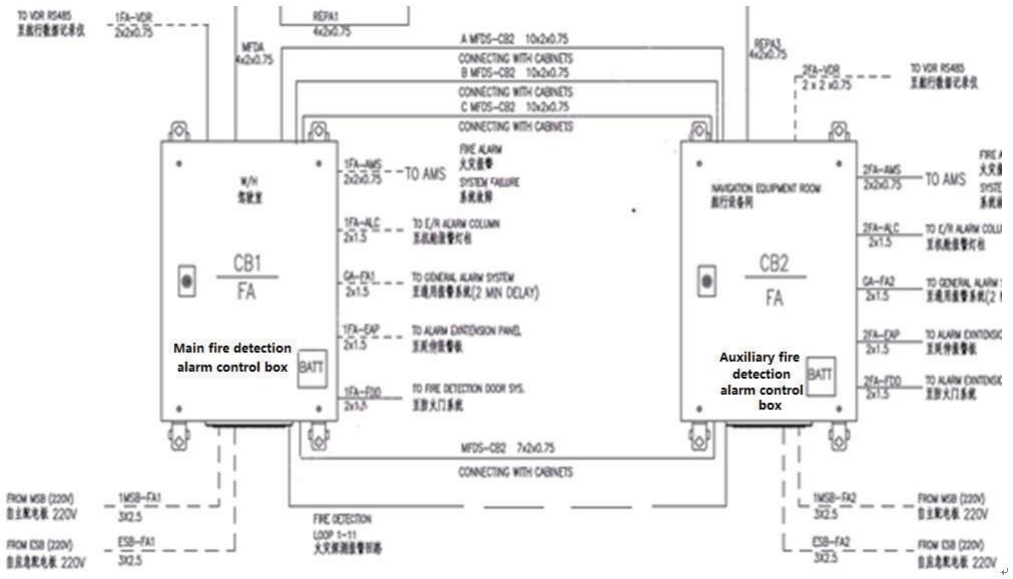

Figure 8 Fixed fire detection and alarm system