



RULES FOR  
CLASSIFICATION OF  
**SHIPS**

NEWBUILDINGS

SPECIAL EQUIPMENT AND SYSTEMS  
ADDITIONAL CLASS

PART 6 CHAPTER 19

# EMERGENCY PROPULSION

JANUARY 2006

*This booklet includes the relevant amendments and corrections  
shown in the July 2009 version of Pt.0 Ch.1 Sec.3.*

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# INTRODUCTION

## General

The Board approved this new chapter in December 2005.

The rules come into force on 1 January 2006.

This chapter is valid until superseded by a revised chapter. Supplements will not be issued except for an updated list of corrections presented in Pt.0 Ch.1 Sec.3. Pt.0 Ch.1 is normally revised in January and July each year.

Revised chapters will be forwarded to all subscribers to the rules. Buyers of reprints are advised to check the updated list of rule chapters printed in Pt.0 Ch.1 Sec.1 to ensure that the chapter is current.

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## SECTION 1 GENERAL REQUIREMENTS

### A. Classification

#### A 100 Application

**101** The rules in this chapter apply to vessels arranged with emergency propulsion in addition to the main propulsion.

**Guidance note:**

The emergency propulsion and main propulsion may have common passive and active components and a failure in any of the common parts may jeopardise both the emergency propulsion and main propulsion. The arrangement chosen for the emergency propulsion has to be considered by the owner, when taking into account the requirements for separation, time required to make it available, and possible restriction in its availability due to the intended area of operation.

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**Guidance note:**

For single propeller plants there will be no additional requirements beyond main class for the steering gear arrangement.

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**Guidance note:**

Pt.6 Ch.2 “Redundant Propulsion” gives generally a higher degree of redundancy and power requirements.

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**102** Compliance with **EP-1(a%)(+)**, **EP-2(a%)(+)** or **EP-3(a%)(+)** notations will, to a varying degree, provide additional measures to enhance the safety of the ship with respect to grounding risk and the probability of reaching safe harbour of refuge after a single failure in the main propulsion system and its auxiliaries. Exceptions are made for failures in acceptable common active and passive components as given by these rules.

The notations for emergency propulsion are only valid with both propulsion systems intact.

**Guidance note:**

Accordingly it is not intended that the ship may leave harbour without doing repair work after any single failure, except in emergency.

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**103** The requirements in these rules are supplementary to the main class rules.

#### A 200 Class notations

**201** Vessels built and tested in compliance with the requirements of the main class rules and this chapter as applicable may be assigned one of the following additional class notations:

Table A1 - Examples of arrangements for emergency propulsion class notations	
Notation	Example of arrangement
<b>EP-1(a%)(+)</b>	<p>Main and emergency propulsion is provided by a common propulsion system (one propeller) with propulsion machinery redundancy, e.g.:</p> <ul style="list-style-type: none"> <li>— two prime movers with clutch, where one of the prime movers may be of power take in type, connected to a common gear, one shaft line and one rudder</li> <li>— double wound electrical motor (armature and excitation), and partly separate auxiliary systems for each prime mover or winding, where two prime movers or two windings in operation constitute the main propulsion system and one in operation constitute the emergency propulsion system.</li> </ul> <p>See Fig.1.</p>
<b>EP-2(a%)(+)</b>	<p>Main and emergency propulsion is provided by separate systems (two propellers), e.g.:</p> <ul style="list-style-type: none"> <li>— one prime mover, one shaft line and one rudder providing the main propulsion system and one separate azimuth or pod-thruster providing the emergency propulsion system, and redundant auxiliary systems for each of the propulsion systems.</li> </ul> <p>See Fig.2.</p>
<b>EP-3(a%)(+)</b>	<p>Main and emergency propulsion is provided by separate systems as for <b>EP-2(a%)(+)</b>, in addition the prime mover and thruster and their auxiliaries are separated by watertight A-60 bulkheads (two propellers separated).</p> <p>See Fig.3.</p>

**202** In addition, for each of the notations given in 201, a suffix **(a%)** shall be added where:

**a** is the percentage of the emergency propulsion power relative to the main propulsion power.

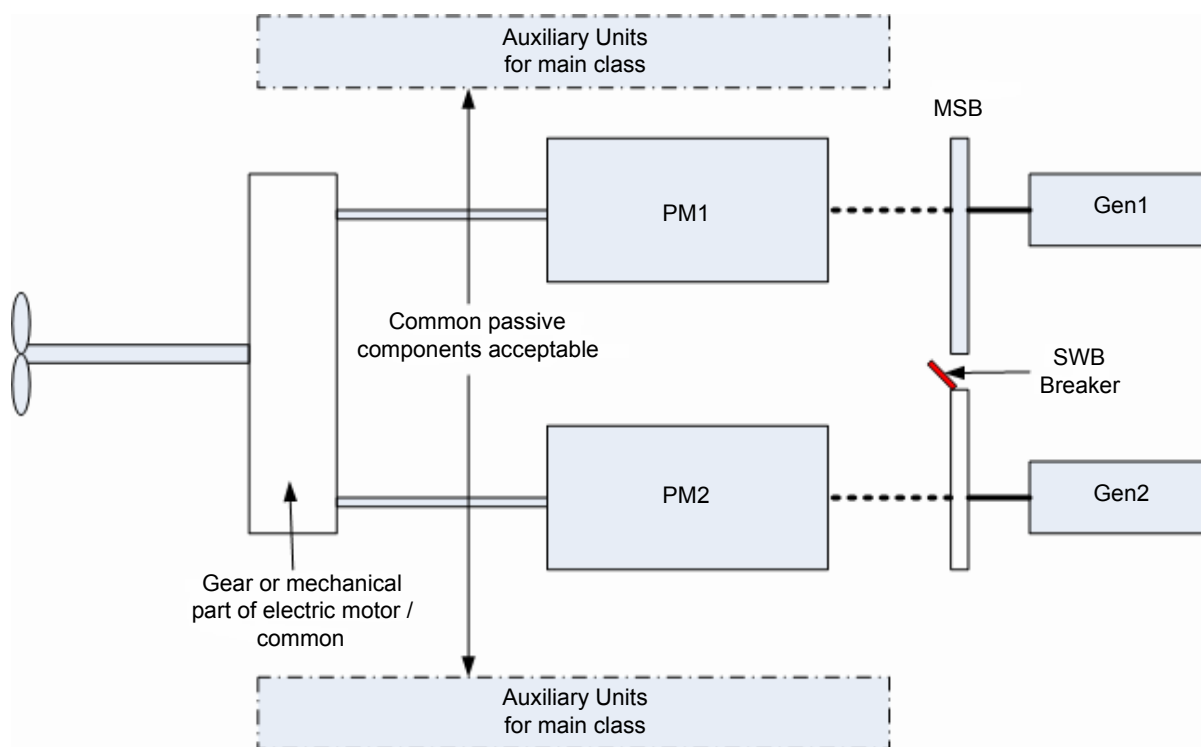
**203** In arrangements where the main propulsion utilises both main and emergency prime mover this figure is to be used for

the main propulsion power when calculating **a**.

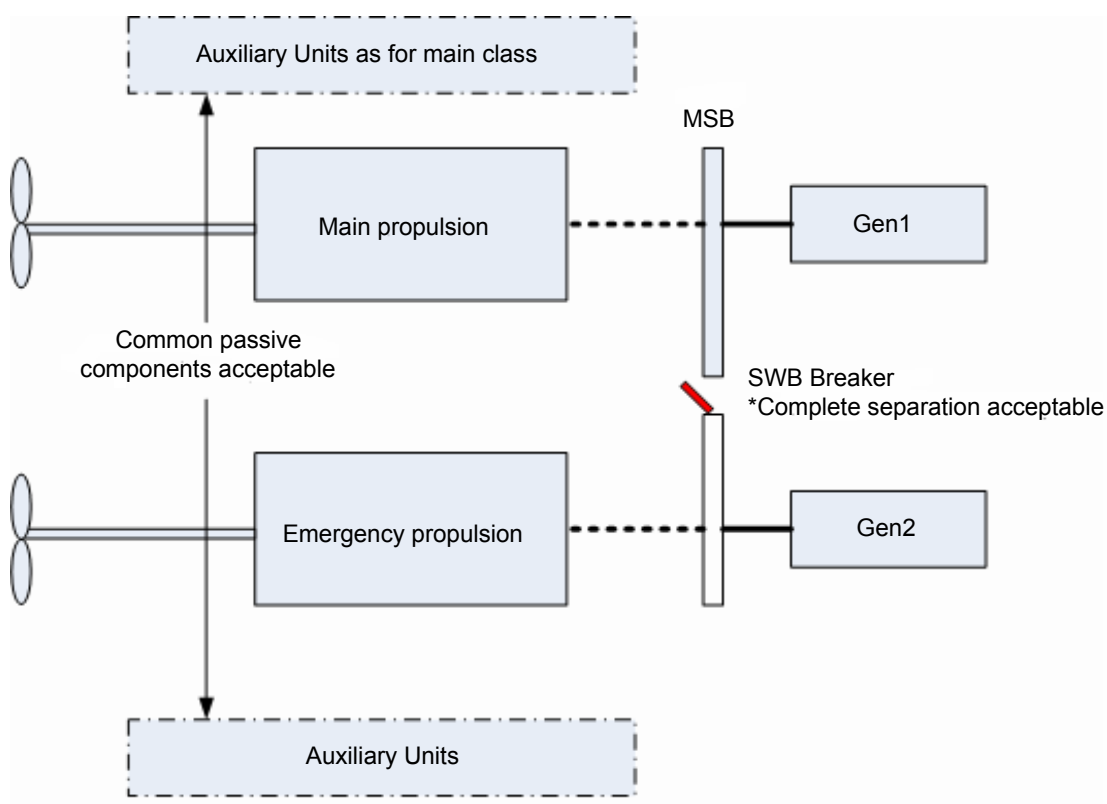
**204** In addition, for each of the notations given in 201, a suffix **(+)** will be added when holding capability is proven in accordance with Sec.2 A104.

**Guidance note:**

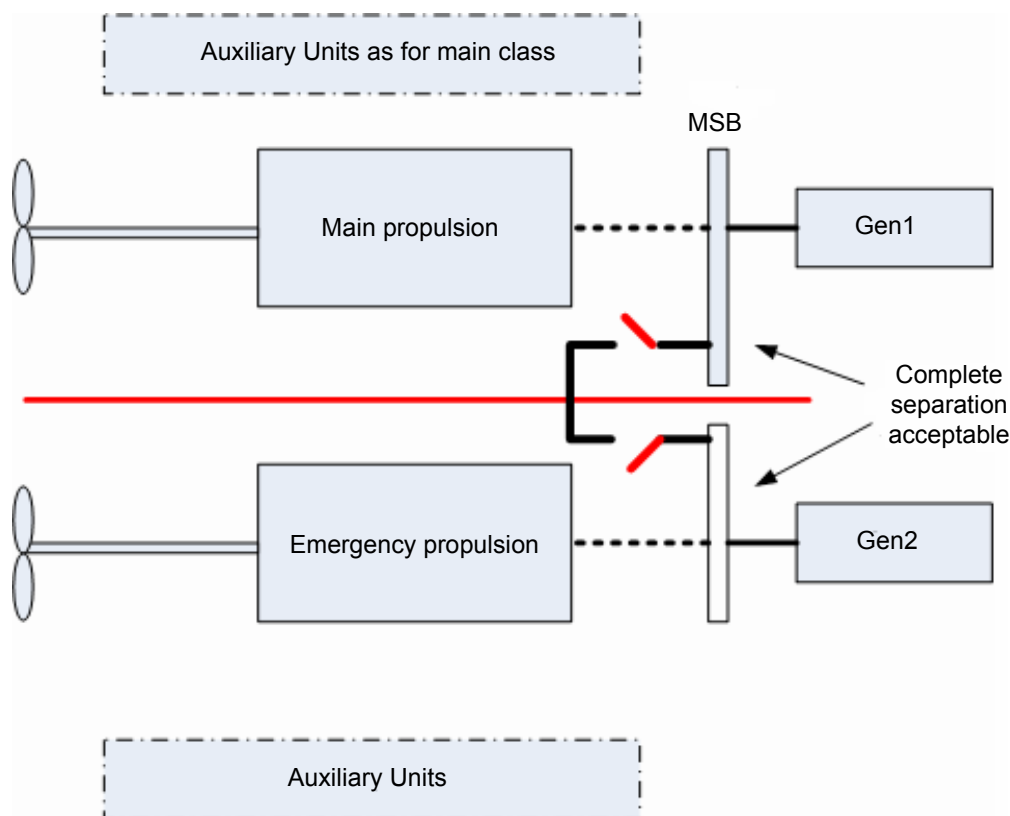
Principle sketches of the **EP** class notations:



**Fig. 1**  
**Principles of EP-1**



**Fig. 2**  
**Principles of EP-2**



**Fig. 3**  
**Principles of EP-3**

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## B. Documentation

### B 100 Submission of plans and information

**101** Documentation of main and emergency propulsion capacity, to determine suffix (**a%**), and when requested, suffix (**+**).

**102** The propulsion systems, with their auxiliaries, shall be documented according to main class requirements.

**103** A Failure Mode and Effect Analysis (FMEA) for the main and emergency propulsion systems, with their auxiliaries, shall be submitted for approval, and shall prove that no single failure in required duplicated components and systems will cause loss of both propulsion systems.

**104** A test procedure for failure testing at the sea trial, based upon the failure modes identified in the FMEA required in 103, shall be submitted for approval.

**105** FMEA(s) and redundancy test program(s) shall be kept on board. The FMEA(s) and redundancy test program(s) shall at all times be updated to cover alterations to the main and emergency propulsion systems.

## C. Certification

### C 100 General

**101** All equipment shall be certified according to main class requirements.

#### Guidance note:

Thrusters used for emergency propulsion only, may be certified as propulsion thrusters or dynamic positioning thrusters.

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## D. Testing

### D 100 Sea trial

**101** The main and emergency propulsion systems, with their auxiliaries, shall be subjected to final tests during sea trials, in compliance with the requirements for main class.

**102** Additional tests shall be performed to verify the availability and functionality of the main and emergency propulsion systems in accordance with the approved test program, and a speed trial is to be performed with the emergency propulsion system consisting of at least two legs, each in opposite direction.

**103** It is not required that the total built-in endurance as required by Sec.2 A106 is demonstrated when time-critical resources are substantiated by adequate tests of rate of consumption.

**104** It is not required that the ability to remain in position as required by Sec.2 A104 is demonstrated.

## SECTION 2 SYSTEM DESIGN

### A. General

#### A 100 Basic requirements

**101** The design shall ensure the ability of the main or emergency propulsion system to remain in operation or be available in accordance with the requirement in 104, after the occurrence of any single failure, as specified in A200.

**102** The emergency propulsion shall be designed for continuous operation.

**Guidance note:**

Generally no restrictions should be put on the starting intervals of electrical machines. If arranged, the arrangement is subject to approval in each case.

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**103** The emergency propulsion system power capacity shall be such that it, as recovered after any failure (as defined in A200), will enable the vessel to maintain a speed of not less than 7 knots except for single failures in acceptable common components.

**104** In addition, if requested, the emergency propulsion system power capacity shall be such that it, as recovered after any failure (as defined in A200), will enable the vessel to remain in position in wind speed of 17 m/s (33 knots) and significant wave height of 4.5 m (15 ft) with 7.3 seconds mean period, both of which are acting concurrently in the same direction, except for single failures in acceptable common components.

**105** The requirement in 104 shall be documented by computation where relevant wave spectrum is utilised or by testing in a model basin, and submitted for information.

**106** The vessel shall be able to proceed with the emergency propulsion system for a period of at least 72 hours.

For vessels built for a specific service where the duration of a sea voyage is less than 72 hours, the built-in endurance of the emergency propulsion system may be limited to the duration of the maximum crossing time, but not less than 12 hours.

**Guidance note:**

In case a vessel is built to proceed with the emergency propulsion system for a period of less than 72 hours, this limitation will be stated in the appendix to the classification certificate.

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#### A 200 Failure modes

**201** For the **EP-1(a%)(+)** notation, the defined failure modes include component breakdown, except for failures in acceptable common active and passive components, but excludes the effects of fire and flooding. Acceptable active common components are propeller, shaft and gear or mechanical part of an electric propulsion motor.

**202** For the **EP-2(a%)(+)** notation, the defined failure modes include active component and system breakdown, but excludes the effects of fire and flooding.

**203** For the **EP-3(a%)(+)** notation, the defined failure modes include component and system breakdown, including the effects of fire and flooding.

**Guidance note:**

Loss of stability (e.g. as a result of flooded compartments) is not a relevant failure mode.

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**204** For notations covered by these rules the scope of active

components is extended compared to main class definition.

**Guidance note:**

Main class differentiates between active and passive components where passive components are not required to be part of the redundancy plan, as their reliability is assumed adequate to prevent component failures. This philosophy is also applied for these notations, but a number of components and systems which in main class is considered to be passive are defined as active, e.g.: pumps, coolers, filters, motorised valves, electric circuit breakers and fuses are considered active. Fuel oil are also considered active because the quality of the oil can deteriorate relatively rapidly, hence the fuel oil arrangement should be duplicated from the service tanks to the consumers.

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### B. System Configuration

#### B 100 General

**101** The basic requirements for providing the emergency propulsion power are as described in Sec.1 A201.

**102** For the **EP-1(a%)(+)** notation: Common passive components in auxiliary systems for the main and emergency propulsion is generally accepted. Active components shall be duplicated according to A200 or arranged as separate duplicated systems where the duplicated systems satisfy the requirements for duplication of active components.

**103** For the **EP-2(a%)(+)** notation: Auxiliary systems for the main and emergency propulsion system shall be duplicated.

**104** For the **EP-3(a%)(+)** notation: Auxiliary systems for the main and emergency propulsion system shall be duplicated and separated by watertight A-60 bulkheads.

**Guidance note:**

Restoration of propulsion power within 30 minutes from dead ship condition as required by SOLAS will only be required to be implemented for the main propulsion system.

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#### B 200 Electrical power generation

**201** For propulsion systems, where the propulsion power is produced directly by the main engines, the electrical power required for auxiliary systems shall be generated by a power plant in compliance with main class requirements and in addition separated by use of switch disconnector(s) or circuit breaker(s) as required by the applicable **EP** notation.

**Guidance note:**

The electrical power generation for the emergency propulsion power may be arranged as a separate system with no connection to the main electrical system.

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**202** For electric propulsion systems, where the propulsion power is produced by generators, the electrical power required for steering and auxiliary systems shall be produced by the electric propulsion generators. Alternatively, the auxiliary electrical power shall be produced by generators in a separate power system in compliance with main class and separated as required by the applicable notation.

**203** The vessel shall be capable of operating the main and emergency propulsion system with the emergency switchboard out of operation.



### B 300 Electrical power distribution

**301** When power for the main and emergency propulsion and their auxiliaries is supplied from one switchboard, the bus-bars of the switchboard shall be arranged for automatic separation into at least 2 sections by switch disconnector(s) or circuit breaker(s), with the circuits for propulsion and auxiliaries distributed between the sections. Automatic separation shall take place when electrical faults are detected on either side of the main bus-bars.

**302** When the switchboard is divided into sections the main and auxiliary systems shall be arranged so that each of the propulsion systems are capable of being operated, including started, independently of the other section(s).

**303** The power distribution system shall be arranged so that the power supply to auxiliaries for the main or emergency propulsion can be maintained, or automatically restored within 30 s, upon any single failure.

**304** For the **EP-3(a%)(+)** notation: If a common electrical system is provided, one switch disconnector or circuit breaker shall be installed in each separated section.

### B 400 Electrical power plant control

**401** The power plant control system shall be arranged so that a single failure therein shall not jeopardise both main and emergency propulsion.

## C. Auxiliary Systems

### C 100 General

**101** When main and emergency propulsion is dependent upon cooling, i.e. air ventilation or another cooling media the cooling system shall be designed with redundancy.

**102** Main and emergency fire fighting systems shall be arranged in accordance with main class and SOLAS requirements.

**103** For the **EP-1(a%)(+)** and the **EP-2(a%)(+)** notations: Fixed piping in auxiliary systems for the main and emergency propulsion is generally accepted, except as given in 201, 301 and 402.

**104** For the **EP-3(a%)(+)** notation: Separate piping systems shall be arranged for main and emergency propulsion systems.

#### Guidance note:

Cross-over pipes can be accepted provided these are arranged for closing from both sides of separating bulkheads, with one valve on each side of the bulkhead(s) fitted directly or as close as possible to it.

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**105** For the **EP-3(a%)(+)** notation: The capacity of the bilge system in each engine room containing propulsion machinery shall be in accordance with the main class rules.

### C 200 Fuel oil

**201** Fuel oil systems shall be arranged with full separation between systems for the main and emergency propulsion systems; each provided with its own service tank and each shall comply with the main class rules.

#### Guidance note:

Cross-over facilities may be arranged, but shall be kept closed in normal operation.

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**202** The transfer and fuel oil pre-treatment systems and tank arrangements shall be able to support the required remaining propulsion capacity in accordance with A104. Fuel pre-treatment shall be understood as all equipment for purification, fil-

tering, heating, and measuring fuel oil.

**203** If the fuel system requires heating, the heating system shall comply with the fuel oil system requirements with respect to duplication.

**204** For the **EP-3(a%)(+)** notation. The fuel oil systems including the service tanks shall be installed in each of the separate engine rooms.

### C 300 Lubrication oil system

**301** Each propulsion system shall have an independent lubrication oil system.

**302** The lubrication oil storage and purification system shall be able to support the emergency propulsion capacity in accordance with A104.

### C 400 Cooling water

**401** Cooling water systems shall comply with main class rules, taking into consideration the requirements for component redundancy given by the requested notation.

**402** Fresh water cooling systems shall be arranged with full separation between systems serving main and emergency propulsion, in view of the risk of severe loss of water or accumulation of gas due to leakage.

### C 500 Compressed air system

**501** If instrument air is required for the main and emergency propulsion system, redundancy shall be arranged to extent of single failure concept, including compressors, storage tanks and reduction valves.

**502** The starting air system shall comply with main class for the main propulsion, and with adequate facilities to enable three starting attempts for the emergency propulsion if this is not part of the main propulsion.

### C 600 Ventilation systems

**601** For the **EP-3(a%)(+)** notation: Ventilation systems shall not have any common units or cross-over pipes when supplying different fire-division areas.

## D. Propulsion, Steering and Auxiliary Control System

### D 100 General

**101** When a centralised control system is arranged, it shall be consistent with the redundancy and separation requirements for the applicable class notation.

### D 200 Propulsion control system

**201** Independent control of propulsion and steering shall be possible for the main and emergency propulsion system. Such means shall be operable after any failure of the central navigating bridge installation. This also includes reliable means of separation of remote and local control.

**202** Independent control systems for each propulsion system shall be arranged according to main class and consistent with the failure concept given in A200. Each system shall include a separate control panel.

**203** Reliable means of communication, also operable during black-out, between the navigating bridge and the emergency control stations shall be arranged.

**204** For the **EP-2(a%)(+)** and **EP-3(a%)(+)** notations: The navigating bridge main and emergency propulsion control systems shall be independent of each other, so that any single failure will only affect one of them.

**205** For the **EP-1(a%)(+)** notation: The navigating bridge

main and emergency remote machinery control system shall be independent for the main and emergency prime movers, so that any single failure will only affect one of them. In addition, an independent back-up shall be provided for control of the acceptable common systems.

**Guidance note:**

Mechanical levers are not required to be duplicated.

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**D 300 Control power sources**

**301** Control power sources shall be distributed consistent with the redundancy and separation requirements for the applicable class notation.

**D 400 Steering system**

**401** For the **EP-1(a%)(+)** notation: The steering system shall be in compliance with main class requirements.

**402** For the **EP-2(a%)(+)** and the **EP-3(a%)(+)** notations:

- a) Steering systems related to main and emergency propulsion shall be separated.
- b) The steering system for main propulsion shall be in compliance with main class requirements.
- c) For the steering system related to emergency propulsion, strength and capacity shall be as required for main system, but at a vessel speed only corresponding to the maximum speed (minimum 7 knots) when propulsion power is provided by emergency unit only. Compliance with the main class Rules in terms of duplication of auxiliaries is not required
- d) If steering system related to emergency propulsion fulfils Pt.4 Ch.14 Sec.1 B601 b), the steering system for main propulsion does not need to include an auxiliary steering gear.

**E. Separation Requirements for EP-3(a%)(+)**

**E 100 General**

**101** Equipment serving main and emergency propulsion shall be separated by bulkheads, which shall be fire insulated A-60 class division, and in addition shall be watertight below the bulkhead deck. Watertight bulkheads shall be strong enough to withstand one sided flooding, and if doors are fitted in such bulkheads, they shall comply with SOLAS reg. II-1/25-9.

**Guidance note:**

Two A-0 bulkheads separated by a space (cofferdam, tank etc.) may be accepted as equivalent to A-60.

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**102** Cabling to equipment serving main and emergency propulsion shall not run along the same route. When this is practically unavoidable, cables running together within an A-60 cable duct or equivalent fire protection are accepted. This alternative is not accepted in high fire risk areas, e.g. engine rooms and fuel treatment rooms.

**Guidance note:**

If cables are located in A-60 cable ducts, means should be provided to keep the temperature inside the duct within the specified temperature for the cables.

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**103** The control panels and cabling on the navigating bridge are accepted as non-separable and do not need to be separated by A-60 partitions provided emergency control stands are arranged outside of the navigating bridge.