

SUB-COMMITTEE ON SHIP SYSTEMS AND  
EQUIPMENT  
6th session  
Agenda item 12

SSE 6/12  
27 November 2018  
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**UNIFIED INTERPRETATION OF PROVISIONS OF IMO SAFETY, SECURITY AND  
ENVIRONMENT-RELATED CONVENTIONS**

**Draft revision of IACS Unified Interpretation SC242 relating to  
SOLAS regulations II-1/28, II-1/29 and II-1/30**

**Submitted by IACS**

**SUMMARY**

*Executive summary:* This document provides a new draft revision of the Unified Interpretation (UI) SC242; the annex to this document provides a copy of the revised version of UI SC242, which offers draft unified interpretations of the relevant elements of SOLAS regulations II-1/28, II-1/29 and II-1/30, on which IACS seeks the Sub-Committee's comments and views

*Strategic direction, if applicable:* SD 6

*Output:* 6.1

*Action to be taken:* Paragraph 10

*Related documents:* DE 55/3; MSC 90/28 (paragraph 9.2); SSE 4/12/10 and SSE 4/19 (paragraph 12.46)

**Background**

1 SOLAS adequately addresses steering gear arrangements having a traditional propulsion system and a rudder-type steering system. However, IACS considers that the Convention does not adequately provide for modern combined propulsion/steering systems such as azimuth thrusters, podded propulsors, waterjets, cycloidal propellers, etc.

2 With a view to facilitating the global and consistent implementation of the regulatory framework for modern steering systems, IACS developed Unified Interpretation (UI) SC242 regarding the steering capability of these systems. A copy of UI SC242 was provided in the annex to document DE 55/3 and MSC 90 subsequently approved MSC.1/Circ.1416 on *Unified Interpretation of SOLAS regulations II-1/28 and II-1/29* (MSC 90/28, paragraph 9.2). Experience in the application of UI SC242 and feedback from the industry indicated that further clarification was needed, in particular with respect to the implementation of SOLAS regulations II-1/29.1 and II-1/29.6.1. Consequently, IACS submitted a revised version of

UI SC242 to the Sub-Committee in the annex to document SSE 4/12/10. However, the Sub-Committee did not endorse the draft revised UI of SOLAS regulations II-1/28 and II-1/29 and invited IACS to note the comments made and take action accordingly (SSE 4/19, paragraph 12.46). Since then, IACS has considered the concerns raised at SSE 4.

### **Discussion**

3 The sketches provided in annex 1 to this document illustrate the various terms used for steering systems and their associated equipment, as discussed in IACS UI SC242.

4 In reviewing IACS UI SC242, IACS members considered that it was important to clarify the relationship between SOLAS regulations II-1/29.1 and II-1/29.6.1. Both are now aligned in requiring a degree of redundancy for both single and multiple steering propulsion units.

5 IACS considers that redundancy should be required in the steering gear for each steerable propulsion unit based on the understanding that, in particular for passenger ships:

- .1 a reduced steering capability after a single failure is not acceptable; and
- .2 a failed steering gear on a ship with multiple steerable propulsion units may impair the steering capability of the ship, either due to lift effect on the underwater part of the failed unit or due to the uncontrolled direction of the propulsion thrust from the failed unit.

6 Consequently, IACS considers the requirement for a main and auxiliary steering gear should be applicable for each of the steering gears in a multiple steering-propulsion unit installation. Alternatively, each of the steering gears is to comply with the interpretation of SOLAS regulation II-1/29.6.1.

7 Upon review, a UI of SOLAS regulation II-1/28.2, regarding the means of going astern, was not considered necessary. Consequently, the discussion of this issue has been deleted from the latest draft revised version of IACS UI SC242.

8 A new UI has been developed for SOLAS regulation II-1/30.2, which clarifies that the requirements of SOLAS regulation II-1/30.2 apply to each steering system in ships fitted with multiple steering systems.

9 Based on the above comments and analysis, IACS has prepared a draft revised version of UI SC242, a copy of which is provided in annex 2 to this document.

### **Action requested of the Sub-Committee**

- 10 The Sub-Committee is invited to consider the foregoing, and in particular:
- .1 the copy of the draft revised version of IACS UI SC242, as provided in the annex to this document; and
  - .2 the need to update MSC.1/Circ.1416 to reflect this draft revised version of IACS UI SC242,

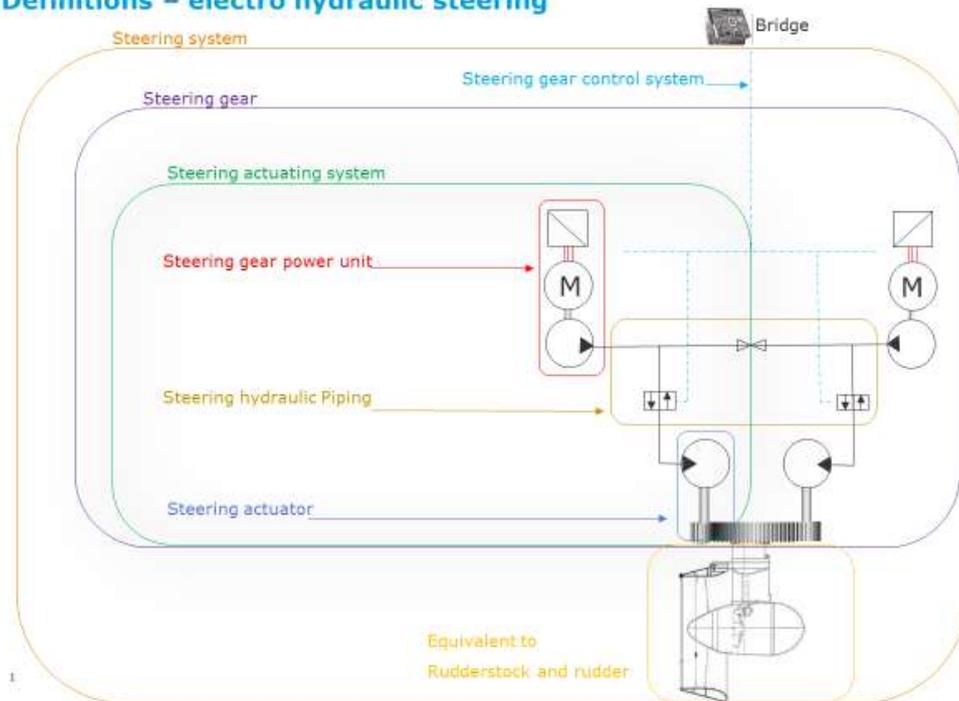
and take action, as appropriate.

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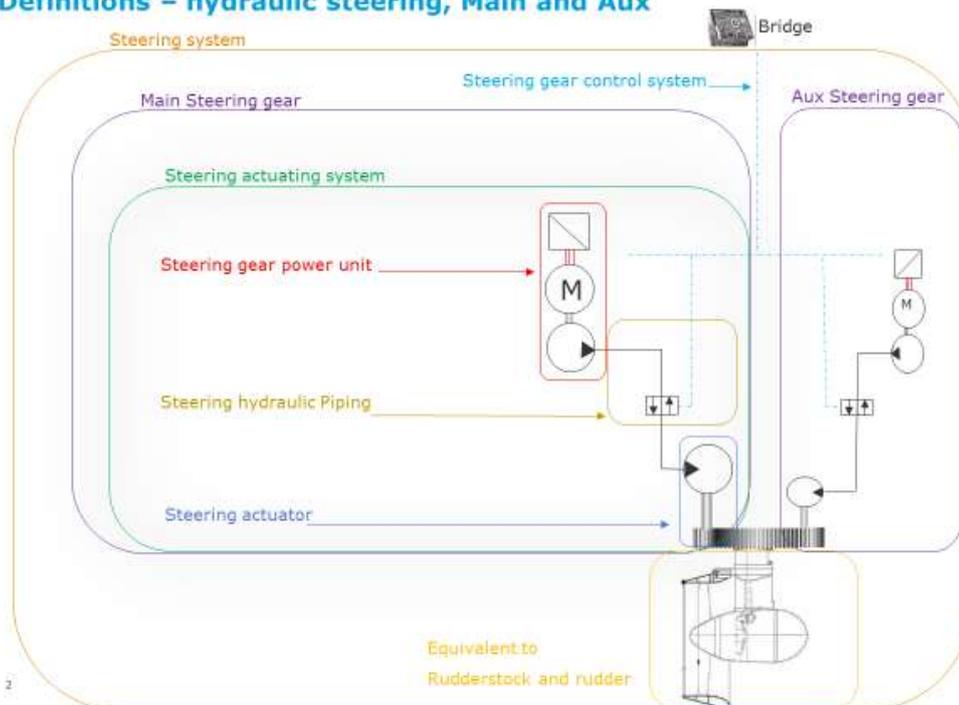
ANNEX 1

SKETCHES ILLUSTRATING THE VARIOUS TERMS USED FOR STEERING SYSTEMS  
AND ITS ASSOCIATED EQUIPMENT

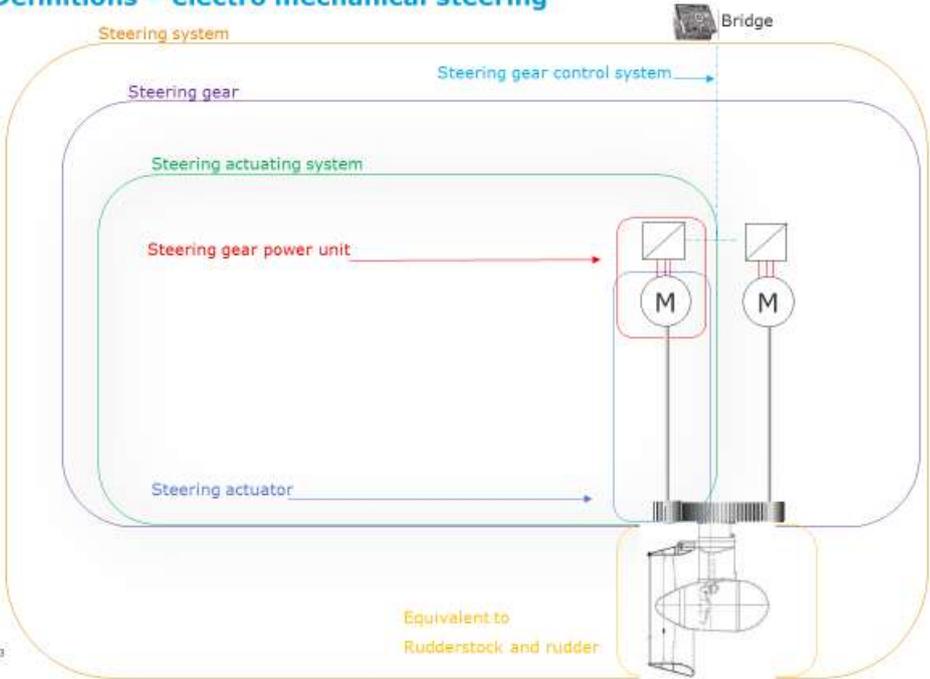
Definitions – electro hydraulic steering



Definitions – hydraulic steering, Main and Aux



**Definitions – electro mechanical steering**



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ANNEX 2

DRAFT REVISION OF UNIFIED INTERPRETATION SC242

**SC 242 Arrangements for steering capability and function on ships fitted with propulsion and steering systems other than traditional arrangements for a ship's directional control**

(Jan 2011)  
(Corr.1  
Aug 2011)  
(Rev.1  
Apr 2016,  
Deleted  
on 20  
Dec 2017)  
(Corr.1  
Aug 2011  
reinstated  
from 21  
Dec 2017)  
(Draft  
Rev.2)

**(Chapter II-1, Regulations 29.1, 29.2.1, 29.3, 29.4, 29.6.1, 29.14, 28.3 and 30.2)**

**Introduction**

The SOLAS requirements for steering gears have been established for ships having a traditional propulsion system and one rudder. For ships fitted with alternative propulsion and steering arrangements, such as but not limited to azimuthing propulsors or water jet propulsion systems, SOLAS Regulations II-1/29.1, 29.2.1, 29.3, 29.4, 29.6.1, 29.14, 28.3 and 30.2 are to be interpreted as follows, except 29.14, which is limited to the steering systems having a certain steering capability due to vessel speed also in case propulsion power has failed.

Note:

- 1) This UI is to be uniformly implemented by IACS Members and Associates for propulsion and steering systems other than traditional arrangements for a ship's directional control:
  - a) when an application for certification of non-traditional steering systems is dated on or after 1 January 2012; or
  - b) which are installed in a new ship for which the date of contract for construction is on or after 1 January 2012.
- 2) Rev.1 of this UI is to be uniformly implemented by IACS Societies for propulsion and steering systems other than traditional arrangements for a ship's directional control:
  - a) when an application for certification of non-traditional steering systems is dated on or after 1 July 2017; or
  - b) which are installed in a new ship for which the date of contract for construction is on or after 1 July 2017.
- 3) Rev.1 of this UI is deleted on 20 Dec 2017 and Corr.1 Aug 2011 is reinstated from 21 Dec 2017.
- 4) Draft Rev.2 of this UI is to be uniformly implemented by IACS Societies for propulsion and steering systems other than traditional arrangements for a ship's directional control:
  - a) when an application for certification of non-traditional steering systems is dated on or after 1 January 2020; or
  - b) which are installed in a new ship for which the date of contract for construction is on or after 1 January 2020.

- 5) The "contracted for construction" date means the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. For further details regarding the date of "contract for construction", refer to IACS Procedural requirement (PR) No.29."

## **Definitions**

For the purpose of this UI the following definitions apply:

"Steering system" is ship's directional control system, including steering gears, steering gear control system and rudder (including the rudder stock) if any, or any equivalent system for applying force on the ship hull to cause a change of heading or course.

"Steering-propulsion unit" is a unit intended for both propulsion and steering of the ship.

"Steering actuator" is a component which converts power into mechanical action to control the steering-propulsion unit. In case of electric steering: electric motor and driving pinion. In case of electro Hydraulic steering: hydraulic motor and driving pinion.

"Steering actuating system" consists of a steering gear power unit, a steering actuator and, for hydraulic or electrohydraulic steering gears, the hydraulic piping.

"Declared steering angle limits" and "maximum steering angle rate of change" are the operational limits in terms of maximum steering angle and maximum steering angle rate of change or equivalent, that are to be declared by the manufacturer / ship designer, also taking into account the vessel speed or propeller torque/speed or other limitation.

## **Regulation 29 – Steering Gear**

### **Regulation 29.1**

*29.1 Unless expressly provided otherwise, every ship shall be provided with a main steering gear and an auxiliary steering gear to the satisfaction of the administration. The main steering gear and the auxiliary steering gear shall be so arranged that the failure of one of them will not render the other one inoperative.*

### ***Interpretation***

For a ship fitted with multiple steering-propulsion units, such as but not limited to azimuthing propulsors or water jet propulsion systems each of the steering-propulsion units shall be provided with a main steering gear and an auxiliary steering gear or with two or more identical steering actuating systems in compliance with interpretation of Regulation 29.6.1 The main steering gear and the auxiliary steering gear shall be so arranged that the failure of one of them will not render the other one inoperative.

For a ship fitted with a single steering-propulsion unit the requirement in Regulation 29.1 is considered satisfied if the steering gear is provided with two or more steering actuating systems, and is in compliance with interpretation of Regulation 29.6.1. A detailed risk assessment is to be submitted in order to demonstrate that in the case of any single failure in the steering gear, control system and power supply the ship steering is maintained.

### **Regulation 29.2.1**

*29.2.1 All the steering gear components and the rudder stock are to be of sound reliable construction to the satisfaction of the Administration. Special consideration shall be given to the suitability of any essential component which is not duplicated. Any such essential component shall, where appropriate, utilize anti-friction bearings such as ball bearings, roller bearings or sleeve bearings which shall be permanently lubricated or provided with lubrication fittings.*

### **Interpretation**

All components used in steering system for ship directional control are to be of sound reliable construction to the satisfaction of the classification society. Special consideration shall be given to the suitability of any essential component which is not duplicated. Any such essential component shall, where appropriate, utilize anti-friction bearings such as ball bearings, roller bearings or sleeve bearings which shall be permanently lubricated or provided with lubrication fittings.

### **Regulation 29.3**

*29.3 The main steering gear and rudder stock shall be:*

- .1 of adequate strength and capable of steering the ship at maximum ahead service speed which shall be demonstrated;*
- .2 capable of putting the rudder over from 35° on one side to 35° on the other side with the ship at its deepest seagoing draught and running ahead at maximum ahead service speed and under the same conditions, from 35° on either side to 30° on the other side in not more than 28 s; where it is impractical to demonstrate compliance with this requirement during sea trials with the ship at its deepest seagoing draught and running ahead at the speed corresponding to the number of maximum continuous revolutions of the main engine and maximum design pitch, ships regardless of date of construction may demonstrate compliance with this requirement by one of the following methods:
  - .1 during sea trials the ship is at even keel and the rudder fully submerged whilst running ahead at the speed corresponding to the number of maximum continuous revolutions of the main engine and maximum design pitch; or*
  - .2 where full rudder immersion during sea trials cannot be achieved, an appropriate ahead speed shall be calculated using the submerged rudder blade area in the proposed sea trial loading condition. The calculated ahead speed shall result in a force and torque applied to the main steering gear which is at least as great as if it was being tested with the ship at its deepest seagoing draught and running ahead at the speed corresponding to the number of maximum continuous revolutions of the main engine and maximum design pitch; or**

- .3 the rudder force and torque at the sea trial loading condition have been reliably predicted and extrapolated to the full load condition. The speed of the ship shall correspond to the number of maximum continuous revolutions of the main engine and maximum design pitch of the propeller;*
- .3 operated by power where necessary to meet the requirements of paragraph 3.2 and in any case when the Administration requires a rudder stock of over 120 mm diameter in way of the tiller, excluding strengthening for navigation in ice; or*
- .4 so designed that they will not be damaged at maximum astern speed; however, this design requirement need not be proved by trials at maximum astern speed and maximum rudder angle.*

### **Interpretation**

The main steering gear shall be:

- .1 of adequate strength and capable of steering the ship at maximum ahead service speed which shall be demonstrated;*
- .2 capable of changing direction of the steering-propulsion unit from one side to the other at declared steering angle limits at an average turning speed of not less than 2.3°/s with the ship running ahead at maximum ahead service speed;*
- .3 for all ships, operated by power; and*
- .4 so designed that they will not be damaged at maximum astern speed; this design requirement need not be proved by trials at maximum astern speed and declared steering angle limits.*

Ship's manoeuvrability tests, such as according to Resolution MSC.137(76), are to be carried out with steering angles not exceeding the declared steering angle limits.

### **Regulation 29.4**

*29.4 The auxiliary steering shall be:*

- .1 of adequate strength and capable of steering the ship at navigable speed and of being brought speedily into action in an emergency;*
- .2 capable of putting the rudder over from 15° on one side to 15° on the other side in not more than 60 s with the ship at its deepest sea-going draught and running ahead at one half of the maximum ahead service speed or 7 knots, whichever is the greater; where it is impractical to demonstrate compliance with this requirement during sea trials with the ship at its deepest seagoing draught and running ahead at one half of the speed corresponding to the number of maximum continuous revolutions of the main engine and maximum design pitch or 7 knots, whichever is greater, ships regardless of date of construction, including those constructed before 1 January 2009, may demonstrate compliance with this requirement by one of the following methods:*

- .1 *during sea trials the ship is at even keel and the rudder fully submerged whilst running ahead at one half of the speed corresponding to the number of maximum continuous revolutions of the main engine and maximum design pitch or 7 knots, whichever is greater; or*
  - .2 *where full rudder immersion during sea trials cannot be achieved, an appropriate ahead speed shall be calculated using the submerged rudder blade area in the proposed sea trial loading condition. The calculated ahead speed shall result in a force and torque applied to the auxiliary steering gear which is at least as great as if it was being tested with the ship at its deepest seagoing draught and running ahead at one half of the speed corresponding to the number of maximum continuous revolutions of the main engine and maximum design pitch or 7 knots, whichever is greater; or*
  - .3 *the rudder force and torque at the sea trial loading condition have been reliably predicted and extrapolated to the full load condition; and*
- .3 *operated by power where necessary to meet the requirements of paragraph 4.2 and in any case when the Administration requires a rudder stock of over 230 mm diameter in way of the tiller, excluding strengthening for navigation in ice.*

### **Interpretation**

The auxiliary steering gear shall be:

- .1 of adequate strength and capable of steering the ship at navigable speed and of being brought speedily into action in an emergency;
- .2 capable of changing direction of the steering-propulsion unit from one side to the other at declared steering angle limits at an average turning speed of not less than 0.5°/s with the ship running ahead at one half of the maximum ahead service speed or 7 knots, whichever is the greater; and
- .3 for all ships, operated by power where necessary to meet the requirements of 29.4.2 and in any ship having power of more than 2,500 kW propulsion power per steering-propulsion unit.

Ship's manoeuvrability tests, such as according to Resolution MSC.137(76), are to be carried out with steering angles not exceeding the declared steering angle limits.

### **Regulation 29.6.1**

*29.6.1 Where the main steering gear comprises two or more identical power units, an auxiliary steering gear need not be fitted, provided that:*

- .1 *in a passenger ship, the main steering gear is capable of operating the rudder as required by paragraph 3.2 while any one of the power units is out of operation;*

- .2 *in a cargo ship, the main steering gear is capable of operating the rudder as required by paragraph 3.2 while operating with all power units;*
- .3 *the main steering gear is arranged so that after a single failure in its piping system or in one of the power units the defect can be isolated so that steering capability can be maintained or speedily regained.*

### **Interpretation**

For a ship fitted with a single steering-propulsion unit where the main steering gear comprises two or more identical power units and two or more identical steering actuators, an auxiliary steering gear need not be fitted provided that the steering gear:

- .1 in a passenger ship, is capable of satisfying the requirements in Interpretation to Regulation 29.3 while any one of the power units is out of operation;
- .2 in a cargo ship, is capable of satisfying the requirements in Interpretation to Regulation 29.3 while operating with all power units;
- .3 is arranged so that after a single failure in its piping system or in one of the power units, steering capability can be maintained or speedily regained.

For a ship fitted with multiple steering-propulsion unit, where each main steering system comprises two or more identical steering actuating systems, an auxiliary steering gear need not be fitted provided that each steering gear:

- .1 in a passenger ship, is capable of satisfying the requirements in Interpretation to Regulation 29.3 while any one of the steering gear steering actuating systems is out of operation;
- .2 in a cargo ship, is capable of satisfying the requirements in Interpretation to Regulation 29.3 while operating with all steering gear steering actuating systems;
- .3 is arranged so that after a single failure in its piping or in one of the steering actuating systems, steering capability can be maintained or speedily regained;
- .4 The above capacity requirements apply regardless whether the steering systems are arranged with common or dedicated power units.

### **Regulation 29.14**

*29.14 Where the rudder stock is required to be over 230 mm diameter in way of the tiller, excluding strengthening for navigation in ice, an alternative power supply, sufficient at least to supply the steering gear power unit which complies with the requirements of paragraph 4.2 and also its associated control system and the rudder angle indicator, shall be provided automatically, within 45 s, either from the emergency source of electrical power or from an independent source of power located in the steering gear compartment. This independent source of power shall be used only for this purpose. In every ship of 10,000 gross tonnage and upwards, the alternative power supply shall have a capacity for at least 30 min of continuous operation and in any other ship for at least 10 min.*

## **Interpretation**

This interpretation is valid to the steering-propulsion units having a certain proven steering capability due to vessel speed also in case propulsion power has failed.

Where the propulsion power exceeds 2,500kW per steering-propulsion unit, an alternative power supply, sufficient at least to supply the steering gear which complies with the requirements of paragraph 4.2 and also its associated control system and the steering gear response indicator, shall be provided automatically, within 45 s, either from the emergency source of electrical power or from an independent source of power located in the steering gear compartment. This independent source of power shall be used only for this purpose. In every ship of 10,000 gross tonnage and upwards, the alternative power supply shall have a capacity for at least 30 min of continuous operation and in any other ship for at least 10 min.

## **Regulation 28 - Means of going astern**

### **Regulation 28.3**

*28.3 The stopping times, ship headings and distances recorded on trials, together with the results of trials to determine the ability of ships having multiple propellers to navigate and manoeuvre with one or more propellers inoperative, shall be available on board for the use of the master or designated personnel.*

## **Interpretation**

The stopping times, ship headings and distances recorded on trials, together with the results of trials to determine the ability of ships having multiple steering-propulsion units to navigate and manoeuvre with one or more of these devices inoperative, shall be available on board for the use of the master or designated personnel.

## **Regulation 30 - Additional requirements for electric and electrohydraulic steering gear**

### **Regulation 30.2**

*30.2 Each electric or electrohydraulic steering gear comprising one or more power units shall be served by at least two exclusive circuits fed directly from the main switchboard; however, one of the circuits may be supplied through the emergency switchboard. An auxiliary electric or electrohydraulic steering gear associated with a main electric or electrohydraulic steering gear may be connected to one of the circuits supplying this main steering gear. The circuits supplying an electric or electro hydraulic steering gear shall have adequate rating for supplying all motors which can be simultaneously connected to them and may be required to operate simultaneously.*

## **Interpretation**

30.2 For a ship fitted with multiple steering systems, the requirements in SOLAS II-1/30.2 are to be applied to each of the steering systems.