

Amendments of the Guidance Relating to the Rules for Classification of Steel Ships

(Development Review : For external opinion inquiry)

Part 5 Machinery Installations

2022. 08.



Machinery Rule Development Team

– Main Amendments –

(1) Effective date : 1 Jul. 2023 (Date of which contracts for construction are signed)

- The requirements for the Water-jet Propulsion Systems and Azimuth or Rotatable Thrusters have been updated and upgraded.
- In reflection of the amendments to UR E25 (Rev.2 Mar 2022), the useless references have been deleted according to the deletion of hydraulic locking failure in 302. 1 of the Rules.
- The requirements for non-traditional steering systems have been moved to Annex 5-1.

Present	Amendment	Note
<p style="text-align: center;">CHAPTER 3 PROPULSION SHAFTING AND POWER TRANSMISSION SYSTEMS</p> <p style="text-align: center;">Section 1 General</p> <p>101. Welded structure component In application to 101. of the Rules, the general requirements for major parts with welded construction are to apply appropriate modifications of Ch 5, Sec 4 of the Rules. 【See Rule】</p> <p>102. Other propulsion and maneuvering machinery 【See Rule】 In application to 102. of the Rules, it may be complied with the following;</p> <p>1. Water-jet propulsion systems and azimuth or rotatable thrusters water-jet propulsion systems or azimuth or rotatable thrusters are to comply with the requirements given in Annex 5-1.</p> <p>2. Bow or side thrusters and their control units (hereinafter called "thrusters") are to comply with the followings. However, in the case of small thrusters with less than 100kW of driving power, the requirements of (1), (2), (3), and (4) (A) below may be omitted. <i>(2019)</i> <i>(2022)</i></p>	<p style="text-align: center;">CHAPTER 3 PROPULSION SHAFTING AND POWER TRANSMISSION SYSTEMS</p> <p style="text-align: center;">Section 1 General</p> <p>101. Welded structure component In application to 101. of the Rules, the general requirements for major parts with welded construction are to apply appropriate modifications of Ch 5, Sec 4 of the Rules. 【See Rule】</p> <p>102. Other propulsion and maneuvering machinery 【See Rule】 In application to 102. of the Rules, it may be complied with the following;</p> <p>1. Water-jet propulsion systems and azimuth or rotatable thrusters water-jet propulsion systems or azimuth or rotatable thrusters are to comply with the requirements given in Annex 5-1.</p> <p>1. Bow or side thrusters and their control units (hereinafter called "thrusters") are to comply with the followings. However, in the case of small thrusters with less than 100kW of driving power, the requirements of (1), (2), (3), and (4) (A) below may be omitted. <i>(2019)</i> <i>(2022)</i></p>	<p>〈Pt 5 Guidance〉</p> <p>(Amendment) Update and upgrade to Rules the requirements for the Water-jet Propulsion Systems and Azimuth or Rotatable Thrusters 〈application date: the date of contract for construction on or after 1 July, 2023〉</p> <p>– Water-jet propulsion systems and azimuth thrusters in Annex 5-1 were deleted as they were moved to Ch 3, Sec 5 and 6.</p>

Present	Amendment	Note
<p>CHAPTER 3 PROPULSION SHAFTING AND POWER TRANSMISSION SYSTEMS</p> <p>Section 5 〈New〉</p>	<p>CHAPTER 3 PROPULSION SHAFTING AND POWER TRANSMISSION SYSTEMS</p> <p><u>Section 5 Water-jet propulsion systems (2023)</u></p> <p><u>503. System design</u></p> <p>1. In case of ships complied with the following, the requirements of <u>503. 3 (8)</u> of the Rules may not be applied.</p> <p>(1) Ships with a gross tonnage less than 500 tons, or (2) Ships engaged in domestic coastal or smooth water service area</p> <p><u>504. Electrical installations</u></p> <p>1. In case of ships complied with the following, the requirements of <u>504. 1, 2, and 3 (2), (5)</u> (excluding short circuit protection) and (7) of the Rules may not be applied.</p> <p>(1) Ships with a gross tonnage less than 500 tons, or (2) Ships engaged in domestic coastal or smooth water service area</p> <p>2. In case of ships complied with the following, notwithstanding <u>504. 3 (1)</u> of the Rules, steering system of each propulsion system may be served separately by one exclusive circuit fed directly from main switchboards. In addition, in cases where three or more propulsion systems are provided, these exclusive circuits may be composed of at least two exclusive circuits. One of these circuits may be supplied through the emergency switchboard.</p> <p>(1) Ships with a gross tonnage less than 500 tons, or (2) Ships engaged in domestic coastal or smooth water service area</p>	<p>〈Pt 5 Guidance〉</p> <p>(Amendment) Update and upgrade to Rules the requirements for the Water-jet Propulsion Systems and Azimuth or Rotatable Thrusters (application date: the date of contract for construction on or after 1 July, 2023)</p> <p>- Exemption requirements for small ships were newly added to the Guidance.</p>

Present	Amendment	Note
<p>CHAPTER 3 PROPULSION SHAFTING AND POWER TRANSMISSION SYSTEMS</p> <p><u>Section 6</u> 〈New〉</p>	<p>CHAPTER 3 PROPULSION SHAFTING AND POWER TRANSMISSION SYSTEMS</p> <p><u>Section 6 Azimuth thrusters (2023)</u></p> <p><u>603. System design</u></p> <p>1. In case of ships complied with the following, the requirements of <u>603. 3 (6)</u> of the Rules may not be applied.</p> <p>(1) Ships with a gross tonnage less than 500 tons, or (2) Ships engaged in domestic coastal or smooth water service area</p> <p><u>604. Electrical installations</u></p> <p>1. In case of ships complied with the following, the requirements of <u>604. 1, 2, and 3 (2), (5)</u> (excluding short circuit protection) and (7) of the Rules may not be applied.</p> <p>(1) Ships with a gross tonnage less than 500 tons, or (2) Ships engaged in domestic coastal or smooth water service area</p> <p>2. In case of ships complied with the following, notwithstanding <u>604. 3 (1)</u> of the Rules, steering system of each thruster may be served separately by one exclusive circuit fed directly from main switchboards. In addition, in cases where three or more thrusters are provided, these exclusive circuits may be composed of at least two exclusive circuits. One of these circuits may be supplied through the emergency switchboard.</p> <p>(1) Ships with a gross tonnage less than 500 tons, or (2) Ships engaged in domestic coastal or smooth water service area</p> <p><u>606. Additional requirements for pod thrusters</u></p> <p>1. In case of ships complied with the following, the requirements of <u>606. 3</u> of the Rules may not be applied.</p> <p>(1) Ships with a gross tonnage less than 500 tons, or (2) Ships engaged in domestic coastal or smooth water service area</p>	<p>〈Pt 5 Guidance〉</p> <p>(Amendment) Update and upgrade to Rules the requirements for the Water-jet Propulsion Systems and Azimuth or Rotatable Thrusters (application date: the date of contract for construction on or after 1 July, 2023)</p> <p>- Exemption requirements for small ships were newly added to the Guidance.</p>

Present	Amendment	Note
<p style="text-align: center;">CHAPTER 7 STEERING GEARS</p> <p style="text-align: center;">Section 1 General</p> <p>102. Terminology [See Rule]</p> <p>1. <omitted></p> <p>2. In addition to 102. 1 of the Rules, the definition of non-traditional steering systems, such as but not limited to, azimuthing propulsors or water jet propulsion systems, is as follows. (See Fig. 5.7.1 ~ Fig. 5.7.3) (2022)</p> <p>(1) Steering system is a ship's directional control system, including steering gear, 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.</p> <p>(2) Steering-propulsion unit is a unit intended for both propulsion and steering of the ship (for example, an azimuth thruster or a rotating podded electrical thruster).</p> <p>(3) Steering gear is the machinery, actuators, power units, and auxiliary equipment applied to turn the rudder or thruster or equivalent about the axis of rotation in both directions for the purpose of steering the ship.</p> <p>(4) Steering actuating system consists of a steering gear power unit, a steering actuator and, for hydraulic or electrohydraulic steering gears, the hydraulic piping.</p> <p>(5) Steering actuator is a steering gear component which converts power into mechanical action to control the rotation of the rudder or thruster or equivalent.</p> <p>(A) In case of electric steering: electric motor and driving pinion</p> <p>(B) In case of electro hydraulic steering: hydraulic motor and driving pinion</p> <p>(6) Declared steering angle limits are the operational limits in terms of maximum steering angle, or equivalent, according to manufacturers' guidelines for safe operation, also taking into account the ship's speed or propeller torque/speed or other limitation; the "declared steering angle limits" are to be declared by the steering system manufacturer for each ship specific non-traditional steering means. ship manoeuvrability tests, such as those in the Standards for ship manoeuvrability (IMO Res. MSC.137(76)) are to be carried out with steering angles not exceeding the declared steering angle limits.</p>	<p style="text-align: center;">CHAPTER 7 STEERING GEARS</p> <p style="text-align: center;">Section 1 General</p> <p>102. Terminology [See Rule]</p> <p>1. <same as the present></p> <p>2. In addition to 102. 1 of the Rules, the definition of non-traditional steering systems, such as but not limited to, azimuthing propulsors or water jet propulsion systems, is as follows. (See Fig. 5.7.1 ~ Fig. 5.7.3) (2022)</p> <p>(1) Steering system is a ship's directional control system, including steering gear, 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.</p> <p>(2) Steering-propulsion unit is a unit intended for both propulsion and steering of the ship (for example, an azimuth thruster or a rotating podded electrical thruster).</p> <p>(3) Steering gear is the machinery, actuators, power units, and auxiliary equipment applied to turn the rudder or thruster or equivalent about the axis of rotation in both directions for the purpose of steering the ship.</p> <p>(4) Steering actuating system consists of a steering gear power unit, a steering actuator and, for hydraulic or electrohydraulic steering gears, the hydraulic piping.</p> <p>(5) Steering actuator is a steering gear component which converts power into mechanical action to control the rotation of the rudder or thruster or equivalent.</p> <p>(A) In case of electric steering: electric motor and driving pinion</p> <p>(B) In case of electro hydraulic steering: hydraulic motor and driving pinion</p> <p>(6) Declared steering angle limits are the operational limits in terms of maximum steering angle, or equivalent, according to manufacturers' guidelines for safe operation, also taking into account the ship's speed or propeller torque/speed or other limitation; the "declared steering angle limits" are to be declared by the steering system manufacturer for each ship specific non-traditional steering means. ship manoeuvrability tests, such as those in the Standards for ship manoeuvrability (IMO Res. MSC.137(76)) are to be carried out with steering angles not exceeding the declared steering angle limits.</p>	<p><Pt 5 Guidance></p> <p>(Amendment) The requirements for non-traditional steering systems are move to Annex 5-1 <application date: the date of contract for construction on or after 1 July. 2023></p> <p>- Move to Annex 5-1</p>

Present	Amendment	Note
<p><u>Fig. 5.7.1 ~ Fig. 5.7.3</u></p> <p>Section 2 Performance and Arrangement</p> <p>201. Number of steering gears [See Rule]</p> <p>1. ~ 2. ⟨omitted⟩</p> <p>3. In application to 201. 1 of Rules, ships with non-traditional steering systems, such as but not limited to, azimuthing propulsors or water jet propulsion systems are to comply with the following.</p> <p>(1) 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 201. 4. 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.</p> <p>(2) For a ship fitted with a single steering-propulsion unit, the requirement in 201. 1 of Rules is considered satisfied if the steering gear is provided with two or more steering actuating systems and is in compliance with 201. 4. 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.</p> <p>4. In application to 201. 2 of Rules, ships with non-traditional steering systems, such as but not limited to, azimuthing propulsors or water jet propulsion systems are to comply with the following. <i>(2022)</i></p> <p>(1) 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:</p> <p>(A) in a passenger ship is capable of satisfying the requirements in 202. 2 while any one of the power units is out of operation; in a cargo ship, is capable of satisfying the requirements in 202. 2 while operating with all power units; and</p> <p>(B) 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.</p>	<p><u>Fig. 5.7.1 ~ Fig. 5.7.3</u></p> <p>Section 2 Performance and Arrangement</p> <p>201. Number of steering gears [See Rule]</p> <p>1. ~ 2. ⟨same as the present⟩</p> <p>3. In application to 201. 1 of Rules, ships with non-traditional steering systems, such as but not limited to, azimuthing propulsors or water jet propulsion systems are to comply with the following.</p> <p>(1) 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 201. 4. 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.</p> <p>(2) For a ship fitted with a single steering-propulsion unit, the requirement in 201. 1 of Rules is considered satisfied if the steering gear is provided with two or more steering actuating systems and is in compliance with 201. 4. 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.</p> <p>4. In application to 201. 2 of Rules, ships with non-traditional steering systems, such as but not limited to, azimuthing propulsors or water jet propulsion systems are to comply with the following. <i>(2022)</i></p> <p>(1) 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:</p> <p>(A) in a passenger ship is capable of satisfying the requirements in 202. 2 while any one of the power units is out of operation; in a cargo ship, is capable of satisfying the requirements in 202. 2 while operating with all power units; and</p> <p>(B) 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.</p>	<p>- Move to Annex 5-1</p> <p>- Move to Annex 5-1</p> <p>- Move to Annex 5-1</p>

Present	Amendment	Note
<p>(2) For a ship fitted with multiple steering propulsion units, 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:</p> <p>(A) in a passenger ship, is capable of satisfying the requirements in 202. 2 while any one of the steering actuating systems is out of operation; in a cargo ship, is capable of satisfying the requirements in 202. 2 while operating with all steering actuating systems; and</p> <p>(B) is arranged so that after a single failure in its piping system or in one of the steering actuating systems, steering capability can be maintained or speedily regained.</p> <p>The above capacity requirements apply regardless whether the steering systems are arranged with common or dedicated power units.</p> <p>202. Performances of main steering gear [See Rule]</p> <ol style="list-style-type: none"> 1. In application to 202. 2 of the Rules, the diameter specified in Pt 4, Ch 1 of the Rules is to be taken as having been calculated for upper rudder stock of mild steel with a yield strength of 235 N/mm² (i.e. with a material factor $K_s = 1$). 2. For ships fitted with non-traditional steering arrangements, such as but not limited to azimuthing propulsors or water jet propulsion systems, the main steering arrangements are to be: <ol style="list-style-type: none"> (1) of adequate strength and capable of steering the ship at maximum ahead service speed which is to 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. 	<p>(2) For a ship fitted with multiple steering propulsion units, 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:</p> <p>(A) in a passenger ship, is capable of satisfying the requirements in 202. 2 while any one of the steering actuating systems is out of operation; in a cargo ship, is capable of satisfying the requirements in 202. 2 while operating with all steering actuating systems; and</p> <p>(B) is arranged so that after a single failure in its piping system or in one of the steering actuating systems, steering capability can be maintained or speedily regained.</p> <p>The above capacity requirements apply regardless whether the steering systems are arranged with common or dedicated power units.</p> <p>202. Performances of main steering gear [See Rule]</p> <ol style="list-style-type: none"> 1. In application to 202. 2 of the Rules, the diameter specified in Pt 4, Ch 1 of the Rules is to be taken as having been calculated for upper rudder stock of mild steel with a yield strength of 235 N/mm² (i.e. with a material factor $K_s = 1$). 2. For ships fitted with non-traditional steering arrangements, such as but not limited to azimuthing propulsors or water jet propulsion systems, the main steering arrangements are to be: <ol style="list-style-type: none"> (1) of adequate strength and capable of steering the ship at maximum ahead service speed which is to 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. 	<p>- Move to Annex 5-1</p>

Present	Amendment	Note
<p>203. Performances of auxiliary steering gear [See Rule]</p> <ol style="list-style-type: none"> 1. In application to 203. 2 of the Rules, the diameter specified in Pt 4, Ch 1 of the Rules is to be taken as having been calculated for upper rudder stock of mild steel with a yield stress of 235 N/mm² (i.e. with a material factor $K_s = 1$). 2. For ships fitted with non-traditional steering arrangements, such as but not limited to azimuthing propulsors or water jet propulsion systems, the auxiliary steering arrangements are to be : <ol style="list-style-type: none"> (1) of adequate strength and capable of steering the ship at navigable speed and of being brought speedily in to 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) operated by power where necessary to meet the requirements of (2) and in any ship having power of more than 2,500 kW propulsion power per steering-propulsion unit. 	<p>203. Performances of auxiliary steering gear [See Rule]</p> <ol style="list-style-type: none"> 1. In application to 203. 2 of the Rules, the diameter specified in Pt 4, Ch 1 of the Rules is to be taken as having been calculated for upper rudder stock of mild steel with a yield stress of 235 N/mm² (i.e. with a material factor $K_s = 1$). 2. For ships fitted with non-traditional steering arrangements, such as but not limited to azimuthing propulsors or water jet propulsion systems, the auxiliary steering arrangements are to be : <ol style="list-style-type: none"> (1) of adequate strength and capable of steering the ship at navigable speed and of being brought speedily in to 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) operated by power where necessary to meet the requirements of (2) and in any ship having power of more than 2,500 kW propulsion power per steering-propulsion unit. 	<p>- Move to Annex 5-1</p>
<p>206. Alternative source of power [See Rule]</p> <ol style="list-style-type: none"> 1. <omitted> 2. For ships fitted with non-traditional steering arrangements, such as but not limited to azimuthing propulsors or water jet propulsion systems, alternative source of power is to be met the following : <ol style="list-style-type: none"> (1) Where the propulsion power exceeds 2,500 kW per steering-propulsion unit, an alternative power supply, sufficient at least to supply the steering arrangements which complies with the requirements in 203. 2 of the Guidance and also its associated control system and the steering system response indicator, is to be provided automatically within 45s. (2) In every ship of 10,000 gross tonnage and upwards, the alternative power supply is to have a capacity for at least 30 min of continuous operation and in any other ship for at least 10 min. (3) The alternative source of power is to be either: <ol style="list-style-type: none"> (A) emergency source of electric power; or (B) an independent source of power located in the steering gear compartment and used only for this purpose. 	<p>206. Alternative source of power [See Rule]</p> <ol style="list-style-type: none"> 1. <same as the present> 2. For ships fitted with non-traditional steering arrangements, such as but not limited to azimuthing propulsors or water jet propulsion systems, alternative source of power is to be met the following : <ol style="list-style-type: none"> (1) Where the propulsion power exceeds 2,500 kW per steering-propulsion unit, an alternative power supply, sufficient at least to supply the steering arrangements which complies with the requirements in 203. 2 of the Guidance and also its associated control system and the steering system response indicator, is to be provided automatically within 45s. (2) In every ship of 10,000 gross tonnage and upwards, the alternative power supply is to have a capacity for at least 30 min of continuous operation and in any other ship for at least 10 min. (3) The alternative source of power is to be either: <ol style="list-style-type: none"> (A) emergency source of electric power; or (B) an independent source of power located in the steering gear compartment and used only for this purpose. 	<p>- Move to Sec 5 and Sec 6 of the Rules</p>

Present	Amendment	Note
<p>207. Electric installations for electric and electro-hydraulic steering gear [See Rule]</p> <ol style="list-style-type: none"> 1. In case of manual auxiliary steering gears for a ship which SOLAS is not applicable to, the power supply circuit from the main switchboard to the steering gear may be one circuit. 2. In case of steering gears complied with the following, the requirements of 207. 1, 5 (excluding short circuit protection) and 7 of the Rules may not be applied. <ol style="list-style-type: none"> (1) Ships with a gross tonnage less than 500 tons, or (2) Ships engaged in domestic coastal or smooth water service area 3. For a ship fitted with multiple steering systems, the requirements in 207. 3 and 4 of the Rules are to be applied to each of the steering systems. <i>(2017)</i> 4. In application to 207. 5 and 6 of the Rules, steering gear motor circuits which are limited to full load current via an electronic converter are exempt from the requirement to provide protection against excess current, including starting current, of not less than twice the full load current of the motor. In this case, the required overload alarm is to be set to a value not greater than the normal load of the electronic converter. 5. Electric motors for electric steering gear power unit are to be at least of S3 40 % with intermittent periodic duty and electric motors for electro-hydraulic steering gear power unit are to be at least of S6 25 % with continuous operation periodic duty according to IEC 60034-1. <i>(2020)</i> <p style="text-align: center;">Section 3 Controls</p> <p><u>Fig 5.7.4</u></p> <p style="text-align: center;">Section 4 Materials, Constructions and Strength</p> <p><u>Fig 5.7.5</u></p>	<p>207. Electric installations for electric and electro-hydraulic steering gear [See Rule]</p> <ol style="list-style-type: none"> 1. In case of manual auxiliary steering gears for a ship which SOLAS is not applicable to, the power supply circuit from the main switchboard to the steering gear may be one circuit. 2. In case of steering gears complied with the following, the requirements of 207. 1, 5 (excluding short circuit protection) and 7 of the Rules may not be applied. <ol style="list-style-type: none"> (1) Ships with a gross tonnage less than 500 tons, or (2) Ships engaged in domestic coastal or smooth water service area 3. For a ship fitted with multiple steering systems, the requirements in 207. 3 and 4 of the Rules are to be applied to each of the steering systems. <i>(2017)</i> 4. In application to 207. 5 and 6 of the Rules, steering gear motor circuits which are limited to full load current via an electronic converter are exempt from the requirement to provide protection against excess current, including starting current, of not less than twice the full load current of the motor. In this case, the required overload alarm is to be set to a value not greater than the normal load of the electronic converter. 5. Electric motors for electric steering gear power unit are to be at least of S3 40 % with intermittent periodic duty and electric motors for electro-hydraulic steering gear power unit are to be at least of S6 25 % with continuous operation periodic duty according to IEC 60034-1. <i>(2020)</i> <p style="text-align: center;">Section 3 Controls</p> <p><u>Fig 5.7.1</u></p> <p style="text-align: center;">Section 4 Materials, Constructions and Strength</p> <p><u>Fig 5.7.2</u></p>	<p>– Move to Sec 5 and Sec 6 of the Rules</p> <p>– Correct numbering</p> <p>– Correct numbering</p>

Present	Amendment	Note
<p style="text-align: center;">Section 5 Testing</p> <p>503. Sea trials</p> <p>1. ~ 3. <omitted></p> <p>4. <u>For ships with non-traditional steering systems, such as but not limited to, azimuthing propulsors or water jet propulsion systems are to comply with the following. Ship manoeuvrability tests, such as according to Resolution MSC.137(76) on Standards for ship manoeuvrability, are to be carried out with steering angles not exceeding the declared steering angle limits. (2022)</u></p> <p>(hereafter, omitted)</p>	<p style="text-align: center;">Section 5 Testing</p> <p>503. Sea trials</p> <p>1. ~ 3. <same as the present></p> <p>4. For ships with non-traditional steering systems, such as but not limited to, azimuthing propulsors or water jet propulsion systems are to comply with the following. Ship manoeuvrability tests, such as according to Resolution MSC.137(76) on Standards for ship manoeuvrability, are to be carried out with steering angles not exceeding the declared steering angle limits. (2022)</p> <p>(hereafter, same as the present)</p>	<p>- Move to Sec 5 and Sec 6 of the Rules</p>

Present	Amendment	Note
<p style="text-align: center;">CHAPTER 7 STEERING GEARS</p> <p style="text-align: center;">Section 3 Controls</p> <p>301. <omitted></p> <p>302. Failure detection and response of all types of steering control systems <i>(2021)</i></p> <p>1. In application to 302. 1 of the Rules, for hydraulic locking failure, refer also to 103., 104. and 301. 7 of the Guidance.</p> <p>(hereafter, omitted)</p>	<p style="text-align: center;">CHAPTER 7 STEERING GEARS</p> <p style="text-align: center;">Section 3 Controls</p> <p>301. <same as the present></p> <p>302. Failure detection and response of all types of steering control systems <i>(2021)</i></p> <p>1. In application to 302. 1 of the Rules, for hydraulic locking failure, refer also to 103., 104. and 301. 7 of the Guidance.</p> <p>(hereafter, same as the present)</p>	<p><Pt 5 Guidance></p> <p><application date: the date of contract for construction on or after 1 July. 2023></p> <p>– Reflect UR E25 (Rev.2). Useless reference is deleted according to the deletion of hydraulic locking failure in 302. 1 of the Rules.</p>

Present	Amendment	Note
<p>Annex 5-1 Requirements for the Water-jet Propulsion Systems and Azimuth or Rotatable Thrusters</p> <p><u>1. Water-jet propulsion systems <omitted></u></p> <p><u>2. Azimuth or rotatable thrusters <omitted></u></p>	<p><u>Annex 5-1 Requirements for Performance and Arrangement of Non-traditional Steering Systems (2023)</u></p> <p><u>1. Application</u></p> <p>The requirements of this Annex apply to the performance and arrangement of non-traditional steering systems, such as but not limited to, azimuth thrusters or water-jet propulsion systems.</p> <p><u>2. Definitions</u></p> <p>The definitions of non-traditional steering systems, such as but not limited to, azimuth thrusters or water-jet propulsion systems, are as follows. (See Fig. 1 ~ Fig. 3)</p> <p>(1) <u>Steering system</u> is a ship's directional control system, including steering gear, 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.</p> <p>(2) <u>Steering-propulsion unit</u> is a unit intended for both propulsion and steering of the ship (for example, an azimuth thruster or a rotating podded electrical thruster).</p> <p>(3) <u>Steering gear</u> is the machinery, actuators, power units, and auxiliary equipment applied to turn the rudder or thruster or equivalent about the axis of rotation in both directions for the purpose of steering the ship.</p> <p>(4) <u>Steering actuating system</u> consists of a steering gear power unit, a steering actuator and, for hydraulic or electrohydraulic steering gears, the hydraulic piping.</p> <p>(5) <u>Steering actuator</u> is a steering gear component which converts power into mechanical action to control the rotation of the rudder or thruster or equivalent.</p> <p>(A) In case of electric steering: electric motor and driving pinion</p> <p>(B) In case of electro hydraulic steering: hydraulic motor and driving pinion</p> <p>(6) <u>Declared steering angle limits</u> are the operational limits in terms of maximum steering angle, or equivalent, according to manufacturers' guidelines for safe operation, also taking into account the ship's speed or propeller torque/speed or other limitation; the "declared steering angle limits" are to be declared by the steering system manufacturer for each ship specific non-traditional steering means. ship manoeuvrability tests, such as those in the Standards for ship manoeuvrability (IMO Res. MSC.137(76)) are to be carried out with steering angles not exceeding the declared steering angle limits.</p>	<p><Pt 5 Guidance></p> <p><application date: the date of contract for construction on or after 1 July. 2023></p> <p>- Water-jet propulsion systems move to Ch 3, Sec 5 of the Rules.</p> <p>- Azimuth thrusters move to Ch 3, Sec 6 of the Rules.</p> <p>- Moved from Ch 7, 102. 2</p>

Present	Amendment	Note
	<div data-bbox="840 199 1780 901"><p>The diagram illustrates a non-traditional steering system architecture. At the top, a 'Bridge' icon is connected to a 'Steering gear control system' (blue line). This system controls two identical 'Steering actuating systems' (green lines). Each actuating system includes a 'Steering gear power unit' (red line, containing a pump and motor 'M') and 'Steering hydraulic Piping' (yellow line) that leads to a 'Steering actuator' (blue line). The actuators are shown as dual-acting cylinders. A dashed blue line indicates a cross-connection between the two hydraulic circuits. At the bottom, a yellow box labeled 'Equivalent to Rudderstock and rudder' contains a 3D model of a ship's rudder assembly. The entire system is enclosed in a large orange rounded rectangle labeled 'Steering system'.</p></div> <p data-bbox="840 917 1792 981">Fig 1 Definition of non-traditional steering system - where equipped with two identical steering actuating systems</p>	

Present	Amendment	Note
	<div><p>Bridge</p><p>Steering system</p><p>Main Steering gear</p><p>Steering gear control system</p><p>Aux Steering gear</p><p>Steering actuating system</p><p>Steering gear power unit</p><p>Steering hydraulic Piping</p><p>Steering actuator</p><p>Equivalent to Rudderstock and rudder</p></div>	
	<p>Fig 2 Definition of non-traditional steering system – where equipped with a main steering gear and an auxiliary steering gear</p>	

Present	Amendment	Note
	<div><p>The diagram illustrates the components and signal flow of an electric steering system. At the top, the 'Bridge' is connected to the 'Steering gear control system' (blue line). This system is part of the 'Steering gear' (purple line), which also includes the 'Steering actuator' (blue line). The 'Steering actuator' is part of the 'Steering actuating system' (green line), which contains the 'Steering gear power unit' (red line). The 'Steering gear power unit' consists of two hydraulic pumps (M) connected to two hydraulic cylinders. These cylinders are connected to the 'Rudderstock and rudder' (yellow line), which is equivalent to the rudder. The 'Steering actuator' is also connected to the 'Rudderstock and rudder'.</p></div> <p>Fig 3 Definition of non-traditional steering system – in case of electric steering system</p>	

Present	Amendment	Note
	<p>3. Number of steering gears</p> <p>(1) For a ship fitted with multiple steering propulsion units, 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 (4). 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 ships not engaged in international voyage one steering actuating system per each steering propulsion system is acceptable.</p> <p>(2) For a ship fitted with a single steering-propulsion unit, the requirement in Ch 7, 201. 1 of Rules is considered satisfied if the steering gear is provided with two or more steering actuating systems and is in compliance with (3). 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.</p> <p>(3) 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:</p> <p>(A) in a passenger ship is capable of satisfying the requirements in 4 while any one of the power units is out of operation; in a cargo ship, is capable of satisfying the requirements in 4 while operating with all power units; and</p> <p>(B) 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.</p> <p>(4) For a ship fitted with multiple steering propulsion units, 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:</p> <p>(A) in a passenger ship, is capable of satisfying the requirements in 4 while any one of the steering actuating systems is out of operation; in a cargo ship, is capable of satisfying the requirements in 4 while operating with all steering actuating systems; and</p> <p>(B) is arranged so that after a single failure in its piping system or in one of the steering actuating systems, steering capability can be maintained or speedily regained.</p> <p>The above capacity requirements apply regardless whether the steering systems are arranged with common or dedicated power units.</p>	<p>- Moved from Ch 7, 201. 3</p> <p>- Moved from Ch 7, 201. 4</p>

Present	Amendment	Note
	<p><u>4. Performances of main steering gear</u></p> <p>(1) <u>of adequate strength and capable of steering the ship at maximum ahead service speed which is to be demonstrated;</u></p> <p>(2) <u>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;</u></p> <p>(3) <u>for all ships, operated by power; and</u></p> <p>(4) <u>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.</u></p> <p><u>5. Performances of auxiliary steering gear</u></p> <p>(1) <u>of adequate strength and capable of steering the ship at navigable speed and of being brought speedily in to action in an emergency;</u></p> <p>(2) <u>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</u></p> <p>(3) <u>operated by power where necessary to meet the requirements of (2) and in any ship having power of more than 2,500 kW propulsion power per steering-propulsion unit.</u></p>	<p>- Moved from Ch 7, 202. 2</p> <p>- Moved from Ch 7, 203. 2</p>