

Guidance for Autonomous Ships

(Development Review : For internal opinion inquiry)

2021. 1.



Machinery Rule Development Team

Effective Date : 1 July 2021

(The contract date for ship construction)

Present	Amendment	Remark
<p style="text-align: center;">CHAPTER 1 GENERAL</p> <p style="text-align: center;">Section 1 General</p> <p>101. <same as the present Rules></p> <p>102. Purpose</p> <p>1. The purpose of this guidance is to ensure the safety and reliability of autonomous ships or systems and functions necessary for autonomous operation through risk assessment. <i>(2021)</i></p> <p>103. Application</p> <p>1. - 5. <same as the present Rules></p> <p>6. Autonomous ships applying this guidance shall be certified for cybersecurity in accordance with the Guidance for Maritime Cyber security System and risk assessment shall be carried out in accordance with the Guidance for Approval of Risk-based Ship Design.</p> <p>7. Equipment and systems that are additionally installed for the operation of autonomous ships shall be subject to cybersecurity type approval in accordance with the Guidance for Type Approval of Maritime Cyber Security and type approval in accordance with Ch 3, Sec 23 of the Guidance for Approval of Manufacturing Process and Type Approval, etc. <i>(2020)</i></p> <p>8. <same as the present Rules></p>	<p style="text-align: center;">CHAPTER 1 GENERAL</p> <p style="text-align: center;">Section 1 General</p> <p>101. <same as the present Rules></p> <p>102. Purpose</p> <p>1. The purpose of this guidance is to ensure the safety and reliability of autonomous ships or systems and functions necessary for autonomous operation through risk assessment. <i>(2021)</i></p> <p>103. Application</p> <p>1. - 5. <same as the present Rules></p> <p>6. Autonomous ships applying this guidance shall be certified for cybersecurity in accordance with the Guidance for Maritime Cyber security System and risk assessment shall be carried out in accordance with the Guidance for Approval of Risk-based Ship Design: <u>may conduct risk assessments or review reliability of autonomous ships or systems if the Society deems necessary.</u> <i>(2021)</i></p> <p>7. Equipment and systems that are additionally installed for the operation of autonomous ships shall be subject to cybersecurity type approval in accordance with the Guidance for Type Approval of Maritime Cyber Security and type approval in accordance with Ch 3, Sec 23 of the Guidance for Approval of Manufacturing Process and Type Approval, etc. <i>(2020)</i> <u>Autonomous ships applying this guidance are to obtain cybersecurity certification appropriate for the ship.</u> <i>(2021)</i></p> <p>8. <same as the present Rules></p>	<p>(Amended)</p> <p>- The requirement has been amended so as not to require a risk assessment at all autonomous levels.</p> <p>(Amended)</p> <p>- The requirements have been amended to ensure that autonomous ships applying this guidance can perform risk assessment or review reliability, if necessary, and obtain appropriate cybersecurity certification.</p>

Present	Amendment	Remark
<p>104. Definitions</p> <p>The definitions of terms are to follow Rules for the Classification of Steel Ships, unless otherwise specified in this Guidance.</p> <p>1. "Autonomous Ships" means ships that supports decision-making through the system and can be substituted by the system in whole or in part for the control and management of the ship.</p> <p>2. - 5. <same as the present Rules></p> <p>6. "Outboard Support Systems" means a system that monitors and controls the operational information of an autonomous ship.</p> <p><Newly added></p> <p>7. - 10. <same as the present Rules></p>	<p>104. Definitions</p> <p>The definitions of terms are to follow Rules for the Classification of Steel Ships, unless otherwise specified in this Guidance.</p> <p>1. "Autonomous Ships" means ships that supports decision-making through the <u>autonomous</u> system and can be substituted by the system in whole or in part for the control and management of the ship. <u>Autonomous ships can be operated manned, un-manned or remotely operated. (2021)</u></p> <p>2. - 5. <same as the present Rules></p> <p>6. "Outboard Support Systems" means a systems that monitors and controls the operational information of an autonomous ship.</p> <p>7. <u>"Decision-making Support Systems" means systems systems that can support decision-making of ship operators, and these systems can be composed of a combination of various systems. (2021)</u></p> <p>7. - 10. <u>8. - 11.</u> <same as the present Rules></p>	<p>(Amended)</p> <p>- Clarify the system for operating autonomous ships.</p> <p>- Added definition for decision-making support systems.</p> <p>- Numbering: 7.~10. → 8.~11.</p>

Present	Amendment	Remark																																																
<p>105. Level of autonomy</p> <p>1. The autonomy level can be classified according to the subjects performing the following functions. Table 1 shows the autonomy level of each function.</p> <p>(1) – (3) <same as the present Rules></p> <p>Table 1 Level of autonomy</p> <table border="1"> <thead> <tr> <th>Level of autonomy</th> <th>Data acquisition/analysis</th> <th>Decision-making</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>AL 1</td> <td>System / Operator</td> <td>Operator</td> <td>Operator</td> </tr> <tr> <td>AL 2</td> <td>System⁽¹⁾</td> <td>Operator(System)⁽¹⁾</td> <td>Operator</td> </tr> <tr> <td>AL 3</td> <td>System</td> <td>System(Operator)⁽²⁾</td> <td>System</td> </tr> <tr> <td>AL 4</td> <td>System</td> <td>System⁽³⁾</td> <td>System⁽³⁾</td> </tr> <tr> <td>AL 5</td> <td>System</td> <td>System</td> <td>System</td> </tr> </tbody> </table> <p>(Notes)</p> <p>(1) <u>The system supports decision-making.</u></p> <p>(2) Operator confirmation of decision-making is required.</p> <p>(3) Operators are constantly monitored for decision-making and action.</p>	Level of autonomy	Data acquisition/analysis	Decision-making	Action	AL 1	System / Operator	Operator	Operator	AL 2	System ⁽¹⁾	Operator(System) ⁽¹⁾	Operator	AL 3	System	System(Operator) ⁽²⁾	System	AL 4	System	System ⁽³⁾	System ⁽³⁾	AL 5	System	System	System	<p>105. Level of autonomy (2021)</p> <p>1. The autonomy level can be classified according to the subjects performing the following functions. Table 1 shows the autonomy level of each function. <u>The level of autonomy is determined by the degree to which the system of off-board remote operation replaces the onboard operator for the following functions. Table 1 shows the level of autonomy by these functions.</u></p> <p>(1) – (3) <same as the present Rules></p> <p>Table 1 Level of autonomy</p> <table border="1"> <thead> <tr> <th>Level of autonomy</th> <th>Data acquisition/analysis</th> <th>Decision-making</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>AL 1</td> <td>System <u>and/or</u> Operator</td> <td>Operator</td> <td>Operator</td> </tr> <tr> <td>AL 2</td> <td>System/<u>Remote</u>^(†)</td> <td>Operator (System/<u>Remote</u>)⁽¹⁾</td> <td>Operator</td> </tr> <tr> <td>AL 3</td> <td>System/<u>Remote</u></td> <td>System/<u>Remote</u> (Operator)⁽²⁾</td> <td>System /<u>Remote</u></td> </tr> <tr> <td>AL 4</td> <td>System</td> <td>System⁽³⁾</td> <td>System⁽³⁾</td> </tr> <tr> <td>AL 5</td> <td>System</td> <td>System</td> <td>System</td> </tr> </tbody> </table> <p>(Notes)</p> <p>(1) <u>The system supports decision-making. The operator's decision-making is supported through system or remote operation, but the onboard operator makes the final decision. (2021)</u></p> <p>(2) Operator confirmation of decision-making is required.</p> <p>(3) Operators are constantly monitored for decision-making and action.</p>	Level of autonomy	Data acquisition/analysis	Decision-making	Action	AL 1	System <u>and/or</u> Operator	Operator	Operator	AL 2	System/ <u>Remote</u> ^(†)	Operator (System/ <u>Remote</u>) ⁽¹⁾	Operator	AL 3	System/ <u>Remote</u>	System/ <u>Remote</u> (Operator) ⁽²⁾	System / <u>Remote</u>	AL 4	System	System ⁽³⁾	System ⁽³⁾	AL 5	System	System	System	<p>(Amended)</p> <p>- A remote concept has been introduced to enable function execution through remote operation.</p>
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Present	Amendment	Remark
<p>2. Each autonomy level can be defined as follows:</p> <p>(1) <same as the present Rules></p> <p>(2) AL 2: Data is collected/analyzed <u>by the</u> system and decision-making and action are performed by the operator. The system supports operator's decision-making.</p> <p>(3) AL 3: Data acquisition/analysis, decision-making and action are performed <u>by the</u> system. However, the operator's confirmation of the decision-making by the system is required, and if the operator confirmation is not preceded, the decision-making is withdrawn. <u>Operator's response is required when system failure occurs.</u></p> <p>(4) - (5) <same as the present Rules></p> <p>106. Class notations</p> <p>1. The scope and autonomy level of this Guidance for autonomous ships is basically made at the request of the owner, but <u>is finalized</u> through a risk assessment.</p> <p>2. <same as the present Rules></p> <p>3. <u>For systems consisting of combinations of several subsystems, such as data acquisition system at autonomous level 1 (AL1), special features can be specified in addition to the notation. Example: AL1 (Ship operation/movement).</u></p> <p>107. - 108. <same as the present Rules></p>	<p>2. Each autonomy level can be defined as follows:</p> <p>(1) <same as the present Rules></p> <p>(2) AL 2: Data is collected/analyzed <u>by the through system or off-board remote operation</u> and decision-making and action are performed by the operator. The system supports operator's decision-making. <u>The operator's decision-making is supported through system or off-board remote operation.</u></p> <p>(3) AL 3: Data acquisition/analysis, decision-making and action are performed <u>by the through system or off-board remote operation.</u> However, the operator's confirmation of the decision-making by the system is required, and if the operator confirmation is not preceded, the decision-making is withdrawn. <u>Operator's response is required when system failure occurs. In case of system failure or remote operation is not working well, an operator's response is required.</u></p> <p>(4) - (5) <same as the present Rules></p> <p>106. Class notations</p> <p>1. The scope and autonomy level of this Guidance for autonomous ships is basically made at the request of the owner, but <u>is finalized may be finally determined</u> through a risk assessment. <u>(2021)</u></p> <p>2. <same as the present Rules></p> <p>3. <u>For systems consisting of combinations of several subsystems, such as data acquisition system at autonomous level 1 (AL1), special features can be specified in addition to the notation. Example: AL1 (Ship operation/movement). Notwithstanding the above 2, in case of request from the shipowner, shipyard, etc., an appropriate level of AL can be assigned to a specific individual system and special features can be specified. Example: AL level (special feature) (2021)</u></p> <p>107. - 108. <same as the present Rules></p>	<p>(Amended)</p> <p>- The requirements have been amended to allow AL notation to specific systems.</p>

Present	Amendment	Remark
<p style="text-align: center;">Section 2 <same as the present Rules></p> <p style="text-align: center;">Section 3 Cyber security</p> <p>301. <same as the present Rules></p> <p>302. Application</p> <p>1. - 4. <same as the present Rules></p> <p>5. <u>Ships with autonomous level 1(AL1) and autonomous level 2(AL2), in which communication networks between the off-board support systems are established, shall be certified for cyber security at least with CS1 determined through the risk assessment. And, ships with autonomous level 3(AL3) or above shall be certified by CS3.</u></p>	<p style="text-align: center;">Section 2 <same as the present Rules></p> <p style="text-align: center;">Section 3 Cyber security</p> <p>301. <same as the present Rules></p> <p>302. Application</p> <p>1. - 4. <same as the present Rules></p> <p>5. Ships with autonomous level 1(AL1) and autonomous level 2(AL2), in which communication networks between the off-board support systems are established, shall be certified for cyber security at least with CS1 determined through the risk assessment. And, ships with autonomous level 3(AL3) or above shall be certified by CS3.</p>	<p>(Amended)</p> <p>- In 103. 7, the requirements have been amended to ensure that autonomous ships applying this guidance obtain appropriate cybersecurity certification. Therefore, 302. 5 has been deleted.</p>

Present	Amendment	Remark
<p style="text-align: center;">CHAPTER 2 AUTONOMOUS SYSTEMS AND AUTONOMOUS SHIPS</p> <p>Section 1 Configuration and Function of Autonomous Systems</p> <p>101. <same as the present Rules></p> <p>102. Function of autonomous systems</p> <p>1. Data acquisition and analysis system</p> <p>(1) It is a system for recognizing the external situation of ships related to marine objects/ships and marine environment and the internal situation related to ship navigation/motion. It collects data from a number of data sources and integrates / analyzes them to provide operator or autonomous navigation system with results that can aid operational decision-making. The main functions of this system are as follows:</p> <p>(A) - (C) <same as the present Rules></p> <p>(2) <same as the present Rules></p> <p>2. - 4. <same as the present Rules></p>	<p style="text-align: center;">CHAPTER 2 AUTONOMOUS SYSTEMS AND AUTONOMOUS SHIPS</p> <p>Section 1 Configuration and Function of Autonomous Systems</p> <p>101. <same as the present Rules></p> <p>102. Function of autonomous systems</p> <p>1. Data acquisition and analysis system</p> <p>(1) It is a system for recognizing the external situation of ships related to marine objects/ships and marine environment and the internal situation related to ship navigation/motion. It collects data from a number of data sources and integrates / analyzes them to provide operator or autonomous navigation system with results that can aid operational decision-making. The main functions of this system are as follows, <u>but not limited to: (2021)</u></p> <p>(A) - (C) <same as the present Rules></p> <p>(2) <same as the present Rules></p> <p>2. - 4. <same as the present Rules></p>	<p>(Amended)</p> <p>- The requirements have been amended so as not to limit the major functions of the data acquisition/analysis system.</p>

Present	Amendment	Remark
<p>103. System configuration according to autonomy level</p> <p>The autonomous systems required according to autonomy level of autonomous ship are as follows.</p> <p>1. <same as the present Rules></p> <p>2. Autonomy level 2 (AL 2)</p> <p>(1) - (2)</p> <p>(3) System configuration</p> <p>(A) Essentially required systems</p> <p>(a) <same as the present Rules></p> <p>(b) <u>Autonomous navigation system (collision avoidance module and/or economic navigation system in accordance with maritime regulations)</u></p> <p>(B) Systems that may be required depending on operating characteristics</p> <p>(a) - (b) <same as the present Rules></p> <p>Fig 2.3 <see the next page></p> <p>3. - 5. <same as the present Rules></p> <p>Section 2 <same as the present Rules></p>	<p>103. System configuration according to autonomy level</p> <p>The autonomous systems required according to autonomy level of autonomous ship are as follows.</p> <p>1. <same as the present Rules></p> <p>2. Autonomy level 2 (AL 2)</p> <p>(1) - (2)</p> <p>(3) System configuration</p> <p>(A) Essentially required systems</p> <p>(a) <same as the present Rules></p> <p>(b) <u>Autonomous navigation system (collision avoidance module and/or economic navigation system in accordance with maritime regulations) <u>Decision-making support system (2021)</u></u></p> <p>(B) Systems that may be required depending on operating characteristics</p> <p>(a) - (b) <same as the present Rules></p> <p>(c) <u>Autonomous navigation system (2021)</u></p> <p>Fig 2.3 <see the next page></p> <p>3. - 5. <same as the present Rules></p> <p>Section 2 <same as the present Rules></p>	<p>(Amended)</p> <p>- System configuration change for AL2 : The decision-making support system is added as an essential system, and the autonomous navigation system is defined as a system that may be required according to operational characteristics.</p>

<Present>

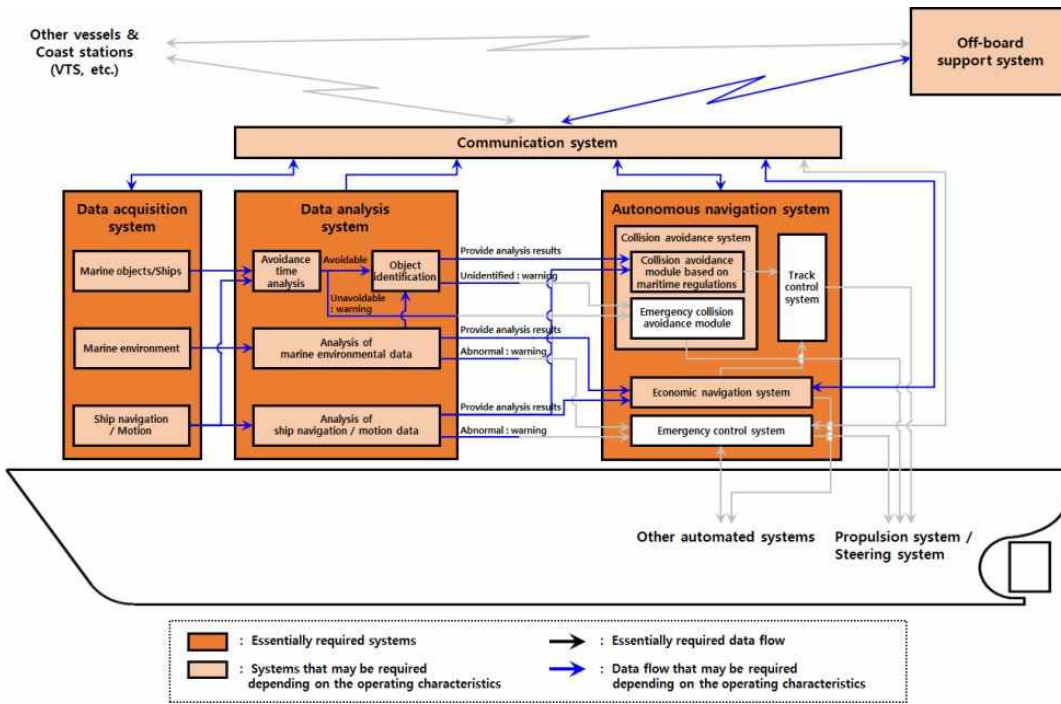
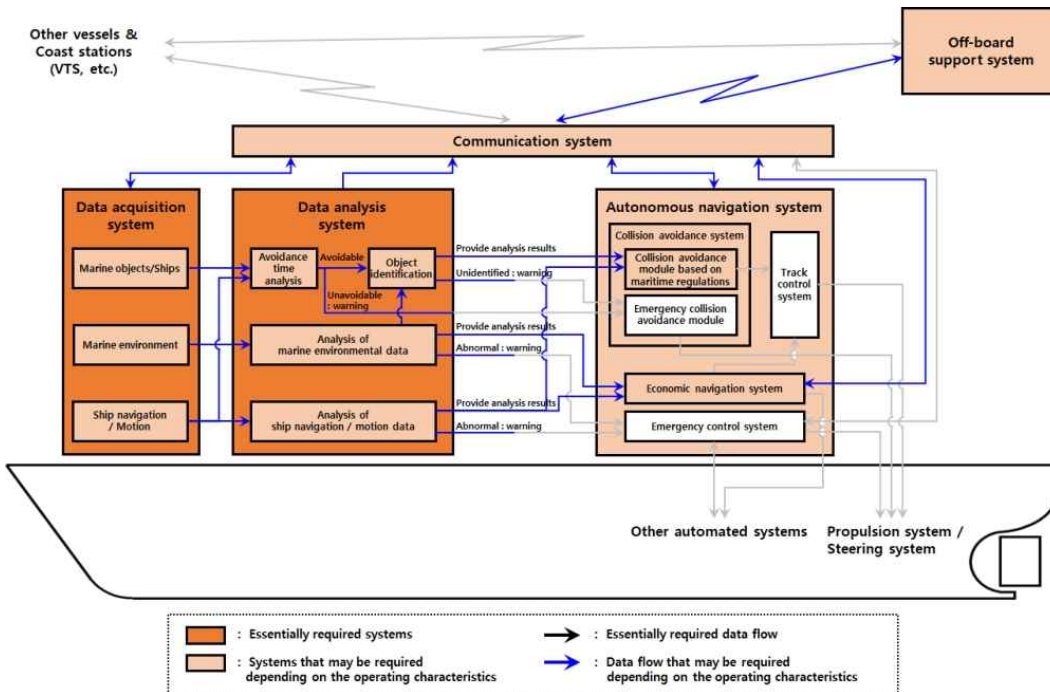


Fig 2.3 Autonomous system required for the ship of autonomy level 2 (AL 2)

<Amendment>



Present	Amendment	Remark
<p>Section 3 Approval procedure of autonomous ships</p> <p>301. General</p> <p>1. The general approval procedure <u>for autonomous ships</u> is shown in Fig 2.8.</p> <p>Fig 2.8 <see the next page></p> <p><Newly added></p> <p><Newly added></p>	<p>Section 3 Approval procedure of autonomous ships</p> <p>301. General (2021)</p> <p>1. The general approval procedure for autonomous ships is shown in Fig 2.8.</p> <p>Fig 2.8 <see the next page></p> <p><u>2. Autonomous level AL1 or AL2 ships whose decision-making and execution is performed by the onboard operator are to comply with the existing classification approval procedure.</u></p> <p><u>3. New concept designs that are difficult to apply to classification technology rules, such as ships with an autonomous level of AL3 or higher in which decision-making and execution are carried out by the system, are to comply with the Guidance for Approval of Risk-based Ship Design.</u></p>	<p>(Amended)</p> <p>- The figure showing the general approval process for autonomous ships has been amended.</p> <p>(Amended)</p> <p>- The requirements have been amended to follow the existing classification approval procedure for the low autonomous level and to follow the guidance for approval of risk-based ship design for the high autonomous level(AL3 or higher).</p>

<Present>

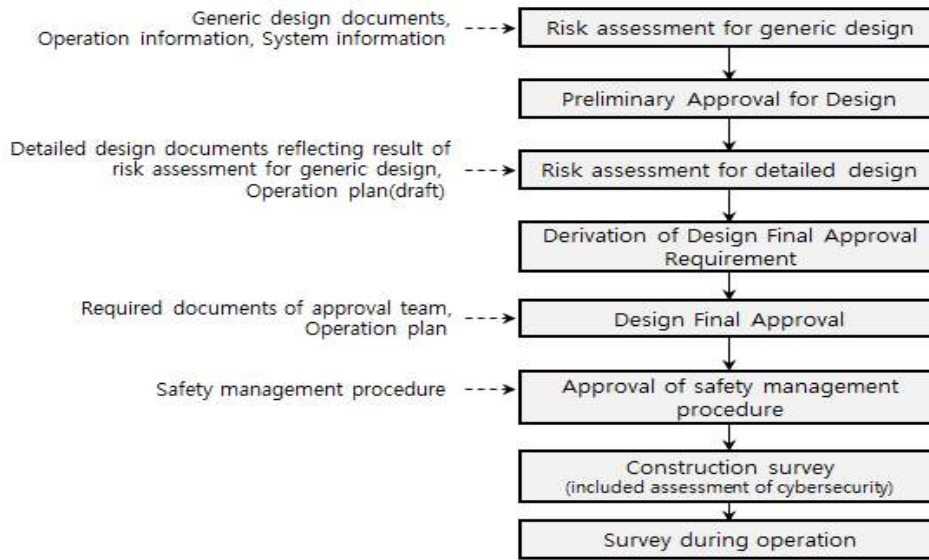


Fig 2.8 The general approval procedure for autonomous ships

<Amendment>

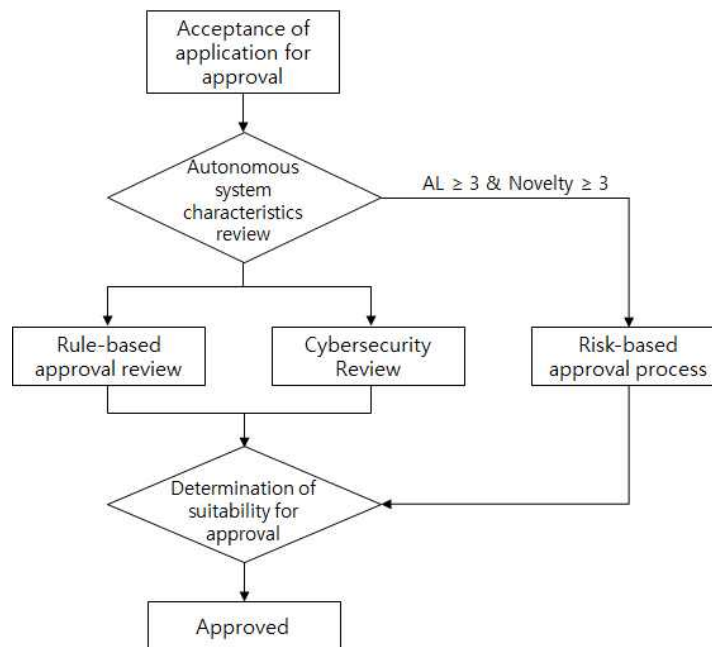


Fig 2.8 The general approval procedure for autonomous ships

Present	Amendment	Remark
<p>⟨Newly added⟩</p>	<p>4. General approval process</p> <p>(1) <u>Review of characteristics of autonomous system</u></p> <p>(A) <u>The design data of the autonomous system installed on the target ship is to be submitted for approval.</u></p> <p>(B) <u>Based on the submitted design data, the target ship's autonomous system is specifically identified.</u></p> <p>(C) <u>Review the adequacy of the requested autonomous level for the autonomous system.</u></p> <p>(D) <u>In the case of autonomous level AL3 or higher, identify the degree of novelty in Table 3.1 of the Guidance for Approval of Risk-based Ship Design corresponding to the identified autonomous system.</u></p> <p>(2) <u>Identification of applicable rules for autonomous systems</u> <u>Identify the rules applicable to the target ship's autonomous system.</u></p> <p>(3) <u>Review of approval for autonomous system</u></p> <p>(A) <u>Review the suitability of approval for the target ship's autonomous system according to the identified rules.</u></p> <p>(B) <u>Review cyber security approval for the target ship's autonomous system.</u></p> <p>(C) <u>If the autonomous level is AL3 or higher and the degree of novelty is 3 or higher, the risk-based approval procedure is carried out for the target ship's autonomous system.</u></p> <p>(4) <u>Approval decision for the autonomous system</u> <u>As a result of the approval review for each field, if it is deemed appropriate, the approval of the autonomous system is completed. If it is judged to be inappropriate, the approval is rejected and the design is requested to be supplemented.</u></p>	<p>(Amended)</p> <p>- The description of "Fig 2.8 The general approval procedure for autonomous ships" is provided in Paragraph 4.</p>

Present	Amendment	Remark
<p>302. Approval procedure</p> <p>1. Risk assessment for generic design</p> <p>(1) The developer is to submit to the approval team of Our Society the generic design document including the document stating operational information and system information specified in Ch 1, 201. 2 of these Guidance.</p> <p>(2) The approval team is to establish a risk assessment plan with the developer based on the generic design document, operational information and system information. The risk assessment plan is to include, at a minimum, the following:</p> <p>(A) Main interest risk definition and corresponding risk assessment criteria</p> <p>(B) Hazard identification work plan (including method and scope)</p> <p>(C) Hazard analysis and evaluation work plan (including method and scope)</p> <p>(D) Work plan (including method and scope) for generic design related experiments, calculations, analysis, simulations, etc.</p> <p>(E) List of functional requirements condition and safety requirements condition (draft)</p> <p>(F) Items of assumption, exemptions and restrictions</p> <p>(3) The developer evaluates the risk according to the risk assessment plan under the supervision of the approval team. The following considerations are to be taken into account when assessing risk. And the relevant work processes and results are to be documented.</p> <p>(A) Identified risk factors, the frequency and magnitude of each risk factor</p> <p>(B) Identifiable safety devices included in the design</p> <p>(C) Risk model for quantitative risk analysis</p> <p>(D) References, assumptions, uncertainties, sensitivity, etc.</p> <p>(E) Comparison of the calculated risk level with the evaluation criteria</p> <p>(F) Risk control measures and risk reduction levels</p>	<p>302. Approval procedure</p> <p>1. Risk assessment for generic design</p> <p>(1) The developer is to submit to the approval team of Our Society the generic design document including the document stating operational information and system information specified in Ch 1, 201. 2 of these Guidance.</p> <p>(2) The approval team is to establish a risk assessment plan with the developer based on the generic design document, operational information and system information. The risk assessment plan is to include, at a minimum, the following:</p> <p>(A) Main interest risk definition and corresponding risk assessment criteria</p> <p>(B) Hazard identification work plan (including method and scope)</p> <p>(C) Hazard analysis and evaluation work plan (including method and scope)</p> <p>(D) Work plan (including method and scope) for generic design related experiments, calculations, analysis, simulations, etc.</p> <p>(E) List of functional requirements condition and safety requirements condition (draft)</p> <p>(F) Items of assumption, exemptions and restrictions</p> <p>(3) The developer evaluates the risk according to the risk assessment plan under the supervision of the approval team. The following considerations are to be taken into account when assessing risk. And the relevant work processes and results are to be documented.</p> <p>(A) Identified risk factors, the frequency and magnitude of each risk factor</p> <p>(B) Identifiable safety devices included in the design</p> <p>(C) Risk model for quantitative risk analysis</p> <p>(D) References, assumptions, uncertainties, sensitivity, etc.</p> <p>(E) Comparison of the calculated risk level with the evaluation criteria</p> <p>(F) Risk control measures and risk reduction levels</p>	<p>(Amended)</p> <p>- As the approval procedure for autonomous ships has been amended, the requirements and Fig 2.9 overlapping with the guidance for approval of risk-based ship design have been deleted.</p>

Present	Amendment	Remark
<p>(G) <u>Items requiring additional risk analysis, testing, calculation and analysis, simulated testing, etc.</u></p> <p>(H) <u>Cautions for construction and operation</u></p> <p>(4) <u>The approval team reviews the rationality and appropriateness of the risk assessment process and results based on the risk assessment plan.</u></p> <p>2. Preliminary Design Approval</p> <p>(1) <u>The approval team is to review the feasibility and safety level of the generic design to determine whether a design preliminary approval certificate is issued.</u></p> <p>(2) <u>Design preliminary approval does not guarantee final design approval.</u></p> <p>3. Risk assessment for detailed design</p> <p>(1) <u>The developer submits the detailed design document and operation plan(draft) reflecting the risk assessment result of the generic design to the approval team.</u></p> <p>(2) <u>The approval team identifies additional or detailed design information and modified design content as compared with the generic design, and establishes a risk assessment plan with the developer based on the operation plan. The key considerations in establishing a risk assessment plan are the same as those for establishing a risk assessment plan for a generic design, but the functional requirements and safety requirements for approval are to be further elaborated.</u></p> <p>(3) <u>The developer evaluates the risk according to the risk assessment plan under the supervision of the approval team, and documents the related work processes and results.</u></p> <p>(4) <u>The approval team reviews the rationality and appropriateness of the risk assessment process and results based on the risk assessment plan.</u></p>	<p>(G) Items requiring additional risk analysis, testing, calculation and analysis, simulated testing, etc.</p> <p>(H) Cautions for construction and operation</p> <p>(4) The approval team reviews the rationality and appropriateness of the risk assessment process and results based on the risk assessment plan.</p> <p>2. Preliminary Design Approval</p> <p>(1) The approval team is to review the feasibility and safety level of the generic design to determine whether a design preliminary approval certificate is issued.</p> <p>(2) Design preliminary approval does not guarantee final design approval.</p> <p>3. Risk assessment for detailed design</p> <p>(1) The developer submits the detailed design document and operation plan(draft) reflecting the risk assessment result of the generic design to the approval team.</p> <p>(2) The approval team identifies additional or detailed design information and modified design content as compared with the generic design, and establishes a risk assessment plan with the developer based on the operation plan. The key considerations in establishing a risk assessment plan are the same as those for establishing a risk assessment plan for a generic design, but the functional requirements and safety requirements for approval are to be further elaborated.</p> <p>(3) The developer evaluates the risk according to the risk assessment plan under the supervision of the approval team, and documents the related work processes and results.</p> <p>(4) The approval team reviews the rationality and appropriateness of the risk assessment process and results based on the risk assessment plan.</p>	

Present	Amendment	Remark
<p>4. Derivation of Design Final Approval Requirement</p> <p>(1) <u>The approval team draws up the final design approval requirements based on the risk assessment plan and the results of the generic design and the detailed design. The design final approval requirements are to include, at a minimum, the following:</u></p> <p>(A) <u>possible risk categories and risk assessment criteria</u></p> <p>(B) <u>Rational basis for limitations and restrictions applied to risk analysis</u></p> <p>(C) <u>Requirements to meet the assumptions and conditions applied for risk calculation</u></p> <p>(D) <u>Requirements for the successful functioning of the safety device and the risk control means</u></p> <p>(E) <u>Requirements to achieve the target function of the design.</u></p> <p>(F) <u>Verification work to demonstrate the fulfillment of the above requirements, if necessary.</u></p> <p>(2) <u>The items listed in the final approval requirements are drafts of survey requirements related to construction and operation.</u></p> <p>5. Design Final Approval</p> <p>(1) <u>The developer submits the operation plan and all documents requested by the approval team for issuance of the design final approval certificate.</u></p> <p>(2) <u>The approval team determine the suitability of the design for the final approval requirements of the design and review the feasibility and safety level of the entire detailed design or the target design to determine whether a design final approval certificate shall be issued.</u></p> <p>(3) <u>The design final approval certificate is the basis for the construction of the design subject and the start of production.</u></p>	<p>4. Derivation of Design Final Approval Requirement</p> <p>(1) The approval team draws up the final design approval requirements based on the risk assessment plan and the results of the generic design and the detailed design. The design final approval requirements are to include, at a minimum, the following:</p> <p>(A) possible risk categories and risk assessment criteria</p> <p>(B) Rational basis for limitations and restrictions applied to risk analysis</p> <p>(C) Requirements to meet the assumptions and conditions applied for risk calculation</p> <p>(D) Requirements for the successful functioning of the safety device and the risk control means</p> <p>(E) Requirements to achieve the target function of the design.</p> <p>(F) Verification work to demonstrate the fulfillment of the above requirements, if necessary.</p> <p>(2) The items listed in the final approval requirements are drafts of survey requirements related to construction and operation.</p> <p>5. Design Final Approval</p> <p>(1) The developer submits the operation plan and all documents requested by the approval team for issuance of the design final approval certificate.</p> <p>(2) The approval team determine the suitability of the design for the final approval requirements of the design and review the feasibility and safety level of the entire detailed design or the target design to determine whether a design final approval certificate shall be issued.</p> <p>(3) The design final approval certificate is the basis for the construction of the design subject and the start of production.</p>	

Present	Amendment	Remark
<p>6. Approval of safety management procedure</p> <p>(1) The developer shall draw up the survey requirements during manufacture and operation on the basis of the safety devices, risk control measures, precautions and restrictions identified in the final approval process of the design and document the safety control procedure sufficiently reflecting the contents of the relevant inspection requirements And submit it to the approval team for approval.</p> <p>(A) The requirements of construction Survey is to ensure that the safety level of the design, which has been approved by the final approval during the construction and manufacturing of the ship, is maintained sufficiently without deterioration. In general, it includes completion test and various test for autonomous systems software and hardware, system interoperability test between each autonomous systems, and survey requirements for sea trial.</p> <p>(B) During the operation, the survey requirements are to ensure that the safety level of the design, which has been proven by the final approval in the course of providing the intended service, is maintained without deteriorating the level of safety.</p> <p>7. Construction survey</p> <p>(1) Survey is to be carried out in accordance with the construction survey requirements set forth in the safety management procedures for system manufacturing and shipbuilding.</p> <p>(2) During the construction survey, a cyber security evaluation according to Ch 1, 301. and 302. of this Guidance is to be carried out.</p> <p>(3) If the design content and assumptions identified in the design final approval procedure are changed at the construction stage and the ship's risk is affected, the relevant risk are to be re-interpreted and reassessed at the discretion of the approval team. The contents of survey requirements and safety management procedures may be revised according to the results.</p>	<p>6. Approval of safety management procedure</p> <p>(1) The developer shall draw up the survey requirements during manufacture and operation on the basis of the safety devices, risk control measures, precautions and restrictions identified in the final approval process of the design and document the safety control procedure sufficiently reflecting the contents of the relevant inspection requirements And submit it to the approval team for approval.</p> <p>(A) The requirements of construction Survey is to ensure that the safety level of the design, which has been approved by the final approval during the construction and manufacturing of the ship, is maintained sufficiently without deterioration. In general, it includes completion test and various test for autonomous systems software and hardware, system interoperability test between each autonomous systems, and survey requirements for sea trial.</p> <p>(B) During the operation, the survey requirements are to ensure that the safety level of the design, which has been proven by the final approval in the course of providing the intended service, is maintained without deteriorating the level of safety.</p> <p>7. Construction survey</p> <p>(1) Survey is to be carried out in accordance with the construction survey requirements set forth in the safety management procedures for system manufacturing and shipbuilding.</p> <p>(2) During the construction survey, a cyber security evaluation according to Ch 1, 301. and 302. of this Guidance is to be carried out.</p> <p>(3) If the design content and assumptions identified in the design final approval procedure are changed at the construction stage and the ship's risk is affected, the relevant risk are to be re-interpreted and reassessed at the discretion of the approval team. The contents of survey requirements and safety management procedures may be revised according to the results.</p>	

Present	Amendment	Remark
<p>8. Survey during operation</p> <p>(1) <u>The ships are to be operated in accordance with the operation plan.</u> (A) <u>The ships are to be operated in accordance with the operational purpose indicated in the operation plan.</u> (B) <u>The ships are to be operated within the operation scope as specified in the operation plan.</u> (C) <u>The ships are to be operated in accordance with the operational scenario presented in the operation plan.</u> (D) <u>All risk situations occurring during operation are to be identified in advance under the normal and abnormal operating scenarios presented in the operation plan, and mitigation measures are to be appropriately prepared for them.</u></p> <p>(2) <u>The survey are to be carried out in accordance with survey requirements during operation set out in the safety management procedure.</u></p> <p>(3) <u>If the design content and assumptions identified in the design final approval procedure are changed at the construction stage and the ship's risk is affected, the relevant risk are to be re-interpreted and reassessed at the discretion of the approval team. The contents of survey requirements and safety management procedures may be revised according to the results.</u></p> <p>Fig 2.9 The general approval procedure for autonomous ships(Detail)</p> <p>302. <same as the present Rules></p> <p>CHAPTER 3 <same as the present Rules></p>	<p>8. Survey during operation</p> <p>(1) The ships are to be operated in accordance with the operation plan. (A) The ships are to be operated in accordance with the operational purpose indicated in the operation plan. (B) The ships are to be operated within the operation scope as specified in the operation plan. (C) The ships are to be operated in accordance with the operational scenario presented in the operation plan. (D) All risk situations occurring during operation are to be identified in advance under the normal and abnormal operating scenarios presented in the operation plan, and mitigation measures are to be appropriately prepared for them.</p> <p>(2) The survey are to be carried out in accordance with survey requirements during operation set out in the safety management procedure.</p> <p>(3) If the design content and assumptions identified in the design final approval procedure are changed at the construction stage and the ship's risk is affected, the relevant risk are to be re-interpreted and reassessed at the discretion of the approval team. The contents of survey requirements and safety management procedures may be revised according to the results.</p> <p>Fig 2.9 The general approval procedure for autonomous ships(Detail) <Deleted></p> <p>302. <same as the present Rules></p> <p>CHAPTER 3 <same as the present Rules></p>	