

**Minimum standard of competence for MEC 2 ECE (STCW Regulation III/3)**

**Function: Marine engineering at the management level**

Column 1	Column 2	Column 3	Column 4
Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Manage the operation of propulsion plant machinery	<p>Design features, and operative mechanism of the following machinery and associated auxiliaries:</p> <ul style="list-style-type: none"> <li>.1 marine diesel engine</li> <li>.2 marine steam turbine</li> <li>.3 marine gas turbine</li> <li>.4 marine steam boiler</li> </ul>	<p>Examination and assessment of evidence obtained from one or more of the following:</p> <ul style="list-style-type: none"> <li>.1 approved in-service experience</li> <li>.2 approved training ship experience</li> <li>.3 approved simulator training, where appropriate</li> <li>.4 approved laboratory equipment training</li> </ul>	<p>Explanation and understanding of design features and operating mechanisms are appropriate</p>
Plan and schedule operations	<p><i>Theoretical knowledge</i></p> <p>Thermodynamics and heat transmission</p> <p>Mechanics and hydromechanics</p> <p>Propulsive characteristics of diesel engines, steam and gas turbines, including speed, output and fuel consumption</p> <p>Heat cycle, thermal efficiency and heat balance of the following:</p> <ul style="list-style-type: none"> <li>.1 marine diesel engine</li> <li>.2 marine steam turbine</li> <li>.3 marine gas turbine</li> <li>.4 marine steam boiler</li> </ul>	<p>Examination and assessment of evidence obtained from one or more of the following:</p> <ul style="list-style-type: none"> <li>.1 approved in-service experience</li> <li>.2 approved training ship experience</li> <li>.3 approved simulator training, where appropriate</li> <li>.4 approved laboratory equipment training</li> </ul>	<p>The planning and preparation of operations is suited to the design parameters of the power installation and to the requirements of the voyage</p>

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Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Plan and schedule operations <i>(continued)</i>	Refrigerators and refrigeration cycle  Physical and chemical properties of fuels and lubricants  Technology of materials  Naval architecture and ship construction, including damage control		
Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery	<i>Practical knowledge</i>  Start up and shut down main propulsion and auxiliary machinery, including associated systems  Operating limits of propulsion plant  The efficient operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery  Functions and mechanism of automatic control for main engine  Functions and mechanism of automatic control for auxiliary machinery including but not limited to: .1 generator distribution systems .2 steam boilers .3 oil purifier .4 refrigeration system .5 pumping and piping systems .6 steering gear system .7 cargo-handling equipment and deck machinery	Examination and assessment of evidence obtained from one or more of the following:  .1 approved in-service experience  .2 approved training ship experience  .3 approved simulator training, where appropriate  .4 approved laboratory equipment training	The methods of preparing for the start-up and of making available fuels, lubricants, cooling water and air are the most appropriate  Checks of pressures, temperatures and revolutions during the start-up and warm-up period are in accordance with technical specifications and agreed work plans  Surveillance of main propulsion plant and auxiliary systems is sufficient to maintain safe operating conditions  The methods of preparing the shutdown, and of supervising the cooling down of the engine are the most appropriate  The methods of measuring the load capacity of the engines are in accordance with technical specifications  Performance is checked against bridge orders  Performance levels are in accordance with technical specifications

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Manage fuel, lubrication and ballast operations	Operation and maintenance of machinery, including pumps and piping systems	Examination and assessment of evidence obtained from one or more of the following:  .1 approved in-service experience  .2 approved training ship experience  .3 approved simulator training, where appropriate	Fuel and ballast operations meet operational requirements and are carried out so as to prevent pollution of the marine environment

**Function: Electrical, electronic and control engineering at the management level**

Column 1	Column 2	Column 3	Column 4
Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
<p>Manage operation of electrical and electronic control equipment</p>	<p><i>Theoretical knowledge</i></p> <p>Marine electrotechnology, electronics, power electronics, automatic control engineering and safety devices</p> <p>Design features and system configurations of automatic control equipment and safety devices for the following:</p> <p>.1 main engine</p> <p>.2 generator and distribution system</p> <p>.3 steam boiler</p> <p>Design features and system configurations of operational control equipment for electrical motors</p> <p>Design features of high-voltage installations</p> <p>Features of hydraulic and pneumatic control equipment</p>	<p>Examination and assessment of evidence obtained from one or more of the following:</p> <p>.1 approved in-service experience</p> <p>.2 approved training ship experience</p> <p>.3 approved simulator training, where appropriate</p> <p>.4 approved laboratory equipment training</p>	<p>Operation of equipment and system is in accordance with operating manuals</p> <p>Performance levels are in accordance with technical specifications</p>
<p>Manage trouble-shooting, restoration of electrical and electronic control equipment to operating condition</p>	<p><i>Practical knowledge</i></p> <p>Troubleshooting of electrical and electronic control equipment</p> <p>Function test of electrical, electronic control equipment and safety devices</p> <p>Troubleshooting of monitoring systems</p> <p>Software version control</p>	<p>Examination and assessment of evidence obtained from one or more of the following:</p> <p>.1 approved in-service experience</p> <p>.2 approved training ship experience</p> <p>.3 approved simulator training, where appropriate</p> <p>.4 approved laboratory equipment training</p>	<p>Maintenance activities are correctly planned in accordance with technical, legislative, safety and procedural specifications</p> <p>Inspection, testing and troubleshooting of equipment are appropriate</p>

**Function: Maintenance and repair at the management level**

Column 1	Column 2	Column 3	Column 4
Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Manage safe and effective maintenance and repair procedures	<p><i>Theoretical knowledge</i></p> <p>Marine engineering practice</p> <p><i>Practical knowledge</i></p> <p>Manage safe and effective maintenance and repair procedures</p> <p>Planning maintenance, including statutory and class verifications</p> <p>Planning repairs</p>	<p>Examination and assessment of evidence obtained from one or more of the following:</p> <p>.1 approved in-service experience</p> <p>.2 approved training ship experience</p> <p>.3 approved workshop training</p>	<p>Maintenance activities are correctly planned and carried out in accordance with technical, legislative, safety and procedural specifications</p> <p>Appropriate plans, specifications, materials and equipment are available for maintenance and repair</p> <p>Action taken leads to the restoration of plant by the most suitable method</p>
Detect and identify the cause of machinery malfunctions and correct faults	<p><i>Practical knowledge</i></p> <p>Detection of machinery malfunction, location of faults and action to prevent damage</p> <p>Inspection and adjustment of equipment</p> <p>Non-destructive examination</p>	<p>Examination and assessment of evidence obtained from one or more of the following:</p> <p>.1 approved in-service experience</p> <p>.2 approved training ship experience</p> <p>.3 approved simulator training, where appropriate</p> <p>.4 approved laboratory equipment training</p>	<p>The methods of comparing actual operating conditions are in accordance with recommended practices and procedures</p> <p>Actions and decisions are in accordance with recommended operating specifications and limitations</p>
Ensure safe working practices	<p><i>Practical knowledge</i></p> <p>Safe working practices</p>	<p>Examination and assessment of evidence obtained from one or more of the following:</p> <p>.1 approved in-service experience</p> <p>.2 approved training ship experience</p> <p>.3 approved laboratory equipment training</p>	<p>Working practices are in accordance with legislative requirements, codes of practice, permits to work and environmental concerns</p>

**Function: Controlling the operation of the ship and care for persons on board at the management level**

Column 1	Column 2	Column 3	Column 4
Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Control trim, stability and stress	<p>Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability</p> <p>Knowledge of the effect on trim and stability of a ship in the event of damage to, and consequent flooding of, a compartment and countermeasures to be taken</p> <p>Knowledge of IMO recommendations concerning ship stability</p>	<p>Examination and assessment of evidence obtained from one or more of the following:</p> <p>.1 approved in-service experience</p> <p>.2 approved training ship experience</p> <p>.3 approved simulator training, where appropriate</p>	<p>Stability and stress conditions are maintained within safety limits at all times</p>
Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea, security and protection of the marine environment	<p>Knowledge of relevant international maritime law embodied in international agreements and conventions</p> <p>Regard shall be paid especially to the following subjects:</p> <p>.1 certificates and other documents required to be carried on board ships by international conventions, how they may be obtained and the period of their legal validity</p> <p>.2 responsibilities under the relevant requirements of the International Convention on Load Lines, 1966, as amended</p> <p>.3 responsibilities under the relevant requirements of the International Convention for the Safety of Life at Sea, 1974, as amended</p>	<p>Examination and assessment of evidence obtained from one or more of the following:</p> <p>.1 approved in-service experience</p> <p>.2 approved training ship experience</p> <p>.3 approved simulator training, where appropriate</p>	<p>Procedures for monitoring operations and maintenance comply with legislative requirements</p> <p>Potential non-compliance is promptly and fully identified</p> <p>Requirements for renewal and extension of certificates ensure continued validity of survey items and equipment</p>

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<b>Competence</b>	<b>Knowledge, understanding and proficiency</b>	<b>Methods for demonstrating competence</b>	<b>Criteria for evaluating competence</b>
Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and protection of the marine environment (continued)	<p>.4 responsibilities under the International Convention for the Prevention of Pollution from Ships, as amended</p> <p>.5 maritime declarations of health and the requirements of the International Health Regulations</p> <p>.6 responsibilities under international instruments affecting the safety of the ships, passengers, crew or cargo</p> <p>.7 methods and aids to prevent pollution of the environment by ships</p> <p>.8 knowledge of national legislation for implementing international agreements and conventions</p>		
Maintain safety and security of the vessel, crew and passengers and the operational condition of life-saving, fire-fighting and other safety systems	<p>A thorough knowledge of life-saving appliance regulations (International Convention for the Safety of Life at Sea)</p> <p>Organization of fire and abandon ship drills</p> <p>Maintenance of operational condition of life-saving, fire-fighting and other safety systems</p> <p>Actions to be taken to protect and safeguard all persons on board in emergencies</p> <p>Actions to limit damage and salve the ship following fire, explosion, collision or grounding</p>	Examination and assessment of evidence obtained from practical instruction and approved in-service training and experience	Procedures for monitoring fire-detection and safety systems ensure that all alarms are detected promptly and acted upon in accordance with established emergency procedures

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Develop emergency and damage control plans and handle emergency situations	<p>Ship construction, including damage control</p> <p>Methods and aids for fire prevention, detection and extinction</p> <p>Functions and use of life-saving appliances</p>	Examination and assessment of evidence obtained from approved in-service training and experience	Emergency procedures are in accordance with the established plans for emergency situations
Use leadership and managerial skills	<p>Knowledge of shipboard personnel management and training</p> <p>A knowledge of international maritime conventions and recommendations, and related national legislation</p> <p>Ability to apply task and workload management, including:</p> <ul style="list-style-type: none"> <li>.1 planning and coordination</li> <li>.2 personnel assignment</li> <li>.3 time and resource constraints</li> <li>.4 prioritization</li> </ul> <p>Knowledge and ability to apply effective resource management:</p> <ul style="list-style-type: none"> <li>.1 allocation, assignment, and prioritization of resources</li> <li>.2 effective communication on board and ashore</li> <li>.3 decisions reflect consideration of team experience</li> </ul>	<p>Assessment of evidence obtained from one or more of the following:</p> <ul style="list-style-type: none"> <li>.1 approved training</li> <li>.2 approved in-service experience</li> <li>.3 approved simulator training</li> </ul>	<p>The crew are allocated duties and informed of expected standards of work and behaviour in a manner appropriate to the individuals concerned</p> <p>Training objectives and activities are based on assessment of current competence and capabilities and operational requirements</p> <p>Operations are demonstrated to be in accordance with applicable rules</p> <p>Operations are planned and resources are allocated as needed in correct priority to perform necessary tasks</p> <p>Communication is clearly and unambiguously given and received</p>

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Use leadership and managerial skills <i>(continued)</i>	<p>.4 assertiveness and leadership, including motivation</p> <p>.5 obtaining and maintaining situation awareness</p> <p>Knowledge and ability to apply decision-making techniques:</p> <p>.1 situation and risk assessment</p> <p>.2 identify and generate options</p> <p>.3 select course of action</p> <p>.4 evaluation of outcome effectiveness</p> <p>Development, implementation, and oversight of standard operating procedures</p>		<p>Effective leadership behaviours are demonstrated</p> <p>Necessary team member(s) share accurate understanding of current and predicted vessel state and operational status and external environment</p> <p>Decisions are most effective for the situation</p> <p>Operations are demonstrated to be effective and in accordance with applicable rules</p>