

**Minimum standard of competence for MEC 2 <3000 kW (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<br><i>(continued)</i>   | Refrigerators and refrigeration cycle<br><br>Physical and chemical properties of fuels and lubricants<br><br>Technology of materials<br><br>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><br>Start up and shut down main propulsion and auxiliary machinery, including associated systems<br><br>Operating limits of propulsion plant<br><br>The efficient operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery<br><br>Functions and mechanism of automatic control for main engine<br><br>Functions and mechanism of automatic control for auxiliary machinery including but not limited to:<br><br>.1 generator distribution systems<br><br>.2 steam boilers<br><br>.3 oil purifier<br><br>.4 refrigeration system<br><br>.5 pumping and piping systems<br><br>.6 steering gear system<br><br>.7 cargo-handling equipment and deck machinery | Examination and assessment of evidence obtained from one or more of the following:<br><br>.1 approved in-service experience<br><br>.2 approved training ship experience<br><br>.3 approved simulator training, where appropriate<br><br>.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<br><br>Checks of pressures, temperatures and revolutions during the start-up and warm-up period are in accordance with technical specifications and agreed work plans<br><br>Surveillance of main propulsion plant and auxiliary systems is sufficient to maintain safe operating conditions<br><br>The methods of preparing the shutdown, and of supervising the cooling down of the engine are the most appropriate<br><br>The methods of measuring the load capacity of the engines are in accordance with technical specifications<br><br>Performance is checked against bridge orders<br><br>Performance levels are in accordance with technical specifications |

| <b>Column 1</b>                                 | <b>Column 2</b>  | <b>Column 3</b>  | <b>Column 4</b>  |
|---|--|--|--|
| <b>Competence</b>                               | <b>Knowledge, understanding and proficiency</b>                            | <b>Methods for demonstrating competence</b>  | <b>Criteria for evaluating competence</b>  |
| 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:<br><br>.1 approved in-service experience<br><br>.2 approved training ship experience<br><br>.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> <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> </ul> | <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> <ul style="list-style-type: none"> <li>.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</li> <li>.2 responsibilities under the relevant requirements of the International Convention on Load Lines, 1966, as amended</li> <li>.3 responsibilities under the relevant requirements of the International Convention for the Safety of Life at Sea, 1974, as amended</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> </ul> | <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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| <p>Monitor and control compliance with legislative requirements and measures to ensure safety of life at sea and protection of the marine environment<br/>(continued)</p> | <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> |   |  |
| <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>               | <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>  | <p>Examination and assessment of evidence obtained from practical instruction and approved in-service training and experience</p> | <p>Procedures for monitoring fire-detection and safety systems ensure that all alarms are detected promptly and acted upon in accordance with established emergency procedures</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>   |
| 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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|--|---|--------------------------------------|---|
| Competence   | Knowledge, understanding and proficiency  | Methods for demonstrating competence | Criteria for evaluating competence  |
| Use leadership and managerial skills<br><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> |