

## Competency Framework for Marine Engineer Class 6



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## Function: Operate Vessel Machinery and Systems

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
<b>Diesel engines.</b>  <b>The layout, function and care required.</b>	1. Common systems and components.	Oral and written examination, and assessment by observation recorded in an approved task book. Task book criteria are marked with an asterisk (*).	Demonstrates knowledge of: 4 & 2 stroke cycle, principal components, location and functions.
	2. Fuel System		<ul style="list-style-type: none"> <li>Identifies key components and describes their purpose, including: diesel supply from fuel tank to injectors, filters, pumps and bleed points, identifying faulty injectors, for both common rail and jerk type systems</li> <li>Describes the operation of the diesel injector</li> <li>Primes the diesel fuel system and removes air</li> <li>Describes bunkering and fuel transfer procedures</li> <li>Bunkers a vessel without spill and according to the bunkering plan</li> </ul>
	3. Lubrication System		<ul style="list-style-type: none"> <li>Identifies key components and describes their purpose, including: layout of a typical lubrication system, types of oil &amp; checking oil, reasons for abnormal oil pressure and the action to take to correct, including fuel and water contamination.</li> <li>Discusses the dangers of fuel contamination and describes action to take to correct</li> <li>Describes maintenance of a clean oil supply</li> <li>Conducts a oil lubrication oil change</li> </ul>
	4. Air System		Identifies key components and describes their purpose, including: filters, turbo charger, blowers, exhaust system and exhaust colour diagnosis.

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	5. Cooling System		Identifies key components and describes their purpose, including: typical raw water cooling system, its components and functions, Impeller replacement, system blockages and rectification, anodes, anti-siphoning valves, typical fresh water cooling system, its components and functions. Impeller replacement, heat exchangers, the importance of correct corrosion inhibitor, thermostat checking and replacement and keel-cooling systems.
	6. Electrical System		<ul style="list-style-type: none"> <li>• Describes safe electrical practices. Identifies key components and describes their purpose, including: batteries, starting systems, glow plugs, alternator, charging system, drive-belt adjustments, fuses and circuit breakers.</li> <li>• Sketches a typical DC and AC distribution system and describes and explains the protection devices</li> <li>• Describes safe electrical practices including the principles and use of Isolating transformers, Residual Current Devices, and certification and use of hand tools</li> </ul>
	7. Starting Systems		<ul style="list-style-type: none"> <li>• Describes the electrical and air start systems found on a vessel of this class</li> <li>• States the reasons for failure to start and state actions to take to make emergency start arrangements</li> </ul>
	8. Propellers & Stern Glands		Identifies key components and describes their purpose, including: shaft, thrust arrangements, stern glands and flexible couplings.
	9. Gearboxes		<ul style="list-style-type: none"> <li>• Identifies key components and describes their purpose</li> <li>• Describes the care of the gearbox and emergency arrangements</li> <li>• Describes the daily checks required</li> </ul>

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	10. Engine and thrust bearing mountings		<ul style="list-style-type: none"> <li>Identifies key components and describes their purpose</li> </ul>
	11. Control systems		<ul style="list-style-type: none"> <li>Identifies key components and describes their purpose</li> <li>Describes back-up control systems</li> <li>Describes safety features including Alarms system interlocks and limp home modes</li> </ul>
	12. Steering systems		<ul style="list-style-type: none"> <li>Describes simple mechanical and hydraulic steering systems.</li> <li>Describes the check made to these systems and the emergency steering gear</li> </ul>
	13. Equipment		<ul style="list-style-type: none"> <li>Describes safe use of winches and windlasses</li> <li>Describes a basic fridge system and the safety precautions when running and maintaining.</li> </ul>
	14. System Safety		<ul style="list-style-type: none"> <li>Lists PPE to be used in the machinery space</li> <li>Demonstrates awareness of engine room hazards and describes hazard identification and onboard procedures for elimination, isolation and minimisation, including, heat, pressures, slipping, moving machinery, guards, hand tools, common onboard chemicals for cleaning and maintenance.</li> <li>Defines confined/enclosed spaces and states the hazards. Describes the procedures for entering</li> </ul>
<b>Operational procedures.</b>	1. Engine Room Watchkeeping		<ul style="list-style-type: none"> <li>Describes the records to be kept in the engine room log book and how these can assist in the early diagnosis of engine faults</li> <li>Describes the purpose and management of the 'Maintenance Plan' as required by the MOSS Maritime transport Operator Plan (MTOP)</li> <li>Describes the importance of keeping the Master informed of the running condition of the vessel</li> </ul>

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	<p>2. Machinery operating procedures are described.</p>		<p>Describes normal operational procedures for engine as described in the MTOP</p>
	<p>3. Safe working practices are demonstrated.</p>		<p>Operates vessel's propelling machinery while maintaining safe working practices and situational awareness.</p>
	<p>4. Safe working practices with lifting gear is described</p>		<ul style="list-style-type: none"> <li>• Describes safety precautions to be taken when operating equipment: winches, windlass, lifting gear, ramps and davits.</li> <li>• Describes precautions to be taken before using lifting gear, including checking of lifting gear and load</li> <li>• Describes procedures for safe use of lifting gear, including signals, entrapment and identification of site specific hazards.</li> <li>• Understands the requirements of Maritime Rule Part 49</li> </ul>
<p><b>Operate and monitor a vessel's engines and auxiliary equipment.</b></p>	<p>1. Load/check spares, fuel, lubricants and fresh water for intended voyage.</p>		<ul style="list-style-type: none"> <li>• Prepare vessel in accordance with the vessel's MTOP, including knowledge of fuel and lubricant piping systems, valves, pumps and safety arrangements.</li> <li>• Loads fuel and lubricants are in accordance with the vessel's safety management plan</li> <li>• Checks spare parts and ensures they are sufficient to cover emergencies and are in accordance with the vessel operating practices</li> <li>• Fills fresh water tanks in accordance with the vessel operating practices.</li> <li>• Completes documentation in accordance with the vessel's MTOP</li> </ul>

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	<p><b>2.</b> Pre-start checks of engines and auxiliary equipment</p>		<p>Completes pre-start checks in accordance with the vessel's MTO, including where applicable:</p> <ul style="list-style-type: none"> <li>• *Propulsion engine/s, including: fuel, oil and cooling water header tank levels, valves, V-belts and hoses</li> <li>• *Auxiliary equipment including: generators, batteries, bilge pumps, strainers, bilge water levels and alarms, refrigeration, hydraulic system, fire-fighting system, electrical system (fuses/circuit breakers and switchboards)</li> </ul>
	<p><b>3.</b> Start and monitor engines and auxiliary equipment</p>		<p>*Starts engines and auxiliary equipment and monitors gauges and instrument readings during warm-up in accordance with the manufacturer's operating instructions</p>
	<p><b>4.</b> Test alarms and safety arrangements</p>		<p>*Tests alarms in accordance with the manufacturer's operating instructions</p>
	<p><b>5.</b> Emergency starting</p>		<p>Describes procedures in accordance with the vessel's MTO</p>
	<p><b>6.</b> Shut-down of engines and auxiliary equipment</p>		<p>*Follows procedures in accordance with the vessel's MTO</p>

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<b>Monitor the operation of the vessel's engines, drive train, and auxiliary equipment.</b>	<b>1.</b> Operate vessel's engines and equipment		*Operates machinery to maintain maximum performance, observing safety precautions, in accordance with the manufacturer's operating instructions
	<b>2.</b> Changes in operational performance		*Monitors and adjusts any changes in accordance with the vessel's MTOP, and identifies likely causes including: heavy weather, reduced visibility, fishing, towing, breakdowns, low fuel, propeller and hull damage.
	<b>3.</b> Environmental protection		Describes bunkering and fuel transfer procedures. Bunker a vessel without spill and according to the bunkering plan. Oil Spill Contingency Plan is described. Penalties associated with accidental discharge of fuels, oils and sewage from the vessel are described. Procedures for the treatment and discharge of sewage, and black and grey water from the vessel are described. Recording of fuel/oil/sewage movement on/off the vessel is demonstrated.

## Function: Maintain Vessel Machinery and Systems

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
<b>Maintain propulsion machinery.</b>	1. Demonstrate knowledge of the requirements under safety management for preventative maintenance and inspection of equipment	Oral and written examination and assessment by observation recorded in an approved task book. Task book criteria are marked with an asterisk (*).	Checks and records in accordance with the vessel's Maintenance Plan, the manufacturers' recommended guidelines and accepted industry practice.
	2. Conduct planned maintenance		Carries out planned maintenance and inspection: <ul style="list-style-type: none"> <li>• Oil change</li> <li>• Fuel filters</li> <li>• Bleeding air from fuel</li> <li>• Battery checks and top-up</li> <li>• Inspects electrical switchboards, wiring, fuses and circuit breakers</li> <li>• Replaces drive belts</li> </ul>
<b>Maintenance and repairs on a vessel's mechanical and electrical systems.</b>	Select and prepare stores and spare parts.		Selects stores and spares for scheduled maintenance to mechanical and electrical systems in accordance with manufacturers' instructions

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<b>Scheduled maintenance.</b>	1. Scheduled maintenance tasks are performed.		Tasks to include where possible: <ul style="list-style-type: none"> <li>• *Electrical systems: alternators or generators, batteries; navigation lights; switch boards, fuses and fuse links, circuit breakers; power points, switches and lights.</li> <li>• *Mechanical systems: propulsion system (main engine, gearbox, shafting, sterntube and propeller), bilge system (pumps and motors, strainers, valves, piping); refrigeration plant; hydraulic system (pumps and motors, piping, control and other valves, filters, header tanks and piping); deck machinery (trawl winches, anchor windlass and anchors, deck cranes); steering systems (wheel, means of transmission from wheel to rudder, steering motor, rudder, emergency steering); fire pumps, valves and piping, hoses and nozzles.</li> <li>• Test and maintain fishing equipment if fitted.</li> </ul>
	2. Systems are tested.		*Test systems before return to service in accordance with manufacturers' instructions.
	3. Complete documentation.		*Completes documentation, and files in accordance with the vessel's MTOP
	4. Handle materials safely.		*Handles, stores and secures maintenance materials and equipment in accordance with vessel's MTOP
<b>Fault diagnosis.</b>	Diagnose faults in mechanical and electrical systems.		*Diagnoses faults including: Mechanical systems – change in oil pressure, overheating, lack of fuel, discolouration of exhaust, uneven running, unusual noises, failure to operate, fault indicating light or alarm. Electrical systems – failure to operate, fault indicating light or alarm.

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<b>Unscheduled maintenance.</b>	Perform unscheduled maintenance tasks.		<p>*Performs unscheduled maintenance and repair tasks where possible to mechanical and electrical systems in accordance with manufacturer's instructions including:</p> <ul style="list-style-type: none"> <li>*Identifies, removes, replaces and tests mechanical and electrical components requiring replacement</li> <li>*Repairs to mechanical systems allow the vessel to continue to operate without causing further damage to the vessel and/or its engines and equipment</li> <li>*Performs any improvised repairs to rectify component failures where replacement or full repair is not possible, to ensure continued safety of the vessel, its crew and passengers, in accordance with the vessel's MTOP.</li> </ul>
<b>Maintain outboard motor.</b>			Cleaning, Lubrication, Greasing, Electrics, Winter storage
<b>Operate Auxiliary Equipment</b>	Operate ancillary engine room equipment <i>-Bilge system</i>		<ul style="list-style-type: none"> <li>Describes the layout of a typical bilge system</li> <li>Describes the principles of suction and the reasons for failure of the system</li> <li>Identifies the likely causes of a rise in bilge level and states the prevention measures to be taken</li> <li>States the reasons for bilge ventilation</li> <li>Describes the causes of back flooding and state the action to take if occurs.</li> <li>Operates a vessel bilge system</li> </ul>

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	Operate ancillary engine room equipment – <i>Fire system</i>		<ul style="list-style-type: none"> <li>• Describes the procedures for identifying fire and explosion hazards, and the actions to take to prevent fire on the vessel.</li> <li>• Describes the layout and maintenance required of a typical vessel fire main system</li> <li>• Describes the principle of operation, use, location and maintenance of a CO2, Dry Powder and Foam extinguisher</li> <li>• Describes the action that may be required as Engineer as part of the vessel Fire Party</li> <li>• Demonstrates basic fire fighting techniques</li> </ul>
	Operate ancillary engine room equipment – <i>Auxiliary generator systems</i>		<ul style="list-style-type: none"> <li>• Describes the operation of auxiliary generation for an AC power system</li> <li>• Describes the safety features required of the system</li> <li>• Describes the operation, limitations and cautions to be undertaken when using inverters</li> </ul>

## Function: Slipway Operations

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
<b>Slipway</b>	Prepare the vessel for the slip	Oral and written examination and assessment by observation recorded in an approved task book.	<ul style="list-style-type: none"> <li>Describes the preparation that needs to be carried out before slipping the vessel, including preparing a list of repairs and survey work requirements</li> <li>Describes the precautions to be taken to keep the vessel stable when going up and coming off the slipway</li> </ul>
	Slipway Safety		Describes the precautions to take to keep safe including: fire main connections, confined spaces, use of PPE, and MSDS.
	Survey Requirements		<ul style="list-style-type: none"> <li>Describes the checks and maintenance that should be carried out when the vessel is on the slipway</li> <li>Describes the checks that are required by the Maritime Rules for the hull, through hull fittings, shafting and drive gear and steering gear</li> </ul>