

Competency Framework for Marine Engineer Class 4

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Function: Diesel Engines and Systems

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
<p>Diesel engines</p> <p>The components, function and care required.</p>	<p>1. Common systems and components</p>	<p>Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination</p>	<p>Describes the cycle of events in both 2 and 4 stroke engines.</p> <p>Draws a timing diagram for each.</p> <p>Names principal engine components and can describe location and functions of these components.</p> <p>Is able to sketch the construction of these components.</p> <p>Describes differences between medium and slow speed diesel engines including construction and uses of each.</p> <p>Describes the construction and states the function of the following engine components: bedplate, crankcase, crankshaft, bearings, camshaft, connecting rod, crosshead, gudgeon pin, piston, piston rod, cylinder liners, cylinder head and valves.</p> <p>Explains how astern running of a ship is achieved using a direct reversing main engine.</p>

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Diesel engines cont.	2. Fuel system	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	<p>Describes and sketches a diesel supply system from fuel tank to injectors.</p> <p>Identifies key components and describes their purpose including filters, pumps and bleed points, for both common rail and jerk type systems.</p> <p>Describes:</p> <ul style="list-style-type: none"> • The construction of system components. • The safety features of the fuel system. • The operation of the diesel injector, electronic and mechanical. • How fuel pumps are timed and calibrated. • The symptoms, causes of and remedies for typical fuel pump and injector defects. • Priming the diesel fuel system and removal of air. • The importance of maintaining a clean fuel supply. • The significance of fuel oil viscosity, relative density and flashpoint. • The dangers of fuel contamination and describes action to take to correct. • Modern high pressure fuel systems and associated safety issues. • How fuel consumption may be reduced in an emergency.
	3. Lubrication system		<p>Describes and sketches the layout of a typical lubricating oil system including the flowpath. Identifies key components of a lubricating oil system and describes their purpose.</p> <p>Describes types of oil and testing of oil.</p> <p>Describes:</p> <ul style="list-style-type: none"> • The construction of system components. • The purpose of lubricating oil and states its main desirable properties.

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Diesel engines cont.		Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	<ul style="list-style-type: none"> • The dangers of lubricating oil contamination and describes action to take to correct. • Reasons for lubricating oil deterioration and how it may be detected, including fuel and water contamination. • The necessity for and maintenance of a clean oil supply. • Conducting a lubricating oil change. • The causes of abnormal oil pressure developing and state the emergency action which must be taken.
	4. Air system		<p>Identifies key components and describes their purpose, including: filters, turbo charger, blowers, exhaust system and exhaust colour diagnosis.</p> <p>Demonstrates an understanding of the principles of supercharging diesel engines and the methods used.</p>
	5. Cooling system		<p>Describes and sketches a typical raw water system including flowpath.</p> <p>Describes and sketches a typical fresh water cooling system including flow path.</p> <p>Identifies key components of both systems and describes their purpose including sacrificial anodes, anti-siphoning valves, heat exchangers and thermostats.</p> <p>Describes pump impeller replacement, thermostat checking and replacement, and the need for replacement of anodes.</p> <p>Describes likely faults with each of these systems, and actions to be taken in the event of failures including blockages.</p> <p>Describes:</p> <ul style="list-style-type: none"> • The construction of individual components in cooling water systems. • The necessity for a header tank.

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Diesel engines cont.		Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	<ul style="list-style-type: none"> • The system care and maintenance required including water testing and treatment. • The reasons an engine may overheat and the action to be taken.
	6. Electrical system		<p>Describes and sketches basic D/C and A/C circuits including circuit protection, and states the hazards and safety features of both.</p> <p>Describes safe electrical practices including isolation, lock outs and use of hand tools.</p> <p>Identifies key components and describes their purpose, including:</p> <ul style="list-style-type: none"> • batteries • starting systems • glow plugs • alternator • charging system • drive-belt adjustments • fuses; and • circuit breakers. <p>Describes a simple ignition system for petrol engines and the methods of fault finding.</p>
	7. Starting systems		<p>Describes:</p> <ul style="list-style-type: none"> • The electrical, hydraulic and air start systems found on a vessel. • The routine maintenance required by each system and problems which arise with each system. • The safety features of starting systems. • The reasons for failure to start and state actions to take to make emergency start arrangements.

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<i>Diesel engines cont.</i>		Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	<ul style="list-style-type: none"> The danger and means of avoidance of hydraulic effect when starting engines.
	8. Control systems		<p>Identifies key components for automatic and remote control both on the bridge and in machinery spaces and describes their purpose.</p> <p>Describes:</p> <ul style="list-style-type: none"> Back-up control systems and manual overrides, and how to bring them into effect quickly when required. Safety features including Alarms system interlocks. The construction, operation and purpose of simple mechanical governors and overspeed trips. <p>Demonstrates an awareness of modern CPU based engine control systems and associated operating requirements.</p>

Function: Vessel Structure and Systems

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Apply vessel principal structural member description and function to vessel operations including fishing vessels (adapted from IMO guidance)	1. Identify the principle structural members of a vessel	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	Explains how the principal structural members of vessels are correctly identified taking into account the category of vessel concerned, including its design features and the construction materials.
	2. Identify the proper names of the various parts		Describes how the location and function of the various parts of vessels are identified in accordance with requirements for the safe operation of the vessel concerned.
	3. Identify damage control techniques		Explains how damage control techniques and procedures are identified, incorporating the vessel's contingency plan where appropriate.
Ship's machinery - components, function and care required	1. Propellers, shafting and stern glands		Identifies key components and describes their purpose, including: shaft, thrust arrangements, stern glands and flexible couplings. Describes and sketches the layout of the shaft system between engine and propeller including stern tube assembly. Describes: <ul style="list-style-type: none"> The attention required by the shaft system before and during running.

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Ship's machinery - components, function and care required cont.	<i>Propellers, shafting and stern glands cont.</i>	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	<ul style="list-style-type: none"> • The possible reasons for overheating of shaft bearings and remedial action to be taken. • The necessity for, and construction of, the thrust bearing either integral with or independent of the gearbox. • The maintenance and attention required by the thrust bearing. • The operation of variable pitch propellers. Describes with the aid of sketches typical tail shaft sealing and lubrication arrangements
	2. Gearboxes and clutches		Identifies key components and describes their purpose. Describes: <ul style="list-style-type: none"> • The maintenance and attention required by gearboxes and clutches. • The operation of common gearbox types and explains any emergency running arrangements provided. • The need for reduction and reversing gearboxes. • The construction and operation of clutches. • The daily checks required. Reasons for excessive vibration developing in the transmission system, and the action to be taken should this occur.
	3. Engine and thrust bearing mountings		<ul style="list-style-type: none"> • Identifies key components and describes their purpose.

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Ship's machinery - components, function and care required cont.	4. Steering systems	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	Describes and sketches simple mechanical and hydraulic steering systems. Describes: <ul style="list-style-type: none"> • The checks made to these systems including emergency steering gear. • The arrangements provided for emergency steering. • What maintenance and attention is required by the steering gear. Describes and sketches a typical rudder assembly and how the mass of the rudder is supported and how its movement is limited.
	5. Steam systems		Demonstrates an understanding of: <ul style="list-style-type: none"> • The construction, safe operation and maintenance of boilers and economisers. • The layout, safe operation and maintenance of steam and feed water systems. • Fittings and safety devices fitted to boilers, economisers, steam systems and associated equipment. • The causes, effects and prevention of water hammer. • The causes, effects and detection of feedwater contamination by seawater or oil. • Feed water testing and treatment. • Describes the construction of a boiler water level gauge glass and explains how the gauge is tested.
	6. Compressed air and pressure vessels		Describes: <ul style="list-style-type: none"> • A typical compressed air system including starting and control air systems. • The construction and maintenance of air receivers, fittings and safety devices.

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Ship's machinery - components, function and care required cont.	7. Electrical system	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	<ul style="list-style-type: none"> • The operation and maintenance of air compressors. Describes: <ul style="list-style-type: none"> • How batteries are installed, their routine maintenance and the precautions to be taken. • Common electrical faults, their causes and symptoms including monitoring for corrosion, moisture and defective connections and sketches a typical DC and AC supply and distribution system, and describes and explains the protection devices. • Emergency supply and distribution. • Switching arrangements for main propulsion and auxiliary machinery including standby and emergency equipment. • The basic operating principles of generators (AC and DC) and their maintenance requirements. • The routine electrical equipment maintenance which is required. • The operation, limitations and cautions to be undertaken when using inverters. • Safe electrical practices including the principles and use of Isolating transformers, Residual Current Devices, and certification and use of hand tools. Explains the need to ensure compatibility of shore supply to ships power.

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Hydraulic and pneumatic systems (Adapted from IMO guidance)	Operate and maintain pumping systems (see also Operate auxiliary equipment – bilge, ballast and fire systems)	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	Describes: <ul style="list-style-type: none"> • How hydraulic and pneumatic systems are operated and maintained in accordance with operational guidelines and manufacturer’s recommendations. • The use of main and standby hydraulic and pneumatic power and servo-mechanism units. The operation, calibration, testing, maintenance and cleanliness of the system.
Pumping systems (Adapted from IMO guidance)			Describes how pumps and piping systems are operated and maintained in accordance with operational requirements and specified procedures. Explains how discharges are monitored in accordance with requirements specified for the prevention of pollution. Demonstrates knowledge of the operation and maintenance of manual, plunger, centrifugal, geared and impeller operated pumps. <ul style="list-style-type: none"> • Demonstrates knowledge of piping systems and pipe fittings including measurement, replacement and servicing.
Refrigeration systems (adapted from IMO guidance)	Operate and maintain refrigeration systems		Describes: <ul style="list-style-type: none"> • How refrigeration systems are operated and maintained in accordance with manufacturers’ specifications and legal requirements. Emergency evacuation and retrieval procedures for CFC gases are applied as specified. <ul style="list-style-type: none"> • The dangers of toxic gases emanating from refrigeration systems and holds are identified. The basic principles of a refrigeration system.

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<p>Catch handling equipment (adapted from IMO guidance)</p>	<p>Operate and maintain catch handling equipment and deck machinery</p>	<p>Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination</p>	<ul style="list-style-type: none"> • Describes how catch handling equipment and deck machinery is operated and maintained in accordance with specified operational procedures and manufacturers' recommendations.

Function: Watchkeeping and Operation

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Operate vessel machinery	Machinery operating procedures are described.	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	Describes normal operational procedures for vessel's machinery as described in the Maritime Transport Operator Plan
Operate and monitor a vessel's engines and auxiliary equipment	1. Load/check spares, fuel, lubricants and fresh water for intended voyage.		Describes: <ul style="list-style-type: none"> • Preparation of a vessel in accordance with the vessel's MTOP, including knowledge of fuel and lubricant piping systems, cooling systems, valves, pumps and safety arrangements. • Loading of fuel and lubricants in accordance with the vessel's safety management plan • Checking of spare parts and ensuring they are sufficient to cover emergencies and are in accordance with the vessel operating practices • Filling fresh water tanks in accordance with the vessel operating practices. • Completing documentation in accordance with the vessel's MTOP
	2. Pre-start checks of engines and auxiliary equipment		Describes completion of pre-start checks in accordance with the vessel's MTOP, including: <ul style="list-style-type: none"> • Propulsion engine/s, including: fuel, oil and cooling water header tank levels, valves, V-belts and hoses. • 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).
3. Start and monitor engines and auxiliary equipment	Describes how to start engines and auxiliary equipment and monitor gauges and instrument readings during warm-up in accordance with the manufacturer's operating instructions.		

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Operate and monitor a vessel's engines and auxiliary equipment cont.	4. Machinery safety equipment	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	Describes the purpose of: crankcase relief doors, bursting discs, oil mist detectors, engine shut-down devices (e.g. trips for low oil pressure, high water temperature).
	5. Test alarms and safety arrangements		Describes the action to be taken in the event of engine alarms, trips or oil mist detectors operating.
	6. Emergency starting		Describes how to test alarms in accordance with the manufacturer's operating instructions.
	7. Shut-down of engines and auxiliary equipment		Describes procedures in accordance with the vessel's MTOP.
	8. Operate vessel's engines and equipment		Explains how to follow procedures in accordance with the vessel's MTOP.
	9. Changes in operational performance		Describes how to operate machinery to maintain maximum performance, observing safety precautions, in accordance with the manufacturer's operating instructions.
Operate auxiliary equipment	1. Operate ancillary engine room equipment - bilge system		Demonstrates an understanding of vessel monitoring systems and an ability to read and interpret the information they provide.
			Explains how to monitor and adjust 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.
			<ul style="list-style-type: none"> • Describes and sketches the layout of a typical bilge system. • Describes the principles of suction and the reasons for failure of the system. • Identifies the likely causes of a rise in bilge level and states the prevention measures to be taken. • States the reasons for bilge ventilation. • Describes the causes of back flooding and state the action to take if it

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Operate auxiliary equipment cont.		Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	occurs.
	2. Operate ancillary engine room equipment - ballast system		<ul style="list-style-type: none"> Describes the operation of a vessel bilge system including use of an oily water separator (see also Environmental protection). Describes ballasting or ballasting procedures including those with regard to maintaining vessel stability. Describes precautions to be taken with regard to the environment when pumping out tanks or other spaces.
	3. Operate ancillary engine room equipment – auxiliary generator systems		<ul style="list-style-type: none"> Describes the operation of generators with regard to bringing on and off-line with the switchboard, including manual and automatic paralleling. Describes the safety features required of the system and precautions which need to be taken. <p>See also Electrical System.</p>
	4. Operate ancillary engine room equipment – fire system		<ul style="list-style-type: none"> Describes and sketches the layout of a typical vessel fire main system. Describes the operation, testing and maintenance required by a typical vessel fire main system.
	5. Operate ancillary engine room equipment – fire system cont.		<ul style="list-style-type: none"> Describes the operation and maintenance required of main and emergency fire pumps. Describes and sketches types of fixed fire-fighting systems. Describes the operation, testing and maintenance required by typical fixed fire-fighting systems.
Slipway	1. Prepare the vessel for the slip		<ul style="list-style-type: none"> Describes the preparation that needs to be carried out before slipping the vessel, including preparing a list of repairs and survey work requirements, the dipping and sounding of tanks. Describes the precautions to be taken to keep the vessel stable when going up and coming off the slipway including clear communication with the deck department.

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	2. Slipway safety	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	Describes the precautions to take to keep safe including: fire main connections, electrical connections, confined spaces, use of Personal Protective Equipment, and Material Safety Data Sheet.
	3. Survey requirements		<ul style="list-style-type: none"> • Describes the checks and maintenance that should be carried out when the vessel is on the slipway • Describes the checks that are required by the Maritime Rules for the hull, through hull fittings, shafting and drive gear and steering gear.

Function: Maintenance Procedures

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Maintenance procedures for vessel's machinery	1. Demonstrate knowledge of the requirements under safety management for preventative maintenance and inspection of equipment.	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	Demonstrates familiarity with checking and recording data and measurements in accordance with the vessel's Maintenance Plan, the vessel's Maritime Transport Operator Plan, the manufacturer's recommended guidelines and accepted industry practice.
	2. Conduct planned maintenance		Describes how to carry out planned maintenance and inspection including: <ul style="list-style-type: none"> • oil changes • fuel filters • bleeding air from fuel • battery checks and top-up • inspection of electrical switchboards, wiring, fuses and circuit breakers • replacing drive belts
Apply theoretical engineering principles to vessel systems operation, including fishing vessels (adapted from IMO Guidance)	Identify marine engineering terms applicable to vessel operating systems		Demonstrates adequate use of marine engineering terms to theoretically diagnose faults and develop solutions appropriate for vessel operating systems

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Fault diagnosis (adapted from IMO Guidance)	1. Apply theoretical fault finding outcomes to maintain vessel operating system	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	Explains how theoretical principles are applied to the development of maintenance schedules for vessel operating systems in accordance with operational requirement.
	2. Diagnose faults in mechanical and electrical systems		Describes how to diagnose faults including: <ul style="list-style-type: none"> 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.
Unscheduled maintenance	Perform unscheduled maintenance tasks		Describes procedures to perform unscheduled maintenance and repair tasks on mechanical and electrical systems in accordance with manufacturer's instructions and specified safety procedures including how to: <ul style="list-style-type: none"> Identify, remove, replace and test mechanical and electrical components requiring replacement . Carry out repairs to mechanical systems which allow the vessel to continue to operate without causing further damage to the vessel and/or its engines and equipment. Perform 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.
Procedure for maintenance and repairs on a vessel's mechanical and electrical systems	1. Select and prepare stores and spare parts	Describes how to select stores and spares for scheduled maintenance to mechanical and electrical systems in accordance with manufacturers' instructions.	
	2. Systems are tested.	Describes the testing of systems before return to service in accordance with manufacturers' instructions.	
	3. Complete	Explains how to complete documentation, and file in accordance with the	

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
<i>Procedure for maintenance and repairs on a vessel's mechanical and electrical systems cont.</i>	documentation	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	vessel's MTOP.
	4. Handle materials safely		Describes how to handle, store and secure maintenance materials and equipment in accordance with vessel's MTOP.

Function: Safety and Stability

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Safety awareness	System safety	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	<p>Lists Personal Protective Equipment to be used in the machinery space.</p> <p>Demonstrates awareness of engine room hazards.</p> <p>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.</p> <p>Defines confined/enclosed spaces and states the hazards, demonstrating appropriate awareness of the associated dangers.</p> <p>Describes the procedures for entering enclosed spaces including all precautions to be taken.</p>
Safe working practices	1. Apply safe working practices (adapted from IMO Guidance)		Describes how safe working practices, contingency and emergency procedures are developed in accordance with the operational requirements of vessel operating systems.
	2. Safe working practices are demonstrated (adapted from IMO Guidance)		Demonstrates an understanding of the operation of a vessel's machinery while maintaining safe working practices and situational awareness.
	3. Safe working practices with lifting gear and winches is		<p>Describes:</p> <ul style="list-style-type: none"> The safety precautions to be taken when operating equipment: winches,

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
	described	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	<p>windlass, lifting gear, ramps and davits.</p> <ul style="list-style-type: none"> • Precautions to be taken before using lifting gear, including checking of lifting gear and load. • Procedures for safe use of lifting gear, including signals, entrapment and identification of site specific hazards. • Understands the requirements of Maritime Rule Part 49. • The layout of a typical trawl winch and outlines the maintenance required. • The safety devices fitted to typical trawl winches, including the provision made for overload.
Maintain vessel stability (adapted from IMO guidance)	1. Use stability data, stability and trim tables and pre-calculated operating conditions		Describes how stability data, stability and trim tables and pre-calculated operating conditions are used in accordance with specifications.
	2. Identify the significance of weathertight and watertight integrity		Explains the significance of weathertight and watertight integrity for the safe operation of vessels.
	3. Describes management of vessel's tanks with regard to stability		Describes the management of fuel, oil and water tanks. Explains how such tanks can affect ship stability.
	4. Identify the significance of free surface effect		Explains the significance of free surface effect and how it may influence the safe operation of a vessel.
Apply safety and health procedures for vessel personnel	1. Apply safety and health precautions and procedures for vessel personnel on		<ul style="list-style-type: none"> • Describes how safety precautions and procedures relating to the activities of vessel personnel working on deck and in machinery spaces are applied.

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AA Adapted from IMO guidance)	board	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	<ul style="list-style-type: none"> Describes how safety precautions relating to the use of protective clothing and equipment are applied as appropriate for the category of vessel concerned.
	2. Identify safety precautions associated with the operation of fishing gear		Identifies safety precautions for fishing vessel personnel operating fishing gear as appropriate for the fishing method and category of fishing vessel concerned.
Principles and guidelines of the Code of Conduct for Responsible Fisheries (adapted from IMO guidance)	Explain the objectives of the Code of Conduct for Responsible Fisheries		Explains the objectives of the Code of Conduct for Responsible Fisheries in accordance with the guidelines of the code.
Apply fire prevention and fire-fighting techniques	Identify provisions concerning fire-fighting equipment, use of equipment and the application of fire safety procedures		<ul style="list-style-type: none"> Describes the procedures for identifying fire and explosion hazards, and the actions to take to prevent fire on the vessel. Describes basic fire fighting techniques. Describes the action that may be required as Engineer as part of the vessel Fire Party. Identifies fire-fighting provisions appropriate for the category of vessel concerned.
Respond to emergency situations involving vessel personnel (adapted from IMO guidance)	1. Follow emergency procedures specified in the vessel's contingency plans		Describes how emergency situation responses appropriate for the vessel in which qualifying service has or is being gained are identified and followed in accordance with the vessel's contingency plan.
	2. Identify relevant emergency situation duties and	Emergency duties and responsibilities are identified in accordance with contingency plans, including the appropriate action to be taken when	

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Respond to emergency situations involving vessel personnel <i>(adapted from IMO guidance)</i> Cont.	responsibilities	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	observing or receiving distress signals.
	3. Identify appropriate action to be taken following a fire or collision		Identifies the appropriate actions to be taken following a fire or collision in accordance with the recommended procedures.
	4. Indicate procedures to be followed in abandoning the vessel		Describes procedures to be followed in abandoning the vessel.
Respond to vessel emergency situations <i>(adapted from IMO guidance)</i>	Follow procedures for the temporary plugging of leaks		Demonstrates knowledge of the procedures to be followed to effect temporary repairs and the plugging of leaks, taking into consideration the structural material involved.
Operate and maintain emergency equipment			Demonstrates awareness of need for maintenance of emergency equipment in accordance with the specified requirements.

Function: Environment

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Environmental awareness	Environmental protection	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	Describes with reference to the MARPOL Convention where appropriate: <ul style="list-style-type: none"> • The discharge of bilge water including proper use of an oily water separator • Bunkering and fuel transfer procedures. • Bunkering a vessel without spill and according to the bunkering plan. • Oil Spill Contingency Plan. • Penalties associated with accidental discharge of fuels, oils and sewage from the vessel. • Procedures for the treatment and discharge of sewage, and black and grey water from the vessel. • Recording of fuel/oil/sewage movement on/off the vessel. • Explains how prevention of pollution from oil, smoke and garbage is achieved.
Prevent pollution of the marine environment by fishing vessels (adapted from IMO guidance)	Apply provisions of the International Convention for the Prevention of Pollution from Ships		Explains how the provision of the MARPOL Convention and the recommendations of the FAO Code of Conduct for Responsible Fisheries are applied to the operations of fishing vessels as appropriate to the operations of the category of fishing vessel concerned.
Responsible harvesting practices (adapted from IMO guidance)	1. Describe the effects of discards and by-catch		Describes the effects of discards and by-catch resulting from fishing operations as they relate to the fishery concerned and global fisheries.
	2. Identify the causes of		Identifies probable damage caused to fishery habitats through fishing activities

	habitat damage due to fishery operation	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	according to the size and type of fishing operation concerned.
	3. Describe the purpose of marine reserves		Describes the purpose of establishing marine reserves in accordance with the objectives indicated by the Code of Conduct for Responsible Fisheries.
Responsible fishing gear/ selectivity (adapted from IMO guidance)	Explain the importance of fishing gear selectivity		Explains the importance of fishing gear selectivity in accordance with the ratio of by-catch to target species catch in local fisheries.

Function: Management and Leadership

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
<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>(Source: Table A-III/2, STCW)</p>	<ol style="list-style-type: none"> 1. A thorough knowledge of life-saving appliance regulations (International Convention for the Safety of Life at Sea) 2. Organization of fire and abandon ship drills 3. Maintenance of operational condition of life-saving, fire-fighting and other safety systems 4. Actions to be taken to protect and safeguard all persons on board in emergencies 5. Actions to limit 	<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>

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
	damage and salvage the ship following fire, explosion, collision or grounding	Examination and assessment of evidence obtained from practical instruction and approved in-service training and experience	
Develop emergency and damage control plans and handle emergency situations (Source: Table A-III/2, STCW)	<ol style="list-style-type: none"> 1. Ship construction, including damage control 2. Methods and aids for fire prevention, detection and extinction 3. Functions and use of life-saving appliances 		Emergency procedures are in accordance with the established plans for emergency situations.
Conduct on board training and assessments (adapted from IMO guidance)	1. Conduct functional skill training arrangements		Describes how on board functional skill training arrangements are conducted in accordance with the specification of the relevant training plan.
	2. Make on board functional skill assessments		Describes how on board functional skill assessments are made in accordance with the specified learning outcomes.
Use leadership and managerial skills (Source: Table A-III/2, STCW)	<ol style="list-style-type: none"> 1. Knowledge of shipboard personnel management and training 2. A knowledge of international conventions and recommendations, 	<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</p>	

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
<p><i>Use leadership and managerial skills cont.</i></p> <p>(Source: Table A-III/2, STCW)</p>	<p>and related national legislation</p> <p>3. Ability to apply task and workload management, including:</p> <p>4. Planning and coordination</p> <p>5. Personnel assignment</p>	<p>Examination and assessment of evidence obtained from practical instruction and approved in-service training and experience</p>	<p>priority to perform necessary tasks.</p> <p>Communication is clearly and unambiguously given and received.</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>Ability to apply task and workload management, including (cont.):</p> <ul style="list-style-type: none"> • Time and resource constraints • Prioritisation <p>Knowledge and ability to apply effective resource management:</p> <ul style="list-style-type: none"> • Allocation, assignment and prioritisation of resources • Effective communication on board and ashore 		<p>Operations are demonstrated to be effective and in accordance with applicable rules.</p>

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
<p><i>Use leadership and managerial skills cont.</i></p> <p>(Source: Table A-III/2, STCW)</p>	<ul style="list-style-type: none"> • Decisions reflect consideration of team experience • Assertiveness and leadership, motivation <p>Obtaining and maintaining situation awareness</p> <hr/> <p>Knowledge and ability to apply decision-making techniques:</p> <ul style="list-style-type: none"> • Situation and risk assessment • Identify and generate options • Select course of action • Evaluation of outcome directives <p>Development, implementation, and oversight of standard operating procedures</p>	<p>Examination and assessment of evidence obtained from practical instruction and approved in-service training and experience</p>	<p>Operations are demonstrated to be effective and in accordance with applicable rules.</p>

Function: Mathematics and Electrotechnology

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Mathematics and electrotechnology	Theoretical knowledge of mathematics	Assessment of evidence obtained from approved training and approved in-service experience by way of written and oral examination	Demonstrate theoretical knowledge of mathematical subjects according to syllabus including: Arithmetic, Algebra, Graphs, Trigonometry, Geometry and Mensuration.
	Theoretical knowledge of electrotechnology		Demonstrate theoretical knowledge of electrotechnical subjects according to syllabus including: nature of electricity, electric currents, electric circuits, resistance, EMF, secondary cells, magnetic field, electromagnetic induction, measuring instruments and measurements.