Australian Government

Australian Maritime Safety Authority

Skills and Knowledge Required for National Law Certificates of Competency

MARINE ORDER 505 CREW COMPETENCIES

Version 1: January 2023

Table of Contents

The requirements for a Certificate 1, 2,3, 4 or diploma detailed in Marine Order 505 (Certificates of competency — national law) 2022, are those mentioned for a Certificate of Competency in this document. The current TLISC approved training package contains these requirements.

Table Matrix – Skills and Knowledge and Qualifications

Certificate of Competency	Table Matrix
1. General Purpose Hand	2 – Elements of shipboard safety, 4 – Seamanship (General Purpose Hand)
2. Coxswain Grade 2	1 – Safety and emergencies, 3 – Follow sound environmental work practices, 5A – Basic engineering, 6 – Nautical Knowledge (Seamanship, Manoeuvring, Regulations)
3. Coxswain Grade 2 (Endorsed to 500 kW inboard powered vessels)	1 – Safety and emergencies, 3 – Follow sound environmental work practices, 5A – Basic engineering, 5B – Coxswain Engineering, 6 – Nautical Knowledge (Seamanship, Manoeuvring, Regulations)
4. Coxswain Grade 1	2 – Elements of shipboard safety, 3 – Follow sound environmental work practices, 5A – Basic engineering, 5B – Coxswain Engineering, 6 – Nautical Knowledge (Seamanship, Manoeuvring, Regulations), 7 – Navigation and Navigational Emergencies
5. Master <24m Near Coastal	2 – Elements of shipboard safety, 3 – Follow sound environmental work practices, 8 – Ship Construction, 8A – Stability, 8B – Coastal Navigation 8C – Radar, 8D – Nautical Knowledge
6. Master (Inland Waters)	2 – Elements of shipboard safety, 3 – Follow sound environmental work practices, 8 – Ship Construction, 8A – Stability, 8D – Nautical Knowledge
7. Master <45m Near Coastal	2 – Elements of shipboard safety, 3 – Follow sound environmental work practices, 8B – Coastal Navigation, 8C – Radar, 9 – Vessel Construction and Machinery, 9A – Stability and Stress Conditions, 9B – Nautical Knowledge and Marine Legislation

Certificate of Competency	Table Matrix
8. Master <100m Near Coastal	Prerequisites and 10 – Command Navigation, Business and Ship Operations
9. MED 3 Near Coastal	2 – Elements of shipboard safety, 3 – Follow sound environmental work practices, 11 – Marine Engine Driving
10. MED 2 Near Coastal	2 – Elements of shipboard safety, 3 – Follow sound environmental work practices, 11 – Marine Engine Driving, 12 – Engineering, Vessel Construction and Machinery
11. MED 1 Near Coastal	2 – Elements of shipboard safety, 3 – Follow sound environmental work practices, 11 – Marine Engine Driving, 12 – Engineering, Vessel Construction and Machinery, 13 – Practical Mathematics, 13A – Engine Driving and Regulations
12. Engineer Class 3 Near Coastal	14 – Marine Engineering 14A – Marine Engineering (Leadership and Management), 14B – Marine Engineering (Electrical), 15 – Skill Set Engineer Class 3, 16 – Certificate of Safety Training

Table 1 Safety and Emergencies

Table 1 is required for the following Certificate of Competency

Coxswain Grade 2 Near Coastal

Outcome	Content	Standards for evaluating competence
Outcome Elements of Shipboard Safety Safety and Emergencies	**Meet operational and emergency safety requirements** 1. Apply basic survival skills in the event of vessel abandonment 2. Follow procedures to minimise and fight fire on a vessel 3. Meet Workplace Health and Safety (WH&S) requirements	• Practice survival techniques • Operate lifesaving and survival equipment • Undertake and understand risk management processes including Safety Management System (SMS) operational practices • Follow safety procedures and take action • Understand and follow fire minimisation procedures • Respond to and fight fires with portable and other fire fighting appliances including correct use of vessel closure and shutdown systems • Identify and respond to risks associated with confined spaces

Table 2 Elements of Shipboard Safety

Table 2 is required for the following Certificates:

- **Coxswain Grade 1 Near Coastal;**
- **Master <24 m Near Coastal;**
- **Master Inland Waters;**
- **Master <45 m Near Coastal;**
- **Master <100 m Near Coastal,**
- **MED 3 Near Coastal;**
- **MED2 Near Coastal;**
- **MED 1 Near Coastal;**
- **Engineer Class 3 Near Coastal;**
- **MED Steam Near Coastal.**

Outcome	Content	Standards for evaluating competence
Outcome Elements of Shipboard Safety Safety and Emergencies including survival craft	**Meet operational and emergency safety requirements** 1. Apply basic survival skills in the event of vessel abandonment 2. Follow procedures to minimise and fight fire on a vessel 3. Meet workplace WHS requirements 4. Survive at sea using survival craft	• Practice survival techniques • Operate lifesaving and survival equipment • Undertake and understand risk management processes including Safety Management System (SMS) operational practices • Follow safety procedures and take action • Understand and follow fire minimisation procedures • Respond to and fight fires with portable and other fire fighting appliances including correct use of vessel closure and shutdown systems • Identify and respond to risks associated with confined spaces • Practice survival techniques using survival craft

Table 3 Follow sound environmental work practices

Table 3 is required for the following Certificates:

- **Coxswain Grade 2 Near Coastal;**
- **Coxswain Grade 1 Near Coastal;**
- **Master <24 m Near Coastal;**
- **Master Inland Waters;**
- **Master <45 m Near Coastal;**
- **Master <100m Near Coastal;**
- **MED3 Near Coastal;**
- **MED2 Near Coastal;**
- **MED 1 Near Coastal;**
- **Engineer Class 3 Near Coastal;**
- **MED Steam Near Coastal.**

Outcome	Content	Standards for evaluating competence
Outcome Environment Follow environmental work practices	**Environmental Responsibilities** • Implement and follow environmental workplace practices and procedures • Implement emergency procedures to respond to hazardous events • Contribute to improved environmental work practices • Maintain and improve vessel environmental management • Maintain environmental records • Precautions to prevent pollution • Sensitive sea and restricted sea areas • MARPOL • Oil spill equipment and its limitations	• Identify safe and environmentally acceptable practices for: - Refuelling - Cleaning up fuel or oil spills - Understanding garbage, sewage, noise, anchoring or marine life and other environmental type maritime responsibilities - Antipollution procedures and equipment

Table 4 General Purpose Hand Near Coastal

Function: Seamanship

Outcome	Content	Standards for evaluating competence
Outcome 4.1 • Apply General Purpose Hand skills and techniques	• Use and maintain ropes • Operate Deck Machinery • Assist in anchoring • Assist in securing vessel alongside • Assist in securing vessel for sea • Safety perform tasks aloft and over the vessel's side • Assist with refuelling in safe and environmentally sound manner	• Identify rope types and common areas of use and safe handling techniques • Safely operate different types of deck machinery according to Standard Operating Procedures (SOP) or Safety Management System (SMS) • Assist in the preparation and anchoring of a vessel in varying weather conditions • Correctly moor a vessel alongside or to a buoy • Understand and use correct nautical terms • Assist in the preparation for a vessel to go to sea • Understand environmental and safety considerations when performing roles onboard, aloft, within confined spaces or over the ship's side
Outcome 4.2 • Assist in the maintenance of the vessel	• Select and use the correct tools or materials for the task • Maintain a clean environment • Follow maintenance instructions or routines • Preparing and painting surfaces • Maintain tools and chemicals	• Understand personal protective equipment (PPE), material safety data sheets (MSDS), cleaning and maintenance techniques • Read or verbally understand maintenance requirements of a vessel • Use correct techniques to maintain different surfaces of a vessel
Outcome 4.3 • Work as part of a crew on a commercial vessel	• Follow instructions of the Master or Engineer • Maintain a deck lookout under the supervision of the master • Respond to emergency situations • Effectively perform ship board duties • Follow written and verbal instructions • Effectively communicate with members of the crew and others aboard a vessel • Complete tasks as according to instructions, including completing records • Complete records	• Maintain vessel rounds or assessments • Communicate effectively with the master when undertaking lookout duties at anchor and at sea • Respond as required to emergency situations • Clarification and communication systems are understood between supervisors and peers • Understand nautical terms, verbal and other instructions • Understand potential sensitivities or communication difficulties between all persons aboard • Complete tasks as required • Seek clarity where instructions are not understood

Table 5A Coxswain Grade 2 and Coxswain Grade 1 Near Coastal

Function: Basic Engineering – (Propulsion limits – Outboard unlimited kW, Inboard <100 kW)

Outcome	Content	Standards for evaluating competence
Outcome 5.1 a Perform basic scheduled and running maintenance on outboard and inboard engines and ancillary deck equipment	• Steering gear • Ancillary deck equipment • Cooling, lubrication and fuel systems • Bilge pumping arrangements • Monitoring machinery • Report and record machinery malfunction • Low voltage (12V to 24V) electrical systems • Conduct refuelling operations • Comply with emergency shutdown procedures	• Appropriate selection and use of machinery and equipment • Maintenance is undertaken in accordance with the technical specifications, maintenance schedules, vessel operating procedures and regulatory requirements, under the supervision of appropriately qualified personnel • Apply safety precautions and pollution control measures during refuelling as per legislative requirements and vessel operating procedures • Maintenance is undertaken according to safe and environmentally acceptable practices as per vessel or manufacturers procedures • Identify, report and record faults
Outcome 5.2 a Operate inboard and outboard engines	• Operate propulsion units and auxiliary systems • Perform Pre-Start, Running and Shut-Down checks • Inspect the fuel systems appropriate to basic inboard and outboard engines • Safely inspect low voltage electrical systems appropriate to basic inboard and outboard engines • Identify, record and report inboard and outboard operating difficulties	• Operate inboard and outboard engines according to vessel or manufacturers' procedures • Ensure fuel, electrical, steering, propulsion and cooling systems operate effectively and faults can be identified and reported • Trouble shoot faults with navigation lights • Trouble shoot faults with trailer lights • Risks associated with portable fuel tanks • Risks associated with road transport of fuel and oil (trailer boats)

Table 5B Coxswain Grade 2 and Coxswain Grade 1 Near Coastal

Function: Coxswain Engineering – (Inboard propulsion systems <500 kW)

Outcome	Content	Standards for evaluating competence
Outcome 5.1 b Operate main propulsion unit and auxiliary systems	**Engineering** • Operate propulsion units and auxiliary systems • Basic operating principles of two – and four – stroke engines • Perform Pre-start and Shut down checks on petrol, diesel engines • Drive train assembly • Steering gear • Ancillary equipment • Cooling, lubricating and fuel systems • Bilge and fire pumping arrangements • Monitoring machinery • Machinery malfunction • Electrical systems (12 V – 240 V) • Liquid Petroleum Gas (LPG) • Basic refrigeration • Conduct refuelling operations • Shore power connection – an awareness of hazards • Comply with emergency shut-down procedures	• Operate equipment, machinery, pumping and auxiliary equipment adhering to principles and practices as described in manufacturers' specifications, manuals and vessel operating procedures to ensure vessel is kept in a safe condition • Maintain equipment and pumps according to vessel and/or manufacturers' maintenance requirements • Apply safety precautions and pollution prevention measures during refuelling according to legislative requirements, suppliers' requirements and vessel operating procedures • Operate machinery according to vessel or manufacturers' procedures • Identify and report faults with main propulsion unit and auxiliary systems • Identify and rectify basic faults with main propulsion unit and auxiliary
Outcome 5.2 b Perform basic servicing and maintenance of main propulsion unit and auxiliary systems	• Bilge and fire pumping systems • Cooling, lubricating and fuel systems • Steering gear • Low Voltage electrical systems • Shore power leads and connections • 2 and 4 stroke engines • Monitoring machinery • Drive chain assembly	• Appropriate selection and use of machinery and equipment • Maintenance is arranged and undertaken in accordance with the technical specifications, maintenance schedules, vessel operating procedures and regulatory requirements • Maintenance is undertaken according to safe and environmentally acceptable practices

Table 6 Coxswain Grade 2 and Coxswain Grade 1 Near Coastal

Function: Nautical Knowledge (Seamanship, Manoeuvring, Regulations)

Outcome	Content	Standards for evaluating competence
Outcome 6.1 Handle a vessel up to 12 metres	**Vessel Handling and Manoeuvring** • Operate a small vessel • Handle a vessel in emergencies • Tow and be towed • Displacement and planning hulls • Understanding of jet units, outboard and inboard propulsion units • Effects of rudders and propellers • Trim and Displacement • Manoeuvring characteristics • Berthing and unberthing in various wind and tidal conditions • Anchoring • Manoeuvres in adverse weather conditions • Manoeuvre vessel in various operations and in varying conditions	• Demonstrate knowledge of the features of a vessel, which relate to handling characteristics and compliance with current maritime publications or accepted procedures • Demonstrate techniques to manoeuvre the vessel through: - Berthing and leaving a berth - Berthing and unberthing in a pen - Person overboard - Coming to and leaving a mooring - Steering astern through a “s” configuration - Turn short around in a limited space - Towing and being towed - Beaching and refloating safely - Turn a vessel across the tide across the wind • Demonstrate knowledge of the techniques for crossing a coastal bar with and against the sea
Outcome 6.2 Apply seamanship skills aboard a vessel up to 12 metres	**Practical Seamanship** • Identify and demonstrate knowledge • Use and maintain ropes • Secure the vessel at anchor • Secure the vessel at a berth • Check condition and seaworthiness of vessel • Knowledge of structural components and material of a small vessel • Basic stability • Respond to navigational emergencies	• Demonstrate knowledge of various types of hull • Identify deteriorated hull and fittings and understand the reason for the deterioration • Identify rope types and common uses • Tie common knots such as reef knot, bowline, sheet bend, clove hitch, round turn and 2 half hitches and understand their use • Eye splice a fibre/synthetic rope end join two ends complying with the rope manufacturer’s recommendations • Whip an end • Rig a vessel for towing and the towed vessel according to established procedures for varying weather conditions • Prepare and anchor a vessel in varying weather conditions • Weigh anchor • Rig a sea anchor to control rate and direction of drift and/or angle to sea • Use a sea anchor to prevent broaching • Understanding of loading and discharging and movement of weight/s • Take appropriate action in relation to navigational emergencies within sheltered waters
Outcome 6.3 Comply with regulations to ensure safe operation of a vessel up to 12 metres	**Regulations and Port Operations** • Comply with the International Regulations for the Prevention of Collision at Sea (IRPCS) • Understand and comply with IALA buoyage requirements • Understand the basic operation of Risk assessments and Safety management systems (SMS) • Maintain records • Understand Commonwealth, State and local regulations	• Identify and implement local, State, Commonwealth and Territory regulations • Apply the duties and responsibility of the Master as per national and international requirements • Undertake watchkeeping duties in compliance with national and international requirements • Apply the International Regulations for the Prevention of Collision at Sea (as amended) • Understand and apply SMS, safety management plans, standard and emergency operating procedures • Understand and comply with the requirements for crew inductions

Table 7 Coxswain Grade 1 Near Coastal

Function: Navigation and Navigational Emergencies

Outcome	Content	Standards for evaluating competence
Outcome 7.1 Respond to emergency situations	**Emergency and Safety Procedures** • Knowledge of small vessel stability and stability terms • Disabled vessel • Collision, grounding • Person overboard • Heavy weather • Beaching • Cyclone activity in the area	• Respond to emergencies in accordance with vessel procedures and acceptable maritime practices • Use current maritime publications relative to a 12m vessel
Outcome 7.2 Collect and assess weather forecasts	**Meteorology** • Basic meteorological terms • Sources of weather reports and warnings • Local weather • Cyclonic and storm tracking, recording, alerts and warnings	• Obtain weather information applicable to an intended voyage • Apply weather information during voyage planning and explain expected weather patterns • Utilise information for passage planning and navigation • Relate information in forecasts to conditions expected for small vessels
Outcome 7.3 Use navigational information and techniques to conduct a safe passage	**Navigation and Local Knowledge** • Chart information (symbols and abbreviations) • Coastal features • Dangers to navigation • Compass • Basic pilotage techniques • Speed, distance and time calculations • Use of tide tables • Electronic aids and their limitations	• Navigate the vessel through a pre-planned route with consideration to : - Fuel consumption - Courses to steer between turning points - Compliance with all navigational buoys, marks and beacons - Identification and avoidance of navigational hazards • Plot the position derived from GPS • Understand dangers of reliance on use of GPS in coastal areas • Plot visual bearings on a chart to derive a position • Steer a pre-planned course • Apply the International Regulations for the Prevention of Collision at Sea (as amended) • Relationship between degrees and minutes of latitude, with nautical miles are established • Identify the times and heights of high and low water tide tables • Explain the impact of tidal range on chart depths • Use of electronic aids could include but not limited to: GPS, chart plotters, AIS, RADAR, depth sounders, communication systems

Table 8 Master <24m Near Coastal

Note: Table 8 is required for Master Inland Waters

Function: Ship's Construction

Outcome	Content	Standards for evaluating competence
Outcome 8.1 Understand principle structural components of a small vessel and their functions	**Design and Construction** • Principal parts of a vessel • Basic methods of design • Construction material (Steel, Aluminium, FRP and Wood) • Regulations governing structure	• Identify structural components from ship's drawings and plans, locate on a vessel and ascertain the relevant regulation governing the structure • Understand the function of structural components and compliance with conventional maritime design • Identify samples of construction material
Outcome 8.2 Maintain the watertight integrity of a vessel	**Watertight Integrity** • Watertight and weathertight integrity • Design characteristics preserving watertight integrity • Maintenance to sustain watertight integrity • Regulations affecting watertight integrity	• Identify watertight features and structural components from ship's drawings and plans and be able to locate them on a vessel • Understand the function of watertight features and structural components in compliance with conventional maritime design • Identify deteriorated hull and fittings and demonstrate knowledge of the reason for the deterioration, in accordance with maritime engineering procedures • Examine a vessel and detail the maintenance procedures required to test and to ensure watertight integrity in compliance with maritime engineering and inspection procedures • Apply regulations affecting watertight integrity • Identify the dangers of working in confined spaces and list precautions and procedures for doing so in compliance with Australian Standards and WH&S
Outcome 8.3 Operate the fuel, fresh and ballast water, bilge and fire pumping systems installed in a vessel	**Pumping Arrangements** • Fuel, fresh and ballast water, bilge and fire pumping arrangements • Sounding and venting facilities • Safety features incorporated in systems • Maintenance requirements to ensure operational readiness • Regulated requirements • Refuelling	• Identify pumping systems on vessel drawings and identify and trace them onboard the vessel • Operate pumping equipment to comply with manufacturer's specification • Identify procedures to avoid contamination of fuel or drinking water • Ensure bilges are clean and dry • Provide fire fighting whilst maintaining stability of the vessel and without environmental contamination • Maintain and test pumping equipment according to manufacturers', vessel, or regulatory specifications • Safety precautions and pollution prevention measures during refuelling are applied according to legislative requirements, supplier's requirements and vessel operating procedures

Outcome	Content	Standards for evaluating competence
Outcome 8.4 Use and maintain deck machinery installed on a vessel	**Deck Machinery** • Mechanical deck equipment • Safety features incorporated in systems • Maintenance requirements to ensure operational readiness • Precautions to be observed when using deck machinery • Regulated requirements	• Operating procedures are in accordance with manufacturers' specification and/or vessel operating procedures • Regulatory requirements are applied • Maintenance procedures comply with manufacturer's requirements • Safety procedures and precautions followed are in accordance with OH&S and maritime safety regulations
Outcome 8.5 Operate steering gear arrangements	**Steering Systems** • Steering gear arrangements • Safety features incorporated in systems • Maintenance requirements to ensure operational readiness • Regulated requirements	• Operating procedures are in accordance with manufacturers' specification and/or vessel operating procedures • Regulatory requirements are applied • Maintenance procedures comply with manufacturer's requirements • Faults are identified promptly and emergency procedures are implemented according to operating procedures • Safety procedures and precautions followed are in accordance with OH&S and maritime safety regulations
Outcome 8.6 Manage hull deterioration	**Vessel Maintenance** • Characteristics and causes of deterioration • Methods to minimise and remedy deterioration • Maintenance management	• Deteriorated hull and fittings are identified in accordance with maritime engineering examination procedures • Regulatory requirements are applied • Maintenance procedures and safety precautions comply with manufacturer's recommendations and warnings • Maintenance schedule is (as minimum) as per manufacturer's requirements
Outome 8.7 Demonstrate knowledge of various methods of slipping a vessel	**Slipping** • Procedures for slipping a vessel. • Undertake an industry visit to witness a vessel being slipped • Safety precautions (ship and personnel) onboard a vessel whilst out of the water • Maintenance to ensure operational readiness • Working in confined spaces • Regulated requirements	• Demonstrate knowledge of slipping procedures as per vessel and engineering practices • Deteriorated underwater fittings are identified • Workplace Health and Safety procedures are observed • Regulatory requirements are interpreted correctly • Maintenance procedures comply with manufacturer's requirements • Safety precautions and procedures comply with vessel operating procedures • The precautions for putting a vessel back in the water conform to marine safety regulations and engineering principles

Table 8A Master <24m Near Coastal

Note: Table 8A is required for Master Inland Waters

Function: Stability

Outcome	Content	Standards for evaluating competence
Outcome 8.8 a Use simplified stability information to maintain the stability of a vessel	**Stability** • Principles of stability • Terms and definitions • Basic physics of stability • Equilibrium • Impact of design and hull shape on stability *Note: Stability knowledge to include basic calculation* **Operating Conditions** • Adding and removing weights • Water on deck • Slack tanks • Roll period • Stiff and tender vessel • Additions and alterations to vessels	• Information obtained from a vessel's simplified stability data book is applied to maintain the stability of a vessel • Demonstrate knowledge of stability, including interpretation of diagrams, principles and content of a vessels simplified stability book • Demonstrate how to improve stability for heavy weather considerations

Table 8B Master <24m Near Coastal

Note: Table 8B is required for Master <45m Near Coastal

Function: Coastal Navigation

Outcome	Content	Standards for evaluating competence
Outcome 8.9 b Plan and conduct a safe passage and determine position	**Chart and Features** • Construction of a navigational chart • Latitude and longitude • Relationship between latitude and longitude • Variation and deviation • Chart scales • Information displayed on a chart or plan • Notice to Mariners	• The information obtained from navigational charts is relevant and applied • That chart symbols and features are identified or selected • That chart corrections are made using Notice to Mariners, are correctly inserted, and deleted as necessary
Outcome 8.9 b Plan and conduct a safe passage and determine position	**Coastal Navigation Techniques** • Relationships between true, magnetic, compass, gyro and relative • Variation and deviation • Deviation card • Compass error • Laying off a safe course • Position determined by visual, estimated and radar means • Position estimation by dead reckoning • Coastal features • Publications for safe navigation • Use of electronic aids to navigation • Reporting systems • Navigation Log	• Apply relevant information obtained from current navigational charts and publications • Navigational hazards are identified including ice • Estimated positions are calculated accurately from known data • Vessel position is accurately fixed using visual, radar and a combination of visual and radar information • Plot a GPS derived position • Positions obtained are within acceptable accuracy levels • Fixing interval is appropriate to the proximity of danger • Calculations and measurements from the chart are accurate • Charts selected are appropriate to the area of operation • Use of electronic aids could include but not limited to: GPS, chart plotters, AIS, RADAR, depth sounders, communication systems • Use radar, range and bearing to plot the vessels position on a chart. Check the GPS position against the plot • Use parallel indexing to maintain a required distance off a point of land • Maintaining situational awareness • Ship routeing information and Traffic Separation Schemes

Outcome	Content	Standards for evaluating competence
Outcome 8.9 b Plan and conduct a safe passage and determine position	**Instrumentation and Navigation Aids** Basic principles, errors and limitations of: • Compasses • Echo sounders • GPS • Automatic steering systems • Alarm systems • Plotters and electronic charts • Alarms • Interaction of navigation aid and equipment • Basic understanding of ECDIS, ARPA, AIS	• Performance checks and tests on navigational equipment and systems are carried out adhering to manufacturer's recommendations and accepted navigational practices • Operating procedures are in accordance with manufacturer's recommendations • Performance limitations of equipment are considered • Use of electronic aids include but are not limited to: GPS, chart plotters, AIS, RADAR, depth sounders, communication systems • Care and maintenance of navigation aids • Automatic Pilots including use, change over from manual and vice versa • Navigation equipment maintenance, logs and updates
Outcome 8.9 b Plan and conduct a safe passage and determine position	**Tides** • Basic tidal theory • Tidal prediction sources • Tide tables, Australian and local	• Relevant information is obtained from tide tables navigational charts, publications and applied • The times and heights of high and low water from Australian or local tide tables for any port are accurate • Chart datum and relevance to the height of tide is understood and practical examples applied • The publications used are current • Areas of extensive tidal effects

Table 8C Master <24m Near Coastal

Note: Table 8C is required for Master <45m Near Coastal

Function: Radar

Outcome	Content	Standards for evaluating competence
Outcome 8.10 c Use radar to maintain safety of navigation and for collision avoidance	**Fundamental Principles** • Fundamental principles and effects on performance • Pulse transmission • Pulse length • Wave length and frequency • Range and bearing measurement • Major components and their siting	• Components are identified as per manufacturer's specification • Demonstrate knowledge of fundamental principles and characteristics on performance of the radar and compensation during use • Setting up and maintaining displays
	Characteristics and Performance • Factors affecting performance • Maximum and minimum range • Bearing and range accuracy • Vertical and horizontal beam width • Range and bearing discrimination • Radar horizon	• Factors affecting performance are recognised during use
	Interpretation of Display • Effects of target aspects • Shore and topography targets • Atmospherics • Weather factors • Blind arcs and shadow areas • False echoes • Radar reflectors • Radar beacons and transponder beacons • Radar logs	• Limitation and operating parameters of the radar are identified • Information obtained from radar is interpreted and analysed to assist in navigation and collision avoidance • Interpretation and analysis to be confirmed by alternative means • Misrepresented information is detected • Limitations and accuracy of equipment and information derived in prevailing conditions are identified • Search and Rescue Radio Transponders (SART) and Racons • Identification of critical echoes
Outcome 8.10 c Use radar to maintain safety of navigation and for collision avoidance	**Functions and Adjustment** • Function of controls • Symbols for controls • Setting up and maintain display • Shutting down display • Maladjustments • Verification of range and bearing	• Procedures adopted to operate a radar set comply with manufacturer's recommendations • Controls are identified and adjusted to provide maximum performance

Outcome	Content	Standards for evaluating competence
	Plotting and Collision Avoidance • Relative and true motion • Radar presentations • Radar plotting • Collision avoidance • International Regulations for the Prevention of Collision at Sea (as amended) • Reporting • Parallel indexing • Basic understanding of ARPA	• Action taken to avoid a close-quarters situation or collision with another vessel is in accordance with the International Regulations for the Prevention of Collision at Sea (as amended) • Radar plots to ascertain target's closest point of approach and time of closest point of approach are actioned to prevent "close quarter" situations developing • Course and speed of other ship • Detecting course changes of other ship • Effects of changes in own ships course and/or speed • Manoeuvring and restricted visibility signals are in accordance with the International Regulations for the Prevention of Collision at Sea (as amended) and used correctly • Course and speed alterations prevent close-quarter situations, comply with International Regulations for Prevention of Collision at Sea (as amended) and avoid navigational hazards

Table 8D Master <24m Near Coastal

Note: Table 8D is required for Master Inland Waters

Function: Nautical Knowledge and Legislation

Outcome	Content	Standards for evaluating competence
Outcome 8.11 d Use Commonwealth, local, State & Territory Acts, Legislation, Codes and other publications relevant to the safe operation of a vessel	**Marine Legislation** • Duties and responsibilities • Certificates onboard a small vessel • Procedures manuals onboard a small vessel • Operational areas and classification of vessels • NSCV Part E and C Section 7 • Contents of Marine Notices, Annual Notices to Mariners • Log Book or Vessel Record Book • Workplace Health and Safety Legislation • Marine Pollution • Local, State, Commonwealth & Territory Marine Legislation • Certificates to be carried onboard • Safety management systems or plans • Induction and shipboard training programs	• Apply current information obtained from Commonwealth, local, State and Territory Acts, Legislation, Codes and other publications relating to the safe navigation of a vessel • The duties and responsibilities of the Master are identified • Understand and apply safety management systems, safety management plans, standard and emergency operating procedures and the requirement for inductions for all crew • Determine and understand risk management techniques • Source information on the various State waterways management regulatory requirements, for example: areas of operation, bar crossings, port authority requirements
Outcome 8.12 d Obtain and interpret meteorology information relevant to a voyage	**Meteorology** • Elements of meteorology • Terms and definitions • Weather systems • Pressure systems and circulation • Sources of weather forecasts and information • Synoptic charts • Instruments for onboard observations • Tropical revolving storms (TRS)	• Weather information obtained is applicable to the intended voyage • Information obtained from observations, reports and instruments is analysed and included in the voyage planning • Actions taken by a small vessel to avoid severe weather are identified
Outcome 8.13 d Maintain a safe navigation watch	**Watchkeeping** • Content, application and intent of the International Regulations for the Prevention of Collision at Sea (as amended) • Watchkeeping standards and principles at sea, anchor and in port • Bridge communication • IALA buoyage system “A”	• International Regulations for the Prevention of Collision at Sea (as amended) are interpreted and applied • Watchkeeping practices comply with accepted standards and procedures • Defined wheelhouse communication and reporting procedures are adopted • The vessel log/record book is maintained in accordance with the NSCV • Situational awareness is maintained

Outcome	Content	Standards for evaluating competence
Outcome 8.14 d Respond to emergency situations	**Emergency Procedures** • Collision, grounding, damage to the vessel • Protection and safety of all persons onboard • Abandoning the vessel • Rescuing persons in distress • Assisting a vessel or aircraft in distress • Assisting a vessel or aircraft in Search and Rescue (SAR) • Musters and Drills • Tropical Revolving Storms	• The emergency situations are identified expeditiously and responded to appropriately • Procedures are appropriate and comply with NSCV Part E and current practices
Outcome 8.15 d • Demonstrate knowledge of the various features of a vessel, which relate to its handling characteristics • Manoeuvre a vessel	**Vessel Handling and Manoeuvring** • Effects of rudders and propellers • Berthing and unberthing in various conditions • Manoeuvres to approach an anchorage • Effects of narrow channels and shallow water on manoeuvring • Effects of interaction • Management of a vessel in heavy weather Crossing a bar • Manoeuvres to launch boats or liferafts • Manoeuvres and procedures for person overboard • Towing and being towed	• Demonstrate knowledge of handling characteristics of a vessel and the significance of the characteristic relative to manoeuvring related to engineering and design principles • Vessel is manoeuvred within its performance parameters • Launch and retrieve liferaft/boat according to vessel procedures • Vessel is manoeuvred to pick up simulated person overboard using internationally recognised practices • Turn a vessel across the tide across the wind • Williamson turn, turning short around • Berthing and leaving a berth in various wind and tide conditions • Berthing and unberthing; berthing in a pen • Coming to and leaving a mooring
Outcome 8.16 d Demonstrate seamanship skills and techniques	**Practical Seamanship** • Knots, hitches and bends using fibre and synthetic rope • Eye splice and short splice in fibre and synthetic rope • Precautions when using rope, wire and chains • Breaking strain and safe working loads of ropes • Maintenance and care of rope, wire and chain • Rigging gear, cranes and maximum loads • Winches and windlasses • Safe handling of moorings and hawsers • Stowing and securing anchors for sea • Securing for rough weather and maintenance of watertight integrity • Lashing and securing equipment • Towing and being towed	• Workplace health and safety procedures are observed • Identify rope types and common uses • Tie common knots such as reef knot, bowline, sheet bend, clove hitch, round turn and 2 half hitches and understand their use • Eye splice a fibre/synthetic rope end join two ends complying with the rope manufacturer's recommendations • Whip an end • Techniques and skills used to perform tasks are in accordance with manufacturers' specifications and industry standards • Maintenance procedures comply with authorised requirements

Table 9 Master <45 m Near Coastal

Note: Table 8B (Coastal Navigation) and 8C (Radar) are required for Master <45m Near Coastal

Function: Vessel Construction and Machinery

Outcome	Content	Standards for evaluating competence
Outcome 9.1 Demonstrate knowledge of the principal structural components of a vessel of 100 m in length	**Vessel Construction** • Fundamental principles of vessel construction • Principal structural components • Load lines conditions of assignment • Structural arrangements to restrain fires • Design characteristics attributing to watertight integrity • Methods for testing tanks and watertight integrity • Regulatory requisites • Elements of ships structure crucial to the safety of the ship	• Identify structural components from ship's drawings and plans and locate on a vessel • Demonstrate knowledge of the function of structural components in compliance with conventional maritime design • Identify various construction material and techniques • Demonstrate knowledge of the construction aspects of a vessel related to cargo
Outcome 9.2 Manage a propulsion unit using the appropriate engineering systems and support services	**Engineering Systems** • Marine engineering terms • Management of marine power units • Ancillary equipment • Safety alarm systems	• Operation of propulsion unit, ancillary power units and equipment is in accordance with technical specifications • Machinery is operated within the accepted safety parameters • Monitoring of safety and fire detection systems is in accordance with formulated emergency procedures • Operation of safety and fire-detection/ suppression systems • Adopted safety precautions and procedures are appropriate

Table 9A Master <45 m Near Coastal

Function: Stability and Stress Conditions

Outcome	Content	Standards for evaluating competence
Outcome 9.3 a Manage stress and dynamic factors affecting a vessel's stability	**Stability** • Terms and definitions • Forces and moments • Centroids and centre of gravity • Density and specific gravity • Dockwater allowance • Transverse and longitudinal dynamics • Effects of free surface • Loading and discharging weights • Final KG • Bilging and permeability • Change of draught and trim (MCT) • Tonnes per centimetre immersion (TPC) • Freshwater allowance • Virtual loss of GM • Stress conditions including trim and stress tables • Stability curves • Stress calculating equipment	• Information obtained from a vessel's stability data book is interpreted correctly • Calculations associated with basic stability management are accurate • Correlate and interpret calculated stability data • Stability and stress conditions are managed within safety parameters • Information communicated is relevant and correct • Stability diagrams and illustrations are accurate • Actions in the event of partial loss of intact stability

Table 9B Master <45 m Near Coastal

Function: Nautical Knowledge

Outcome	Content	Standards for evaluating competence
Outcome 9.4 b Monitor and control compliance with legislative requirements	**Marine Legislation** • Commonwealth, local, State and Territory Acts and subordinate legislation • National Standard for Commercial Vessels (NSCV) • International Aeronautical and Maritime Search and Rescue (IAMSAR) • MARPOL 73/78 • Standards of Training, Certification and Watchkeeping (STCW) as amended • Safety of Life at Sea (SOLAS) • Safety management systems (SMS) or plans • International Maritime Organisation (IMO) • Environmental legislation	• Information obtained from International, Commonwealth, local, State and Territory Acts, Legislation, Codes and other publications relating to the safe navigation and operation of a vessel is current and applied • Procedures for monitoring ship's operations and maintenance comply with legislative requirements • Responsibilities under international maritime law embodied in international agreements and conventions are clearly identified, interpreted and applied • Procedures and communications used for co-ordinating SAR operations are in accordance with IMO requirements • Understand and apply SMS, safety management plans, standards and emergency operating procedures • Understand and comply with the requirements for crew inductions • Determine and understand risk management techniques • Source information on the various State waterways management regulatory requirements, for example: areas of operation, bar crossings and port authority requirements • Sensitive sea areas and restrictions, oil spill equipment and its limitations • Plan for coping with increased volume of garbage, bilge water, sludge and sewage • Consequences of pollution in a cold climate
Outcome 9.5 b Predict meteorological and oceanographic conditions	**Meteorology and Oceanography** • Vertical division of atmosphere • Heat exchange process • Cloud classification • Air masses and fronts • Synoptic chart analysis • Tropical meteorology • Instruments • Ocean currents • Sea state	• Weather forecasts for an intended voyage are obtained using all available data and the forecast • Information obtained from observations, reports and instruments is deciphered and applied to ensure safety of the vessel

Outcome	Content	Standards for evaluating competence
Outcome 9.6 b Execute appropriate watchkeeping arrangements and procedures	**Watchkeeping** • Content, application and intent of the International Regulations for the Prevention of Collision at Sea (as amended) • Watchkeeping principles • Bridge teamwork procedures • Ship Reporting Systems • VTS procedures • Assessing watchkeepers' skills • Fitness for duty • Fatigue management • Drug and alcohol policy • General provisions on ship routeing	• Watchkeeping arrangements and practices comply with STCW as amended, Marine Orders and Regulations • Allocation, assignment and prioritisation of resources • Assertive and leadership is demonstrated • Situational awareness is maintained • Consideration is given to navigational watch teams experience • Watchkeeping arrangements are planned, organised and implemented, including: - Standing Orders and calling the Master - Taking over the watch - Clear weather - Restricted visibility - Hours of darkness - Coastal and congested waters - Navigation with a pilot onboard - Ship at anchor and in port - Ship carrying dangerous cargo • The International Regulations for the Prevention of Collision at Sea (as amended) are appropriately applied • Communication and reporting procedures adopted on the bridge are clearly defined, accepted and implemented • Adopted procedures enhance navigational safety, protection of the marine environment and the safety of all onboard
Outcome 9.7 b Manoeuvre a vessel in any prevailing conditions	**Vessel Handling and Manoeuvring** • Interaction • Propulsion and manoeuvring systems • Manoeuvring in restricted waters • Squat, shallow water and similar effects • Embarkation and disembarkation of pilots • Anchoring and manoeuvres to approach an anchorage • Management of vessel in heavy weather • Manoeuvres to launch boats or liferafts • Methods for retrieving survivors • Effects of deadweight, draught, trim, speed and under keel clearance of vessel's stopping distance and rate of turn • Berthing manoeuvres • Traffic separation schemes • Emergency heavy weather management procedures	• Decisions made are justified with consideration to the vessel's manoeuvring and propulsion unit's characteristics in the prevailing conditions • In analysing the safe manoeuvring of a vessel, explanation is given to: interaction, tide, current, passing vessels and own vessel's bow and stern wave • Initial responses are concise and appropriate measures taken are adequate • Safe operating limits are not exceeded • Safety precautions followed are relevant • Manoeuvre a vessel: - Crossing a bar; following an quartering sea, berthing and unberthing; coming to and leaving a mooring; steering through an 's' configuration; towing and being towed; turn short around; turn a vessel across the tide across the wind; Williamson turn, turn short around

Outcome	Content	Standards for evaluating competence
Outcome 9.8 b Respond to navigational emergencies	**Emergency Procedures** • Beaching a vessel • Grounding and refloating a vessel • Collision • Damage control • Emergency steering • Emergency towing arrangements and procedures • Salvage arrangements • Musters and drills • Cyclones and heavy weather • Assisting a vessel in distress	• Contingency plans are formulated and adopted for emergency situations • Initial actions including manoeuvring of the ship are in accordance with contingency plans without risk to the vessel or crew safety are assessed • Follow-up actions are justified in accordance with marine safety procedures • Equipment utilised is appropriate and safe • That communication and reporting procedures adopted are clearly defined and accepted • Safety precautions and WH&S considerations are followed • Actions to be taken when an emergency arises in port • Distress alerts and procedures • SART • Radio communications • Actions to keep all onboard safe in the event of an emergency
Outcome 9.9 b Prepare a cargo plan to ensure safe cargo operations whilst loading, unloading and during a voyage	**Cargo Operations** • Purchases and tackle • Stresses and loads • Safe working loads • Cargo handling and securing equipment • International Maritime Dangerous Goods (IMDG) Code • Bulk Cargo Code • Cargo stowage and securing • Loading and unloading • Ballasting • Documentation • Authorities requisites • ‘Enhanced survey regime’	• Information, procedures and documentation relating to the handling of dangerous and harmful cargo are reliable and correctly identified in accordance with the IMDG Code and with awareness of material safety data sheets (MSDS) • Cargo operations and the distribution of cargo are planned using reliable information and in accordance with established guidelines • Emergency procedures for incidents involving dangerous and hazardous cargoes are appropriate • Cargo monitoring procedures are appropriate – including scheduling of inspections to ensure all parts are checked in a given time • Safety precautions and procedures comply with maritime regulations, procedures and WH&S requirements • Monitoring for damage, defects and corrosion including causes and prevention • Considerations in severe weather
Outcome 9.10 b Establish and maintain a harmonious workplace environment	**Organisation and Management** • Management and leadership • Leadership style • Group dynamics • Conflict resolution • Organisation skills	• Individual crew members are informed of the expected standards of work and behaviour and allocated appropriate duties • Crew training objectives and activities are based on an assessment of current competence and operational requirements • Initial indications and possible causes of conflict are promptly identified • Propose appropriate strategies to deal with conflict within the workplace • Communication skills used facilitate constructive response to conflict

Outcome	Content	Standards for evaluating competence
Outcome 9.11 b Organise and manage communications onboard to receive information and advice	**Communications** • International code flags and usage of signal books • International Code of Signals (ICS) • Global Maritime Distress Safety System (GMDSS) • Radio • IAMSAR • Morse (SOS)	• Information obtained from ICS and other publications relating to inter-ship communications is current and actioned • Procedures for monitoring ship's communication systems comply with legislative requirements • Communication procedures ensure that marine safety information and inter-ship safety messages are received and acknowledged
Outcome 9.12 b Work safely in enclosed spaces	**Confined space** · Asses confined spaces · Seek permission to enter a confined space · Plan and enter an enclosed space safely · Take emergency action regarding an enclosed space	• Identify and minimise risks associated with enclosed space entry • Seek authorisation or regulatory permission to enter an enclosed space • Prepare a plan for access into an enclosed space • Manage work operations and safety requirements within an enclosed space • Meet regulatory enclosed space requirements; including but not limited to permits, entry and exits, maintenance of equipment
Outcome 9.13 b Application of leadership and teamworking skills	• Working knowledge of shipboard personnel management and training • A knowledge of relevant international maritime conventions and recommendations and national legislation	• Ability to apply task and workload management including: – Planning and coordination – Personnel assignment – Time and resource constraints – Prioritisation • Knowledge and ability to apply effective resource management: – Allocation, assignment and prioritisation of resources – Assertiveness and leadership including motivation – Obtaining and maintaining situational awareness • Knowledge and ability to apply decision making techniques: – Situation and risk assessment – Identify and consider generated options – Selecting course of action – Evaluation of outcome effectiveness • Development, implementation and oversight of standard operating procedures

Table 10 Master <100m Near Coastal

Applicants must have completed an approved program of study that meets the standards specified in section A-II/1 and the relevant section in A-II/2 of the STCW Code and includes the following:

1. approved modules in command navigation, shipmasters business and management, and ship operations and administration;
2. an approved course of basic safety training (that complies with STCW Code section A-VI/1 paragraph 2 and section VI/6 paragraph 4);
3. training in advanced fire fighting (that complies with STCW Code A-VI/3);

A **Master<100m**: Must hold a Diploma of Maritime Operations (Master <100m Near Coastal).

Additional units can be completed as a skill set to complete the Diploma of Maritime Operations (Master up to 500 GT)

- Provide medical first aid on board a vessel
- Certificate of proficiency in survival craft and rescue boats other than fast rescue boats
- Transmit and receive information by the Global Maritime Distress and Safety System

Function: Command navigation, business and ship operations as set out in point 1 above

Outcome	Content	Standards for evaluating competence
Outcome 10.1 Apply command navigation procedures on vessels limited by tonnage or near coastal operations	**Watchkeeping Practices** • Establish safe watchkeeping procedures on vessels, potentially with limited qualified personnel • Respond to potential collision and emergency situations • Maintain watchkeeping records	• Develop Standing Orders to supplement SMS • Apply accepted principles for watchkeeping, assigning and responsibilities of bridge teams, briefings, handover of watch, bridge resource management, fatigue management strategies • Navigation including checks, position fixing, passage plan analysis, traffic monitoring and safe progress is undertaken using accepted principles • Demonstrate leadership of bridge team in response to navigational emergency • Potential collision situations are analysed and appropriate actions taken including search and rescue • Record keeping practices comply with regulations and vessel operating procedures
Outcome 10.2 Manage business and administration on vessels limited by tonnage or near coastal operations	**Business and Administration** • Develop plans for general and specific vessel operations • Ensure legal requirements are fulfilled • Ensure commercial and business requirements are fulfilled • Monitor and control vessel expenditure • Develop and implement vessel safety management system (SMS) • Monitor and control vessel physical resources • Analyse and compile operational and voyage data • Provide leadership to officers and crew • Allocate duties and maintain set standards of work on board vessel • Resolve conflict • Plan, organise, promote and evaluate shipboard training and assessment	• Vessel operations plans are drawn up according to company goals, procedures operational orders, regulatory requirements, established maritime practice and are reviewed, validated and evaluated • National and international conventions, codes, laws, regulations and standards are implemented • General contracts, legal requirements, company procedures and established marine management practices are interpreted and implemented • Vessel budgets and accounting procedures are prepared and reported according to established financial procedures • Vessel inventory of plant, equipment and other physical resources are maintained and reported on using established praties • Operational voyage data collection and reporting is implemented using established marine management practice • Demonstrate leadership capabilities • Work requirements for crew are clear and within capability of crew member • Recognise and control conflict • Identify and organise workplace training and assessment requirements as identified

Outcome	Content	Standards for evaluating competence
Outcome 10.3 Mange operations and maintenance on vessels limited by tonnage or near coastal operations	**Operations and Maintenance** • Manage maintenance of vessel stability and safety parameters • Administer planning or cargo operations • Dock or slip vessel • Carry out inspection and routine maintenance • Administer correct selection and use of maintenance equipment and materials	• Vessel safety parameters are correctly maintained within normal operational limits • Vessel routine preventative maintenance is planned and carried out according to procedures • Appropriate plans, procedures and preparations are implemented for docking/slipping a vessel • Inspections, identification of deterioration, maintenance procedures and tasks and reporting and recording practices are undertaken according to WH&S, pollution prevention, regulatory, company procedures and manufactures requirements • Correct tools are used for maintenance tasks, defects are identified, equipment is cleaned and stowed appropriately

Table 11 Marine Engine Driver Grade 3

Function: Marine Engine Driving

Outcome	Content	Standards for evaluating competence
Outcome 11.1 Demonstrate knowledge of the construction, operation and service of marine internal combustion engines	**Basic Cycles of Operation and Component Identification of:** • Marine 2 – and 4 – stroke diesel engines • Marine 2 – and 4 – stroke petrol engines • Basic timing diagrams • Fuel systems including: • Petrol/diesel • Carburettors/fuel injectors • Fuel storage and management • Injection pumps • Basic governor operation • Fuel system maintenance • Fuel system fault finding and possible emergency operation • Basic combustion process • Air filters • Turbo/Supercharging	• Major parts of marine internal combustion engines are identified • Main differences between 2 – and 4 – stroke cycles of operation are identified • Fuel systems are managed safely in accordance with regulations, manufacturer's instructions and vessel procedures to prevent pollution of the marine environment are applied • Marine internal combustion engines are operated within the technical specifications • Operation and surveillance of main propulsion plant and auxiliary systems is sufficient to maintain safe operating conditions • Basic operational faults are recognised and repair or maintenance assistance is organised
	Cooling systems including: • Keel cooling/heat exchangers • Circulating pumps • Ship's side valves • Coolant circulation and thermostats • Corrosion • Maintenance • Instrumentation • Emergency procedures	• Cooling systems are operated in accordance with established procedures and prevent pollution of the marine environment
	Lubricating systems including: • Lube oil circulating systems • Lube oil system components • General lubrication and cooling effects • Lubrication system problems • Lube oil contamination • Lube oil system management and maintenance • Lube oil system instrumentation • Refuelling operations (environment, safety and regulations)	• Lubricating systems are operated in accordance with established procedures and prevent pollution of the marine environment

Outcome	Content	Standards for evaluating competence
Outcome 11.2 • Demonstrate knowledge of the workings of marine propulsion systems • Recognise and takes steps to rectify basic operational faults	**Power Transmission Including:** • Basic reverse/reduction gearbox operation • Types of gear trains • Lubrication and cooling of gearboxes including filters and strainers • Fault identification • Emergency operation • Propeller and intermediate shafting alignment • ·Bearing types, materials, installation, lubrication • Shaft seals and glands, packing • Couplings types, fitting, keys and keyways • Propeller types, fitting, keys and keyways, securing nuts, locking • Controllable pitch propellers • Stern drive and water jet drive units • Maintenance and inspection • Causes of vibration and undue wear	• Marine propulsion systems components are identified and functions explained in simple terms • Describe the operation and servicing of propulsion system within the technical specifications • Basic operational faults are recognised and repair or maintenance assistance is organised
Outcome 11.3 Prepare a vessel's machinery for sea	**Engine watchkeeping** • Inspection and checks of main and auxiliary machinery and associated spaces • Start-up procedures • Instrumentation • Running checks • Keeping of running and maintenance logs • Shut down procedures	• Methods of preparing for start-up and of making available fuel, lubricants, cooling water and air comply with vessel operating procedures and manufacturer's recommendations • Checks of pressures, temperatures and revolutions during the start-up and warm-up periods are in accordance with the technical specifications • Methods of preparing the shut-down and supervising the cooling down of the engine are in accordance with vessel operating procedures and manufacturer' s recommendations

Outcome	Content	Standards for evaluating competence
Outcome 11.4 Identify and operate components of auxiliary systems	**Steering Systems, including:** • Rudder construction and rudder types • Rudder and stock support bearings • Glands, packing, seals • Tiller arm attachment • Steering operation of hydraulic, cable, rod and gear • Testing of steering and hydraulic systems • Emergency steering checks	• Steering arrangements are operated in accordance with manufacturer's instructions, operational procedures and regulations • Maintenance is arranged in accordance with the technical specifications
	Pumping Systems, including: • Fire/bilge/tank circulating systems • Fault identification, maintenance, prevention of corrosion • Valve types – construction and routine servicing • Back-flooding prevention • Strainers, mud boxes, foot valves • Dual duty systems/cross connection. • Use of flexible materials, hoses, etc. • Drive systems, belts, clutches, motors, etc. • Environmental responsibilities • Regulations and legislative requirements	• Pumping systems are operated in accordance with manufacturer's instructions, operational procedures and regulations to ensure safety of operation and prevention of pollution of the marine environment • Maintenance is arranged in accordance with the technical specifications
	Refrigeration systems, including: • Hazards of refrigerant gases • Identification of components • Environmental responsibilities	• Refrigeration system is operated and maintained in accordance with manufacturer's recommendations, regulations and vessel operating procedures to ensure safety of operation and prevention of pollution of the environment **WARNING:** *Relevant Commonwealth, local and State / Territory training and qualification requirements need to be fulfilled by any persons carrying out installation, maintenance and / or repair of refrigeration equipment especially with regard to preventing the escape of refrigerants into the atmosphere and to electrical work.*

Outcome	Content	Standards for evaluating competence
Outcome 11.5 Operate electrical systems	**Direct Current Systems** (DC) (not exceeding 32 V DC) including: • Batteries – types, care and maintenance, hazards • Basic care of electrical systems in general – fault recognition • Charging systems – regulators, alarms/ indicators • Uses of fuses and circuit breakers – selection of correct capacity • Connecting batteries • Starter motors, alternators and associated equipment – operation maintenance	• DC systems are operated and operator preventative maintenance in accordance with manufacturer's recommendations, regulations and vessel operating procedures to ensure safe operation. **WARNING:** *Relevant State/Territory electrical licensing requirements need to be fulfilled by any persons carrying out installation, maintenance and/or repair of electrical circuits or systems that are 50 v A.C. or above, OR 120 v DC or above, on a vessel.*
	Electric Systems (above 32 V DC and up to 415 V AC including: • Protective devices on switchboards • Personal safety • Shore power connection • Fault identification, location, and safety implications	• Electrical systems are operated in accordance with manufacturer's recommendations, regulations and vessel operating procedures to ensure safe operation • Electrical system faults are recognised and where necessary steps are taken to make them immediately safe **WARNING:** *Relevant State/Territory electrical licensing requirements need to be fulfilled by any persons carrying out installation, maintenance and/or repair of electrical circuits or systems that are 50 v A.C. or above, OR 120 v DC. or above, on a vessel.*
Outcome 11.6 Use deck machinery	**Use of deck machinery** • Lifting equipment • Winches, capstans • Safe working procedures • Basic hydraulic systems, their operation and user-maintenance • Legislation affecting lifting equipment	• Lifting equipment and deck machinery is operated and user-maintenance is carried out in accordance with manufacturer's recommendations, regulations and vessel operating procedures
Outcome 11.7 Demonstrate knowledge of the basic techniques of hull maintenance	**Hull maintenance** • Basic hull inspection and maintenance • Use of sacrificial anodes	• Maintenance procedures and techniques for hulls are in accordance with regulations and vessel operating procedures

Outcome	Content	Standards for evaluating competence
Outcome 11.8 - Demonstrate the actions to be taken in the event of fire or explosion - Describe actions for the operation and maintenance of fire-fighting equipment in the engine space	• Fire fighting systems • Fire/explosion, corrosion • Fire triangle • Minimisation of hazards • Identification and maintenance of fire-fighting equipment • Use of fire-fighting equipment • Management/control of fires • Personnel safety • Emergency shut-offs and closures • Fire alarm systems – heat/smoke detectors • Alarm panels • Fixed fire-fighting installations • Control of passengers/crew • Communications, instructions, etc.	• Fire control is implemented in accordance with maritime safety and vessel operating procedures whilst maintaining crew safety, vessel stability and operational capability • Actions taken to control fires are based on full and accurate assessment of the incident, using all available sources of information • Priority, timing and sequence of actions are appropriate to the overall requirements of the incident and to minimise damage and potential damage to the vessel, injuries to personnel and impairment of the operational effectiveness of the vessel • Maintenance of fire-fighting appliances is in accordance with manufacturer's specifications • Alarms are actioned, recorded and reported according to vessel procedures and marine safety requirements
• **Outcome 11.9** • Demonstrate knowledge of the principles of the stowage and management of explosive and flammable materials	• Stowage and management of flammable/ explosive liquids, gases, solids and other materials normally carried onboard (spare fuel, lubricants, LPG cooking gas, flares) • Dangers inherent with the above materials	• Stowage of flammable/explosive materials and their management, is in accordance with established rules and procedures
• **Outcome 11.10** • Maintain running log including fuel calculations and written reports	• Writing of simple reports • Keeping of running and maintenance logs • Working out simple calculations for fuel capacity, consumption and voyage duration	• Running and maintenance logs are completed according to vessel and maritime procedures including regular reports • Calculations for fuel capacity, consumption and voyage duration
Outcome 11.11 • Work effectively with others	Work in a group environment promoting team commitment and cooperation, supporting team members and dealing effectively with issues, problems and conflict	• Work effectively as part of a crew

Table 12 Marine Engine Driver Grade 2

Note: Table 12 (Marine Engine Driving) is also required for MED 2

Function: Engineering, Vessel Construction and Machinery

Outcome	Content	Standards for evaluating competence
Outcome 12.1 Operate and carry out basic user maintenance of marine internal combustion engines	• Diesel engine construction • Diesel engine operation and routine maintenance • Turbo charging arrangements • Diesel engine fuel injection, timing and control equipment • Engine protection arrangements • Engine performance and reasons for lack of performance (fault-finding procedures) • Planned maintenance • Operational practice	• Constructional parts of marine internal combustion engines are identified in accordance with manufacturer's manuals • Two – and four – stroke cycles of operation are explained in compliance with manufacturer's specifications • Marine internal combustion engines are operated within the technical specifications • Surveillance and operation of main propulsion plant and auxiliary systems is within the operating limits specified by vessel procedures or manufacturer's recommendations • Operational faults are recognised and rectified in accordance with manufacturer's specifications and fault-finding procedures • Maintenance is undertaken in accordance with vessel maintenance plan, vessel procedures and manufacturer's recommendations • Records are maintained in compliance with regulations and vessel recordkeeping procedures
Outcome 12.2 Operate and carry out basic user maintenance of lubricating oil and cooling-water systems	• Dry sump and wet sump lubrication systems • Correct pressure and flow conditions • Oil quality monitoring • Oil filter changing procedures • Heat exchanger, keel cooler, and raw water cooling systems • Construction and maintenance of heat exchangers • Corrosion prevention	• Lubricating systems are managed in accordance with established Regulations, manufacturers' instructions and vessel operating procedures and so as to prevent pollution of the marine environment • Cooling systems are managed in accordance with manufacturer's recommendations and established procedures • Maintenance is undertaken in accordance with vessel maintenance plan, vessel procedures and manufacturer's recommendations • Recordkeeping procedures are compliant with regulations
Outcome 12.3 Operate and carry out basic user maintenance of pumps, bilge and seawater systems	• Types of pumps and safety devices required • Pump capabilities and requirements for priming • Bilge pumping arrangements for vessels with several compartments • Dangers associated with back-flooding and methods to prevent back-flooding • Seawater circulating systems • Cross connections between seawater systems and bilge systems • Cross connections between bilge/ ballast/seawater systems and fire main	• Pumping systems are managed in accordance with established rules and procedures to ensure safety of operation and prevention of pollution of the marine environment • Maintenance is undertaken in accordance with vessel maintenance plan, vessel procedures and manufacturer's recommendations • Records are maintained in compliance with regulations and vessel recordkeeping procedures

Outcome	Content	Standards for evaluating competence
Outcome 12.4 Operate and carry out basic user maintenance of steering gear	• Electro-hydraulic steering gear • Common faults in steering gear • Testing of steering gear • Routine maintenance on steering systems • Emergency steering	• The steering arrangements are operated and maintained in accordance with the technical specifications • Emergency steering checks are in accordance with vessel maintenance plan, vessel procedures and manufacturer's recommendations • Records are maintained in compliance with regulations and vessel recordkeeping procedures
Outcome 12.5 Operate and manage fuel and fuel oil systems	• Arrangement of fuel oil systems and filters • Fuel oil tank components • Methods of fuel oil tank content measurement • Fuel tank filling • Condensation in fuel tanks • The effect of slack tanks on vessel stability	• Fuel systems are managed in accordance with established rules and procedures to ensure safety of operation and avoid pollution of the marine environment • Records are maintained in compliance with regulations and vessel recordkeeping procedures
Outcome 12.6 Demonstrate knowledge of the principles of oil and grease lubrication systems	• Functions of lubricating oil • Functions of grease	• The basic principles of lubrication are described in accordance with engineering principles
Outcome 12.7 Safely operate and carry out simple maintenance of electrical systems	• Main faults that can occur in electrical systems • Earth indicating devices • Maintenance and operation of batteries • Connecting batteries in series and parallel • Electrical distribution systems • Single and three phase AC power • Isolation of electrical circuits • Connection to shore power • Use of multi-meter to test voltage and continuity • Protection devices	• Electrical systems are operated and maintained in accordance with electrical regulations • Records are maintained in compliance with regulations and vessel recordkeeping procedures **WARNING:** *Relevant State/Territory electrical licensing requirements need to be fulfilled by any persons carrying out installation, maintenance and/or repair of electrical circuits or systems that are 50 v A.C. or above, or 120 v D.C. or above, on a vessel.*
Outcome 12.8 Demonstrate knowledge of the safe handling of LPG, liquid fuels and refrigerant gases	• Dangers associated with LPG and petrol vapour • Storage of LPG cylinders • Testing of LPG detectors • Safety procedures for vessel refuelling • Dangers of refrigerant gas leaks in confined spaces	• Flammable/explosive materials are stowed and managed in accordance with regulations and established rules and procedures • Refrigerant gases are stowed and managed in accordance with regulations and Australian Standards **WARNING:** *Relevant Commonwealth, local and State/ Territory training and qualification requirements need to be fulfilled by any persons carrying out installation, maintenance and /or repair of refrigeration equipment especially with regard to preventing the escape of refrigerants into the atmosphere and to electrical work.*

Outcome	Content	Standards for evaluating competence
Outcome 12.9 • Demonstrate knowledge of the precautions against fire and explosion • Demonstrate the methods of dealing with fires	• Major causes of fire and explosion onboard • Recognition and uses of different types of portable fire extinguishers • Fire pumps and fire main systems • Use of hoses and nozzles • Fixed installations, closing appliances and remote shut-offs • Safety precautions to be observed during a watch and immediate actions to be taken in the event of a fire or accident	• Fire control is implemented in accordance with maritime safety and vessel operating procedures whilst maintaining crew safety, vessel stability and operational capability • Actions taken to control fires are based on full and accurate assessment of the incident, using all available sources of information • Order of priority, timing and sequence of actions is appropriate to the overall requirements of the incident and to minimise damage and potential damage to the vessel, injuries to personnel and impairment of the operational effectiveness of the vessel • Maintenance of fire-fighting appliances is in accordance with manufacturer's specifications • Alarms are actioned, recorded and reported according to vessel procedures and marine safety requirements
Outcome 12.10 Recognise and correct deteriorated fittings and machinery	• Corrosion and means of prevention • Pipework repairs • Recognition and measurement of tail shaft weardown • Machinery log keeping	• Maintenance activities are planned in accordance with technical, legislative, safety and procedural specifications • Maintenance is carried out in compliance with manufacturer's specifications
Outcome 12.11 Prepare a vessel for sea and secure a vessel after a voyage	• Spares and stores required for proposed voyage • Preparations and checks necessary before sailing • Shutting down machinery • Securing vessel after voyage	• Vessel and machinery are prepared for sea and secured after voyage in accordance with ship and manufacturer's procedures

Outcome 12.12
Demonstrate knowledge of the methods of propulsion reversal
	• Construction and operation of:
	  • reverse-reduction gearboxes; and
	  • controllable pitch propellers
		• Method of propulsion reversal and the operation of marine gearboxes is in accordance with technical specifications

Outcome 12.13 Calculate consumption of fuel, speed and range of vessels	• Calculation of volumes • Conversion of volumes to litres • Specific gravity • Specific fuel consumption • Calculations involving specific fuel consumption, speed and range	• Calculations with bunkering capacity, consumption of fuel, speed and the range of a vessel are carried out and accurate to accepted working tolerances

Table 13 Marine Engine Driver Grade 1

Note: Table 11 (Marine Engine Driving) and Table 12 (Engineering, Vessel Construction and Machinery) are also required for MED 1

Function: Practical Mathematics

Outcome	Content	Standards for evaluating competence
Outcome 13.1 Calculate fuel consumption and storage	• Consumption of fuel and lubricating oil for a particular voyage, using quantity in litres and mass in tonnes and specified regular shaped tanks • Hourly fuel consumption • Remaining steaming times • Requirements for replenishing lubricating oil in oil tanks • The area and circumference of a circle • The volumes of regular shaped tanks • Tank capacities and pumping capacities for tank filling and emptying • Relationship between theoretical vessel speed, propeller pitch and R.P.M. Calculations involving specific fuel consumption, power, speed and range • Calibration tables	• Calculations as per the “content statement” are carried out and conform to accepted engineering tolerances
Outcome 13.2 Carry out engineering calculations	• Common SI units such as: kilogram, tonne, Newton, Newton metre, Pascal, joule, watt, and metre • Conversion of units to multiples of base units Convert fractions to decimals • Calculations to determine the area and circumference of a circle • Calculations involving the volume and capacity of regular shaped tanks • Use calibration tables to measure quantities in tanks • Use of relative density/specific gravity to convert quantity in litres and volume to mass Calculations involving pumping capacities for tank filling and emptying • Calculations involving the consumption of fuel and lubricating oil, hourly fuel consumption, theoretical steaming times and distances covered • Calculations involving the relationship between theoretical vessel speed, propeller pitch and engine speed • Calculations involving specific fuel consumption, power, speed and range • Terminology of simple levers • Calculations involving mechanical advantage, load, effort, moments • Understanding of terminology of material technology • Calculations involving stress, strain and safe working load	• Calculations as per the “content statement” are carried out and conform to accepted engineering tolerances

Table 13A Marine Engine Driver Grade 1

Function: Engine Driving and Regulation

Outcome	Content	Standards for evaluating competence
Outcome 13.3 a Operate and maintain marine internal combustion engines and propulsion transmission systems up to 1500 kW	• Simple constructional details • Cycles and timing diagrams for two – and four – stroke diesel engines • Care and management of two – and four – stroke diesel engines • Safety devices fitted to propulsion engines • Engine fuel systems • Engine and gearbox lubricating systems • Engine and gearbox cooling systems • Transmission systems from engine output shaft to propeller • Engine malfunctions and corrective action	• Marine internal combustion engines and transmission systems are operated and maintained within technical specifications and in accordance with accepted practices and procedures • The causes of machinery malfunctions are identified (fault finding) and any resultant restrictions applied to operations are justified and conveyed to the vessel Master • Actions are to ensure the overall safety of the ship and plant having due regard to the prevailing circumstances and conditions
Outcome 13.4 a Operate and maintain auxiliary machinery systems up to 1500 kw, including steering gear and refrigeration systems	• Pumps and pumping systems for bilge, fuel oil, freshwater and seawater systems • Types of pumps and associated safety devices • Hydraulic systems including steering gear • Electro-hydraulic steering gear • Emergency operation in the event of electrical or hydraulic failure • Simple hydraulic circuits • Maintenance of hydraulic systems • Refrigeration plant and its operation • Identification of refrigeration system components • The refrigeration cycle • Types of refrigerant • Identification of faults in refrigeration systems	• Auxiliary machinery systems are operated and maintained within technical specifications, in accordance with accepted practices and vessel procedures to ensure safety of operation and avoid pollution of the marine environment • Hydraulic systems and steering gear are operated and maintained in accordance with technical specifications to ensure safety of operation and avoid pollution of the marine environment • Refrigeration systems are operated in accordance with technical specifications to ensure safety of operation and avoid pollution **WARNING:** *Relevant Commonwealth, local and State / Territory training and qualification requirements need to be fulfilled by any persons carrying out installation, maintenance and / or repair of refrigeration equipment especially with regard to preventing the escape of refrigerants into the atmosphere and to electrical work.*
Outcome 13.5 a Operate, test and maintain electrical and control equipment	• DC equipment • Electrical principles and circuits • Operate and manage in a safe manner, the AC generation, protective devices and shore power arrangements • Operate 240 to 440 voltage alternating current electrical systems	• Electrical and control equipment is operated and maintained within technical specifications, in accordance with regulations, accepted practices and procedures and with regard to safety **WARNING:** *Relevant State/Territory electrical licensing requirements need to be fulfilled by any persons carrying out installation, maintenance and/or repair of electrical circuits or systems that are 50 v A.C. or above, OR 120 v D.C. or above, on a vessel*

Outcome	Content	Standards for evaluating competence
Outcome 13.6 a Maintain deck equipment and machinery	• Operation and maintenance of deck machinery • Winches and windlass • Safeguards/protective devices for winches • Causes and rectification of problems • Carry out basic welding • Carry out basic brazing • Cary out basic cutting • Carry out basic machining • Safe operating practices	• Deck equipment and machinery are maintained in accordance with technical specifications and with regard to safety • The causes of machinery malfunctions are identified (fault finding) and any resultant restrictions applied to operations are justified and conveyed to the vessel Master • Actions are to ensure the overall safety of the ship and plant having due regard to the prevailing circumstances and conditions
Outcome 13.7 a Organise maintenance and repairs	• Identification and use of manufacturer's manuals • Planning and preparation for maintenance including systematic isolation, dismantling and reassembly of plant • Inspections undertaken on a vessel's hull during slipping or dry-docking	• Maintenance and repair procedures are organised within technical specifications, accepted practices and vessel procedures • The organisation and preparation of operations is suited to the design parameters of the power installation and to the requirements of the voyage • Detect and diagnose faults
Outcome 13.8 a Demonstrate knowledge of methods of fire protection, detection and extinction	• Operation and maintenance of fire protection, detection and extinguishing equipment • Operation of machinery in such a way as to minimise fire risk • Causes of fire onboard a vessel • Fire hazards aboard a vessel during operation and maintenance periods • Causes and methods of prevention of fires/explosion associated with LPG • Classes of fires • Types of fire extinguishers for marine use, including portable, non-portable and fixed fire-fighting installations • Requirements for particular types of portable extinguishers for different classes of fire • Fire detection and alarms • Closing devices and remote shut-offs, gas/foam flooding systems • Control and extinguishment of large compartment fires • Hazards associated with the use of gas flooding systems	• Operational effectiveness of all fire detection and extinguishing systems is maintained at all times in accordance with performance specifications and legislative requirements • Fire control is implemented in accordance with maritime safety and vessel operating procedures whilst maintaining crew safety, vessel stability and operational capability • Actions taken to control fires are based on full and accurate assessment of the incident, using all available sources of information • The order of priority, timing and sequence of actions are appropriate to the overall requirements of the incident and to minimise damage and potential damage to the vessel, injuries to personnel and impairment of the operational effectiveness of the vessel • Alarms are actioned, recorded and reported according to vessel procedures and marine safety requirements

Outcome	Content	Standards for evaluating competence
Outcome 13.9 a Apply regulations to be observed regarding operational or accidental pollution of the marine environment and methods to prevent such pollution	• Marine pollution regulations • Operation of equipment in such a way as to minimise environmental pollution • Causes of pollution particularly relating to discharges from engine compartments and vessel operation • Statutory requirements regarding the discharge of oil, galley waste, garbage and plastics overboard • Methods of prevention of pollution • Requirements for reporting incidents • Procedures for dealing with an oil spill	• Legislative requirements relating to protection of the marine environment are correctly identified and applied • Demonstrate knowledge of how international legislative requirements are applied locally • Procedures for monitoring shipboard operations and ensuring compliance with legislative requirements relating to protection of the marine environment are observed
Outcome 13.10 a Monitor legislative requirements	• Relevant maritime law • International Agreements and Conventions	• Certificates, how they are obtained and periods of validity • Responsibilities affecting safety of passengers and crew • Responsibilities under relevant International Conventions including but not restricted to: • Marine Safety (Domestic Commercial Vessel) National Law Bill 2012, Regulations and Marine Orders • National Standard for Commercial Vessels • STCW, Loadline, SOLAS, MARPOL • Other State, National and local legislation
Outcome 13.11 a Identify the life-saving appliances required and demonstrate knowledge of their maintenance and use life-saving appliances	• Life-saving appliances • Launching arrangements for inflatable liferafts including hydrostatic releases • Maintenance and checks necessary to keep life-saving appliances in correct operating condition	• Actions in responding to abandon ship and survival situations are appropriate to the prevailing circumstances and conditions and comply with accepted safety practices and standards • Maintenance procedures for life-saving appliances meet legislative requirements • Actions to protect and safeguard all persons onboard in an emergency • Organise fire and abandon ship drills
Outcome 13.12 a Employ damage control techniques for hull damage	• Practice of correct damage control procedures following hull damage • Methods of damage control with specific reference to action to be taken in the event of flooding	• Emergency procedures are in accordance with the established plans for emergency situations, for example fire, collision, explosion, grounding • Ship construction related to damage control

Outcome	Content	Standards for evaluating competence
Outcome 13.13 a Maintain a safe working environment	• Causes of accidents with marine mechanical equipment • Methods of prevention • Operating procedures for use of winches and other rotating/moving machinery • Hazards associated with and the procedures for safe entry into confined spaces • Hazards associated with and the procedures for the safe operation of lifting devices • Hazards associated with radio and radar transmitters	• Working practices are in accordance with legislative requirements, codes of practice, permits to work and environmental concerns
Outcome 13.14 a Manage vessel stability	• Manage the dynamic factors affecting the stability of a vessel up to 80 m • Calculate stability • Control vessel stress and stability • Maintain records of stability management • Carry out basic calculations	• Manage loading and weight distribution of a vessel to ensure assigned load line conditions are not exceeded • Manage stability of vessel in a range of conditions • Recognise problems affecting vessel stability • Stowage arrangements for bringing stores onboard
Outcome 13.15 a Manage refuelling	• Plan refuelling or fuel transfer operations • Prepare vessel for refuelling or fuel transfer operations • Complete refuelling operations • Manage and emergency	• Complete required records • Implement procedures for dealing with spills • Measure tank levels • Recognise faulty equipment and take appropriate action • Recognise problems and hazards and take appropriate actions • Select and use relevant equipment • Take appropriate action in an accidental spillage, fire or safety incident
Outcome 13.16 a Manage an engine room and small engineering team	• Lead and develop a small engineering team • Organise engine room for departure • Manage daily engine room routine • Manage engineering team • Manage engineering procedures in port • Manage engineering emergencies	• Demonstrate effective communication techniques • Lead team members and demonstrate sound personal management • Monitor and review activity • Plan and organise activity • Read and interpret maritime regulations, rules, instructions, MSDS, safety data sheets (SDS) and WHO/OHS instructions • Write reports

Table 14 Engineer Class 3 Near Coastal

Function: Marine Engineering

Outcome	Content	Standards for evaluating competence
Outcome 14.1 Use mathematical techniques to solve engineering problems	• Areas of geometric figures • Volumes of geometric solids • Relationship between relative density/specific gravity and volumes • Representation of a force as a vector • Resolution of vectors to a resultant thrust obtained from tangential forces in simple structures and lifting apparatus • Basic laws of friction • Force to overcome friction • Friction losses in simple slides • Simple lifting machines • First moments as applied to levers • Velocity ratio • mechanical advantage • efficiency of simple machines • levers, rope blocks, screw and hydraulic jacks	• Calculations are carried out with results in accordance with manufacturers' or design specifications, product data sheet
Outcome 14.2 Carry out mathematical calculations relative to: • Vessel stress and stability • Heat value of fuel • Heat transference and expansion rates • Fluid pressures	• Stress, strain and elastic limit • Working stress and safe working load • Relationship between circumferential and longitudinal stress in thin cylinders and spherical shells • Equilibrium of floating bodies • Linear expansion due to heating • Units of heat • Specific heat • Sensible heat (enthalpy) • Latent heat (enthalpy) • Higher and lower calorific values of fuel • Relationship between power and mean effective pressure • Turning moment applied to a shaft • Calorific value • Specific fuel consumption • Variation in fuel consumption with vessel speed	• Calculation results conform to engineering practices and/or case study results • Principles of ship construction and factors affecting trim, stability and measurements to preserve trim and stability • IMO recommendations concerning ship stability

Outcome	Content	Standards for evaluating competence
Outcome 14.3 • Identify properties of common marine engineering materials and methods of joining • Manufacture simple components • Apply simple heat treatment	• Characteristics and limitations of materials used in construction and repair of ships and equipment • Characteristics and limitations of processes used for fabrication and repair • Properties and parameters considered in the fabrication and repair of systems and components	• Identification of important parameters for fabrication of typical ship-related components are appropriate • Selection of material conforms to vessel design • Use of equipment and machine tools are according to engineering workshop practices • Identify common marine engineering materials • List the properties as per material specifications • Fabricate the following in conformance with welding and mechanical techniques, to engineering tolerances: – Fit male and female finger joint – Machine and make threads to demonstrate use of lathe • Join two sections of: a) the same material; and b) different material
Outcome 14.4 Demonstrate knowledge of the properties of liquids and gases commonly used aboard vessels	• Properties of liquids and gases commonly used onboard ship	• Monitor and control vessel fluids and gases to ensure compliance with legislative requirements and measures to ensure safety of life at sea and protection of the marine environment
Outcome 14.5 Demonstrate knowledge of precautions against fire or explosion	• Principles of fire • Methods of fire prevention • Detection and alarm systems • Common causes • Advantages of cleanliness and good housekeeping practices • Oil mist detectors • Storage and use of LPG and petrol • Bunkering and transfer of fuel • Safety devices to prevent fire or explosion • Dangers of accumulation of oil or gas in enclosed spaces	• Identify and demonstrate knowledge of the causes of fires and explosions and the means of prevention in accordance with maritime safety regulations and vessel procedures • Procedures for monitoring fire detection and safety systems ensure that all alarms are detected promptly and acted upon in accordance with established ship procedures
Outcome 14.6 Operate and maintain fire protection, detection and extinguishing equipment and operate machinery in such a way as to minimise fire risk	• Methods of dealing with fire onboard vessels • Construction, testing and use of various portable and fixed fire extinguishers • Remote shut-offs and closing appliances	• Type and potential risk of the fire is identified, explained and initial actions conform to emergency procedures and contingency plans
Outcome 14.7 Implement safety precautions before entering tanks or confined spaces	• Dangers encountered in tanks and confined spaces • Precautions before entering tanks or confined spaces	• Maintenance activities are planned and carried out in accordance with technical, legislative, safety, and procedural specifications

Outcome	Content	Standards for evaluating competence
Outcome 14.8 Demonstrate knowledge of the construction features of a ship that impact on its watertight integrity and stability	• Common terms associated with vessel construction • Interpret plans • Rudder details • Oil and water lubricated stern tube details • Propeller types and fitting • Underwater fittings • Free surface effect • Management of tanks to maintain trim and stability	• Structural components of a vessel are identified and information from vessel technical drawings is interpreted in accordance with design • Demonstrate knowledge of how the procedures ensure and maintain the watertight integrity and stability of the ship are in accordance with accepted practice • Damage control procedures and equipment • Materials used in construction
Outcome 14.9 • Demonstrate knowledge of elementary principles, care and management of auxiliary power sources (steam and motor), including boilers and their fittings • Operate auxiliary power sources	• Waste heat boilers and economisers and their fittings • Auxiliary oil-fired boilers and their fittings • Boiler water treatment and testing • Correct use of gauge glasses • Danger of water hammer • Maintenance of boiler water density • Diesel generators • Shaft generators	• Auxiliary power sources are maintained and operated within manufacturer's specifications and vessel maintenance schedules • Assessment of boiler condition is based on relevant information available from local and remote indicators and physical inspection and is in compliance with manufacturer's operating instructions and procedures • Malfunctions and deviations from the operating specifications are identified and rectification procedures comply with vessel procedures and manufacturer's recommendations • Incidents are reported to the vessel Master detailing the operational restrictions necessary
Outcome 14.10 Demonstrate knowledge of elementary principles, care and management of the various types of auxiliary machinery systems up to 3000 kW	• Care and management of pumps and pumping, piping systems, and other shipboard auxiliaries • Types of pumps and principles of operation • Pumping systems for fuel oil, freshwater, seawater, lubricating oil, and bilge-water • Centrifugal separators • Oily water separators • Sewage systems	• Operation of auxiliary equipment is planned and carried out in accordance with established rules and procedures to ensure safety of operations and avoid pollution of the marine environment • Auxiliary equipment is maintained and operated within manufacturer's specifications and vessel maintenance schedules • Malfunctions and deviations from the specifications are identified and rectification procedures comply with vessel procedures and manufacturer's recommendations • Incidents are reported to the vessel Master detailing any operational restrictions necessary
Outcome 14.11 Dismantle, inspect, repair and reassemble vessel machinery	• The importance of correct alignment • The effects of incorrect alignment • Achieving correct alignment of machinery and machinery parts	• Dismantling, inspecting, repairing and reassembling equipment is in accordance with manuals and good practice
Outcome 14.12 Use gauges and meters to monitor and measure	• Construction and use of the various gauges and meters	• The electrical, pressure and measuring gauges and meters are used in accordance with the technical specifications and parameter

Outcome	Content	Standards for evaluating competence
Outcome 14.13 Maintain engineering records including oil pollution	• Maintenance of records and machinery logs • Organisation of planned maintenance • Maintenance of spare parts and consumable stores • Knowledge of statutory and survey requirements • Knowledge of pollution legislation	• A record is maintained of the movements and activities relating to the ship's engineering systems in accordance with vessel procedures and maritime engineering and safety procedures • Maintenance activities are planned and carried out in accordance with technical, legislative, safety, and procedural specifications • Plans, specifications, materials, spare parts and equipment are available according to vessel contingency plans for maintenance and repair • Procedures for monitoring operations and maintenance comply with legislative requirements • Potential non-compliance is promptly identified and action taken to prevent actual occurrence • Requirements for renewal and extension of certificates ensure continued validity of survey items and equipment
Outcome 14.14 Monitor legislative requirements	• Relevant maritime law • International Agreements and Conventions	• Certificates, how they are obtained and periods of validity • Responsibilities affecting safety of passengers and crew • Responsibilities under relevant International Conventions including but not restricted to: – *Marine Safety (Domestic Commercial Vessel) National Law Bill 2012,* Regulations and Marine Orders – *National Standard for Commercial Vessels* – STCW, Loadline, SOLAS, MARPOL – Other State, National and local legislation
Outcome 14.15 Demonstrate use of life-saving appliances and abandon ship procedures	• The operation of survival craft and rescue boats • Survival craft launching appliances and arrangements and their equipment, including EPIRBs	• Actions in responding to abandon ship and survival situations are appropriate to the prevailing circumstances and comply with accepted safety practices and standards • Organise fire and abandon ship drills • Actions to protect and safeguard all onboard during an emergency

Outcome	Content	Standards for evaluating competence
Outcome 14.16 Operate and maintain refrigeration systems	• Principles of refrigeration • Properties of common refrigerants • Operating temperature and pressures • Methods of temperature control • Care and management of refrigeration equipment, recognition of defects	• Demonstrate knowledge of the operating principles of a refrigeration system in accordance with manufacturer's specifications • Refrigeration and air-conditioning systems are operated and maintained within technical specifications and in accordance with accepted practices and procedures to ensure safety of operation and avoid pollution of the marine environment **WARNING:** *Relevant Commonwealth, local and State / Territory training and qualification requirements need to be fulfilled by any persons carrying out installation, maintenance and / or repair of refrigeration equipment especially with regard to preventing the escape of refrigerants into the atmosphere and to electrical work.*
Outcome 14.17 Manage the operation of propulsion plant machinery	• Marine diesel engines • Basic understanding of the operation of: – Steam turbine – Gas turbine – Steam boiler	• Design features and operative mechanisms • Heat cycle, thermal efficiency and heat balance • Propulsive characteristics including speed, output and fuel consumption • Diagnosis and identification of faults and actions to rectify
Outcome 14.18 Operation, surveillance and performance assessment of propulsion plant and auxiliary equipment	• Manage safe and effective maintenance and repair procedures	• Detect, diagnose and identify causes of machinery malfunctions • Correct faults • Plan repairs • Plan and undertake maintenance • Use safe work practices • Attend to maintenance according to manufacturer's directions and legislative requirements • Maintain maintenance records in accordance with legislative requirements

Outcome	Content	Standards for evaluating competence
Outcome 14.19 Operate and maintain two – and four – stroke machinery Operate and maintain compressed ignition engines Operate marine internal combustion engines and associated systems up to 3000 kW	• Simple constructional details • Care and management of two – stroke and four – stroke main propulsion internal combustion engines • Care and management of compressed ignition internal combustion engines • Two – and four – stroke cycles and timing • Scavenging and supercharging • Engine cooling and lubrication • Tuning • Overloading • Safety devices • Engine governors and trips • Starting, reversing and operational procedures • Engine bearings • Detection of defects • Crankcase explosions	• Identify and demonstrate knowledge of the function of internal combustion engine components • The methods of preparing for start-up and making available fuels, lubricants, cooling water and air are in accordance with vessel procedures or manufacturer's specification • Checks of pressures, temperatures and revolutions during the start-up and warm-up period are in accordance with the technical specifications • Watchkeeping (or bridge monitoring) schedules ensure the main propulsion plant is operated within manufacturer's specifications • Function and mechanism of automatic control for main engines and auxiliaries including: – Generator distribution system – Steam boilers – Oil purifiers – Pumping gear – Steering gear systems – Cargo handling equipment – Deck machinery • Malfunctions and deviations from the operating specifications are identified promptly and accurately and rectification procedures comply with the vessel procedures and manufacturer's recommendations and are reported to the vessel Master detailing any operational restrictions necessary • Arrangements for ensuring the safe and efficient operation and condition of the machinery installation are in compliance with vessel operating procedures • Detect, identify and diagnose faults, take action to rectify
Outcome 14.20 Demonstrate knowledge of the principles of engine cooling, fuel and lubricating systems	• Cooling systems for diesel engines • Relationship between temperature and efficiency • Cooling water testing • Fuel systems for diesel engines • Safety devices • Centrifugal separators • Fuel filters • Lubricating systems for diesel engines • Boundary and full fluid film • Viscosity • Additives and total base numbers • Onboard tests of lubricating oil	• Engine cooling, fuel and lubricating systems are operated and maintained in accordance with technical specifications to ensure safety of operation and avoid pollution of the marine environment
Outcome 14.21 Outline the principles of air compressors, their care and maintenance	• Reciprocating air compressors • Cooling and intercooling • Compressor defects • Relief valves • Air receivers and their mountings • Oil contamination of air start systems	• Air compressors and ancillary equipment are operated and maintained in accordance with technical specifications and accepted procedures to ensure safety of operation

Table 14 A Engineer Class 3 Near Coastal

Function: Marine Engineering (Leadership and Management)

Outcome	Content	Standards for evaluating competence
Outcome 14 a Maintain a safe engineering watch	• Watchkeeping practices comply with accepted standards and procedures • STCW watchkeeping standards • Bridge teamwork procedures • Assessing engineering watchkeepers' skills • Fitness for duty • Fatigue management • Drug and alcohol policy	• Watchkeeping arrangement are planned and implemented • Watchkeeping procedures including: • Taking over the watch • Performing deck watch • Watchkeeping in port • Watchkeeping with ship carrying hazardous cargo • Cargo • Fatigue management • Consideration given to unmanned engine room, ship operations • Watchkeeping arrangements are planned, organised and implemented, including: – Standing Orders and calling the Master – Taking over the watch – Clear weather – Restricted visibility – Hours of darkness – Coastal and congested waters –ships need to respond – Ship at anchor and in port – Ship carrying dangerous cargo • Communication and reporting procedures adopted on the bridge are clearly defined, accepted and implemented • Adopted procedures enhance navigational safety, protection of the marine environment and the safety of all onboard
Outcome 14 a Application of leadership and teamworking skills	• Working knowledge of shipboard personnel management and training • A knowledge of relevant international maritime conventions and recommendations and national legislation	• Ability to apply task and workload management including: – Planning and coordination – Personnel assignment – Time and resource constraints – Prioritisation • Knowledge and ability to apply effective resource management: • Allocation, assignment and prioritisation of resources • Assertiveness and leadership including motivation • Obtaining and maintaining situational awareness • Knowledge and ability to apply decision making techniques: • Situation and risk assessment • Identify and consider generated options • Selecting course of action • Evaluation of outcome effectiveness • Development, implementation and oversight of standard operating procedures

Table 14B Engineer Class 3 Near Coastal

Function: Marine Engineering (Electrical)

Outcome	Content	Standards for evaluating competence
Outcome 14.20 b Define electrical terms and solve basic electrical problems using mathematics	• S.I. Units, Amperes, Volts, Ohms • Ohms law • Resistance in series and parallel • Batteries in series and parallel • Heating effect of electric current • Calculation of electrical power given a network of resistance and applied voltage	• Terms are defined in accordance with electrical trade handbooks and calculations conform to principles of electricity
Outcome 14.21b Manage operation of electrical and electronic control equipment	• Marine electronics, power electronics, automatic control engineering and safety devices	• Design features of high voltage installations • Design features and system configuration of auto control equipment and safety devices for main engine • Features of hydraulic and pneumatic control equipment **Warning**: *Relevant State/Territory electrical licensing requirements need to be fulfilled by any persons carrying out installation, maintenance and/or repair of electrical circuits or systems that are 50 v A.C. or above, or 120 v D.C. or above, on a vessel.*
Outcome 14.22b Demonstrate electrical safety during repair and inspection of electrical circuitry and equipment	• Procedures for safe isolation of electrical and other types of plant and equipment • Supervision and management of electrical work • Safe working procedures on electrical plant and equipment	• Isolation, dismantling and reassembly of plant and equipment is in accordance with electrical trade practices and procedures **Warning:** *Relevant State/Territory electrical licensing requirements need to be fulfilled by any persons carrying out installation, maintenance and/or repair of electrical circuits or systems that are 50 v A.C. or above, or 120 v D.C. or above, on a vessel.*
Outcome 14.23 b Demonstrate knowledge and use of the colour coding system for electric conductors	• Colour coding system	• Earth active and neutral conductors are defined and wiring is connected in accordance with design diagrams and electrical trade practices and procedures

Outcome	Content	Standards for evaluating competence
Outcome 14.24 b Operate and maintain electric starter motors	• Types of AC and DC motor starters • Circuit protection devices for over and under loading	• Operation and maintenance requirements are explained in accordance with vessel procedures and manufacturer's manuals • AC and DC motors, starters and protection devices are operated and maintained in accordance with technical specifications and established procedures to ensure safety of operation **Warning**: *Relevant State/Territory electrical licensing requirements need to be fulfilled by any persons carrying out installation, maintenance and/or repair of electrical circuits or systems that are 50 v A.C. or above, or 120 v D.C. or above, on a vessel.*
Outcome 14.25 b Demonstrate knowledge of the principles of operation and operating procedures for AC and DC generators	• Preparing, starting, coupling and changing over alternators or generators • Management of load sharing • Location of common faults and action to prevent damage • Design features, system configuration of automatic control equipment and safety devices	**Warning:** *The operation of AC and DC generators is explained in accordance with manufacturer's manuals and operating procedures comply with manufacturer's instructions and vessel procedures, installation, maintenance and/or repair of electrical circuits or systems that are 50 v A.C. or above, or 120 v D.C. or above, on a vessel.*
Outcome 14.26 b Manage and maintain batteries and accumulators	• Types of accumulators and storage batteries • Accumulators and storage battery construction • Accumulator and storage battery charging • Accumulator and storage battery maintenance and safety	• Accumulators and storage batteries are managed and maintained within technical specifications and in accordance with established procedures to ensure safety of operation. **Warning:** *Relevant State/Territory electrical licensing requirements need to be fulfilled by any persons carrying out installation, maintenance and/or repair of electrical circuits or systems that are 50 v A.C. or above, or 120 v D.C. or above, on a vessel.*
Outcome 14.27 b Repair, maintain and manage power distribution of single and three phase electrical power	• Single phase distribution systems • Three phase distribution systems • Circuit protection • Earth fault detection and rectification • Electrical safety procedures • Maintain marine switchboards • Test automatic control devices	• Distribution systems are managed and operated within technical specifications and in accordance with established rules of the electrical trade **Warning**: *Relevant State/Territory electrical licensing requirements need to be fulfilled by any persons carrying out installation, maintenance and repair of electrical circuits or systems that are 50 v A.C. or above, or 120 v D.C. or above, on a vessel.*

Table 15 Engineer Class 3 Near Coastal

Applicants must have completed an approved program of study that meets the standards specified in section A-III/2 and the relevant sections of the STCW Code and includes the following:

1. approved modules in command navigation, shipmasters business and management, and ship operations and administration;
2. an approved course of basic safety training (that complies with STCW Code section A-VI/1 paragraph 2 and section VI/6 paragraph 4).

Function: Skill Set Engineer Class 3

Outcome	Content	Standards for evaluating competence
Outcome 15.1 Employ tools, equipment and materials in a shipboard context	• Follow safe work practices • Maintain marine pumps • Maintain valves • Maintain air compressors • Maintain heat exchangers • Inspect marine boilers • Inspect marine refrigeration units • Maintain marine lubricating systems • Maintain and repair deck machinery	• Table 16
Outcome 15.2 Maintain and repair marine electrical and electronic equipment	• Maintain marine generators • Maintain marine switchboards • Maintain marine electrical motors • Test marine electrical motor starters • Maintain marine electrical distribution systems • Maintain DC electrical systems • Identify faults in automated control systems • Operate electrical testing and measuring equipment and test automatic control devices	• Table 16A
Outcome 15.3 Maintain and repair shipboard machinery and equipment	• Follow safe work practices • Carry out heat treatment • Use hand tools • Use hand power tools • Perform onboard pipe work • Use machine tools • Perform welding and thermal cutting operations • Perform soldering operations • Select and use sealants, adhesives, bonding agents, gaskets and packing	• Assess own work and outcomes • Maintain knowledge of current codes, standards, regulations and industry packages • Communicate procedures associate with hand and machine tools and equipment (verbally and in writing) • Demonstrate correct methods, procedures, use of material when operating hand and power tools • Safely use hand and machine tools

Table 16 Engineer Class 3 Near Coastal

Function: Certificate of Safety Training

Outcome	Content	Standards for evaluating competence
• Survive at sea in the event of ship abandonment	• As per the Requirements of Table A-VI/1-1 – Personal Survival Techniques	• Course delivered by an AMSA (MO3) approved RTO
• Comply with emergency procedures • Take precautions to prevent pollution of the marine environment • Observe safe working practices • Contribute to effective communications on board ship • Contribute to effective human relationships on board ship • Understand and take necessary actions to control fatigue	• As per the Requirements of Table A-VI/1-4 – Personal Safety and Social Responsibilities	• Course delivered by an AMSA (MO3) approved RTO