Australian Government

MARL002 Apply basic principles of naval architecture

Release: 1

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Modification History

Release 1. New unit of competency.

Application

This unit involves the skills and knowledge required to perform basic calculations related to the seaworthiness of commercial vessels, including those dealing with watertight integrity and vessel stability.

This unit applies to people working in the maritime industry as a Marine Engineering Watchkeeper on commercial vessels greater than 750 kW or as an Engineer Class 3 Near Coastal.

This unit has links to legislative and certification requirements.

Pre-requisite Unit

Not applicable.

Competency Field

L - Marine Engineering

Unit Sector

Not applicable.

Elements and Performance Criteria

Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element.
1 Calculate shipboard areas and volumes	1.1 Basic principal structural members of ship and proper names of various parts are detailed
	1.2 Simpson's Rules are applied to calculate shipboard areas
	1.3 Simpson's Rules are applied to calculate shipboard volumes

2	**Calculate vessel displacement**	2.1	Tonnes per centimetre (TPC) values and Simpson's Rules are applied to calculate vessel displacement
		2.2	Calculations are performed using TPC values and Simpson's Rules to solve problems related to vessel displacement
3	**Calculate ship dimensions**	3.1	Ship form dimensions are calculated using coefficients for areas
		3.2	Ship form coefficients for underwater volumes are calculated
		3.3	Influence of common hull modifications on hull form coefficients is explained
		3.4	Calculations are performed to solve problems of ship form coefficients following change to vessel length resulting from mid body insertion or removal
4	**Explain position of centre of gravity of vessel in relation to its keel and midships**	4.1	Centre of gravity calculations for a vessel are performed
		4.2	How centre of gravity changes with redistribution, addition and/or removal of mass is explained
		4.3	How addition, removal or transfer of mass may cause overturning moments is identified
		4.4	Problems are solved involving addition, removal and vertical movement of mass by performing centre of gravity calculations for typical vessel loaded conditions
		4.5	Calculations are performed using results from inclining experiments to obtain initial stability characteristics
5	**Explain effects of water density and flooding of mid-length compartment on vessel draft**	5.1	Relationship between changes in underwater volume and changes in water density is outlined
		5.2	Fresh water allowance of a vessel is determined
		5.3	Change in mean draft for vessel movement between waters of different densities is calculated
		5.4	Volume lost-volume gained relationship for flooded compartments is explained
		5.5	Calculations are performed to solve problems of mid-length compartment flooding in simple box-shaped hull forms
		5.6	Fundamental actions to be taken in the event of partial loss of intact buoyancy are identified

6	**Perform calculations related to propellers and vessel speed**	6.1	Relationship between propellers and vessel speed is explained
		6.2	Problems related to vessel speed and propellers are solved by calculating theoretical, apparent and true speeds, apparent and true slips, wake speed and Taylor wake fraction
		6.3	Impact of fouling on vessel hull and propeller is outlined
7	**Calculate voyage and daily fuel consumptions**	7.1	Fuel consumption is determined by applying admiralty coefficient for fuel consumption taking account of ship speed, shaft power and displacement
		7.2	Calculations are performed to solve problems of vessel fuel consumption taking account of ship speed, shaft power and displacement
		7.3	Impact of fouling on vessel fuel consumption is explained
8	**Calculate pressures and loads on surfaces due to hydrostatics**	8.1	Standard formula for hydrostatic pressure is defined
		8.2	Hydrostatic load on vertical and horizontal surfaces is calculated
		8.3	Method of calculating loads on typical tank structures for different filling rates is explained

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

Specifies different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Range is restricted to essential operating conditions and any other variables essential to the work

environment.

Shipboard areas include one or more of the following:	• bulkheads • elemental areas • water planes
Shipboard volumes include one of the following:	• transverse sectional areas • water plane areas
Problems related to vessel displacement include one of the following:	• addition of mass • removal of mass
Coefficients for areas include one of the following:	• midships (CM) • waterplane (CW)
Coefficients for underwater volumes include one of the following:	• block (Cb) • prismatic (Cp)
Centre of gravity includes one or more of the following:	• centre of gravity (CG) • longitudinal centre of gravity (LCG) • vertical centre of gravity (VCG)
Mass includes one or more of the following:	• ballast • cargo • fuel • passengers
Filling rates include one or more of the following:	• accidental flooding • tank testing

Unit Mapping Information

This is a new unit. This unit is equivalent to MARL5004A Apply basic principles of naval architecture.

Links

Companion Volume implementation guides are found in VETNet - https://vetnet.education.gov.au/Pages/TrainingDocs.aspx?q=772efb7b-4cce-47fe-9bbd-ee3b1d1eb4c2