Australian Government

MARL016 Apply intermediate principles of marine mechanics

Release: 1

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Modification History

Release 1. New unit of competency.

Application

This unit involves the skills and knowledge required to apply intermediate principles of marine mechanics and to perform associated calculations needed to operate and maintain marine machinery.

This unit applies to the work of a Marine Engineer Class 2 on commercial vessels greater than 3000 kW and forms part of the requirements for the Certificate of Competency Marine Engineer Class 2 issued by the Australian Maritime Safety Authority (AMSA).

No licensing, legislative or certification requirements apply to this unit at the time of publication.

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 Apply principle of moments to determine forces in supports, connections, bearings and support systems	1.1 Equilibrium of solids is explained
	1.2 Polygon of forces is applied to determine an unknown force
	1.3 Principle of moments is applied to solve moments of any quantity
	1.4 Resultant of a system of co-planer forces is calculated
	1.5 Twisting moment due to engine crank mechanisms is calculated

		1.6	Moments of areas and solids are calculated
2	**Perform friction calculations**	2.1	Laws of friction are applied to solve problems involving friction in inclined planes
		2.2	Coefficient of friction is converted to angle of repose
		2.3	Friction theory is applied to solve problems involving screw threads
		2.4	Brake torque is analysed and problems are solved relating to work lost on brake shoes and brake discs
3	**Solve motion problems**	3.1	Linear velocity/time and acceleration/time graphs are applied to derive standard linear formula
		3.2	Problems of linear and angular motion involving uniform acceleration and deceleration are solved
		3.3	Marine engineering problems involving free falling bodies are solved
4	**Solve problems using principle of momentum**	4.1	Relationship between momentum and impulse is explained
		4.2	Conservation of energy theory is applied to problems involving collision of perfectly elastic bodies
5	**Solve problems using principles of dynamics**	5.1	Centripetal force is distinguished from centrifugal force
		5.2	Relationship between centripetal and centrifugal force and mass, angular velocity and radius is clarified
		5.3	Problems are solved involving centripetal and centrifugal forces
		5.4	Centripetal acceleration is distinguished from centrifugal force
		5.5	Out-of-balance forces on co-planer systems are calculated
		5.6	Bearing reactions in rotating shafts are determined
		5.7	Radius of gyration and moment of inertion when applied to rotating bodies is explained
		5.8	Centrifugal forces in governors are calculated
		5.9	Principles of dynamics are applied to solve problems involving rotating bodies, accelerating shafts, motors and

			flywheels
6	**Calculate stresses and strains on components due to axial loading and restricted thermal expansion**	6.1	Reduction in area and percentage elongation of tensile test specimens is calculated
		6.2	Stresses in composite bodies of dissimilar dimensions and dissimilar materials are calculated
		6.3	Problems involving thermal stress on components due to temperature change with free and restricted expansion are solved
7	**Apply thin cylinder theory to determine stresses in pressure vessels**	7.1	Stress on thin-shelled pressure vessels due to internal pressure is calculated
		7.2	Formula for calculating stress on thin-shelled pressure vessels to incorporate special conditions is modified
8	**Apply torsion theory to calculate shear stress**	8.1	Torsion equation is applied to solve problems involving solid and hollow shafts
		8.2	Power transmitted in shafts and coupling bolts is calculated
		8.3	Torsion equation is applied to calculate stress and deflection in a close-coiled helical spring
		8.4	Power transmitted by shafts and couplings is calculated
9	**Solve problems involving fluids**	9.1	Variation of fluid pressure with depth is calculated
		9.2	Bernoulli's Theorem is used to solve problems of velocity, pressure and head in pipes and ducted systems
		9.3	Archimedes' Principle is used to solve problems related to floating vessels using real and apparent weight
10	**Apply beam theory to solve problems**	10.1	Reactions of a loaded beam are calculated
		10.2	Shear force and bending moment diagrams are constructed for simply supported and cantilever beams
		10.3	Shear force and bending moment diagrams for beams with concentrated and uniformly distributed loads are calculated
		10.4	Beam equation is applied to derive stresses in beams loaded with concentrated and uniformly distributed loads
		10.5	Beam equation is applied to calculate bending stresses

Foundation Skills

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

Range of Conditions

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

Governors must include:	• porter • watt
Special conditions must include:	• joint efficiencies • safety factors

Unit Mapping Information

This unit replaces and is equivalent to MARL6003A Apply intermediate principles of marine mechanics.

Links

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