



Australian Government

MARL061 Perform basic marine engineering calculations

Release: 1

MARL061 Perform basic marine engineering calculations

Modification History

Release 1. This is the first release of this unit of competency in the MAR Maritime Training Package.

Application

This unit involves the skills and knowledge required to perform basic engineering calculations required for the operation of marine machinery and equipment.

This unit applies to people working in the maritime industry in the capacity of:

- Electro-Technical Officer (STCW Electro-Technical Officer Unlimited)
- Engineer Class 3 Near Coastal
- Engineer Watchkeeper (STCW Engineer Watchkeeper Unlimited).

Licensing/Regulatory Information

Legislative and regulatory requirements are applicable to this unit.

- Regulatory requirements include STCW International Maritime Organization (IMO) model course competencies and areas of knowledge, understanding and proficiency, together with the estimated total hours required for lectures and practical exercises. Teaching staff should note that timings are suggestions only and should be adapted to suit individual groups of trainees depending on their experience, ability, equipment and staff available for training.

Near Coastal Qualifications:

- This unit is one of the requirements to obtain Australian Maritime Safety Authority (AMSA) certification as an Engineer Class 3 Near Coastal as defined in the Marine Order 505 (Certificates of competency - National Law) 2013.

Blue Waters Qualifications:

- This unit is one of the requirements to obtain Australian Maritime Safety Authority (AMSA) certification as an Electro-Technical Officer (STCW Electro-Technical Officer Unlimited) or Engineer Watchkeeper (STCW Engineer Watchkeeper Unlimited) and to meet regulatory requirements this unit must be delivered consistent with Marine Orders and with the relevant sections of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW).

Pre-requisite Unit

Not applicable.

Competency Field

L - Engineering

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Apply mathematical formulae to solve engineering problems

PERFORMANCE CRITERIA

Performance criteria describe the performance needed to demonstrate achievement of the element.

1.1 Proportions, variation, percentages and averages are calculated, and method of unity is applied

1.2 Problems involving the manipulation of indices are solved

1.3 Written descriptions of actual or hypothetical engineering problems are expressed in mathematical terms

1.4 Algebraic formulae and equations are manipulated to change subjects, as and when required

1.5 Index problems are converted to logarithmic problems, and vice versa, according to the Law of Logarithms

1.6 Calculator is used to resolve engineering problems

2 Calculate areas, volumes and masses of regular and irregular figures

2.1 Problems related to areas and volumes of regular geometric figures are solved using standard formulae

2.2 Problems relating to surface areas and volumes of circular figures are solved

2.3 Centres of gravity (CG) and centroids of area are found for both line figures and areas

2.4 Concept of density is applied to calculate masses

3 Apply trigonometry to solve problems relating

3.1 Basic trigonometric ratios of sine, cosine and tangent, together with their reciprocals are explained with respect

**to angular measurement
and the resolution of
vectors**

to the sides of a right-angled triangle

- 3.2 Pythagoras' Theorem is proved
- 3.3 Problems associated with single angle trigonometric identities, including those derived from the application of Pythagoras' Theorem to the basic sin, cos and tan identities, are solved
- 3.4 Derivation of multiple, double and half angle trigonometric identities are shown and used to simplify complicated trigonometric expressions and identities
- 3.5 Sine rule and cosine rule for solution of triangles are proved and applied

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.

Unit Mapping Information

This unit is equivalent to MARL009 Perform basic Engineering calculations.

Links

Companion Volume implementation guide can be found in VetNet -

<https://vetnet.gov.au/Pages/TrainingDocs.aspx?q=772efb7b-4cce-47fe-9bbd-ee3b1d1eb4c2>

Assessment Requirements for MARL061 Perform basic marine engineering calculations

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Performance Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria on at least one occasion and include:

- assessing own work outcomes and maintaining knowledge of current codes, standards, regulations and industry practices
- explaining basic mathematical concepts and techniques relevant to engineering
- identifying and determining appropriate mathematical techniques and formula to solve engineering problems
- identifying the methods and procedures needed to select mathematical techniques and formula to solve engineering problems
- imparting knowledge and ideas through verbal, written and visual means
- performing accurate and reliable calculations
- performing calculations relevant to engineering, including volumes and masses of regular and irregular areas
- reading and interpreting written information on engineering problems and expressing this information in mathematical terms
- solving problems using appropriate laws and principles
- using a calculator to resolve engineering problems.

Knowledge Evidence

Evidence required to demonstrate competence in this unit must be relevant to and satisfy all of the requirements of the elements and performance criteria and include knowledge of:

- calculations, including:
 - algebra
 - calculations with positive and negative integers
 - graphs
 - indices
 - mensuration
 - simplifying expressions
 - trigonometry
- centre of gravity (CG), longitudinal centre of gravity (LCG) and vertical centre of gravity

(VCG)

- centroids of area
- formulae for areas, volumes and masses of regular and irregular shapes
- indices
- Law of Logarithms
- proportions, variation, percentages, averages and method of unity
- Pythagoras' Theorem.

Assessment Conditions

Assessors must hold credentials specified within the Standards for Registered Training Organisations current at the time of assessment.

Assessment must satisfy the Principles of Assessment and Rules of Evidence and all regulatory requirements included within the Standards for Registered Training Organisations current at the time of assessment.

Assessment processes and techniques must be appropriate to the language, literacy and numeracy requirements of the work being performed and the needs of the candidate.

Practical assessment must occur in a workplace, or realistic simulated workplace, under the normal range of workplace conditions.

Simulations and scenarios may be used where situations cannot be provided in the workplace or may occur only rarely, in particular for situations relating to emergency procedures and adverse weather conditions where assessment would be unsafe, impractical or may lead to environmental damage.

Resources for assessment must include access to:

- applicable documentation, such as legislation, regulations, codes of practice, workplace procedures and operational manuals
- tools, equipment, machinery and materials currently used in industry.

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