



Australian Government

Assessment Requirements for MARL039
Apply advanced principles of marine
engineering thermodynamics

Release: 1

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Modification History

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

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
- communicating knowledge and ideas through verbal, written and visual means
- explaining advanced principles of engineering thermodynamics
- identifying and applying relevant mathematical formulas and techniques to solve advanced problems related to engineering thermodynamics
- identifying and interpreting numerical and graphical information, and performing advanced mathematical calculations related to engineering thermodynamics, such as calculation of power, isentropic efficiencies, thermal efficiency, and work and fuel consumption for gas turbine cycles
- identifying, collating and processing information required to perform advanced calculations related to engineering thermodynamics
- reading and interpreting written information needed to perform complex calculations related to engineering thermodynamics
- solving problems using appropriate laws and principles
- using calculators to perform accurate, reliable and complex mathematical calculations.

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:

- air compressors, including:
 - components
 - faults and hazards
 - first law of thermodynamics
 - operating cycle of reciprocating air compressors
 - performance characteristics
 - property diagrams
 - types

- uses
- working principles of reciprocating compressors
- atomic and molecular weights and the kilogram-mole (kg-mol)
- basic gas expansion and contraction, heat transfer
- basic principles of engineering thermodynamics
- Daltons Law of partial pressures
- enthalpy
- expansion and compression of gases
- fluid properties, including:
 - density
 - dryness fraction
 - enthalpy of water
 - pressure
 - saturated steam
 - specific volume
 - superheated steam
 - temperature
- gas laws
- gas turbines
- heat cycles, including:
 - marine diesel engine
 - marine steam boiler and steam turbine
 - marine gas turbine
- heat transfer, including:
 - forms:
 - conduction
 - convection
 - radiation
 - methods
 - principles
- internal combustion engines, including:
 - heat engine cycles
 - improvements
 - operating principles of two-stroke and four-stroke internal combustion engines
 - performance characteristics
 - second law of thermodynamics
- internal combustion engine cycles
- key terms, including:
 - enthalpy of fusion
 - evaporation

- sensible heat
- transfer of heat energy
- laws of thermodynamics
- methods, including:
 - duct attenuators
 - duct lining
 - lined duct splitters
 - lined plenums
 - natural attenuation
 - sound absorbing materials/placement
 - vibration isolators
 - white noise
- noise and vibration control, including:
 - fundamentals of sound
 - noise and vibration problems
 - methods of control
 - operating cycle of reciprocating air compressors
- operating principles of two-stroke and four-stroke internal combustion engines
- parameters, including:
 - adiabatic saturation or constant enthalpy
 - humidifying or dehumidifying
 - latent heat
 - sensible heat
- principles of refrigeration, including:
 - processes:
 - adiabatic
 - isothermal
 - polytropic
- Rankine cycle
- refrigeration and air conditioning (RAC) cycles and systems
- steam plants
- International System of Units (SI)
- tables and/or diagrams, including:
 - pressure-enthalpy
 - pressure-specific volume
 - specific enthalpy-specific entropy
 - temperature-pressure
 - temperature-specific enthalpy
 - temperature-specific entropy
- thermodynamic and heat transmission, including:

- air conditioning combustion
- gas cycles/engine analysis
- heat transfer
- properties and vapours
- refrigeration
- steam cycles
- thermodynamic principles
- thermodynamic processes, including:
 - adiabatic
 - isobaric
 - isochoric
 - isothermal
 - polytropic
- thermal efficiency calculations
- work health and safety (WHS)/occupational health and safety (OHS) requirements and work practices.

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:

- relevant documentation, including workplace procedures, regulations, codes of practice and operation manuals
- tools, equipment, materials, and relevant personal protective equipment (PPE) currently used in industry.

Links

Companion Volume implementation guide can be found in VetNet -

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