



Australian Government

MARA019 Manage advanced liquefied gas tanker cargo operations

Release: 1

MARA019 Manage advanced liquefied gas tanker cargo operations

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 manage advanced liquefied gas tanker cargo operations.

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

- Chief Mate
- Deck Officers
- Engineering Officers
- Engineers
- Masters
- Ratings.

Licensing/Regulatory Information

This unit is equivalent to and delivers the objectives of the following STCW provisions:

- STCW Reg V/1-2 (3 and 4) and Code Section A-V/1-2 (2), Table A-V/1-2-2.

Legislative and regulatory requirements are applicable to this unit.

- This unit is one of the requirements to obtain Australian Maritime Safety Authority (AMSA) certification as Chief Mate, Deck Officers, Engineering Officers, Engineers, Masters or Ratings for advanced operations on liquefied gas tankers 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).
- Those 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.

Pre-requisite Unit

Not applicable.

Competency Field

A - Handling Cargo and Vessel Stability

Unit Sector

Not applicable.

Elements and Performance Criteria

ELEMENTS

Elements describe the essential outcomes.

1 Perform work safely and monitor all cargo operations

PERFORMANCE CRITERIA

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

- 1.1** Communication with personnel is clear, concise and accurate and information is understood and acted upon
- 1.2** Cargo operations are carried out in a safe manner, taking into account liquefied gas tanker designs, systems and equipment
- 1.3** Cargo operations are planned, risk is managed and carried out in accordance with accepted principles and procedures to ensure safety of operations and avoid pollution of the marine environment
- 1.4** Potential non-compliance with cargo operation-related procedures are identified and rectified promptly
- 1.5** Pumping operations are carried out in accordance with accepted principles and procedures relevant to the type of cargo
- 1.6** Proper loading, stowage and unloading of cargo is undertaken to ensure that stability and stress conditions remain within safe limits at all times
- 1.7** Actions taken and procedures are followed and correctly applied, and the appropriate shipboard cargo-related equipment used
- 1.8** Calibration and use of monitoring and gas detection equipment are in compliance with operational practices

		and procedures
	1.9	Procedures for monitoring and safety systems ensure that all alarms are detected promptly and acted upon in accordance with workplace emergency procedures
	1.10	Personnel are allocated duties and informed of procedures and standards of work to be followed in a manner appropriate to the individuals concerned and in accordance with safe operational practices
2	Recognise physical and chemical properties of liquefied gas cargoes	
	2.1	Information resources are used effectively to identify properties and characteristics of liquefied gases and their impact on safety, the environment and vessel operation
	2.2	Information resources are used effectively to identify properties and characteristics of related gases and their impact on safety and vessel operation
3	Take precautions to prevent hazards	
	3.1	Cargo-related hazards to the vessel are identified, risk assessed, and control measures are implemented
	3.2	Cargo-related hazards to personnel are correctly identified and proper control measures are taken
	3.3	Gas-detection devices are used in accordance with manuals and workplace practices
4	Apply work health and safety (WHS)/occupational health and safety (WHS) precautions	
	4.1	Procedures designed to safeguard personnel and the ship are observed at all times
	4.2	Safe working practices are observed, and appropriate safety and protective equipment is correctly used
	4.3	Working practices are conducted in accordance with legislative requirements, codes of practice, permits to work and environmental concerns
	4.4	Breathing apparatus are used correctly by personnel
	4.5	Entry into enclosed spaces is undertaken in accordance with workplace procedures
5	Respond to emergencies	
	5.1	Type and impact of the emergency is promptly identified, and the response actions conform with workplace emergency procedures and contingency plans

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| | 5.2 | Order of priority, the levels and timescales of making reports and informing personnel are undertaken relevant to the nature of the emergency and accurately reflect the urgency of the problem |
| | 5.3 | Evacuation, emergency shutdown (ESD) and isolation procedures are undertaken appropriate to the nature of the emergency and are implemented promptly |
| | 5.4 | Medical emergency procedures are identified and required actions taken in a medical emergency conform to current recognised first aid practices and international guidelines |
| 6 | Take precautions to prevent pollution of the environment | |
| | 6.1 | Operations are conducted in accordance with accepted principles and workplace procedures to prevent pollution of the atmosphere |
| | 6.2 | Operations are conducted in accordance with accepted principles and workplace procedures to prevent pollution of the environment |
| 7 | Monitor and control compliance with legislative requirements | |
| | 7.1 | Cargo handling is conducted in compliance with relevant IMO instruments |
| | 7.2 | Cargo handling is conducted in compliance with industrial standards and codes of safe working practices |
| | 7.3 | Workplace documentation is completed in accordance with workplace procedures |

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 is a new unit. No equivalent unit.

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 MARAO19 Manage advanced liquefied gas tanker cargo operations

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:

- applying pump theory, characteristics and types of cargo pumps and their safe operation
- applying relevant international regulations, codes, industry guidelines, industry standards and port regulations concerning the safe loading, unloading, care and handling of cargo
- applying safe preparation, procedures and checklists during pre-docking preparation, post-docking and loading cargo operations, during sea passage, unloading and ship-to-ship transfer
- applying safe work practices and risk assessments for personal and shipboard safety
- applying safe work practices following a collision, grounding and spillage
- applying safety management system (SMS) and requirements
- calibrating and using monitoring and gas-detection systems, instruments and equipment
- communicating effectively with personnel and reporting authorities
- conducting cargo operations with acceptable safety limits, including stress limits at all times
- conducting risk assessments
- evaluating liquefied gas tanker design, systems, equipment and cargo to inform decision making during cargo operations
- evaluating the effect of bulk liquid cargo on trim, stability and structural integrity, including use of trim and stability manuals during cargo operations
- managing and supervising personnel with responsibility for cargo-related responsibilities
- monitoring enclosed space rescue, emergency cargo valve operations, medical emergency, envelopment of ship in toxic or flammable vapour, fire, system failure or failure of services essential to cargo, jettisoning of cargo, collision, grounding and spillage emergencies
- monitoring hazards and control measures to manage toxicity, flammability, explosion, reactivity, corrosivity, inert gas composition, electrostatic, polymerising cargo, oxygen deficiency and health hazards
- monitoring plans and procedures for loading, unloading, care and handling of cargo
- monitoring SMS and requirements
- performing cargo measurements and calculations relevant to cargo operations

- using all checklists, procedures and applying safe preparations for all cargo operations
- using and monitoring cargo handling equipment and instrumentation
- using fundamental chemistry, physics and correct and relevant definitions to ensure the safe carriage of liquefied gases in bulk on liquefied gas tanker ships
- using liquefied gas tanker design, systems and equipment to inform decision making during cargo operations
- using loading and unloading plans
- using safety data sheets (SDS)/material safety data sheets (MSDS), International Bulk Chemical (IBC) Code and International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code)
- using personal protective equipment (PPE) and devices
- using SDS/MSDS during cargo operations and first aid incidents.

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:

- alarms and trips, including:
 - high-level alarms
 - low-level alarms
- calibration and use of monitoring and gas-detection systems, instruments and equipment
- cargo area venting and accommodation ventilation
- cargo measurements and calculations, including:
 - boil-off cargo calculations
 - gas phase
 - liquid phase
 - on board quantity (OBQ)
 - remain on board (ROB)
- cargo heating systems
- cargo-related electrical and electronic control systems, including automatic detection systems
- checklists, safe work procedures and safety preparations for all cargo operations, including:
 - pre-docking preparation, including:
 - gas-freeing
 - inerting
 - warm-up
 - post-docking and loading, including:
 - closed loop sampling
 - cooling down
 - deballasting

- gassing up
- inerting (oxygen and dew point reduction)
- loading
- sampling
- tank inspections
- sea passage, including:
 - boil-off
 - cooling down
 - inhibiting
 - pressure maintenance
- unloading, including:
 - ballasting
 - cleaning systems
 - stripping systems
 - systems to make the tank liquid-free
- ship-to-ship transfer
- compliance requirements, including:
 - environmental procedures
 - codes of safe working practices
 - industrial standards
 - industry guidelines
 - International Convention for the Prevention of Pollution from Ships (MARPOL)
 - International Convention for the Safety of Life at Sea (SOLAS)
 - permits to work
 - port regulations
- consequences, including dangers of non-compliance with relevant legislation and regulations
- design, systems and equipment of liquefied gas tankers, including:
 - ballast system
 - boil-off systems
 - cargo emergency shutdown (ESD) systems
 - cargo containment systems
 - cargo containment systems, materials of construction and insulation
 - cofferdam heating systems
 - cargo handling equipment and instrumentation, including:
 - cargo pumps and pumping arrangements, including:
 - cargo pipelines and valves
 - cargo tank level-gauging systems
 - expansion devices
 - flame screens

- tank pressure monitoring and control systems
 - temperature monitoring systems
- cargo temperature maintenance system
- custody transfer system
- gas-detecting systems
- general arrangement and construction
- reliquefaction systems
- development of cargo operation plans, procedures and checklists for cargo operations
- effect of bulk liquid cargo on trim, stability and structural integrity
- emergency procedures, including actions to be taken in event of:
 - cargo operations ESD
 - collision
 - emergency cargo valve operations
 - enclosed space rescue
 - envelopment of ship in toxic or flammable vapour
 - failure of services essential to cargo
 - firefighting
 - grounding
 - jettisoning of cargo
 - ship emergency response plans
 - spillage
 - system failure
- firefighting systems, including:
 - fire-extinguishing agents, advantages and disadvantages
 - fire protection and extinguishing systems
- fundamental chemistry, physics and relevant definitions related to the safe carriage of liquefied gases in bulk ships, including:
 - the chemical structure of gases
 - the properties and characteristics of liquefied gases (including CO₂) and their vapours, including:
 - basic thermodynamic laws and diagrams
 - bubble point
 - compatibility, reactivity and positive segregation of gases
 - compression of gases
 - critical temperature of gases and pressure
 - dewpoint
 - diffusion and mixing of gases
 - effect of low temperature-brittle fracture
 - flashpoint, including:
 - auto-ignition temperature

- upper and lower explosive limits
- gauging systems
- hydrate formation
- liquid and vapour densities
- lubrication of compressors
- nature and properties of solutions
- polymerisation
- properties of materials
- properties of single liquids
- refrigeration of gases
- reliquefaction of gases
- saturated vapour pressure/reference temperature
- simple gas laws
- states of matter
- thermodynamic units
- hazards and control measures, including:
 - corrosivity
 - electrostatic hazards
 - explosion
 - flammability
 - health hazards
 - inert gas composition
 - oxygen deficiency
 - polymerising cargo
 - reactivity
 - toxicity
- international regulations, codes, industry guidelines, industry standards and port regulations concerning the safe loading, unloading, care and handling of cargo, including:
 - code of safe working practices
 - IBC Code
 - IGC Code
 - MARPOL
 - SOLAS
 - International Medical Guide for Ships
 - SDS/MSDS
 - Medical First Aid Guide (MFAG)
- loading, unloading, care and handling of cargo
- loading and unloading plans
- maintenance work, before and during repairs, including work affecting:
 - electrical and control systems

- piping
- pumping
- medical first aid procedures, including antidotes onboard liquefied gas tankers
- pollution prevention procedures, including:
 - controlled operational pollution at sea
 - pollution prevention requirements of ships construction and equipment
- pressure control systems, pressure surge and typical settings
- pump theory and characteristics, including:
 - safe pump operation
 - types of cargo pumps
- rationale, practical application and implications of ship design, systems and equipment, including:
 - impact on decision making in typical and emergency situations
 - location, positioning and segregation
 - operational advantages, disadvantages and limitations
- risk assessments
- safe working practices, risk assessment, personal shipboard safety procedures and precautions, including:
 - before and during repairs and maintenance work, including work affecting:
 - electrical and control systems
 - piping
 - pumping
 - cold burn
 - electrical safety
 - entering enclosed spaces, including:
 - compressor rooms
 - correct use of different types of breathing apparatus
 - frostbite
 - hot and cold work precautions
 - proper use of personal toxicity monitoring equipment
- safe operation of systems and equipment
- selection and correct use of PPE, including personal toxicity monitoring equipment
- system capabilities
- tank atmosphere control systems, including:
 - inert gas
 - nitrogen
 - storage, generation and distribution systems
- tank temperatures, impact of cargo on temperatures and typical settings
- tanker safety culture and implementation of SMS
- types of cargo tank construction

- types of liquefied gas tankers
- types, selection and correct use of breathing apparatus
- use of SDS/MSDS, IBC and IGC Codes and related documents
- work health and safety (WHS)/occupational health and safety (OHS) legislation and policies.

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, materials and relevant personal protective equipment (PPE) currently used in industry.

Links

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