



Australian Government

Assessment Requirements for MARA019 Manage advanced liquefied gas tanker cargo operations

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:

- 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

Companion Volume implementation guide can be found in VetNet -

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