14. Medical First Aid

Course Framework

1. Scope
This course provides training for Officers and ratings who have not previously served on board LNG tankers as part of the regular complement. It comprises of a familiarization training programme appropriate to their duties, including Liquefied natural gas tanker safety, fire safety measures and systems, pollution prevention, operational practice and obligations under applicable laws and regulations. The course takes full account of Section A-V/1 of the STCW Code adopted by the International Convention on Standards of Training, Certification and Watch keeping for Seafarers 1978, as amended in 1995.
Any of this training may be given on board or ashore. It should be supplemented by practical instruction on board and, where appropriate, in a suitable shore-based installation.

2. Objective
Those successfully completing the course should enable the candidate to serve on LNG tankers in a capacity other than master, chief engineer, chief officer or second engineer, and be able to operate or give support to those directly responsible for the Cargo equipment and for loading, discharging and care in transit for handling of cargo on liquefied natural gas tankers.

3. Entry standards
This course is open to experienced seafarers not necessarily served on LNG TANKERS but who have completed a shore-based basic fire-fighting training course approved by the Administration, and an approved course on first aid. (See flow chart below).

4. Course certificate
The liquefied natural gas tanker familiarization training programme must be approved by the Administration. Officers and ratings who are qualified in accordance with regulation V/1 paragraph 1 as appropriate, that is they have experience appropriate to their duties on LNG tankers, or complete this training programme, shall be issued with an appropriate certificate. An existing certificate may be suitably endorsed by the issuing Administration.

5. Course intake limitations
The number of trainees should not exceed 20, and practical training should be undertaken in small groups of not more than four. STW 39/3/1 ANNEX Page 7 "STW\39\3-1.doc

6. Staff requirements
The instructor shall have appropriate training in instructional techniques and training methods (STCW Code A-1/6, paragraph 7). It is recommended that all training and instruction is given by qualified personnel experienced in the characteristics and handling of Liquefied natural gas cargoes and the safety procedures involved. Staff may be recruited from among deck and engineer officers of Liquefied natural gas tankers, and/or fleet superintendents as appropriate.

7. Teaching facilities and equipment
Ordinary classroom facilities and an overhead projector are sufficient for most of the course. However, dedicated CBT modules to be run on an ordinary PC as well as exercises on an operational, hands-on liquid cargo handling simulator, will greatly enhance the quality and result of the course. In such cases sufficient PCs for use by one or two trainees will be required. In addition, a video player will be required if using videos in the teaching program.
The following equipment should be available:
1. Oxygen Resuscitator
2. Breathing apparatus
3. Portable oxygen meter
4. Portable combustible-gas detector
5. Portable toxic-gas detector
6. Chemical absorption tubes for toxic-gas detector (for methane)
7. Tank evacuation equipment

8. **Use of Simulators**

The revised STCW Convention sets standards regarding the performance and use of simulators for mandatory training, assessment or demonstration of competence. The general performance standards for simulators used in training and for simulators used in assessment of competence are given in Section A-I/12. Section B-I/12 provides guidance on the use of simulators in these activities. Simulator-based training and assessment is not a mandatory requirement for this liquefied natural gas tanker training program. However, it is widely recognized that well-designed lessons and exercises can improve the effectiveness of training and shorten training times compared to traditional methods.

If using simulator-based training, instructors should ensure that the aims and objective of these sessions are defined within the overall training program and that tasks are selected so as to relate as closely as possible to shipboard tasks and practices. Instructors should refer to STCW, Section A-I/12, and Part 2.
## Course Outline

**Competency:** Apply immediate first aid in the event of accident or illness on board

<table>
<thead>
<tr>
<th>Course Outline</th>
<th>Approximate Time (Hours)</th>
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<tbody>
<tr>
<td>Knowledge, understanding and proficiency</td>
<td>Lectures, demonstrations and practical work</td>
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<tr>
<td>1. Immediate Action</td>
<td>2.0</td>
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<tr>
<td>2. First-aid Kit</td>
<td>1.5</td>
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<tr>
<td>3. Body Structure and Function</td>
<td>2.5</td>
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<tr>
<td>4. Toxicological Hazards aboard Ship</td>
<td>3.5</td>
</tr>
<tr>
<td>5. Examination of Patient</td>
<td>1.5</td>
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<tr>
<td>6. Spinal Injuries</td>
<td>3.0</td>
</tr>
<tr>
<td>7. Burns, Scalds and Effects of Heat and Cold</td>
<td>3.0</td>
</tr>
<tr>
<td>8. Fractures, Dislocations and Muscular Injuries</td>
<td>3.0</td>
</tr>
<tr>
<td>9. Medical Care of Rescued Persons, including Distress, Hypothermia and Cold Exposure</td>
<td>2.0</td>
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<tr>
<td>10. Radio Medical Advice</td>
<td>1.0</td>
</tr>
<tr>
<td>11. Pharmacology</td>
<td>2.5</td>
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<tr>
<td>12. Sterilization</td>
<td>0.5</td>
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<tr>
<td>13. Cardiac Arrest, Drowning and Asphyxsis</td>
<td>2.0</td>
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<tr>
<td>14. Psychological/Psychiatric Problems</td>
<td>2.0</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>30.0</strong></td>
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<td>15. Review and Assessment</td>
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</table>
## Course Timetable

<table>
<thead>
<tr>
<th>PERIOD / DAY</th>
<th>1ST Period (1.5 hours)</th>
<th>2nd Period (1.5 hours)</th>
<th>3rd Period (1.5 hours)</th>
<th>4th Period (1.5 hours)</th>
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<td>1</td>
<td>1. Introduction</td>
<td>2. Properties and hazards of Liquefied Natural gas</td>
<td>2.2 LNG properties</td>
<td>2.3 Hazards from LNG</td>
</tr>
<tr>
<td></td>
<td>1.1 The course</td>
<td>2.1 Types of liquefied gases carried</td>
<td></td>
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<tr>
<td></td>
<td>1.2 Development of liquefied gas shipping</td>
<td></td>
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<td></td>
<td>1.3 Terminology</td>
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<tr>
<td>2</td>
<td>3. Cargo containment</td>
<td>4. The LNG tanker</td>
<td>5.1 Tanks, piping and valves</td>
<td>5.4 Control of boil off gas (BOG)</td>
</tr>
<tr>
<td></td>
<td>3.1 Independent tanks</td>
<td>4.1 General layout of a LNG tanker</td>
<td>5.2 Pressure relief and vacuum protection system</td>
<td>5.5 Low duty &amp; High duty compressors and heaters</td>
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<tr>
<td></td>
<td>3.2 Membrane tanks</td>
<td>4.2 Survival capability and tank location</td>
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<td>3.3 Integral tanks, internal insulation tanks</td>
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<td>3</td>
<td>5.6 LNG Vaporizers</td>
<td>5.9 Custody Transfer system (CTS) and Dual Fuel System</td>
<td>6.1 Methods of control, hold space and cargo tank drying</td>
<td>7. Safety precautions and measure</td>
</tr>
<tr>
<td></td>
<td>5.7 Inert gas Generator and Nitrogen Generator</td>
<td>6. Tank environmental control</td>
<td>6.2 Warming up</td>
<td>7.1 Tank atmosphere evaluation</td>
</tr>
<tr>
<td></td>
<td>5.8 Instrumentation</td>
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<td>6.3 Inerting, gas freeing, aerating</td>
<td>7.2 Fire prevention and fire fighting</td>
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<td>6.4 Purging, gassing up</td>
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<td>6.5 Cooling down, loading, discharging</td>
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<td>6.6 Loaded &amp; ballast passage</td>
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<td></td>
<td>7.6 Loaded &amp; ballast passage</td>
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<tr>
<td>4</td>
<td>7.3 Pollution prevention</td>
<td>7.5 Accommodation 10. Exchange of information &amp; experiences</td>
<td>8. Ship-shore interface</td>
<td>9.2 Alarms</td>
</tr>
<tr>
<td></td>
<td>7.4 Protection and safety equipment</td>
<td></td>
<td>9. Emergency operations</td>
<td>9.3 Emergency procedures</td>
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<td></td>
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<td></td>
<td>9.1 Organizational structure</td>
<td>9.4 First-Aid treatment</td>
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<tr>
<td>5</td>
<td>9.5 Emergency measures</td>
<td>10.1 Discussion/Case Studies</td>
<td>10.2 Assessment</td>
<td></td>
</tr>
</tbody>
</table>

### Notes

- **12:00 - 13:00**
  - Period 2
  - Period 3
  - Period 4

- **10.1 Discussion/Case Studies**
  - Period 5
Learning Objectives

Knowledge, understanding and proficiency

1 Introduction

Required performance

1.1 The course

1.1.1. States the background for and the purpose of the course as:
• the 1995 STCW Convention calls for mandatory minimum requirements for training and qualification of masters, officers and ratings on LNG tankers
• the training is divided into two parts:
  • LEVEL 1 - LNG Tanker
    familiarization course: a basic
    safety training course for officers
    and ratings ON BOARD
  • LEVEL 2 - A specialized liquefied
    natural gas tanker operations for
    masters, officers and others who
    are to have immediate
    responsibilities for cargo handling
    and cargo equipment
• this course covers the requirements
  for level 1 training required by
  Reg.V/3 Para.1 and specified in
  resolution 12 of STCW

1.1.2. States that personnel on LNG tankers
should at least, have attended an
approved basic fire-fighting course and
an approved course on first aid before
entering this training course

Required performance

1.2 Development of liquefied gas
shipping

R2 T1, T2,T5 A1, A2, A3
1.2.1. lists important stages in the transport of
LNG by ships, such as:
• by 1963, LNG was in service
carrying cargo at atmospheric
pressure
1.2.2. States that the sea transport of LNG in
bulk is internationally regulated—with
regard to safety—through standards
established by the International Maritime
Organization
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1.2.3. States that these standards are set out in the IMO’s Gas Carrier Codes which cover design, construction and other safety measures for ships carrying liquefied gases in bulk

1.3 Terminology
1.3.1. Defines terminology and explains abbreviations commonly used aboard LNG tankers and on LNG terminals

2 Properties and Hazards of Liquefied Natural Gas
R2 T1, T3, T5 A1

2.1 Types of Liquefied gases carried
2.1.1 States that, generally speaking, a liquefied gas is the liquid form of the substance which at ambient temperature and atmospheric pressure would be a gas
2.1.2 States that cargoes transported by gas tankers are listed in IMO’s Gas Carrier Code, chapter XIX/19
2.1.3 States that LNG is liquefied natural gas from which impurities are removed
2.1.4 States that the principal constituent of LNG is methane

2.2 LNG properties
• states of aggregation
• boiling point
• vapour pressure/temperature relationship
• liquid density
• vapour density
• vapour density
• flashpoint
• flammability
• flammable (explosive) range
• auto ignition temperature
• reactivity
• toxicity
• threshold limit value (TLV)
• control of boil off

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2.3 Hazards from LNG

2.3.1 States that LNG are transported at or close to their boiling point
2.3.2 States that the boiling temperatures is -163 deg C for methane
2.3.3 State that low temperatures can cause cold burns which may damage skin and tissue when in direct contact with cold liquid or vapour
2.3.4 States that these low temperatures can cause brittle fracture if cold cargo comes in sudden contact with metals
2.3.5 States that LNG cargoes gives off vapour readily because they are boiling
2.3.6 States that cargo vapour can be flammable, toxic or both
2.3.7 States that cargo vapour in sufficient concentration will exclude oxygen and may cause asphyxiation whether the vapour is toxic or not
2.3.8 States that an explosive mixture may be produced when most cargo vapours are mixed with air
2.3.9 States that the vapours from some LNG cargoes are toxic by inhalation
2.3.10 States that some toxic gases are carried
in gas tankers can be absorbed into the body through the skin
2.3.11 States that some gases are caustic and can damage human tissue
2.3.12 States that some cargoes in LNG tankers are reactive and may react in a number of ways
2.3.13 States that necessary information for each cargo on board must be available on cargo data sheets
2.3.14 States that all personnel on board should use the cargo data sheets to acquaint themselves with the characteristics of each cargo to be loaded

3 Cargo Containment Systems R2, R3, R4, R5, R8 T1, T5, B1, B2, B8, B13 A1, A2

3.1 Independent tanks
3.1.1 States that independent tanks are completely self supporting and neither form part of the ship's hull not contribute to the hull strength
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3.1.2 States that there are three different types of independent tanks for gas carriers: types A, B & C
3.1.3 Describes generally a self supporting prismatic tank(type A)
3.1.4 Describes generally a self supporting spherical tank(type B)
3.1.5 Describes generally a self supporting
cylindrical tank (type C)

3.2 Membrane Tanks, and its
design principles

3.2.1 Describes generally a membrane tank and its design principles. Describes the tank support, cargo tank and cargo space protection devices

3.2.2 Semi Membrane tanks, Integral tanks & Internal Insulation tanks Describes generally a semi membrane tank and its design principles

3.3 Describes generally Integral tanks & Internal Insulation tanks

4 The Liquefied Natural Gas (LNG) tanker

R1, R2, R3, R4,R5, R8
T1, T2, T3, T4, T5, B1, B2, B7, B8, B15

4.1 Layout of a LNG tanker

4.1.1 States that the cargo area is segregated from other parts of the ship

4.1.2 States that cargo handling systems are completely separated from accommodation spaces, machinery spaces and other gas safe area

4.1.3 States that gas dangerous spaces and zones are spaces and zones within the cargo area which are not equipped with approved arrangements to ensure that their atmosphere is maintained in a safe condition at all times and which are, therefore, likely to contain cargo vapours

4.1.4 States that a gas safe space is a space other than a gas dangerous space

4.1.5 States that air intakes for accommodation and engine room have to be at a minimum distance from ventilation outlets from gas dangerous spaces
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4.1.6 States that access to accommodation or engine room has to be at a minimum distance from the forward division of the accommodation
4.1.7 States that access from a gas dangerous zone on the open weather deck to a gas safe space is arranged through an airlock
4.1.8 States that the airlock doors should be self closing and that there must not be any hook or other device by which they could be held open
4.1.9 States that an audible and visual alarm system gives a warning on both sides of the airlock when one door is moved from the closed position
4.1.10 States that gas safe spaces within the cargo area have positive pressure ventilation
4.1.11 States that when this over pressure is lost, all electrical equipment that is not of a certified safe type should be deenergised
4.1.12 States that use of segregation, separation and airlocks are fundamental to the safety of the LNG tanker

4.2 Survival capability and tank location
4.2.1 States that the IMO codes divide gas tankers into four categories, ship types 1G, 2G, 2PG, 3G, which reflect the hazard rating of the cargoes to be carried
4.2.2 States that a type 1G ship is a gas tanker intended for the carriage of products
considered to present the greatest
overall hazards, and types 2G, 2PG and
3G are intended for products of
progressively lesser hazards
4.2.3 States that type 1G ships are required for
highly hazardous cargoes such as
chlorine
4.2.4 States that the most common cargoes,
such as LNG, must be carried in type 2G
4.2.5 States that the background for IMO’s
grouping of ship types is the ship’s
capability to survive damage caused by
collision or stranding and the capability of
tanks to contain the cargo after
sustaining such damage
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5 Cargo Equipment and
Instrumentation
R2, R3,
R4, R5, R8
T1, T2, T3,
T4, T5, B3,
B7, B11,
B13, B14,
B15
A1, A2

5.1 Tanks, piping and valves
5.1.1 describes generally the cargo piping
arrangement
5.1.2 states that the construction materials in
tanks, piping and equipment containing
cargo liquid and vapour should be
resistant to the cargo
5.1.3 states that the resistance to the cargo is
dictated by the minimum service
temperature and the compatibility with the cargo carried
5.1.4 states that all connections and personal access to a cargo tank have to be arranged through the cargo tank dome area
5.1.5 lists commonly found fixed piping arrangements in a cargo tanks, such as:
  • sample tubes
  • vapour line
  • condensate line
  • stripping line/ puddle heat line
  • discharge line
  • liquid line
  • upper purge line/spray line
  • ventilation line
5.1.6 states that there are usually three sample tubes at different levels in the cargo tank
5.1.7 states that the monitoring of tank atmosphere and cargo sampling can be done through the sample tubes
5.1.8 states that the main purpose of the vapour line is to lead the boil-off to the reliquefaction plant or to the shore via the cross-over
5.1.9 states that the main purpose of the condensate line is to lead reliquefied gas from the reliquefaction plant to the cargo tank
5.1.10 states that the stripping line is used for removal of remaining liquid cargo from the pump sump by means of pressure

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5.1.11 states that the purpose of the puddle
heat line is to lead heated cargo vapour from the cargo compressor to the pump sump for vaporizing the remnants of a liquid cargo
5.1.12 states that the main purpose of the discharge line is to lead the liquid cargo from the cargo tank to the crossover by means of the cargo pump
5.1.13 states that the main purpose of the liquid line is to lead the liquid cargo from shore to the cargo tank via the crossover
5.1.14 states that the purpose of the upper purge line is to lead different types of ventilation gases into or from the cargo tank
5.1.15 states that the main purpose of the spray line is to spray liquid cargo into the tank during cool-down of the cargo tank
5.1.16 states that the main purpose of the ventilation line is to lead vapour from the cargo tank safety relief valve to the vent outlet
5.1.17 states that a cargo tank should have shutoff valves located as close to the tank as practicable for all liquid and vapour connections, with the exception of pressure-relief valves and liquid level gauging devices
5.1.18 states that the IMO establishes rules for place, type and number of valves in a cargo piping system
5.1.19 states that the IMO regulations require remotely operated emergency shutdown valves in the cargo piping system

5.2 Pressure-relief and vacuumprotection system
5.2.1 describes generally the pressure-relief piping system
5.2.2 states that all cargo tanks should be provided with a pressure relief system
5.2.3 states that IMO has established rules for vacuum protection of cargo tanks
5.2.4 states that all equipment and piping which may be isolated when full of liquid should be provided with a pressure-relief valve
5.2.5 states that the pressure-relief and vacuum-protection system gives an automatically controlled protection against too high or too low pressure within the cargo-handling system

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5.3 Pumps and unloading systems (Cargo pumps & Spray pumps)
5.3.1 describes generally the unloading system
5.3.2 states that the main cargo pumps fitted aboard liquefied gas tankers are of the centrifugal type
5.3.3 states that these cargo pumps are either submerged or deep well pumps
5.3.4 states that on some LNG gas tankers the cargo pumps may be mounted on deck
5.3.5 states that in addition to the main unloading pumps there are arrangements for alternative unloading
5.3.6 states that alternative unloading can be done by means of vapour pressure, replaceable pump or eductor
5.3.7 describes generally the operating principle of a centrifugal pump
5.3.8 describes generally safe centrifugal pump handling
5.3.9 explains the Operations of fully submerged pumps used on LNG Tankers

5.4 Control of boil-off gas (BOG)
5.4.1 states that heat is always transferred from a warmer area to a relatively cooler area
5.4.2 states that the temperature of the cargo will increase as long as the cargo is
relatively cooler than the environment
5.4.3 states that when the temperature of the cargo increases, the pressure in the cargo tank increases
5.4.4 states that because of the transmission of heat to the cargo means must be provided to control the vapour pressure in the cargo tanks
5.4.5 lists the methods of controlling vapour pressure in cargo tanks such as:
  • leading the cargo boil-off to the ship’s boiler, gas turbine or main engine to be used as fuel
  • leading the cargo boil-off to the ship’s reliquefaction plant, where the vapour is liquefied
  • cooling the liquid cargo in a heat exchanger
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  • cooling the shell of the cargo tank and thereby the cargo
5.4.6 describes generally a simplified vapour-handling system for LNG boil-off
5.4.7 describes generally a simplified single-stage direct reliquefaction cycle
5.4.8 describes generally a simplified cascade reliquefaction cycle
5.4.9 describes generally a simplified indirect reliquefaction cycle
5.4.10 states the differences between compressors used on LNG Tankers and those used on other Gas Carriers

**5.5 Low Duty & High Duty Compressors, Low Duties & High Duties Heaters**
5.5.1 describes generally the operating principle of a reciprocating compressor
5.5.2 describes generally the operating principle of a screw compressor
5.5.3 states that the reciprocating and screw compressors used on board gas carriers are commonly of the oil-free type
5.5.4 describes generally the different type of cargo compressor and their operations on board LNG carriers when compared with other Gas carriers
5.5.5 states that seawater is commonly used as a heating medium for the cargo heater
5.5.6 states that it is necessary to run the booster pump when discharging to a pressurized shore tank
5.5.7 states that a vaporizer is used to maintain the pressure in the cargo tank during discharging
5.5.8 states that seawater and steam are each commonly used as the heating medium for vaporisers

5.6 LNG vapourizers & Forcing Vapourizers
5.6.1 LNG vaporiser is used for purging inert gas from the cargo tanks prior cooling down and Forcing vaporiser is used for producing LNG vapour to be sent to the main boiler as fuel gas
5.6.2 The produced LNG vapour is added to natural boil-off gas in Forcing Vaporisers

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5.6.3 During cargo un-loading, if vapour return from the shore is not available to the
cargo tanks, the LNG Vapourisers can be used to produce vapour by bleeding LNG from the main line and supplying it to the cargo tanks.

5.6.4 In the event of both cargo pumps fail in a cargo tank, emergency discharge by pressurizing cargo tank using LNG vapouriser.

5.7 Inert gas Generator and Nitrogen Generator, Nitrogen pressurization and purge

5.7.1 Defines ‘inert gas’ and lists generally the IMO requirements concerning inerting and the production of inert gas on board.

5.7.2 Describes different methods of producing inert gas.

5.7.3 States that the composition of inert gas produced by an inert gas generator is:

- approximately 84% nitrogen
- approximately 0.5% oxygen
- approximately 15% carbon dioxide
- approximately 0.5% carbon monoxide, oxides of nitrogen and sulphur dioxide

5.7.4 Describes an inert gas generator system.

5.7.5 Describes the different factors which influence the content of soot in inert gas from an inert gas generator.

5.7.6 Describes the limitations of using inert gas produced by an inert gas generator.

5.7.7 Describes and explains different methods of drying inert gas.

5.8 Instrumentation, Level Gauging System & Integrated Automated System (IAS)

5.8.1 states that all electrical equipments installed or used in gas-dangerous space or zones should be approved for operation in a flammable atmosphere.

5.8.2 states that each cargo tank is provided with means for indicating level, pressure and temperature of the cargo.

5.8.3 states that the liquid level in cargo tanks is commonly measured by means of float.
5.8.4 describes generally a float gauge
5.8.5 states that each cargo tank is fitted with high level alarms
5.8.6 states that the purpose of high-level alarms is to prevent overflow of cargo tanks
5.8.7 states that every gas tanker has a fixed gas-detection system
5.8.8 states that the fixed gas-detection system’s alarm is activate when the vapour concentration reaches 30% of the lower explosive limit (LEL)
5.8.9 states that gas sampling and analysing from different parts of the ship is done continuously and sequentially
5.8.10 describes a simplified fixed gas-detection system
5.8.11 states that the fixed gas-detector gives an automatically controlled protection against concentrations of flammable gas that are too high, and that it is thereby fundamental to the safety of the liquefied Natural gas tanker
5.8.12 Describes the principle of operation of IAS
5.8.13 States the purpose and operation of IAS

5.9 Custody Transfer System (CTS), Dual fuel System & High Voltage System
5.9.1 Describes the principle of operation of CTS
5.9.2 States the purpose and operation of CTS
5.9.3 States the preloading and completion of
loading procedures using CTS
5.9.4 States that CTS is designed to provide continuous, maintenance free and reliable accuracy
5.9.5 Describes the principle of operation of Dual fuel System
5.9.6 States the purpose and operation of Dual fuel System
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5.9.7 Describes the principle of operation of High Voltage System
5.9.8 States the purpose and operation of High Voltage System

6 Tank Environmental Control R2, R7 T1, T5 A1, A2, A3
6.1 Methods of control, Hold space and Cargo tank drying,
Nitrogen purging
6.1.1 Explains that environmental control within cargo tanks and hold spaces is achieved by means of piping systems provided for this purpose
6.1.2 explains that when a gas tanker is to change cargo, the following procedures for environmental control in cargo tanks are normally carried out:
• warming up
• inerting
• gas-freeing/aerating
• purging
• cooling down
6.1.3 states that sampling tubes, pressure sensors and temperature sensors are provided in the tanks to ensure that procedures are correctly carried out
6.2 Warming Up

6.2.1 states that the warming up of cargo tanks is necessary for the following reasons:
- vaporizing of liquid cargo residues in pumps sump after discharging/stripping
- warming up of tank’s shell prior to inerting and gas-freeing/aerating in order to avoid condensation and the formation of ice

6.2.2 states that warming up is done by drawing cold vapour from the tip of cargo tanks to the heaters, where the vapour is heated and led back to the pump sump or to the bottom of the tanks

6.2.3 states that during the warming up procedure the temperature and pressure readings must be kept under observation

6.3 Inerting, Gas Freeing/Aerating

6.3.1 states that the purpose of inerting is primarily to prevent flammable vapour/air mixtures in tanks and piping

6.3.2 states that inerting is done by replacing cargo vapours with an inert gas until the percentage concentration of oxygen is lowered

6.3.3 states that inert gas used on gas tankers is either nitrogen or inert gas produced in the ship’s inert-gas plant

6.3.4 state that the correct inerting procedure is ensured by regular checks of the tank atmosphere

6.3.5 states that atmosphere checks are done
by measuring the percentage of oxygen through the sampling tubes
6.3.6 states that the atmosphere in a inerted tank or void space is safe with regard to fire hazard but dangerous with regard to health
6.3.7 states that the purpose of gas-freeing or aerating is to replace residues of inert gas and cargo vapour with air
6.3.8 states that gas-freeing is done by introducing air into the inerted tanks and piping
6.3.9 states that correct gas-freeing operations are verified by regular checks of the tank atmosphere
6.3.10 states that atmosphere checks are done by measuring the percentage of oxygen content and values of ppm of vapours from cargo or inert gas
6.3.11 states that an atmosphere in tanks or void spaces is gas-free only when the oxygen content is 21% by volume and when no vapours from cargoes or inert gas can be measured in values above their TLV

6.4 Purging Inert Gas, Gassing up of Cargo System, Inerting of Cargo System
6.4.1 states that the purpose of purging is to prepare cargo tanks and piping to receive cargo
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6.4.2 states that purging is done to reduce oxygen content and humidity in a tank by introducing nitrogen or inert gas from the
ship’s inert-gas plant
6.4.3 states that in some cases purging with
cargo vapours from the cargo to be
loaded is also required after purging with
inert gas or nitrogen
6.4.4 states that regular checks of the tank
atmosphere are carried out during the
purging operation
6.4.5 states that atmosphere checks are done
by measuring percentage of oxygen and
by reading the dew point temperature

6.5 Cooling down Cargo system,
Ship shore Preparation &
Manifold Connection,
Loading, Discharging &
Emergency Discharge
6.5.1 States that the reason for cooling down
cargo tanks and piping prior to loading is
to prevent undue thermal stresses
6.5.2 states that cool-down is done by
introducing cargo liquid slowly into the
tank via the cooling-down line or the
spray-line system
6.5.3 states that the liquid cargo will tend to
vaporize when introduced into a warmer
tank, thus taking heat from the tank
atmosphere and the tank shell
6.5.4 states that the correct cool-down
operation is verified by temperature
readings which are made possible by
temperature sensors installed in tank
and/or the tank shell
6.5.5 states that the cooling down in
completed when the temperature of the
tank atmosphere and shell is acceptably
low in relation to the temperature of the
cargo to be loaded
6.5.6 states the procedure of loading,
discharging and emergency discharge
and precautions requires to be taken for
manifold connection

6.6 Loaded and Ballast Passage
6.6.1 Lists the procedures during a loaded
passage and during a ballast passage
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7 Safety Precautions and Measures
R2, R8 T1, T3, T5,
B6, B10, B15,
B18, B21
A1, A2, A3

7.1 Tank atmosphere evaluation
7.1.1 lists circumstances when the atmosphere in cargo tanks and enclosed spaces must be tested as:
prior to entry by personnel, with or without personal safety equipment
during inerting, gas-freeing and purging operations
to establish a gas-free condition prior to repair work, shipyard entry or dry-docking
for equality control before changing cargo
7.1.2 states that gas measurements are the only way to get correct information about the composition of the atmosphere in a tank
7.1.3 States that the essential information in evaluating the atmosphere in a tank includes:
• Constitute gases
• Flammability
• Toxicity/oxygen deficiency
• Reactivity
7.1.4 states that any atmosphere in tanks or enclosed spaces is to be considered dangerous unless proper checks prove otherwise
7.1.5 states that gas–measuring equipments of the evaluation of a tank atmosphere must be available on board.
7.1.6 States the importance of taking measurements of the atmospheres at several positions within a tank.
7.1.7 States that only a tank or space that has been declared gas–free can be entered by personnel without breathing apparatus and protective clothing.
7.1.8 states that a gas-free tank or space cannot be considered to remain gas-free unless regular measurement of the atmosphere prove that it is so.
7.1.9 lists the different types of gas measuring equipment common on board gas tankers.

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**7.2 Fire prevention**
7.2.1 lists the three elements necessary to cause combustion or a fire:
- Flammable material
- Oxygen
- Source of ignition
7.2.2 states that these three elements may be represented by the sides of a triangle.
7.2.3 states that the complete triangle represents a fire or explosion.
7.2.4 states that the way to prevent fire is to prevent the formation of such a triangle.
7.2.5 states that the removal of any one side of the triangle will extinguish the fire.
7.2.6 states that two sides of the triangle are normally removed on board gas tankers for safe operation in tanks and on decks.
7.2.7 states that oxygen and ignition sources must be eliminated in cargo tanks where flammable material is present in the form of cargo vapours
7.2.8 states that cargo vapours and ignition sources must be eliminated on deck and in other gas-dangerous zones where oxygen is present
7.2.9 lists precaution against fire as:
• Prohibiting smoking except in designated places
• Prohibiting any form of naked light
• Prohibiting matches and lighters outside accommodation
• Requiring only approved types of fixed electrical equipment
• Requiring only approved types of portable electrical equipment as hand lamps, radios, etc.
• Maintaining over pressure in gas-safe spaces inside cargo area
• Keeping accommodation doors, windows and portholes closed
• Stopping all cargo operations if an electrical storm is taking place
• Keeping close control over the condition and use of tools and equipment
• Keeping closed control and ensuring safe conditions if hot work, hammering, chipping or sandblastings is to be carried out

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• Keeping the bonding in hoses and line systems mechanically and
electricity sound
• Avoiding spills of flammable liquid and releases of cargo vapour

7.2.10 lists dangers from:
• Accumulation of oily rags, waste and other flammable materials
• Static electricity

7.3 Pollution Prevention
7.3.1 defines pollutions as inconvenience or damage, caused by human activities, to humans, animals, plants and to our environment as a whole, by introducing hydrocarbon compounds into the air, into the water or onto the land
7.3.2 states that all operations on board involving cargo, ballast and bunkers should be done in accordance with the applicable pollution regulations
7.3.3 States that during cargo-transfer operations care should be taken to avoid released of cargo liquid and/or vapours
7.3.4 states that the preparation for cargo transfer includes procedures to be followed to prevent pollution of air and of water
7.3.5 States that these procedure includes:
• Inspection of cargo hoses, loading arms, valves and gaskets
• Inspection of cargo system and instrumentation
• Inspection of flanges, valves, connections and tank hatches for tightness
7.3.6 states that personnel on watch should be present at all times during cargo transfer operations and should regularly carry out the inspection mentioned under 7.3.5

7.4 Protection and safety equipment
7.4.1 states that for purposes of emergency escape there must be respiratory and eye protection equipment for every person on board
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7.4.2 states that for the protection of personnel engaged in loading and discharging operations, there must be suitable protective clothing on board.
7.4.3 states that for entering gas–filled spaces there must be complete sets of safety equipment on board.
7.4.4 states that all equipment for personnel protection must be kept in clearly marked lockers.
7.4.5 states that decontamination showers and eyewash must be available in certain location on deck.
7.4.6 states that on all gas tankers a water spray system for cooling, fire prevention and crew protection must be installed to cover certain deck areas, superstructure and accommodation.
7.4.7 states that protective clothing should be worn by all personnel when involved in cargo operations.
7.4.8 states that stretchers and medical first aid equipment must be provided on board.
7.4.9 states that gas-measuring equipment for atmosphere evaluation must be provided on board.
7.4.10 demonstrates the use of:
  • filter type respiratory protection for emergency escape
  • self-contained breathing apparatus
  • protective clothing
  • a complete set of safety equipment
  • oxygen resuscitator
  • gas indicator tubes
• portable gas detector
• portable combustible –gas indicator
• portable oxygen meter

7.5 Accommodation
7.5.1 states that the accommodation is located outside the cargo area
7.5.2 States that superstructure for accommodation are designed to minimize the possibility of entry of cargo vapour and that this design feature should not be impaired in any way
7.5.3 states that no entrances, air inlets or openings to the accommodation are facing the cargo area
7.5.4 states that accommodation portholes and windows facing the cargo area and those within a certain distance from the cargo area, are of the non-opening type
7.5.5 states that all doors, portholes or windows in accommodation should be kept closed during cargo operations
7.5.6 states that mechanical ventilation and air conditioning units supply air to accommodation spaces
7.5.7 states that all ventilation system should be stopped or operated on closed cycle if there is any possibility of cargo vapour being drawn into accommodation spaces

8 Ship/Shore Interface R2 T1, T3, T5, B9, B15
A1, A2
8.1.1 states that safe conditions alongside a terminal are enhanced by safety regulations, good communication and
the best possible co-operation between ship and terminal
8.1.2 lists safety precautions and procedures for personnel on watch prior to and during cargo transfer with regard to:
• Communication
• Cargo information
• Moorings
• Emergency towing-off wires
• Gangways or accommodation ladders
• Fire-fighting equipment
• Lighting
• Unauthorised persons
• Persons smoking, drunk or drugged
• Sign and notices
• Craft alongside
• Scuppers
• Weathers precautions
• Connection/disconnection of cargo hoses
• Safety equipment and protective clothing
• Doors and portholes
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9 Emergency Operations R2, R9 T1,T3,T5 A1,A2

9.1 Organizational Structure

9.1.1 states that the planning for and the implementation of emergency procedures requires and emergency organization
9.1.2 states that on most ships the basic structure of the emergency organization consists of four elements:
• emergency command centre
• emergency party
• back up emergency party
• engineers group or technical team
9.1.3 states that general composition and the
task of the emergency command centre
9.1.4 states the general composition and the
task of the emergency party
9.1.5 states the general composition and task
of the back up emergency party
9.1.6 states the general composition and the
task of the engineers group
9.1.7 states that all personnel on board should
know their place in the emergency
organization and their duty in case the
emergency procedure is being initiated

9.2 Alarms
9.2.1 states that fire alarms signals or general
alarm signals are given in case of
• fire
• collision
• grounding
• man overboard
• hoses burst
• major spillage of cargo liquid or
escape of vapour
• other emergency situation which
call for emergency actions
9.2.2 states that other alarm signals are given
in case of:
• high concentration of toxic or
flammable vapours
• Unacceptable conditions in cargo
tanks or cargo systems
• Unacceptable conditions in
auxiliary cargo system

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9.3 Emergency procedures
(Cargo tank leak) –

9.3.1 states that the ship’s muster lists and emergency instruction specify action to be taken by all crew members and officers in case of an emergency
9.3.2 state that all personnel should be familiar with the emergency instruction and act to the instruction when the alarm is raised
9.3.3 states that the ship’s safety plan and fire control plan specify details and location of all equipment for emergency use
9.3.4 states that all personnel should know the location of emergency equipment and be familiar with its use
9.3.5 states that it is essential that personnel are properly trained for emergency operations
9.3.6 state that all equipment which may be used in an emergency must be maintained in good order and be ready for use at all times
9.3.7 list basic emergency action to be taken in
case of:
• fire
• collision
• grounding
• bursting of a cargo hose, cargo tank leak
• accident involving personnel

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9.3.8 lists fire-extinguisher media and explain their use
9.3.9 states the emergency procedure for fighting a liquefied Natural gas fire
9.3.10 State that emergency procedures for accidents involving cargo on board are given in the ICS cargo data sheets

**9.4 First-Aid treatment** R6 T1 A1,A2

9.4.1 states that first-aid procedure for accidents involving cargo are given in the ICS cargo data sheets
9.4.2 states that all personnel should be familiar with the first aid procedure set out in the data sheet for the cargo carried
9.4.3 states that the emergency showers should be used in the event of spillage of cargo liquid in eyes or on skin
9.4.4 states that correct treatment for most cargoes in washing within water at least 15 minutes and removing affected clothing
9.4.5 States that if frostbites has occurred this should be treated by immersion in lukewarm water
9.4.6 states that for symptoms of vapours exposure the treatment for most cargoes
is to:
• remove victim to fresh air
• give artificial resuscitation if breathing has stopped or is weak/irregular

9.4.7 states that all personnel should be instructed and trained in the technique of mouth-to-mouth resuscitation and basic first-aid treatment

10 Assessment/Discussion STCW
To be arranged by course instructor