

MARINE ACT, 1986
(ACT NO. 30 OF 1986)

MARINE (CERTIFICATES OF COMPETENCY
(TANKERS AND DANGEROUS CARGOES)) REGULATIONS, 1989

IN exercise of the powers conferred upon me by sections 98, 99, 143 and 212 of the Marine Act, 1989, I have made the following Regulations—

Short title

1. These regulations may be cited as the Marine (Certificates of Competency (Tankers and Dangerous Cargoes)) Regulations, 1989.

Object

2.—(1) These Regulations require that persons in charge of tankers carrying dangerous cargoes must be qualified in the handling of these cargoes.

(2) This object is achieved—

- (a) by requiring that the persons concerned must have their certificates of competency appropriately endorsed; and
- (b) by prescribing the training and experience a person must undergo or have before his certificate of competency can be endorsed.

Regulations to be read as one

3.—(1) These Regulations are to be read as one with Marine (Certificates of Competency and Manning of Vessels) (General) Regulations, 1989, and the other Regulations referred to in those Regulations.

(2) In particular words and phrases defined in the Marine (Certificates of Competency and Manning of Vessels) (General) Regulations, 1989 have the same meaning when used in these Regulations.

Interpretation

4. In these Regulations—

“appropriate endorsement” means—

- (a) in the case of an oil tanker—a Dangerous Cargo (Petroleum) endorsement;
- (b) in the case of a chemical tanker—a Dangerous Cargo (Liquid Chemical) endorsement; and
- (c) in the case of a gas tanker—a Dangerous Cargo (Liquid Gas) endorsement;

“appropriate Resolution” means—

- (a) in the case of responsible position on an oil tanker—Resolution 10;
- (b) in the case of a responsible position on a chemical tanker—Resolution 11;

(c) in the case of a responsible position on a gas tanker—Resolution 12; and

passed at the International Conference on Training and Certification of Seafarers held in London from 14 June to 7 July 1978 (copies of which Resolutions are set out in the Schedule);

“appropriate tanker” means—

- (a) in respect of an application for a Dangerous Cargo (Petroleum) endorsement—an oil tanker;
- (b) in respect of an application for a Dangerous Cargo (Liquid Chemical) endorsement—a chemical tanker; and
- (c) in respect of an application for a Dangerous Cargo (Liquid Gas) endorsement—a gas tanker;

“responsible positions” in respect of a tanker, means the position of Master, Chief Mate, Chief Engineer or Second Engineer on the tanker or any other position on the tanker where the holder of the position has, in respect of its cargo immediate responsibility for its loading, discharging, care in transit or handling;

“tanker” means a registered vessel constructed for the transportation in bulk of oil, chemical or gas.

Certain persons required to possess extra qualifications for service on tankers

5. For the purposes of subsection 98(1) of the Act a tanker shall not be deemed to have sufficient qualified crew on board unless the certificates of competency of those members of its crew who hold responsible positions on the tanker each has an appropriate endorsement.

Requirements for endorsement

6. The Marine Board shall not endorse a certificate of competency with an appropriate endorsement unless the Marine Board is satisfied that the holder of the certificate—

- (a) has satisfactorily completed an approved course of training which meets the requirements for training as set out in the appropriate Resolution; and
- (b) has completed—
 - (i) 6 months' shipboard service in connection with cargo handling duties on an appropriate tanker; or
 - (ii) 28 days' approved shipboard training in cargo handling duties on an appropriate tanker; or
 - (iii) such other service, which may include a combination of the services specified in paragraphs (i) and (ii), as the Marine Board determines to be equivalent to the service specified in paragraph (i) or (ii).

Transitional provision

7. Notwithstanding regulation 6, the Marine Board may endorse a certificate of competency with an appropriate endorsement—

- (a) where it is satisfied that the holder of the certificate has completed a total of 6 months seagoing service in a responsible position on an appropriate tanker during the period of 6 years immediately prior to these Regulations coming into effect; and

- (a) where the holder of the certificate produces to the Marine Board—
- (i) a letter from the owner of the vessel confirming that the service was carried out satisfactorily; and
 - (ii) a report of service, in a form approved by the Marine Board and signed by the Master or Chief Engineer of the Vessel, confirming that service, and stating the type of cargo carried and that the holder of the certificate of competency carried out his duties competently.

Dated this third day of May 1989.

A. V. TORA
Minister for Communications, Works and Transport

THE SCHEDULE

RESOLUTION 10

TRAINING AND QUALIFICATIONS OF OFFICERS AND RATINGS OF OIL TANKERS

THE CONFERENCE.

BEING AWARE of the possible dangers of human life and to the environment from accidents involving the handling of oil in bulk.

RECOGNIZING the importance and urgency of establishing requirements for the officers and key ratings having special responsibilities for the handling of oil in bulk.

NOTING Resolution 8 of the International Conference on Tanker Safety and Pollution Prevention, 1978,

RECOGNIZING that suitable arrangements are not widely available for the training of officers and ratings having special responsibility for handling such cargoes.

RESOLVES:

- (a) to adopt the Recommendation on Training and Qualifications of Officers and Ratings of Oil Tankers, annexed to this Resolution;
- (b) to urge all Governments concerned to give effect to the contents of this Recommendation as soon as practicable,

INVITES the Inter-Governmental Maritime Consultative Organization:

- (a) to keep this Recommendation under review and to bring any future amendments to the attention of all Governments concerned;
- (b) to communicate this Resolution to all Governments invited to the Conference.

ANNEX

RECOMMENDATION ON TRAINING AND QUALIFICATIONS OF OFFICERS AND RATINGS OF OIL TANKERS

1. TRAINING OF OFFICERS AND RATINGS HAVING SPECIFIC DUTIES AND RESPONSIBILITIES IN CONNEXION WITH CARGO AND CARGO EQUIPMENT

Training should be divided into two parts, a general part concerning principles involved, and a part on the application of those principles to ship operation. Any of this training may be given at sea or ashore. Such training should be supplemented by practical instructions at sea and, where appropriate, in a suitable shore-based installation. All training and instruction should be given by a properly qualified person.

A—PRINCIPLES

1. Characteristics of oil cargoes

An outline treatment including practical demonstration of the physical properties of oil carried in bulk: vapour pressure/temperature relationship. Influence of pressure on boiling temperature. Explanation of saturated vapour pressure, diffusion, partial pressure, flammability limit, explosive limits, petroleum vapour, vapour travel, flashpoint and auto-ignition temperature. Practical significance of flashpoint and lower flammable limit. Simple explanation of types of electrostatic charge generation.

2. Toxicity

Simple principles and explanations of basic concepts: toxicity limits, both acute and chronic effects of toxicity, system poisons and irritants.

3. Hazards

(a) Explosion and flammability hazards

Flammability limits. Sources of ignition and explosion. Danger from vapour cloud drift.

(b) Health hazards

Dangers of skin contact, inhalation and ingestion.

(c) Hazards to the environment

Effect on human and marine life from release of oil at sea. Effect of specific gravity and solubility. Effect of vapour pressure and atmospheric conditions.

(d) Corrosion hazards

4. Hazard control

Inerting, monitoring techniques, anti-static measures, ventilation, segregation and the importance of compatibility of materials.

5. Safety equipment and protection of personnel

The function and calibration of gas measuring instruments and similar equipment. Specialized fire extinguishing appliances, breathing apparatus and tank evacuating equipment. Safe use of protective clothing and equipment.

B—SHIPBOARD APPLICATION

1. *Regulations and codes of practice*

Importance of developing ships' emergency plans. Familiarization with:

- (a) the appropriate provisions of relevant international conventions;
- (b) international and national codes;
- (c) IMCO Manual on Oil Pollution;
- (d) relevant tank safety guides.

2. *Ship design and equipment of oil tankers*

Familiarization with:

- (a) piping, pumping, tank and deck arrangements;
- (b) types of cargo pumps and their application to various types of cargo;
- (c) tank cleaning, gas freeing and inerting systems;
- (d) cargo tank venting and accommodation ventilation;
- (e) gauging systems and alarms;
- (f) cargo heating systems;
- (g) safety factors of electrical systems.

3. *Ship operations*

Cargo calculations. Loading and discharging plans. Loading and discharge procedure including ship-to-ship transfers. Check lists. Use of monitoring equipment. Importance of proper supervising of personnel. Gas freeing operations and tank cleaning operations. Where appropriate, crude oil washing procedures and the operation and maintenance of inert gas systems. Control of entry into pumprooms and enclosed spaces. Use of gas detecting and safety equipment. Load-to-top and proper ballasting and de-ballasting procedures. Air and water pollution prevention.

4. *Repair and maintenance*

Precautions to be taken before and during repair and maintenance work including that affecting pumping, piping, electrical and control systems. Safety factors necessary in the performance of hot work. Control of hot work and proper hot work procedures.

5. *Emergency operations*

Emergency plan. Cargo operations emergency shutdown. Action in the event of failures of service essential to cargo. Fire-fighting on oil tankers. Action following collision, stranding or spillages. First aid procedures and the use of resuscitation equipment. Use of breathing apparatus. Rescue from enclosed spaces.

NOTE: It is recommended that as great a use as possible should be made of shipboard operations and equipment manuals, films and suitable visual aids, and that the opportunity should be taken to introduce discussion of the part to be played by safety organization on board ship, and the role of safety officers and safety committees.

II. TRAINING OF OTHER PERSONNEL

Such personnel should undergo training on board ship and, where appropriate, ashore, which should be given by a qualified person experienced in the handling and characteristics of oil cargoes and safety procedures.

1. *Regulations*

Knowledge of the ship's rules and regulations governing the safety of the personnel on board a tanker in port and at sea.

2. *Health hazards and precautions to be taken*

Dangers of skin contact. Inhalation and accidental swallowing of cargo. Oxygen deficiency with particular reference to inert gas systems. The harmful properties of cargoes carried. Personnel accidents and associated first aid. Lists of do's and don'ts.

3. *Fire prevention and fire-fighting*

Control of smoking and cooking restrictions. Sources of ignition. Fire and explosion prevention. Methods of fire-fighting. Outline of portable apparatus and fixed installations.

4. *Pollution prevention*

Procedures to be followed to prevent air and water pollution. Measures to be taken in the event of spillage.

5. *Safety equipment and its Use*

The proper use of protective clothing and equipment, resuscitators, escape and rescue equipment.

6. *Emergency procedures*

Familiarization with emergency plan procedures.

7. *Cargo equipment and operations*

General description of cargo handling equipment. Safe loading and discharge procedures and precautions. Safe entry into enclosed spaces.

III. FIRE-FIGHTING TRAINING

All personnel should have attended an approved basic or advanced practical fire-fighting training course relevant to their duties and responsibilities.

RESOLUTION 11

TRAINING AND QUALIFICATIONS OF OFFICERS AND RATINGS
OF CHEMICAL TANKERS

THE CONFERENCE,

BEING AWARE of the possible dangers to human life and to the environment from accidents involving the handling of chemicals in bulk,

RECOGNIZING the importance and urgency of establishing requirements for the officers and key ratings having special responsibilities of the handling of hazardous or noxious chemicals in bulk,

HAVING CONSIDERED Resolution A.286 (VIII) adopted by the Assembly of the Inter-Governmental Maritime Consultative Organization on this matter,

NOTING that the subject matter of Resolution A.286 (VIII) is closely related to the aims of the Conference,

RESOLVES:

- (a) to adopt the Recommendation on Training and Qualifications of Officers and Ratings of Chemical Tankers, annexed to this Resolution;
- (b) to urge all Governments concerned to give effect to the contents of this Recommendation as soon as practicable.

INVITES the Inter-Governmental Maritime Consultative Organization:

- (a) to keep this Recommendation under review and to bring any future amendments including provisions concerning the handling of hazardous of noxious dry chemicals in bulk, to the attention of all Government concerned;
- (b) to communicate this Resolution to all Governments invited to the Conference.

ANNEX

RECOMMENDATION ON TRAINING AND QUALIFICATIONS OF OFFICERS AND RATINGS OF CHEMICAL TANKERS

I. TRAINING OF OFFICERS AND RATINGS RESPONSIBLE FOR CARGO HANDLING AND EQUIPMENT

Training should be divided into two parts, a general part of principles involved and a part on the application of the principles to ship operation. Any of this training may be given at sea or ashore. Such training should be supplemented by practical instruction at sea and, where appropriate, in a suitable shore-based installation. All training and instruction should be given by a properly qualified person.

A—PRINCIPLES

1. *Elementary physics*

An outline treatment including practical demonstration of the physical properties of chemicals carried in bulk; vapour pressure/temperature relationship. Influence of pressure on boiling temperature. Explanation of saturated vapour pressure, diffusion, partial pressure, flammability limit, flashpoint and auto-ignition temperature. Practical significance of flashpoint and lower flammable limit. Practical significance of flashpoint and lower flammable limit. Simple explanation of types of electrostatic charge generation.

2. *Elementary chemistry*

Chemical symbols and structures, elements of the chemistry of acids and bases, structure and properties of well known chemicals carried, chemical reaction of well known groupings, sufficient to enable proper utilization of Codes.

3. *Toxicity*

Simple principles and explanation of basic concepts; toxicity limits, both acute and chronic effects of toxicity, systemic poisons and irritants.

4. *Hazards*(a) *Explosion and flammability hazards*

Flammability limits. Source of ignition and explosion.

(b) *Health hazards*

Dangers of skin contact, inhalation and ingestion.

(c) *Hazards to the environment*

Effect on human and marine life from release of chemicals at sea. Effect of specific gravity and solubility. Danger from vapour cloud drift. Effect of vapour pressure and atmospheric conditions.

(d) *Reactivity hazards*

Self-reaction; polymerization, effects of temperatures, impurities as catalysts. Reaction with air water and other chemicals.

(e) *Corrosion hazards*

Dangers to personnel, attacks on structural materials. Effects on concentration. Evolution of hydrogen.

5. *Hazard control*

Inerting, water padding, drying agents, monitoring techniques. Anti-static measures. Ventilation. Segregation. Cargo inhibition. The importance of compatibility of materials.

6. *Safety equipment and protection of personnel*

The function and calibration of measuring instruments and similar equipment. Specialized fire extinguishing appliances, breathing and escape apparatus. Safe use of protective clothing and equipment.

B—SHIPBOARD APPLICATION

1. *Regulations and codes of practice*

Familiarization with IMCO, national and relevant international codes and port regulations. The importance of developing ships' emergency plans.

2. *Ship design and equipment of chemical tankers*

A brief description of specialized piping, pumping and tank arrangements, overflow control. Types of cargo pumps and their application to various types of cargo. Tank cleaning and gas freeing systems. Cargo tank venting and accommodation ventilation, air locks. Gauging systems. Tank temperature controls systems. The safety factors of electrical systems.

3. *Ship operations*

Cargo calculation. Loading and discharging plans. Loading and discharge procedure. Check lists. Use of monitoring equipment. Gas freeing operations and tank cleaning operations (proper use of absorption and wetting agents and detergents). Use and maintenance of inert atmospheres. Control of entry into pumprooms and enclosed spaces. Use of detecting and safety equipment. Disposal of waste and washings.

4. *Repair and maintenance*

Precautions to be taken before the repair and maintenance of pumping, piping, electrical and control systems.

5. *Emergency operations*

Emergency plan. Cargo operations emergency shutdown. Action in the event of failure of services essential to cargo. Fire-fighting on chemical tankers. Action following collision, stranding or spillages. First aid procedure and the use of resuscitation and decontamination equipment. Use of breathing apparatus. Rescue from enclosed spaces.

NOTE: It is recommended that as great a use as possible should be made of ship-board operations and equipment manuals, films and suitable visual aids, and that the opportunity should be taken to introduce discussion of the part to be played by safety organization on board ship, and the role of safety officers and safety committees.

II. TRAINING OF OTHER PERSONNEL

Such personnel should undergo training on board ship and, where appropriate, ashore, which should be given by a qualified person who has attained the required standard and is experienced in the carriage of this type of cargo and safety procedures.

1. *Regulations*
Knowledge of the ship's rules and regulations governing the safety of the personnel on board a tanker in the port and at sea.
2. *Health hazards and precautions to be taken*
Dangers of skin contact, inhalation and accidental swallowing of cargo, Oxygen deficiency with particular reference to inert gas systems. The harmful properties of cargoes carried. Personnel accidents and associated first aid. Lists of do's and don'ts.
3. *Fire prevention and fire-fighting*
Control of smoking and cooking restrictions. Sources of ignition. Fire and explosion prevention. Methods of fire-fighting. Outline of portable apparatus and fixed installations.
4. *Pollution prevention*
Procedures to be followed to prevent air and water pollution. Measures to be taken in the event of spillage.
5. *Safety equipment and its Use*
The proper use of protective clothing and equipment, resuscitators, escape sets, rescue equipment.
6. *Emergency procedures*
Familiarization with emergency plan procedures.
7. *Cargo equipment and operations*
General description of cargo handling equipment. Safe loading and discharge procedures and precautions. Safe entry into enclosed spaces.

III. FIRE-FIGHTING TRAINING

All personnel should have attended an approved basic or advanced practical fire-fighting training course relevant to their duties and responsibilities.

RESOLUTION 12

TRAINING AND QUALIFICATIONS OF MASTERS, OFFICERS AND RATINGS OF LIQUEFIED GAS TANKERS

THE CONFERENCE,

BEING AWARE of the possible dangers to human life and to the environment from accidents involving the handling of liquefied gasses in bulk,

RECOGNIZING that suitable arrangements for the mandatory training of masters, officers and ratings having special responsibility for the handling of such cargoes are not widely available, being of the opinion that mandatory minimum requirements should be implemented as soon as practicable,

RESOLVES to adopt the Recommendations on Training and Qualifications of Masters, Officers and Ratings of Liquefied Gas Tankers, the text of which is given in the Annex to this Resolution,

RECOMMENDS:

- (a) that all Governments concerned take account of the guidance contained in the Annex to this Resolution;
- (b) that all masters, officers and ratings aboard such ships should be required to complete approved basic training in safety, emergency procedures and fire-fighting. Such training should be of adequate scope and duration to ensure appreciation of not only the hazards involved, but also the safety features included in the design and construction of the ship in order to preclude indecision or panic in the handling of emergencies and small casualties;
- (c) that all masters, deck and engineer officers and those ratings having specific duties and responsibilities in connexion with the cargo and cargo equipment should be required to complete approved special training courses and that such courses should be of adequate duration and supplemented by shipboard training and experience;
- (d) that all Governments concerned, in recognizing standards of proficiency, should either require separate assessment upon the conclusion of the prescribed training or accept successful completion of approved courses of training which are closely monitored and may include periodic assessment and an overall evaluation by the instructor of the performance and participation of the student;
- (e) that all Governments concerned should satisfy themselves as to the standard of competency of the officer primarily responsible for cargo and should ensure that appropriate documentation is issued to those so qualified by training and experience.

INVITES the Inter-Governmental Maritime Consultative Organization:

- (a) to keep this Recommendation under review and to bring any future amendments to the attention of all Governments concerned;
- (b) to communicate this Resolution to all Governments invited to the Conference.

ANNEX

RECOMMENDATION ON TRAINING AND QUALIFICATIONS
OF MASTERS, OFFICERS AND RATINGS OF
LIQUEFIED GAS TANKERS

I. INTRODUCTION

1. Training should be divided into two parts:
 - (a) supervised instruction, conducted in a shore-based facility or aboard a specially equipped ship having training facilities and special instructors for this purpose, dealing with the principles involved and the application of these principles to ship operation. In special situations Administrations may permit a junior officer or rating to be trained aboard liquefied gas tankers on which he is serving; provided that such service is for a limited period, as established by the Administration, and that such crew member does not have duties or responsibilities in connexion with cargo or cargo equipment and provided further that he is later trained in accordance with the Recommendation for any subsequent service;
 - (b) supplementary shipboard training and experience wherein the principles learned are applied to a particular type of ship and cargo containment system.
 2. In drawing up an Administration-approved syllabus of training, the IMCO code of Construction and Equipment of Ships Carrying Liquefied Gases in Bulk and relevant Tanker Safety Guides should be taken into account.
- The training should be at the following levels:

A—MASTERS, ALL OFFICERS AND ALL RATINGS

1. *Basic safety training course for gas tankers*

This training should preferably be conducted at an approved shore training establishment prior to an assignment to a ship. Alternatively, the safety training could be given in organized approved shipboard training programmes conducted by a qualified person under the supervision and direction of the master. Such safety training should include the following:

- (a) *General*
 - (i) Types of gases carried.
 - (ii) Hazards associated with those gases which are likely to be handled.
 - (iii) General description of cargo carrying systems.
 - (iv) Loading and unloading systems including cargo vent systems.
 - (v) Design safety features and special requirements.
- (a) *Fire-prevention and fire-fighting*
Control of smoking and cooking restrictions. Sources of ignition. Fire and explosion prevention. Methods of fire-fighting. Outline of portable apparatus and fixed installations.
- (b) *Health Hazards and personnel protection*
 - (i) Hazards of skin contact and inhalation of cargo vapours or inert gas. Types of antidotes and their effects.
 - (ii) Proper use of protective clothing and breathing apparatus, resuscitators and rescue equipment and escape sets.
 - (iii) Entry into enclosed spaces.

- (d) *Pollution prevention*
Procedures to be followed to prevent air and water pollution. Measures to be taken in the event of spillage.
- (e) *Emergency procedures*
Basic outline of emergency plan. Procedures in case of:
 - (i) fire
 - (ii) collision and stranding
 - (iii) liquefied gas spills or leaks
 - (iv) personnel casualty.

2. *Fire-fighting course to include the specific characteristics of fires aboard gas tankers*

- (a) All personnel should have attended an approved basic or advanced practical fire-fighting training course relevant to their duties and responsibilities.
- (b) This training should be given at a shore establishment or aboard a specially equipped ship having training facilities and special instructors for this purpose.

3. *As soon as new crew members have joined a ship, they should be made fully acquainted with all aspects of the emergency procedures listed.*

B—MASTERS, ALL DECK AND ENGINEER OFFICERS AND THOSE
RATINGS HAVING SPECIFIC DUTIES AND RESPONSIBILITIES
IN CONNEXION WITH CARGO AND CARGO EQUIPMENT

1. This part should apply in full to the master, chief mate, chief engineer officer, second engineer officer and officer primarily responsible for the cargo if he is not included in the preceding four designations.

2. The Administration may, however, permit variations in the depth of knowledge required in the following syllabus according to the duties and functions to be performed by other crew members.

3. Specific duties and responsibilities in connexion with cargo and cargo equipment are those concerned with cargo loading or discharging, cargo care, processing or supervisory duties for the on board use of cargo and operation or maintenance of equipment related thereto.

4. Such training should include but not necessarily be limited to:

(a) *Chemistry and physics*

An introduction to basic chemistry and physics as it relates to the safe carriage of liquefied gases in bulk in ships:

- (i) Properties and characteristics of liquefied gases and their vapours
 - (1) definition of gas
 - (2) simple gas laws
 - (3) gas equation
 - (4) density of gases
 - (5) diffusion and mixing in gases
 - (6) compression of gases
 - (7) liquefaction of gases
 - (8) refrigeration of gases
 - (9) critical temperature
 - (10) practical significance of flashpoint

- (11) upper and lower explosive limits
- (12) auto-ignition temperature
- (13) compatibility of gases
- (14) reactivity
- (15) polymerization
- (ii) Properties of single liquids
 - (1) densities of liquids
 - (2) variation with temperature
 - (3) vapour pressure and temperature
 - (4) vapourization and boiling liquids
- (iii) Nature and properties of solutions
 - (1) solubility of gases in liquids
 - (2) miscibility between liquids and effects of temperature change
 - (3) densities of solutions and dependence on temperature and concentration
 - (4) effects of dissolved substances on melting and boiling points
 - (5) hydrates, formation and dispersion
 - (6) hygroscopicity
 - (7) drying of air and other gases
- (b) *Health hazards*
 - (i) Toxicity
 - (1) modes by which liquified gases and then vapour may be toxic
 - (2) toxic properties of inhibitors and of products of combustion of both materials of construction and the liquified gases carried
 - (3) acute and chronic effects of toxicity, systematic poisons and irritants
 - (4) Threshold Limiting Value (TLV)
 - (ii) Hazards of skin contact, inhalation and ingestion
 - (iii) First aid and administering of antidotes
- (c) *cargo containment*
 - (i) Principles of containment systems
 - (ii) Rules
 - (iii) Surveys
 - (iv) Tank construction, materials, coatings, insulation
 - (v) Compatibility
- (d) *Operation procedures*
 - (i) Regulations and Codes of practice
 - (ii) Familiarization with IMCO, national and relevant international codes
 - (iii) Port regulations
 - (iv) Importance of ship's emergency plan and allocation of responsibilities
- (e) *Pollution*
 - (i) Hazards to human life and to the marine environment
 - (ii) Effect of specific gravity and solubility
 - (iii) Danger from vapour cloud drift
 - (iv) Jettisoning of cryogenic liquids
 - (v) National, international and local regulations

- (f) *Cargo handling system*
 - (i) Description of main types of pumps and pumping arrangements and vapour return systems, piping systems and valves
 - (ii) Explanation of pressure, vacuum, suction, flow, head
 - (iii) Filters and strainers
 - (iv) Expansion devices
 - (v) Flame screens
 - (vi) Commonly used inert gases
 - (vii) Storage, generation, distribution systems
 - (viii) Outline of different types of systems and their safe and efficient operation and service
 - (ix) Temperature and pressure monitoring systems
 - (x) Cargo vent systems
 - (xi) Liquid re-circulation and re-liquefaction systems
 - (xii) Cargo gauging and instrumentation systems
 - (xiii) Gas detection and monitoring systems
 - (xiv) CO₂ monitoring systems
 - (xv) Cargo boil-off systems
 - (xvi) Auxiliary systems
- (g) *Ship operating procedures*
 - (i) Loading and discharging preparations and procedures
 - (ii) Check lists
 - (iii) Cargo condition maintenance on passage and in harbour
 - (iv) Segregation of cargoes and procedures for cargo transfer
 - (v) Changing cargoes, tank cleaning procedures
 - (vi) Cargo sampling
 - (vii) Ballasting and de-ballasting
 - (viii) Warm up and cool down systems
 - (ix) Warm up and gas freeing procedures
 - (x) Procedures for cool down of gas free system from ambient temperature and safety precautions involved.
- (h) *Safety practices and equipment*
 - (i) Function, calibration and use of portable measuring instruments
 - (ii) Fire-fighting equipment and procedures
 - (iii) Breathing apparatus
 - (iv) Resuscitators
 - (v) Escape sets
 - (vi) Rescue equipment
 - (vii) Protective clothing and equipment
 - (viii) Entry into enclosed spaces
 - (ix) Precautions to be observed before and during repair and maintenance of cargo and control systems
 - (x) Supervision of personnel during potentially hazardous operations
 - (xi) Types and principles of certified safe electrical equipment
 - (xii) Sources of ignition
- (i) *Emergency procedures*
 - (i) Emergency plan
 - (ii) Emergency shut-down of cargo operations
 - (iii) Emergency cargo valve closing systems
 - (iv) Action in the event of failure of systems or services essential to cargo
 - (v) Action in event of collisions or strandings, spillages, envelopment of ship in toxic or flammable vapour.

5. Supplementary shipboard training and experience based on the ship's operation manual should include the following systems as applicable:

- (a) *Cargo handling systems*
 - (i) Piping systems, pumps, valves, expansion devices and vapour system
 - (ii) Services requirements and operating characteristics of the cargo handling system
 - (iii) Liquid re-circulation
- (b) *Instrumentation systems*
 - (i) Cargo level indicators
 - (ii) Gas detection systems
 - (iii) Hull and cargo temperature monitoring systems
 - (iv) Various methods of transmitting a signal from a sensor to the monitoring station
 - (v) Automatic shut down systems
- (c) *Boil-off disposal*
 - (i) Use as fuel
 - (1) compressors
 - (2) heat exchanger
 - (3) gas piping and ventilation in machinery and manned spaces
 - (ii) Principles of dual-fuel
 - (4) boilers
 - (5) gas turbines
 - (6) diesel engines
 - (iii) Emergency venting
 - (iv) Re-liquefaction
- (d) *Auxiliary systems*
 - (i) Ventilation, inerting
 - (ii) Valves
 - (1) quick closing
 - (2) remote control
 - (3) pneumatic
 - (4) excess flow
 - (5) safety relief
 - (6) pressure/vacuum
 - (iii) Steam systems for voids, ballast tanks, condenser
- (e) *General principles of operating the cargo handling plant*
 - (i) Inerting cargo-tanks and void spaces
 - (ii) Tank cool down, loading
 - (iii) Operations during loaded and ballasted voyages
 - (iv) Discharging and tank stripping
 - (v) Emergency procedures, including pre-planned action in the event of leaks, fires, collision, stranding, emergency cargo discharge, personnel casualty.

NOTE: It is recommended that as much use as possible should be made of shipboard operations and equipment manuals, films, visual and other suitable aids and that there should be discussion on the part that is to be played by safety organization on board ship, and the role of safety officers and safety committees. Encouragement should be given to the provision of such suitable aids to carry out a continuing and effective on board training and safety programme.

C—THE OFFICER PRIMARILY RESPONSIBLE FOR CARGO

The officer primarily responsible for cargo should:

- (a) be directly responsible for the master
- (b) have successfully completed all the required courses
- (c) have served aboard a ship carrying liquefied gases in bulk for at least two months, such service to have:
 - (i) been performed under the direction, supervision and training of an officer primarily responsible for cargo;
 - (ii) included cargo transfer, both loading and discharging;
- (d) satisfy the master as to his overall qualifications and ability.

II GENERAL

1. Administrations should ensure that an authorized document is issued to every person who is by training and experience qualified in accordance with this Annex to serve as an officer primarily responsible for cargo.

2. Under appropriate approved standards, the master of each ship should ensure that the officer primarily responsible for cargo possesses such document and has had recent adequate practical experience aboard the appropriate type of ship to permit him to perform his duties safely.

3. The Administration should, in consultation with all those concerned, formulate or promote the formulation of an appropriate structure of refresher and updating courses.