STCW Circular No. 2015 - 03

ANNEX II

UPDATING COURSE FOR
OFFICERS IN CHARGE OF AN ENGINEERING WATCH

(On Seagoing Ships Powered by Main Propulsion Machinery of 750 kW Propulsion Power or More)

In Compliance with
Regulation I/11, par. [4] and [5]
of the
2010 Manila Amendments to the
1978 STCW Convention

PART A
COURSE FRAMEWORK

1. OBJECTIVES

This training program entitled **"Updating Course for Officers in Charge of an Engineering Watch"** serving on seagoing ships powered by main propulsion machinery of 750 kW propulsion power or more was developed to comply with the requirements under paragraphs [4] and [5] of Regulation I/11 (Revalidation of Certificates) and in consonance with Regulation I/15 (Transitional Provisions) of the 2010 Manila Amendments to the 1978 International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW'78 Convention), as amended.

It intends to update the knowledge, understanding and proficiency of Officers in Charge of an Engineering Watch serving on board seagoing ships powered by main propulsion machinery of 750 kW propulsion power or more, who were certificated under the STCW'78 Convention, as amended in 1995, with the new competence requirements and revalidate their Certificate of Competency (COC).

Additionally, this training program covers certain KUPs leading to Management Level Marine Engineering competencies that are now incorporated in the new Bachelor of Science in Marine Engineering (BSMarE) curriculum to align and prepare the aforementioned Officers in taking the new management level course for marine engineering officers.

2. ENTRY STANDARDS

Entrants to this training program shall be Officers in Charge of an Engineering Watch on seagoing ships powered by main propulsion machinery of 750 kW propulsion power or more who are holders of COC issued under Regulation III/1 of the STCW'78 Convention, as amended in 1995.

3. EXEMPTION

There is no particular exemption from any part of this training program. However, since the topics about *Steam and Gas Turbine relating to marine propulsion plant machinery* were not covered by this updating course, a *"limitation on Steam and Gas Turbines"* shall be indicated in the COCs of successful candidates for certification.

4. COURSE INTAKE LIMITATIONS

Maritime Training Institutions (MTIs) offering this training program shall ensure that trainees shall not exceed a maximum of **24 in each class**. For practical sessions, the following **man-machine ratio** shall apply:

- **4:1** for each engine room simulator exercise for a Full Mission Engine Room Simulator; and
- **2:1** for Desktop Engine Room Simulator.

5. CERTIFICATE OF COURSE COMPLETION

Trainees who have successfully completed this training program and passed the assessment hereof shall be issued a Certificate of Training Completion. The format of such certificate shall be in accordance with the format prescribed by the Administration.

6. STAFF REQUIREMENTS

Every MTI offering this training program shall have a Training Supervisor, a minimum of two (2) Instructors and at least one (1) Assessor, who shall be subject to accreditation by the Administration and meet the general and specific qualification standards per function for an Instructor and an Assessor of the Management Level Course for Marine Engineering Officers as provided for under MARINA STCW Circular No. 2014-04.

7. TRAINING FACILITIES

For the theoretical part of this training program, the MTI shall provide *at least one (1) dedicated classroom* with *multimedia overhead projector*, *a computer set*, *white board and paraphernalia* needed, and other facilities needed. This does not however prevent the MTI from utilizing additional teaching facilities to support learning.

8. TRAINING EQUIPMENT

For Function 1:

1. At least one (1) Engine Room Simulator with:
   - 1.1. a valid "Type-approved Certificate" issued by an internationally recognized Classification Body stating the simulator's compliance with Regulation I/12 of the STCW'78 Convention, as amended and showing the STCW Competence Standards that can be covered/addressed using such simulator;
   - 1.2. briefing room; and
   - 1.3. debriefing room.

For Function 2:

1. The following equipment shall be provided by the MTI offering this training program:
   - 1.1. Engine room simulator as described for Function 1 with capability to operate, synchronize and test generators including safety devices;
   - 1.2. Electrical laboratory equipment and training materials for analyzing and testing;
   - 1.3. Model A.C. and D.C. generators;

1.4. A selection of marine cables and fittings;

1.5. Electronic circuit experiment equipment including electro circuit elements such as various semiconductor devices, *i.e.* thyristor, IGBT, MOSFET, LSI, LED), circuit diagrams and configurations;

1.6. Various operational automatic control devices/equipment (*i.e.* PID controllers, sequencer, transducer, recorders, control valves, thermostats, pressure switches, level switches, iron-cored solenoid, resistance thermometer bulb, standard of adjustable resistance to create desired temperature signal, hydraulic testing equipment)

1.7. Operational PID control experiment equipment for temperature/ level/ pressure control system

2. Operational Hydraulic and pneumatic control equipment

3. Other equipment and training materials that can be used by trainees to demonstrate required competences

For Function 4:

1. Photographs, drawings and plans illustrating various types of ship and constructional details

2. Other equipment and training materials to demonstrate required competences

9. TEXTBOOKS AND OTHER REFERENCES, VIDEOS AND OTHER TEACHING AIDS

MTIs offering this training program shall be responsible in determining and selecting the textbooks and other references that they will use, provided that the same shall be relevant and updated. The guidance and suggestions in the revised IMO Model Course 7.04 and 7.02 validated during the 44th Session of the IMO's Sub-Committee on STW may be considered in determining the textbooks, videos and other teaching aids that would be necessary to facilitate learning in this training program.

PART B
COURSE OUTLINE

MODULE	COMPETENCE AND TOPICS	HOURS ALLOCATED
FUNCTION 1. MARINE ENGINEERING AT THE OPERATIONAL LEVEL *(including selected KUPs leading to certain Competences in Marine Engineering at the Management Level (ML)*		
F1 - Module 1	**Maintain a safe engineering watch**	
	1. Engine-room Resource Management Principles: 1.1. allocation, assignment, and prioritization of resources 1.2. effective communication 1.3. assertiveness and leadership 1.4. obtaining and maintaining situational awareness 1.5. consideration of team experience	8
F1 - Module 2	**Operate main and auxiliary machinery and associated control systems**	
	1. Basic construction and operation principles of machinery systems, including:	
	1.1. Marine Diesel Engine: • Diesel engine fuel atomization and combustion *(Note: in relation to environmental rules and regulations)*	8
	1.2. Marine Boiler: • Steam boiler fuel atomization and combustion	8
	1.3. Other Auxiliaries:	
	• Purifier and fuel oil treatment • Thermal fluid heating Systems	8 4
	2. Safety and emergency procedures for operation of propulsion plant machinery, including control systems: 2.1. Main Engine Auto-slow down and Shut down 2.2. Power Failure (Blackout)	 8 2
	3. Preparation, operation, fault detection and necessary measures to prevent damage for the following machinery items and control systems	
	3.1. Auxiliary Prime Movers and Associated Systems *(Note: Focus should be on modern types of enignes like electronic control and common rail systems)*	4

MODULE	COMPETENCE AND TOPICS	HOURS ALLOCATED
F1 - Module 3	**Manage the operation of propulsion plant machinery (ML)**	
	1. Design features and operative mechanism of Marine Diesel Engines and associated auxiliaries	8
	2. Design features and operative mechanism of Propeller Shaft and Associated Ancillaries	4
F1 - Module 4	**Plan and schedule operations (ML)**	
	1. Thermodynamics and heat transmission 1.1. Refrigeration 1.2. Combustion 1.3. Air Conditioning	16
	2. Mechanics and hydromechanics 2.1. Balancing 2.2. Simple Harmonic Motion 2.3. Stress & Strain 2.4. Torsion 2.5. Combined Stress	32
	3. Propulsive characteristics of Deisel Engines including speed, output and fuel consumption of:	
	3.1. Propeller and load diagrams	4
	3.2. Propulsion characteristics diesel	4
	4. Heat cycle, thermal efficiency and heat balance of the following:	
	4.1. Marine diesel engine	4
	4.2. Marine steam boiler	4
	5. Refrigerators and refrigeration cycle	4
	6. Technology of materials	6
F1 - Module 5	**Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery (ML)**	
	1. The efficient operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery, covering: 1.1. Engine lubrication; 1.2. Boiler water testing; and 1.3. Boiler water treatment.	8

MODULE	COMPETENCE AND TOPICS	HOURS ALLOCATED
FUNCTION 2. ELECTRICAL, ELECTRONIC AND CONTROL ENGINEERING AT THE OPERATIONAL LEVEL *(including selected KUPs leading to certain Competences in Electrical, Electronic and Control Engineering at the Management Level (ML)*		
F2 - Module 1	**Operate electrical, electronic and control systems**	
	1. Basic Electrical Engineering 1.1. High-voltage installations 2. Basic Electronics 2.1. Electronic control equipment	 5 8
F2 - Module 2	**Manage operation of electrical and electronic control equipment (ML)**	
	1. Marine electrotechnology, electronics, power electronics, automatic control engineering and safety devices:	
	1.1. Marine electro technology	8
	1.2. Automatic control engineering and safety devices	24
	2. Design features and system configuration of operational control equipment for electrical motors	24
	3. Features of hydraulic and pneumatic control equipment	8

FUNCTION 4. CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD AT THE OPERATIONAL LEVEL *(including selected KUPs leading to certain Competences in Controlling the Operation of the Ship and Care of Persons on Board at the Management Level (ML)*		
F4 - Module 1	**Ensure compliance with pollution prevention requirements**	
	1. Importance of proactive measures to protect the marine environment	4
F4 - Module 2	**Application of leadership and team working skills**	
	1. Shipboard personnel management and training	20
	2. Related international maritime conventions and recommendations, and national legislation	
	3. Task and workload management	
	4. Effective resource management	
	5. Decision making techniques	

MODULE	COMPETENCE AND TOPICS	HOURS ALLOCATED
F4 - Module 3	**Control trim, stability and stress (ML)**	
	1. Fundamental Principles of Ship Construction, Trim and Stability	
	1.1. Construction Arrangements *Note: Coverage of this topic needs to be based on the consideration that candidate trainees have already been exposed to the actual designs on board. Hence, it would be more important to discuss, for instance, the latest designs and related classification rules.*	16
F4 - Module 4	**MONITOR AND CONTROL COMPLIANCE WITH LEGISLATIVE REQUIREMENTS AND MEASURES TO ENSURE SAFETY OF LIFE AT SEA, SECURITY AND THE PROTECTION OF THE MARINE ENVIRONMENT (ML)**	
	1. International Maritime Law Embodied in International Agreements and Conventions, with regard to:	
	1.1. Certificates and other documents required to be carried on-board ships by international conventions	1
	1.2. Responsibilities under the relevant requirements of the International Convention on Load Lines	1
	1.3. Responsibilities under the relevant requirements of the International Convention for the Safety of Life at Sea	1
	1.4. Maritime declarations of health and the requirements of the International Health Regulations	1
	1.5. Reponsilities under other international maritime law embodied in international agreement and conventions that impact on the role of management level marine engineering officers:	
	1.5.1. United Nations Convention on the Law of the Sea (UNCLOS)	1
	1.5.2. Maritime Labour Convention (MLC 2006)	4
	1.5.3. Classification Societies	1
	1.5.4. General Average and Marine Insurance	1

MODULE	COMPETENCE AND TOPICS	HOURS ALLOCATED
	1.6. Responsibilities under International Instruments affecting the Safety of the Ship, Passengers, Crew and Cargo:	
	1.6.1. Ballast Water Convention 2004	1
	1.6.2. Port State Control	2
	1.7. National legislation for implementing international agreements and conventions	1

TOTAL HOURS (Excluding Time for Assessment): 276

Geneal Rule on Time Allocation:

METIs must note that the number of hours allocated for the topics in this Function are the minimum and can be increased as may be necessary to cover other topics that may be deemed necessary to further update the operational level officers subject herein.

PART C
COURSE SYLLABUS

COURSE SYLLABUS

FUNCTION 1

MARINE ENGINEERING AT THE OPERATIONAL LEVEL

(Including Selected KUPs Leading to Certain Competencies in the Management Level)

FUNCTION 1 - MODULE 1

Competence: Maintain a safe engineering watch

1. Egnine-room Resource Management (ERM)

1.1. Explains ERM principles based on Bridge Resource Management (BRM)/ERM principles described in STCW Code Chapter VIII Section A-VIII/2, Part 3 paragraph 8

1.2. Explains ERM in terms of maintaining the safe engineering watch including why ERM is necessary

1.3. Explains the resources considered to be included in ERM

1.4. Explains the resource management in a specific manner taking examples such as personnel management, information management and management of installations/equipment

1.5. Explains what is necessary to practice ERM

1.6. Explains what is meant by the following in practicing ERM

1.6.1. allocation, assignment and prioritization of the resources

1.6.2. effective communication

1.6.3. assertiveness and leadership

1.6.4. obtaining and maintaining situational awareness

1.6.5. consideration of team experience

FUNCTION 1 - MODULE 2

Competence: Operate main and auxiliary machinery and associated control systems

1. Basic construction and operation principles of machinery systems, including:

1.1. Marine Diesel Engine:

1.1.1. **Diesel engine fuel atomization and combustion**

1.1.1.1. Describes the combustion process in a boiler or an engine cylinder

1.1.1.2. Describes the chemical reaction in combustion as being between combustible materials such as hydrocarbon on fuels and the oxygen contained in atmospheric air

1.1.1.3. States that, as a result of combustion, heat energy become available, enabling thermodynamic operations to be carried out

1.1.1.4. States that the heat released during the combustion of a unit of a substance is termed calorific value (CV)

1.1.1.5. States that the main combustible elements in marine fuels are carbon, hydrogen and sulphur

1.1.1.6. States that sulphur is usually present in marine fuels

1.1.1.7. States that sulphur, although combustible, is an undesirable element in a fuel

1.1.1.8. Explains how atomization is produced by the injector nozzle

1.1.1.9. Explains why swirl and penetration are important to the ignition and combustion of the fuel/air mixture

1.2. Marine Boiler:

1.2.1. **Steam boiler fuel atomization and combustion**

1.2.1.1. States that the elements carbon and hydrogen combine chemically with oxygen during combustion to form the gaseous products carbon dioxide and water vapor

1.2.1.2. Explains the part played by nitrogen in the combustion process

1.2.1.3. States that, to ensure that the combustion process is as compete as possible, excess air is normally supplied

1.2.1.4. States that the excess of air must be kept to a minimum, consistent with good combustion

1.2.1.5. States that although excess air is supplied, there may be some incomplete combustion of carbon to carbon monoxide (CO)

1.2.1.6. States that in practice the products of combustion are normally a gaseous mixture of carbon dioxide, sulphur dioxide, water-vapor, possibly carbon monoxide and an ash, possibly containing sodium and vanadium

1.2.1.7. States that poor combustion creates smoke, which pollutes the atmosphere and wastes fuel and reduces the efficiency of the engine or boiler

1.2.1.8. Explains why the proportion of CO2 or O2 in exhaust gases provides an indication of combustion efficiency

1.2.1.9. Describes briefly the instruments available to indicate and record the percentage of CO2 and O2 in exhaust gas

1.2.1.10. States the ranges of percentages of CO2 which indicate:

- good combustion
- poor combustion
- bad combustion

1.2.1.11. Explains the importance of atomization when it is required to mix a liquid fuel with air prior to combustion

1.2.1.12. Explains why the viscosity of a fuel is important in its atomization

1.2.1.13. States that in the above objective atomization is produced by the fuel, at high pressure, passing through a small orifice in the burner nozzle

1.2.1.14. Describes, with a single line diagram a combustion air register identifying:

- swirl vanes
- the flame stabilizer
- air-flow control valves
- the burner

1.2.1.15. States typical values of the pressure drop and of the velocity of combustion air in the register

1.2.1.16. Explains why the thorough and rapid mixing of atomized fuel and combustion air is important

1.2.1.17. Describes furnace conditions which indicate good combustion

1.2.1.18. Describes, with the aid of sketches, how pressure-jet, steam-jet and rotary-cup burners atomize fuel and promote adequate fuel/air mix ratio

1.3. Other auxiliaries:

1.3.1. **Purifier and fuel oil treatment**

1.3.1.1. Describes the following with the aid of sketches:

- bowl assembly
- operating water
- seal water
- gravity disk
- valve cylinder
- Separation disk/plate

1.3.1.2. States principles of purifying to eliminate water or dirt particles from oil

1.3.1.3. Explains why fuel oil treatment is necessary

1.3.1.4. Explains in simple terms, the purification by using gravity force and filters, and centrifugal separation

1.3.1.5. Describes the following types of filter, which are used in fuel oil lines

- mesh/gauze elements
- magnetic elements
- fiber assemblies

1.3.1.6. Explains how the force of gravity is used to separate out liquids and solids of different densities

1.3.1.7. Describes the operation principles of an oil purifier

1.3.1.8. Explains why the use of centrifugal separation is much faster and more effective than gravity in the separation process

1.3.1.9. Describes, with the aid of simple sketches, a bowl separator and a tube separator, showing the main components and the principal differences between the two

1.3.1.10. States the rotation speeds used in the equipment described in the above objective

1.3.2. **Thermal fluid heating Systems**

1.3.2.1. States the functions of a thermal fluid heating system onboard ship

1.3.2.2. States the differences between a thermal fluid heating system and an auxiliary steam system

1.3.2.3. States the properties of thermal fluids used onboard ship

1.3.2.4. Describes with the aid of diagrams and sketches the components and their functions, fittings and safety devices of a thermal fluid system

1.3.2.5. Explains the need for a minimum flow of the thermal fluid in the system

1.3.2.6. Describes the safety precautions and possible dangers when operating a thermal fluid heating system

1.3.2.7. Describes the operation of a thermal fluid heating system

2. Safety and Emergency Procedures for Operation of Propulsion Plant Machinery, including Control Systems:

2.1. Main Engine Auto-slow down and Shut down and inter-lock system

2.1.1. Explains main engine auto-slow down and shut down taking a typical system as an example in terms of the following:

2.1.1.1. specific conditions

2.1.1.2. processes appeared until slow-slow down/shut down

2.1.1.3. transient phenomenon of the plant

2.1.1.4. procedures for recovery (changeover of maneuvering position, maneuvering method, eliminating causes and etc.)

2.1.1.5. main engine control system

2.1.2. Explains main engine manual emergency slow down and shut down in terms of the following, taking a typical system as an example

2.1.2.1. specific conditions

2.1.2.2. impacts on the plant

2.1.2.3. procedures for recovery

2.2. Power Failure (Blackout)

2.2.1. Explains briefly power supply system on board ships and its backup system

2.2.2. Explains specific conditions of blackout and procedures for recovery responding to their causes taking a typical system as an example, including the following:

2.2.2.1. transient phenomenon of the plant

2.2.2.2. equipment/installations to be promptly addressed

2.2.2.3. sequential restarting auxiliaries

2.2.2.4. auxiliaries to be manually restarted

2.2.2.5. generator control system and power distributing system

3. Preparation, Operation, Fault Detection and Necessary Measures to Prevent Damage for the Following Machinery Items and Control Systems

3.1. Auxiliary Prime Movers and Associated Systems *(Note: Focus should be on modern types of enignes like electronic control and common rail systems)*

(Diesel engine)

3.1.1.1. States precautions before starting an engine such as confirming fuel oil line, starting air line, cooling sea/fresh water line established and amount of lubricating oil inside the sump tank

3.1.1.2. Describes briefly components constructing each associated system for an engine

3.1.1.3. States preparations and procedures for manual start of an engine

3.1.1.4. States the conditions of remote-auto start of an engine

3.1.1.5. States the differences between manual start and remote-auto start of an engine

3.1.1.6. Describes briefly the control system and its components including their function

3.1.1.7. States the safety devices and their functions

3.1.1.8. Lists the normal operating pressures and/or temperatures for:

- exhaust gas
- inlet air
- circulating water at inlet and outlet
- lubricating oil
- fuel

FUNCTION 1 - MODULE 3
Competence: Manage the operation of propulsion plant machinery (ML)

1. Design features and operative mechanism of Marine Diesel Engines and associated auxiliaries

1.1. Describes with the aid of sketches/computer aided drawing, material selection, and design features of the structure of diesel engine:

1.1.1. Structure of the bedplate

1.1.2. Bedplate connection to the tank top

1.1.3. Arrangement of holding down bolts

1.1.4. Structure of A-frames and columns

1.1.5. Arrangement of tie bolts

1.1.6. Cylinder block and entablature

1.1.7. Arrangement of main bearing caps

1.1.8. Arrangement of piston rod gland assembly

1.1.9. Arrangement of turbochargers and air coolers

1.2. Describes with the aid of sketches/computer aided drawing, material selection, and design features of the running gear of diesel engine:

1.2.1. Crankshaft

1.2.2. Main bearing

1.2.3. Thrust block and bearing

1.2.4. Bottom end bearing

1.2.5. Connecting rod

1.2.6. Cross head and bearing

1.2.7. Guides and guide shoes

1.2.8. Lubrication of main bearing, bottom end bearing and cross head bearing

1.2.9. Cam shaft drive arrangement

1.2.10. Gear wheel transmission

1.2.11. Chain wheel transmission

1.2.12. Cam shaft bearing arrangement

1.3. Describes with the aid of sketches/computer aided drawing, material selection, and design features of the fuel injection equipment of diesel engine:

1.3.1. Fuel injection pumps including fuel pumps for common rail system

1.3.2. Fuel injectors

1.3.3. Arrangement of fuel injector

1.3.4. Variable injection timing

1.4. Describes with the aid of sketches/computer aided drawing, material selection, and design features of the combustion chamber components of diesel engine:

1.4.1. Cylinder cover and mountings / excess pressure release method

1.4.2. Cooling of cylinder cover

1.4.3. Cylinder Liner and cooling arrangements

1.4.4. Piston crown

1.4.5. Piston assembly

1.4.6. Geometry of combustion chamber

1.4.7. Exhaust valve and cooling arrangement

1.5. Describes with the aid of sketches/computer aided drawing, material selection, and design features of piston rings, compatibility to cylinder liner and cylinder lubrication employed in a diesel engine:

1.5.1. Cylinder liner material

1.5.2. Piston rings material

1.5.3. Manufacturing methods of cylinder liner

1.5.4. Manufacturing methods of piston rings

1.5.5. Types of cylinder lubrication and mechanism

1.5.6. Selection of cylinder lubrication oil

1.6. Describes with the aid of sketches the operative mechanism of diesel engine system

1.6.1. Starting and Reversing system

1.6.2. Cooling water system

1.6.3. Lubrication oil system

1.6.4. Fuel oil system

1.6.5. Scavenging, supercharging and exhausting

1.6.6. Engine safety system

1.6.7. Engine emergency operating system

2. Design features and operative mechanism of Propeller Shaft and Associated Ancillaries

2.1. Describes with the aid of sketches/computer aided drawing, material selection and design features of propeller shaft and associated ancillaries:

2.1.1. Establishing the shaft centre line

2.1.2. Deviation while building

2.1.3. Alignment deviation in service

2.1.4. Fair curve alignment

2.1.5. Shaft checks

2.1.6. Shaft bearings

2.1.6.1. Plain bearings

2.1.6.2. Tilting pad bearings

2.1.6.3. Roller bearings

2.1.7. Coupling bolts

2.1.8. Stern tubes

2.1.9. Stern tube sealing arrangements

2.1.10. Fixed pitch propellers

2.1.11. Methods of mounting fixed pitch propellers

2.1.11.1. Keyed propellers

2.1.11.2. Keyless propellers

2.1.12. Controllable pitch propellers

2.1.13. Gears and clutches

2.1.14. Reverse reduction gearbox

2.1.15. Flexible couplings

2.1.16. Air operated clutches

FUNCTION 1 - MODULE 4
Competence: Plan and schedule operations (ML)

1. Thermodynamics and Heat Transmission

1.1. **Refrigeration**

1.1.1. Demonstrates knowledge and understanding of:

1.1.1.1. Vapor compression cycle

1.1.1.2. Refrigerant properties and hazards

1.1.1.3. Refrigerant tables

1.1.1.4. Cycle on p-h diagram

1.1.1.5. Coefficient of performance

1.1.1.6. Refrigerant mass flow

1.1.1.7. Compressor calculations

1.1.1.8. Secondary refrigerants.

1.2. **Combustion**

1.2.1. Demonstrates knowledge and understanding of:

1.2.1.1. Combustion equations

1.2.1.2. Fuel composition

1.2.1.3. Air-fuel ratio

1.2.1.4. Excess air

1.2.1.5. Volumetric analysis of combustion products

1.2.1.6. Calorific value

1.3. **Air Conditioning**

1.3.1. Demonstrates knowledge and understanding of:

1.3.1.1. Comfort conditions

1.3.1.2. Psychrometric charts

1.3.1.3. Wet and dry bulb temperatures

1.3.1.4. Humidity

1.3.1.5. Dew point

1.3.1.6. Dehumidifying and humidifying processes

1.3.1.7. Air conditioning systems

2. Mechanics and Hydromechanics

2.1. **Balancing**

2.1.1. Demonstrates knowledge and understanding of:

2.1.1.1. Primary and secondary forces

2.1.1.2. Primary and secondary couples

2.1.1.3. Complete balancing of reciprocating machinery

2.1.1.4. Critical speed

2.2. **Simple Harmonic Motion**

2.2.1. Demonstrates knowledge and understanding of:

2.2.1.1. Equation of simple harmonic motion

2.2.1.2. Amplitude, frequency and periodic time

2.2.1.3. Vibrating spring mass systems

2.2.1.4. Springs

2.2.1.5. Resonance

2.2.1.6. Transmissibility

2.2.1.7. Vibrations of flywheels and gearwheels

2.3. **Stress and Strain**

2.3.1. Demonstrates knowledge and understanding of:

2.3.1.1. Stress and strain relationships in thin cylindrical and spherical shells

2.3.1.2. Stress in thin, rotating rims

2.3.1.3. Thermal stress

2.3.1.4. Stress in compound bars

2.3.1.5. Elastic strain energy

2.3.1.6. Stresses due to gradually applied and shock loads

2.4. **Torsion**

2.4.1. Demonstrates knowledge and understanding of:

2.4.1.1. Stress, strain and strain energy due to torsion

2.4.1.2. Fundamental torsion equation

2.4.1.3. Reciprocating engine crank effort

2.4.1.4. Rudder stock turning moment from steering gear o Deflection of helical springs

2.5. **Combines Stress**

2.5.1. Demonstrates knowledge and understanding of:

2.5.1.1. Stresses on an oblique plane

2.5.1.2. Material subjected to two perpendicular stresses

2.5.1.3. Axial and bending stress

2.5.1.4. Mohr's stress circle. Principal stresses and strains

2.5.1.5. Combined bending and twisting

3. Propulsive Characteristics of Deisel Engines Including Speed, Output and Fuel Consumption

3.1. **Propeller and load diagrams**

3.1.1. Explains the following with the aid of sketches where applicable:

3.1.1.1. Propeller curve

3.1.1.2. Propeller design point

3.1.1.3. Fouled hull, sea margin and heavy propeller

3.1.1.4. Constant ship speed lines

3.2. **Propulsion Characteristics Diesel**

3.2.1. Explains the following with the aid of sketches where applicable:

3.2.1.1. Continuous service rating

3.2.1.2. Engine margin

3.2.1.3. Limits for continuous operation

3.2.1.4. Limits for overload operation

3.2.1.5. Specific fuel oil consumption (SFOC)

3.2.1.6. SFOC based on reference ambient conditions stated in ISO 3046/1-1986

3.2.1.7. Adjustment of SFOC for lower calorific value of fuels and ambient conditions different from ISO reference conditions

4. Heat Cycle, Thermal Efficiency and Heat Balance of the following:

4.1. **Marine Diesel Engine**

4.1.1. Explains the following with the aid of sketches where applicable:

4.1.1.1. Dual cycle

4.1.1.2. Thermal efficiency of dual cycle

4.1.1.3. Heat balance of marine diesel engine

4.2. **Marine Steam Boiler**

4.2.1. Explains the following with the aid of sketches where applicable:

4.2.1.1. Rankine cycle

4.2.1.2. Thermal efficiency of Rankine cycle

4.2.1.3. Heat balance of a marine steam plant

4.2.1.4. Boiler performances

4.2.1.5. Boiler efficiency

5. Refrigerators and Refrigeration Cycle

5.1. **Refrigeration and Air Conditioning system**

5.1.1. Assess common refrigerants used on board, using factors such as their properties, economics of use, handling, health hazards, and environmental impact

5.1.2. Explain the environmental concerns of traditional refrigerants and the methods used to address these concerns

5.1.3. Explain correct procedures for the recovery of refrigerants from refrigeration systems

5.1.4. Analyze functions and operation of all components including fittings and safety devices of refrigeration and air conditioning plants

5.1.5. Interpret symptoms, effects, and remedial actions for common faults in refrigeration and air conditioning systems

5.1.6. Precautions during cargo operations – re-circulation system of AHU

5.1.7. Explain the purposes and procedures for pumping down, leak test, refrigerant charging and oil changing

5.1.8. Record keeping of refrigerant consumption

6. Technology of Materials

6.1. **Destructive and non-destructive testing of material**

6.1.1. Describe common methods of non-destructive testing of materials and their application to main and auxiliary machinery components

6.1.2. Discuss destructive tests on specimens such as stress tests, hardness tests and metallographic tests

6.2. **Engineering processes used in construction and repair**

6.2.1. Evaluate common fabrication techniques, including welding, forging, and casting

6.2.2. Assess common repair techniques

FUNCTION 1 - MODULE 5

Competence: Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery (ML)

1. The Efficient Operation, Surveillance, Performance Assessment and Maintaining Safety of Propulsion Plant and Auxiliary Machinery

1.1. **Engine lubrication**

- 1.1.1. Identify diesel engine lubricant types, properties, and applications
- 1.1.2. Outline principles of diesel engine lubrication
- 1.1.3. In relation to contamination and deterioration of diesel engine lubricants:
  - 1.1.3.1. Discuss the sources, types, and effects of contamination
  - 1.1.3.2. Discuss the causes, types, and effects of deterioration
  - 1.1.3.3. Describe typical testing and treatment methods, and
  - 1.1.3.4. Interpret typical results of testing, giving appropriate actions which should be undertaken
- 1.1.4. Describe, using diagrams, the distribution of lubricating oil to diesel engines, in particular the:
  - 1.1.4.1. Guides and crosshead bearings of slow speed diesel engines
  - 1.1.4.2. Top end bearings of medium speed engines
  - 1.1.4.3. Bottom end bearing
  - 1.1.4.4. Main bearings
  - 1.1.4.5. Camshaft drives, showing direction of flow, typical clearances, and stating normal operating parameters

1.2. **Boiler water testing**

- 1.2.1. Define pH and explain how it is measured and controlled
- 1.2.2. Evaluate the tests used in the control of boiler and feed water treatment
- 1.2.3. Interpret the implications of out of limit readings from water treatment tests and state the corrective procedures which should be undertaken

1.3. **Boiler water treatment**

- 1.3.1. Evaluate common methods of boiler, feed and make up water treatment
- 1.3.2. Show how oxygen is eliminated in boilers
- 1.3.3. Enumerate the normal and maximum operating limits for boiler and feed water treatment
- 1.3.4. Itemize the sources and types of contamination of boiler, feed, and make up water and explain the effects of these contaminations on the reserves of treatment chemicals
- 1.3.5. Compare the procedures which may be used to counter contamination of boiler, feed, and make up water

COURSE SYLLABUS

FUNCTION 2

ELECTRICAL, ELECTRONIC AND CONTROL ENGINEERING AT THE OPERATIONAL LEVEL

(Including Selected KUPs Leading to Certain Competencies in the Management Level)

FUNCTION 2 - MODULE 1
Competence: Operate electrical, electronic and control systems

1. Basic Electrical Engineering

1.1. **High-voltage installations**

1.1.1. States that more than 1,000 V is usually called high-voltage

1.1.2. States how and why high-voltage installations are used on board ships

1.1.3. States what voltages are mostly used as high voltage on board ships

1.1.4. Describes equipment/installations in high-voltage systems such as high-voltage generator, distribution board, motors etc.

1.1.5. States the special characteristics and features of high-voltage installations in comparison with less than 1,000 V

1.1.6. States that high-voltage systems are normally earthed via a resistor

1.1.7. Explains how the presence of earth faults is indicated in a high-voltage system with an earthed neutral

1.1.8. States safety precautions to be strictly observed to prevent accidents when working on high-voltage electrical equipment

1.1.9. States that any operation of high-voltage installations must be carried out remotely at places where a certain distance is being kept from the installations

2. Basic Electronics

2.1. **Electronic control equipment**

2.1.1. Defines the following electronic control equipment and states briefly their control mechanism:

2.1.1.1. relay circuit unit

2.1.1.2. digital sequential control devices

2.1.1.3. Integrated Automation Control and Monitoring System (IACMS)

2.1.1.4. Programmable Logic Controller (PLC)

2.1.1.5. analogue/digital/computer PID Controller

2.1.1.6. computer programmable controller

2.1.2. States how control equipment cited above are utilized for main engine, CPP, generator, boiler and auxiliaries in terms of the following:

2.1.2.1. main engine; start/stop, revolution, injection timing, electronic governor and the others (auto-load, crash astern, automatic shut down, automatic slow down, etc)

2.1.2.2. controllable Pitch Propeller (CPP); auto load/blade angle control

2.1.2.3. generator; generator automatic control (GAC) (auto-synchro, load sharing, etc) primary mover start/stop sequence

2.1.2.4. boiler; Automatic Combustion Control (ACC), burner control, Feed Water Control (FWC),

2.1.2.5. Steam Temperature Control (STC),

2.1.2.6. auxiliary machinery; purifier automatic control (automatic sludge discharge), temperature/level/pressure/viscosity control

FUNCTION 2 - MODULE 2

Competence: Manage operation of electrical and electronic control equipment (ML)

1. Marine Electrotechnology, Electronics, Power Electronics, Automatic Control Engineering and Safety Devices

1.1. Marine Electro-technology

1.1.1. Discusses the following in terms of electrical practice in ships:

1.1.1.1. Materials of conductors – single wire and multi-stranded

1.1.1.2. Commonly used insulation material

1.1.1.3. Effect of temperature, oxidation, fire, oil, seawater, acids and solvents on insulation materials

1.1.1.4. Sheathing of electric cables

1.1.1.5. Cable runs in machinery spaces, cargo holds and cold-storage chambers

1.1.1.6. Passing of cables through bulkheads and decks

1.1.1.7. Deck Machinery

1.1.1.8. Fail safe brake

1.1.1.9. Coil operated brake

1.1.1.10. Deck winches and capstans, windlass and deck cranes

1.1.1.11. Electrical Interference

1.1.1.12. Equipment susceptible to electric interference

1.1.1.13. Common sources of interference

1.1.1.14. Method of suppression of interference

1.1.2. **Automatic control engineering and safety devices**

1.1.2.1. Explains the basic concepts of:
- Open and closed control loops
- Process control
- Essential components in process control loops

1.1.2.2. Explains the operation and use of sensors and transmitters in shipboard systems:
- Resistance temperature devices
- Thermocouples. Flow and pressure measurement
- Level measurement
- Ambient temperature compensation
- Viscosity measurement
- Torque measurement
- Force balance transmitters
- Oil/water interface and oil in water monitoring
- The pneumatic flapper/nozzle system
- Pneumatic 20 – 100 kPa, analogue 4 to 20 mA signals, Pneumatic pilot relays
- Control air supply
- Operational amplifiers
- Electrical supply

1.1.2.3. Discusses Controllers and Basic Control Theory
- Disturbances and time delays and means to reduce them
- Two step, proportional, integral, and derivative control actions

1.1.2.4. Identifies the operation and use of Final Control Elements
- Diaphragm operated control valves
- Flow/lift characteristics of control valves
- Control valve actuators and positioners. "Fail - safe", "fail - set" strategies
- Wax element valves
- Electrically operated valves

1.1.2.5. Control Loop Analysis
- Temperature control systems
- Level control systems
- Pressure control systems
- Split range and cascade control
- Single, two and three element control

1.1.2.6. Explains the operation and use of governors
- Need for governors. Governor terms, concepts and operation
- Hydraulic governors. Digital governors, Power sharing
- Governing systems

1.2. **Design Features and System Configuration of Operational Control Equipment for Electrical Motors**

1.2.1. **Three Phase A.C. Motors**

1.2.1.1. Construction, principle of operation of 3-phase induction motors
1.2.1.2. Design features of star and delta motors
1.2.1.3. Starting, speed controlling and braking methods of 3-phase induction motors
1.2.1.4. Load-torque characteristics and protection

1.2.2. **Three Phase Synchronous Motors**

1.2.2.1. Construction. Principle of operation. Load characteristics
1.2.2.2. Power factor improvement with synchronous motors

1.2.3. **Effect of varying frequency and voltage of A.C. Motors**

1.2.3.1. Speed
1.2.3.2. Temperature
1.2.3.3. Torque
1.2.3.4. Power output
1.2.3.5. Starting time, current

1.2.4. **Motor control and protection**

1.2.4.1. D. C. motors
1.2.4.2. A.C. motors

1.2.5. **Insulated Gate Bipolar Transistor (IGBT) motor speed control**

1.2.5.1. Gate driving characteristics with high current
1.2.5.2. High frequency, high current switch
1.2.5.3. Advantages of IGBT in varying motor speed control

1.2.6. **Motor speed control by Thyristors**

1.2.6.1. Application of thyristors in motor speed control

1.2.7. **Three Phase Generators**

1.2.7.1. Construction. Salient and cylindrical rotor types
1.2.7.2. Shaft generators
1.2.7.3. Excitation methods
1.2.7.4. Automatic voltage regulation
1.2.7.5. Synchronization
1.2.7.6. Parallel operation
1.2.7.7. Generator trouble shooting

1.2.8. **Three Phase Transformers**

1.2.8.1. Construction Polarity

1.2.8.2. Configurations in Star and Delta combinations

1.2.8.3. Open delta configuration

1.2.9. **Distribution**

1.2.9.1. Main switchboard construction and configuration

1.2.9.2. Short circuit protection - fuses, main circuit breakers

1.2.9.3. The generator air circuit breaker

1.2.9.4. Protection co-ordination

1.2.9.5. Distribution configuration

1.2.9.6. Electrical equipment for tankers and hazardous areas and safety systems

1.2.10. **Emergency Power**

1.2.10.1. Automatic starting arrangements for the emergency generator

1.2.10.2. Emergency power requirements

1.2.10.3. Essential and non essential circuits

1.2.10.4. Batteries

1.3. **Features of Hydraulic and Pneumatic Control Equipment**

1.3.1. **Hydraulic control equipment**

1.3.1.1. System components, Hydraulic Circuits, Hydraulic System Fitting & Maintenance

1.3.2. **Pneumatic control equipment**

1.3.2.1. Fluids, Pneumatic Circuits, Pneumatic System Fitting & Maintenance Components and Trouble shooting

COURSE SYLLABUS

FUNCTION 4

CONTROLLING THE OPERATION OF THE SHIP AND CARE FOR PERSONS ON BOARD AT THE OPERATIONAL LEVEL

(Including Selected KUPs Leading to Certain Competencies in the Management Level)

FUNCTION 4 - MODULE 1
Competence: Ensure compliance with pollution prevention requirements

1. Proactive Measures to Protect the Marine Environment

1.1. **Importance of proactive measures to protect the marine environment**

1.1.1. Explains the need for taking proactive measures to protect the marine environment

1.1.2. Describes the proactive measures that can be taken on board the ships to protect the marine environment for shipboard operations, including:

1.1.2.1. bunkering

1.1.2.2. loading / discharging Oil, Chemicals and hazardous cargoes

1.1.2.3. tank cleaning

1.1.2.4. cargo hold washing

1.1.2.5. pumping out bilges (hold and engine room)

1.1.2.6. ballast water exchange

1.1.2.7. purging and Gas freeing

1.1.2.8. disposal of other garbage

1.1.2.9. discharge of sewage

FUNCTION 4 - MODULE 2
Competence: Application of leadership and team working skills

1. Shipboard personnel management and training

1.1. Organization of crew, authority structure, responsibilities

1.1.1. Describes typical shipboard organization

1.1.2. Explains management level, states positions and describes roles

1.1.3. Explains operational level, states positions and describes roles

1.1.4. Explains support level, states positions and describes roles

1.1.5. Outlines chain of command

1.2. Cultural awareness, inherent traits, attitudes and behaviors, cross-cultural communication

1.2.1. Explains cultural awareness

1.2.2. Gives examples of inherent cultural traits

1.2.3. Explains association between inherent traits, attitudes and behaviors

1.2.4. Describes special care needed in cross-cultural communication, especially on board ship

1.3. Shipboard situation, informal social structures on board

1.3.1. Describes common informal structures with multi-cultural crews

1.3.2. Explains why informal social structures need to be recognized and allowed for

1.3.3. Describes actions to improve cross-cultural relationships

1.4. Human error, situation awareness, automation awareness, complacency, boredom

1.4.1. Explains terms "active failures" and "latent conditions"

1.4.2. Explains errors of omission and errors of commission

1.4.3. Describes and explains a typical error chain

1.4.4. Explains situation awareness and gives a shipboard example

1.4.5. Describes actions subsequent to a near miss

1.4.6. Describes linkage between automation, complacency and boredom

1.4.7. Describes actions to address complacency and boredom

1.5. Leadership and teamworking

1.5.1. Explains functional and designated leadership

1.5.2. Describes leadership qualities including self-awareness, situation awareness, interpersonal skills, motivation, respect

1.5.3. Describes leadership characteristics, including persona, assertiveness, decisiveness, applying emotional intelligence

1.5.4. Describes leadership techniques, including, leading by example, setting expectations, providing oversight, delegating

1.5.5. Outlines the differences between team and group behavior

1.5.6. Describes the advantages of a team approach in shipboard operations

1.5.7. States the difference between a "standing team" and a "mission" or "task" team

1.5.8. Explains "team-of-one" and why it is common on board

1.5.9. States the features of good team communications

1.6. Training, structured shipboard training program

1.6.1. Outlines importance of structured shipboard training

1.6.2. Describes effective implementation of structured shipboard training

1.6.3. Explains responsibility of officers to provide structured shipboard training

1.6.4. Describes mentoring and coaching

1.6.5. Describes how trainee progress through shipboard training programs is assessed

1.6.6. Describes recording and reporting of trainee progress

1.6.7. Describes company involvement in structured shipboard training programs

1.6.8. Explains that training programs have to be adjusted to suit ship's operational needs

2. Related international maritime conventions and recommendations, and national legislation *(Note: Emphasis of this topic must be on human factors, not on technical factors)*

2.1. Intent, history and application of SOLAS convention, including the ISM and ISPS Codes

2.2. Intent, history and application of STCW Convention and role of STW Sub-Committee

2.3. Intent, history and application of Maritime Labor Convention

2.4. Role of IMO with respect to maritime conventions

2.5. Role of ILO with respect to maritime conventions

2.6. How IMO and ILO collaborate with respect to maritime conventions

2.7. How convention provisions are implemented

2.8. Role of flag state in implementing provisions of maritime conventions

2.9. Role of port state in implementing provisions of maritime conventions

2.10. Recommendations and state legislation

2.10.1. How recommendations differ from regulations

2.10.2. IMO guidelines on the mitigation of fatigue

2.10.3. IMO principles of safe manning and the guidelines for their implementation

2.10.4. Examples of recommendations and state legislation dealing with human factors

3. Task and workload management

3.1. Planning and coordination

3.1.1. States what planning means with respect to individuals and groups

3.1.2. Describes how planning outcomes are measured

3.1.3. Describes the role of feedback with respect to planning outcomes

3.1.4. Defines coordination

3.1.5. Gives examples of shipboard coordination

3.2. Personnel assignment

3.2.1. States what personnel assignment means

3.2.2. Gives examples of personnel assignment on board

3.3. Human limitations

3.3.1. Describes common human limitations such as fatigue, misunderstanding, and complacency

3.3.2. Describes onboard activities that test human limitations, including use of technology

3.3.3. Describes indicators that human limitations are being exceeded
3.3.4. Explains steps taken to avoid pushing crew members beyond personal limitations
3.3.5. Explains how hidden pressures can cause personal limitations to be exceeded
3.3.6. Describes the consequences of pushing a person beyond their personal limitations
3.3.7. Outlines STCW 2011 "Fitness for Duty" requirements

3.4. Time and resource constraints
3.4.1. Gives examples of time constraints
3.4.2. Describes factors that cause time constraints
3.4.3. States how time constraints are usually addressed on board
3.4.4. Gives examples of resource constraints
3.4.5. Describes factors that cause resource constraints
3.4.6. States how resource constraints are usually addressed on board

3.5. Personal abilities
3.5.1. States personal characteristics essential to effective leadership and teamwork on board
3.5.2. Describes own abilities contributing to leadership and teamwork on board
3.5.3. Describes how personal characteristics are managed and strengthened
3.5.4. Explains how to personally contribute to leadership and teamwork on board

3.6. Prioritization
3.6.1. Gives examples of prioritization
3.6.2. Explains why prioritization is necessary

3.7. Workloads, rest and fatigue
3.7.1. Describes own shipboard workload
3.7.2. Explains the dangers of high workload
3.7.3. Explains the disadvantages of low workload
3.7.4. Describes how workload can be assessed
3.7.5. Describes how to ensure an appropriate workload
3.7.6. States the provisions for seafarers to get adequate rest
3.7.7. Describes recording of hours of rest
3.7.8. Describes signs of fatigue
3.7.9. Explains how fatigue can result in very serious consequences
3.7.10. Gives examples of fatigue management guidelines and regulations

3.8. Management (leadership) styles

3.8.1. Explains how leadership and management differ
3.8.2. Explains and gives examples of designated and functional leadership
3.8.3. States leadership qualities
3.8.4. Describes leadership techniques
3.8.5. Describes development of an effective leadership persona
3.8.6. Explains the need for a leader to "have an honest look at himself or herself"

3.9. Challenges and responses

3.9.1. Explains what is meant by a "challenge and response" environment
3.9.2. Explains why a challenge and response environment is not always appropriate
3.9.3. States when an authoritarian approach is justified
3.9.4. Describes "chain of command"

4. Effective resource management

4.1. Effective communication aboard and ashore

4.1.1. Describes the essence of effective communication
4.1.2. States the main components of a communication system
4.1.3. States the barriers to effective communication
4.1.4. Describes four lines of communication
4.1.5. Describes effective communication techniques
4.1.6. Explains why closed loop communication is used when maneuvering the ship
4.1.7. Describes communication protocols commonly used at sea
4.1.8. Gives examples of internal and external communication
4.1.9. Explains how communication with people ashore may differ from communication on board
4.1.10. Explains what needs to be done to create a good communication climate

4.2. Allocation, assignment and prioritization of resources

4.2.1. Outlines the resources to be managed aboard a ship at sea
4.2.2. Describes how use of resources is managed
4.2.3. Gives examples of shipboard resource allocation, assignment and prioritization

4.3. Decision making reflecting team experience

4.3.1. Describes how to get the best out of a team
4.3.2. Describes allocation of work based on competence
4.3.3. Explains that good teamwork and leadership are indivisible
4.3.4. Explains how a good leader can exploit a team dynamic

4.4. Assertiveness and leadership, including motivation

4.4.1. Describes the leadership required of a junior watchkeeper

4.4.2. Explains why assertive leadership may not be effective

4.4.3. Describes how an individual or a team may be motivated and de-motivated

4.5. Obtaining and maintaining situation awareness

4.5.1. Gives examples of situation awareness while watchkeeping

4.5.2. Gives examples of lack of situation awareness while watchkeeping

4.5.3. Describes how modern electronic aids can lead to lack of situation awareness

4.5.4. Explains the dangerous link between fatigue and situation awareness

4.6. Appraisal of work performance

4.6.1. Describes how work performance can be appraised

4.6.2. States the benefits of effective work performance appraisal

4.7. Short and long term strategies

4.7.1. Defines strategy

4.7.2. Explains the role of short term strategies in effective onboard resource management

4.7.3. Describes when the use of short term strategy is necessary

4.7.4. Explains the role of long term strategies in effective onboard resource management

5. Decision making techniques

5.1. Situation and risk assessment

5.1.1. Explains how a situation is assessed and gives an example

5.1.2. States key characteristics of situation assessment

5.1.3. Describes how situation awareness may be weakened

5.1.4. Defines risk

5.1.5. Describes the relationship between situation assessment and risk

5.1.6. Describes how risk may be assessed

5.1.7. Describes how risk may be managed

5.1.8. Explains the role of risk assessment in risk management

5.1.9. Describes the role of situation and risk assessment in decision making

5.2. Identify and consider generated options

5.2.1. Gives examples of consideration of options available

5.2.2. Describes how an option may be created

5.2.3. Describes the role of leadership in creating options

5.3. Selecting course of action

5.3.1. States obligation to identify most appropriate course of action

5.3.2. Describes considerations in identifying most appropriate course of action

5.4. Evaluation of outcome effectiveness

5.4.1. Gives examples of outcomes of shipboard courses of action

5.4.2. Describes how the outcome of a course of action can be assessed

5.4.3. Describes possible follow-up actions once outcome is assessed

5.5. Decision making and problem solving techniques

5.5.1. Gives examples and explains problem solving techniques

5.6. Authority and assertiveness

5.6.1. Explains the various forms of authority

5.6.2. Describes the form of authority found on board a ship

5.6.3. Gives meaning of assertiveness

5.6.4. Describes shipboard situations justifying greater assertiveness

5.7. Judgment

5.7.1. Gives meaning of judgment

5.7.2. Explains difference between "reality judgment" and "value judgment"

5.7.3. Gives example of use of judgment on board

5.8. Emergency management

5.8.1. Describes the most common shipboard emergencies

5.8.2. States leadership requirements when dealing with a shipboard emergency

5.8.3. Describes the preparations for dealing with a shipboard emergency

FUNCTION 4 - MODULE 3

Competence: Control trim, stability and stress (ML)

1. Fundamental Principles of Ship Construction, Trim and Stability

1.2. **Ship Construction Arrangements** *(Note: Coverage of this topic needs to be based on the consideration that candidate trainees have already been exposed to the actual designs on board. Hence, it would be more important to discuss, for instance, the latest designs and related classification rules.)*

1.2.1. Describes common arrangements for:

1.2.1.1. Double bottom construction

1.2.1.2. Safety features for duct keels

1.2.1.3. Forward and after peak structures
1.2.1.4. Anchor cable termination details
1.2.1.5. Longitudinal, transverse and combined framed vessels
1.2.1.6. Decks
1.2.1.7. Hatch covers
1.2.1.8. Bulwarks
1.2.1.9. Deep frames
1.2.1.10. Design consideration for discontinuities in the vessel structure
1.2.1.11. Bilge keel consideration
1.2.1.12. Strakes for the hull
1.2.1.13. Fitting through the hull. Engine, deck machinery and stabilizer strength members
1.2.1.14. Bulkhead construction and their position
1.2.1.15. Maintenance of strength and watertight integrity when bulkheads are pierced for normal operation
1.2.1.16. Rudder and its support arrangements
1.2.1.17. Stern frame
1.2.1.18. Design criteria for specialized ships
1.2.1.19. Structural fire protection
1.2.1.20. Ship's General arrangement drawing
1.2.1.21. Shell expansion
1.2.1.22. Deck plan
1.2.1.23. Midship section

FUNCTION 4 - MODULE 4

Competence: **Monitor and Control Compliance with Legislative Requirements and Measures to Ensure Safety of Life at Sea, Security and the Protection of the Marine Environment (ML)**

1. International Maritime Law Embodied in International Agreements and Conventions

1.1. **Certificates and other documents required to be carried on-board ships by international conventions**

1.1.1. states that IMO publishes a list of certificates and documents required to be carried on board ship

1.1.2. states how a current version of the IMO list of certificates and documents required to be carried on board ship may be obtained

1.1.3. identifies the certificates required by MLC (2006) to be carried on board ship

1.1.4. identifies the certificates and documents that are required to be carried on board a ship of any type using the IMO information

1.1.5. states the period of validity for each of the above certificates and explains the requirements for renewing or maintaining the validity of each

1.1.6. explains how each of the certificates and documents required to be carried on board ships are obtained

1.1.7. explains the proof of validity that may be required by authorities for the certificates and documents above

1.2. **Responsibilities under the relevant requirements of the International Convention on Load Lines**

1.2.1. states that a ship to which the Convention applies must comply with the requirements for that ship

1.2.2. explains the general requirements of the Conditions of Assignment to be met before any vessel can be assigned a loadline

1.2.3. describes the factors that determine the freeboards assigned to a vessel

1.2.4. describes the requirements and coverage of initial, renewal and annual surveys

1.2.5. describes the contents of the record of particulars which should be supplied to the ship

1.2.6. explains the documentation and records that must be maintained on the ship in terms of:

1.2.6.1. certificates

1.2.6.2. record of particulars

1.2.6.3. record of freeboards

1.2.6.4. information relating to the stability and loading of the ship

1.2.7. states that after any survey has been completed no change should be made in the structure, equipment or other matters covered by the survey without the sanction of the Administration

1.2.8. states that, after repairs or alterations, a ship should comply with at least the requirements previously applicable and that, after major repairs or alterations, ships should comply with the requirements for a new ship in so far as the Administration deems reasonable and practicable

1.2.9. describes the preparation required for renewal and annual loadline surveys

1.2.10. states that the appropriate load lines on the sides of the ship corresponding to the season and to the zone or area in which the ship may be must not be submerged at any time when the ship puts to sea, during the voyage or on arrival

1.2.11. states that when a ship is in fresh water of unit density the appropriate load line may be submerged by the amount of the fresh water allowance shown on the International Load Line Certificate (1966)

1.2.12. states that when a ship departs from port situated on a river or inland waters, deeper loading is permitted corresponding to the weight of fuel and all other materials required for consumption between the point of departure and the sea

1.2.13. explains the treatment of a port lying on the boundary between two zones or areas

1.2.14. explains the circumstances in which an International Load Line Certificate (1966) would be cancelled by the Administration

1.3. **Responsibilities under the relevant requirements of the International Convention for the Safety of Life at Sea**

1.3.1. states the obligations of the master of a ship at sea on receiving a signal from any source that a ship or aircraft or a survival craft thereof is in distress

1.3.2. explains the rights of the master of a ship in distress to requisition one or more ships which have answered his call for assistance

1.3.3. explains when the master of a ship is released from the obligation to render assistance

1.3.4. states that all equipment fitted in compliance with Regulation V/12 must be of a type approved by the Administration

1.3.5. states that all ships should be sufficiently and efficiently manned

1.3.6. states that manning is subject to Port State Control inspection

1.3.7. lists the contents of the minimum safe manning document referred to in Assembly resolution A481 (XII), Principles of Safe Manning

1.3.8. describes the procedure for the testing of the ship‘s steering gear before departure

1.3.9. describes the requirements for the display of operating instructions and change-over procedures for remote steering gear control and steering gear power units

1.3.10. describes the requirements for emergency steering drills

1.3.11. lists the entries which should be made in the log-book regarding the checks and tests of the steering gear and the holding of emergency drills

1.3.12. explains the basic requirements for the carriage of dangerous goods in packaged form and IMDG Code

1.3.13. explains the basic requirements for the carriage of dangerous goods in solid form in bulk

1.4. **Maritime declarations of health and the requirements of the International Health Regulations**

1.4.1. **Arrival Documents and Procedures** (International Health Regulations (1969) as amended)

1.4.1.1. defines for the purposes of these regulations:

1.4.1.1.1. arrival of a ship
1.4.1.1.2. baggage
1.4.1.1.3. container or freight container
1.4.1.1.4. crew
1.4.1.1.5. diseases subject to the Regulations
1.4.1.1.6. disinsecting
1.4.1.1.7. epidemic
1.4.1.1.8. free pratique
1.4.1.1.9. health administration
1.4.1.1.10. health authority
1.4.1.1.11. infected person
1.4.1.1.12. in quarantine
1.4.1.1.13. international voyage
1.4.1.1.14. isolation
1.4.1.1.15. medical examination
1.4.1.1.16. ship
1.4.1.1.17. suspect
1.4.1.1.18. valid certificate

1.4.1.2. states that a health authority should, if requested, issue, free of charge to the carrier, a certificate specifying the measures applied to a ship or container, the parts treated, methods used and the reasons why they have been applied

1.4.1.3. states that, except in an emergency constituting a grave danger to public health, a ship which is not infected or suspected of being infected with a disease subject to the Regulations should not be refused free pratique on account of any other epidemic disease and should not be prevented from discharging or loading cargo or stores, or taking on fuel or water

1.4.1.4. states that a health authority may take all practicable measures to control the discharge from any ship of sewage and refuse which might contaminate the waters of a port, river or canal

1.4.1.5. describes the measures which the health authority of a port may take with respect to departing travelers

1.4.1.6. states that no health measures should be applied by a State to any ship which passes through waters within its jurisdiction without calling at a port or on the coast

1.4.1.7. describes the measures which may be applied to a ship which passes through a canal or waterway in a territory of a State on its way to a port in the territory of another State

1.4.1.8. states that, whenever possible, States should authorize granting of free pratique by radio

1.4.1.9. explains that the master should make known to port authorities, as long as possible before arrival, any case of illness on board, in the interests of the patient and the health authorities and to facilitate clearance of the ship

1.4.1.10. states that, on arrival of a ship, an infected person may be removed and isolated and that such removal should be compulsory if required by the master

1.4.1.11. states that a ship should not be prevented for health reasons from calling at any port, but if the port is not equipped for

1.4.1.12. applying the health measures which in the opinion of the health authority of the port are required, the ship may be ordered to proceed at its own risk to the nearest suitable port convenient to it

1.4.1.13. explains the actions open to a ship which is unwilling to submit to the measures required by the health authority of a port

1.4.1.14. describes the measures concerning cargo and goods

1.4.1.15. describes the measures concerning baggage

1.4.2. **Plague**

1.4.2.1. states that, for the purposes of the Regulations, the incubation period of plague is six days

1.4.2.2. states that vaccination against plague should not be required as a condition of admission of any person to a territory

1.4.2.3. states that during the stay of a ship in a port infected by plague, special care should be taken to prevent the introduction of rodents on board

1.4.2.4. states that ships should be permanently kept free of rodents and the plague vector or be periodically derailed

1.4.2.5. describes the requirements for the issue of a Ship Sanitation Control Certificate or a Ship Sanitation Control Exemption Certificate and states their periods of validity

1.4.2.6. states the conditions in which a ship on arrival is to be regarded as infected, suspected or healthy

1.4.2.7. describes the measures which may be applied by a health authority on the arrival of an infected or suspected ship

1.4.3. **Cholera**

1.4.3.1. describes the measures which may be applied by a health authority on the arrival of a healthy ship from an infected area states that, for the purposes of the Regulations, the incubation period of cholera is five days

1.4.3.2. describes the measures to be taken by the health authority if a case of cholera is discovered upon arrival or a case has occurred on board

1.4.4. **Yellow Fever**

1.4.4.1. states that, for the purposes of the Regulations, the incubation period of yellow fever is six days

1.4.4.2. states that vaccination against yellow fever may be required of any person leaving an infected area on an international voyage

1.4.4.3. states that every member of the crew of a ship using a port in an infected area must be in possession of a valid certificate of vaccination against yellow fever

1.4.4.4. states the conditions in which a ship on arrival is to be regarded as infected, suspected or healthy

1.4.4.5. describes the measures which may be applied by a health authority on the arrival of an infected or suspected ship

1.4.5. **Documents**

1.4.5.1. states that bills of health or any other certificates concerning health conditions of a port are not required from any ship

1.4.5.2. describes the master‘s obligations concerning a Maritime Declaration of Health

1.4.5.3. states that the master and the ship‘s surgeon, if one is carried, must supply any information required by the health authority as to health conditions on board during the voyage

1.4.5.4. states that no health document, other than those provided for in the Regulations, should be required in international traffic

1.5. **Reponsilities under Other International Maritime Law Embodied in International Agreement and Conventions that Impact on the Role of Management Level Marine Engineering Officers**

1.5.1. **United Nations Convention on the Law of the Sea (UNCLOS)**

1.5.1.1. explains that the outcome of UNCLOS III conference convened at Geneva in 1974 was the United Nations Convention on the Law of the Sea commonly known as —UNCLOS

1.5.1.2. explains that UNCLOS attempts to codify the international law of the sea

1.5.1.3. states that UNCLOS defines the legal status of the high seas and establishes regulations for the control of marine pollution

1.5.1.4. states that UNCLOS is a treaty document of 320 articles and 9 annexes, governing all aspects of ocean space, such as delimitation, environmental control, marine scientific research, economic and commercial activities, transfer of technology and the settlement of disputes relating to ocean matters

1.5.1.5. states that UNCLOS came into force internationally on 16 November 1994

1.5.1.6. states that UNCLOS sets the width of the territorial sea at 12 nautical miles, with a contiguous zone at 24 nautical miles from the baseline

1.5.1.7. states that UNCLOS defines innocent passage through the territorial sea and defines transit passage through international straits

1.5.1.8. states that UNCLOS defines archipelagic States and allows for passage through archipelagic waters

1.5.1.9. states that UNCLOS establishes exclusive economic zones (EEZs) extending to 200 nautical miles from baselines

1.5.1.10. explains that it defines the continental shelf and extends jurisdiction over the resources of the shelf beyond 200 miles where appropriate

1.5.1.11. explains that states in dispute about their interpretation of UNCLOS may submit their disagreements to competent courts such as the International Court of Justice (in The Hague), or the Law of the Sea Tribunal (in Hamburg)

1.5.1.12. states that the responsibility for enforcement of regulations rests mainly with flag States, but as vessels enter zones closer to the coast the influence of coastal State jurisdiction and, ultimately, port State jurisdiction, gradually increases

1.5.1.13. states that Article 94 of the UNCLOS deals with duties of the flag State, while Article 217 deals with enforcement by flag States

1.5.1.14. states that Article 218 of the UNCLOS deals with port State jurisdiction

1.5.1.15. explains when a vessel is voluntarily within a port or at an offshore terminal, the port State may, where the evidence warrants, begin proceedings in respect of discharges in violation of international rules (i.e. regulations in MARPOL 73/78)

1.5.1.16. states that another State in which a discharge violation has occurred, or the flag State, may request the port State to investigate the violation

1.5.1.17. states that Article 200 of the UNCLOS deals with coastal State jurisdiction as applied in relation to pollution provisions

1.5.1.18. states that where there are clear grounds for believing that a vessel navigating in the territorial sea of a State has violated laws and regulations of the coastal State adopted in accordance with UNCLOS or applicable international pollution regulations, the coastal State may inspect the vessel and, where evidence warrants, institute proceedings including detention of the vessel

1.5.1.19. states that vessels believed to have violated pollution laws in an EEZ may be required to give identification and voyage information to the coastal State

1.5.1.20. explains that as per UNCLOS, States must agree international rules and standards to prevent pollution from vessels (Article 211). (This obligation is currently met by MARPOL 73/78) (This obligation is currently met by MARPOL 73/78)

1.5.1.21. explains that Coastal States may also promulgate and enforce pollution regulations in their own EEZs which may, in some circumstances, include imposition of routeing restrictions

1.5.1.22. states that in the territorial sea additional navigational restraints (e.g. traffic separation schemes and sea lanes) may be imposed on vessels with dangerous and hazardous cargoes

1.5.1.23. explains that Coastal States and ports may make entry to internal waters and harbors conditional on meeting additional pollution regulations

1.5.2. **Maritime Labour Convention (MLC 2006)**

1.5.2.1. explains that the Maritime Labor Convention, 2006 is an important new international labor Convention that was adopted by the International Labor Conference of the International Labor Organization (ILO), under article 19 of its Constitution at a maritime session in February 2006 in Geneva, Switzerland

1.5.2.2. explains that it sets out seafarers‘ rights to decent conditions of work and helps to create conditions of fair competition for shipowners

1.5.2.3. explains that it is intended to be globally applicable, easily understandable, readily updatable and uniformly enforced

1.5.2.4. explains that the MLC, 2006, complementing other major international conventions, reflects international agreement on the minimum requirements for working and living conditions for seafarers

1.5.2.5. explains that the Maritime Labor Convention, 2006 has two primary purposes:

1.5.2.6. to bring the system of protection contained in existing labor standards closer to the workers concerned, in a form consistent with the rapidly developing, globalized sector (ensuring “decent work”);

1.5.2.7. to improve the applicability of the system so that shipowners and governments interested in providing decent conditions of work do not have to bear an unequal burden in ensuring protection (“level playing field” fair competition)

1.5.2.8. explains that the Maritime Labor Convention, 2006 has been designed to become a global legal instrument that, once it enters into force, will be the “fourth pillar” of the international regulatory regime for quality shipping, complementing the key Conventions of the International Maritime Organization (IMO) such as the International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS), the International Convention on Standards of Training, Certification and Watchkeeping, 1978, as amended (STCW) and the International Convention for the Prevention of Pollution from Ships, 73/78 (MARPOL)

1.5.2.9. states that it sometimes called the consolidated Maritime Labor Convention, 2006 as it contains a comprehensive set of global standards, based on those that are already found in 68 maritime labor instruments (Conventions and Recommendations), adopted by the ILO since 1920

1.5.2.10. states that the new Convention brings almost all of the existing maritime labor instruments together in a single new Convention that uses a new format with some updating, where necessary, to reflect modern conditions and language

1.5.2.11. explains that the Convention “consolidates”‖ the existing international law on all these matters

1.5.2.12. states that the MLC, 2006 applies to all ships engaged in commercial activities (except fishing vessels, ships of traditional build and warships or naval auxiliaries)

1.5.2.13. states that ships of 500 GT or over are required to be certified: they must carry a Maritime Labor Certificate as well as a Declaration of Maritime Labor Compliance

1.5.2.14. states that ships below 500 GT are subject to inspection at intervals not exceeding three years

1.5.2.15. explains that the existing ILO maritime labor Conventions will be gradually phased out as ILO Member States that have ratified those Conventions ratify the new Convention, but there will be a transitional period when some parallel Conventions will be in force

1.5.2.16. explains that countries that ratify the Maritime Labor Convention, 2006 will no longer be bound by the existing Conventions when the new Convention comes into force for them

1.5.2.17. explains that countries that do not ratify the new Convention will remain bound by the existing Conventions they have ratified, but those Conventions will be closed to further ratification

1.5.2.18. describes that the Convention is organized into three main parts: the Articles coming first set out the broad principles and obligations which is followed by the more detailed Regulations and Code (with two parts: Parts A and B) provisions

1.5.2.19. states that the Regulations and the Standards (Part A) and Guidelines (Part B) in the Code are integrated and organized into general areas of concern under five Titles:

- **Title 1: Minimum requirements for seafarers to work on a ship:** minimum age, medical certificates, training and qualification, recruitment and placement
- **Title 2: Conditions of employment:** Seafarers Employment Agreements, Wages, Hours of Work and Hours of Rest, Entitlement to Leave, Repatriation, Seafarer compensation for the ship‘s Loss or Foundering, Manning Levels, Career and Skill Development and Opportunities for Seafarers‘ Employment
- **Title 3: Accommodation, recreational facilities, food and catering**
- **Title 4: Health protection, medical care, welfare and social security protection:** Medical Care on-board ship and Ashore, Ship-owners‘ Liability, Health & Safety Protection and Accident Prevention, Access to Shore-based Welfare Facilities, Social Security
- **Title 5: Compliance and enforcement**:
- **Flag State Responsibilities:** General Principles, Authorization of Organizations, Maritime Labor Certificate and Declaration of Maritime Labor Compliance, Inspection and Enforcement, On-board Complaint Procedures, Marine Casualties
- **Port State Responsibilities:** Inspections in Port, Detailed Inspection, Detentions, On-shore Seafarer Complaint Handling Procedures

- **Labor-supplying Responsibilities:** Recruitment and Placement services, Social security provisions

1.5.2.20. explains that it occasionally contains new subjects in comparison to the existing ILO Maritime labor conventions, particularly in the area of occupational safety and health to meet current health concerns, such as the effects of noise and vibration on workers or other workplace risks

1.5.2.21. explains that the standards in the new Convention are not lower than existing maritime labor standards as the aim is to maintain the standards in the current maritime labor Conventions at their present level, while leaving each country greater discretion in the formulation of their national laws establishing that level of protection

1.5.2.22. explains that the advantages for ships of ratifying countries that provide decent conditions of work for their seafarers will have protection against unfair competition from substandard ships and will benefit from a system of certification, avoiding or reducing the likelihood of lengthy delays related to inspections in foreign ports

1.5.2.23. explains that the Maritime Labor Convention, 2006 aims to establish a continuous – compliance awareness‖ at every stage, from the national systems of protection up to the international system and it will improve compliance and enforcement;

- Starting with the individual seafarers, who – under the Convention – have to be properly informed of their rights and of the remedies available in case of alleged non-compliance with the requirements of the Convention and whose right to make complaints, both on board ship and ashore, is recognized in the Convention.
- It continues with the shipowners. Those that own or operate ships of 500 gross tonnage and above, engaged in international voyages or voyages between foreign ports, are required to develop and carry out plans for ensuring that the applicable national laws, regulations or other measures to implement the Convention are actually being complied with.
- The masters of these ships are then responsible for carrying out the shipowners‘ stated plans, and for keeping proper records to evidence implementation of the requirements of the Convention.
- As part of its updated responsibilities for the labor inspections for ships above 500 gross tonnage that are engaged in international voyages or voyages between foreign ports, the flag State (or recognized organization on its behalf) will review the shipowners‘ plans and verify and certify that they are actually in place and being implemented.

- Ships will then be required to carry a maritime labor certificate and a declaration of maritime labor compliance on board.
- Flag States will also be expected to ensure that national laws and regulations implementing the Convention‘s standards are respected on smaller ships that are not covered by the certification system.
- Flag States will carry out periodic quality assessments of the effectiveness of their national systems of compliance, and their reports to the ILO under article 22 of the Constitution will need to provide information on their inspection and certification systems, including on their methods of quality assessment.
- This general inspection system in the flag State (which is founded on ILO Convention No. 178) is complemented by procedures to be followed in countries that are also or even primarily the source of the world‘s supply of seafarers, which will similarly be reporting under article 22 of the ILO Constitution.
- The system is further reinforced by voluntary measures for inspections in foreign ports (port State control).

1.5.2.24. states that the appendices to the Convention contain key model documents: a maritime labor certificate and a declaration of maritime labor compliance

1.5.2.25. explains that the Maritime Labor Certificate would be issued by the flag State to a ship that flies its flag, once the State (or a recognized organization that has been authorized to carry out the inspections), has verified that the labor conditions on the ship comply with national laws and regulations implementing the Convention

1.5.2.26. states that the certificate would be valid for five years subject to periodic inspections by the flag State

1.5.2.27. explains that the declaration of maritime labor compliance is attached to the certificate and summarizes the national laws or regulations implementing an agreed-upon list of 14 areas of the maritime standards and setting out the shipowner‘s or operator‘s plan for ensuring that the national requirements implementing the Convention will be maintained on the ship between inspections

1.5.2.28. states that the lists of the 14 areas that must be certified by the flag State and that may be inspected, if an inspection occurs, in a foreign port are also set out in the Appendices to the Convention

1.5.3. **Classification Societies**

1.5.3.1. explains the reasons for having a ship classed with a classification society

1.5.3.2. states that the majority of ships are built under survey

1.5.3.3. explains that the classification society approves plans, examines the manufacture of parts and tests materials during the building of hull, machinery, equipment and, where appropriate, refrigerating machinery explains that equipment refers to anchors, chain cables, mooring ropes and wires, mooring arrangements, windlasses and mooring winches

1.5.3.4. states that, if requested, the classification societies will also survey and certificate cargo-handling equipment

1.5.3.5. states that on satisfactory completion of surveys and sea trials the society issues certificates of class, which are kept aboard ship, and enters the particulars of the ship in its register

1.5.3.6. states that a classification society will also survey an existing ship providing it meets the society‘s rules regarding scantlings, materials, workmanship and condition, assign a class to it

1.5.3.7. states that to retain its class a ship must undergo periodical surveys as laid down in the society‘s rules

1.5.3.8. explains the nature and frequency of all surveys undertaken for classification purposes including machinery surveys

1.5.3.9. states that periodical surveys are:

- annual survey
- docking survey at approximately 2 yearly intervals
- intermediate survey
- special survey every 4 years, which may be extended to five years

1.5.3.10. explains the special survey requirements may be met by a system of continuous survey such that the interval between successive surveys on any given item does not exceed 5 years

1.5.3.11. explains the use of conditions of class and removal of classification

1.5.3.12. states that an occasional survey, additional to the regular surveys, must be conducted after any damage to the hull, machinery or equipment which may affect the ship‘s seaworthiness

1.5.3.13. states that repairs or alterations must be carried out under survey and to the satisfaction of the society‘s surveyors

1.5.3.14. states that classification societies carry out surveys for the issue of statutory certification on behalf of many governments

1.5.3.15. states that a classification society may be asked to conduct the loading port survey on its classed refrigerating machinery

1.5.3.16. explains that, when convenient, the loading port survey may be combined with a periodical survey for classification

1.5.4. **General Average and Marine Insurance**

1.5.4.1. defines a general average act

1.5.4.2. states that general average sacrifices and expenses are to be borne by the different contributing interests on the basis of these Rules

1.5.4.3. explains that only such losses, damages or expenses which are the direct consequence of the general average act are allowed as general average and that no indirect loss whatsoever will be admitted

1.5.4.4. explains in general terms the purpose of marine insurance

1.5.4.5. explains what is meant by an insurable interest

1.5.4.6. describes briefly how insurance is arranged through brokers

1.5.4.7. explains the principle of “utmost good faith”

1.5.4.8. explains the effect of misrepresentation or non-disclosure of material circumstances known to the assured

1.5.4.9. explains “warranty” and the effect on a marine insurance policy of breach of warranty

1.5.4.10. describes briefly voyage policies, time policies and floating policies

1.5.4.11. describes briefly the perils usually covered in a marine insurance policy

1.5.4.12. explains the use of “Institute Clauses”

1.5.4.13. explains the “duty of assured” clause (“Sue and Labor” clause)

1.5.4.14. explains the function of Protection and Indemnity Associations (P and I clubs)

1.5.4.15. lists risks, liabilities and expenses covered by P and I clubs

1.6. **Responsibilities under international instruments affecting the safety of the ship, passengers, crew and cargo**

1.6.1. **Ballast Water Convention 2004**

1.6.1.1. defines the following:

- ballast water
- ballast water management
- sediments

1.6.1.2. describes the application of this convention

1.6.1.3. describes the conditions where the application of this convention may be exempted

1.6.1.4. describes the management and control requirement based on Section B Regulation B1 to B6

1.6.1.5. describes the Annex – Section A, B, C, D and E briefly

1.6.1.6. describes the standards that need to be observed in ballast water exchange

1.6.1.7. states under Regulation B-4 Ballast Water Exchange, all ships using ballast water exchange should:

- Whenever possible, conduct ballast water exchange at least 200 nautical miles from the nearest land and in water at least 200 meters in depth, taking into account Guidelines developed by IMO;
- In cases where the ship is unable to conduct ballast water exchange as above, this should be as far from the nearest land as possible, and in all cases at least 50 nautical miles from the nearest land and in water at least 200 meters in depth

1.6.1.8. States as per Annex – Section B Management and Control Requirements for Ships:

- Ships are required to have on board and implement a Ballast Water Management Plan approved by the Administration (Regulation B-1). The Ballast Water Management Plan is specific to each ship and includes a detailed description of the actions to be taken to implement the Ballast Water Management requirements and supplemental Ballast Water Management practices.

1.6.1.9. explains that in accordance with SOLAS Chapter V, Regulation 28 – Records of navigational activities and daily reporting, the commencement and termination of the operation should be recorded

1.6.1.10. explains that the navigational records generated during ballast water exchange may be reviewed during ISM Audits and port state control inspections

1.6.2. **Port state control**

1.6.2.1. explains that ―Port State control‖ is the inspection of foreign ships present in a nation‘s ports for the purpose of verifying that the condition of the ships and their equipment comply with the provisions of international conventions and codes, and that the ships are manned and operated in compliance with those provisions

1.6.2.2. explains that the primary responsibility for maintaining ships‘ standards rests with their flag States, as well as their owners and masters. However, many flag States do not, for various reasons, fulfill their obligations under international maritime conventions, and port State control provides a useful —safety net‖ to catch substandard ships.

1.6.2.3. states that a “Port State Control regime”, where set up under a “memorandum of understanding”‖ (“MOU”) or similar accord between neighboring port States, is a system of harmonized inspection procedures designed to target substandard ships with the main objective being their eventual elimination from the region covered by the MOU‘s participating States

1.6.2.4. states that there are eight international PSC agreements currently in force world-wide

1.6.2.5. identifies how to ascertain which port state agreement a particular port state might be party to and any areas of particular focus that may currently be in place

1.6.2.6. outlines that in addition to the general control of above listed certificate and documents, examinations/inspections of the following are generally given priority by Port State Control Officer (PSCO):

- Nautical publication (SOLAS 74 R V/20)
- Navigational equipment (SOLAS 74 R V/12 and 19)
- Emergency starting and running tests (SOLAS 74 R II-2 - 4.3)
- Lifesaving equipment. Rafts FF (SOLAS 74 R III/20, 23, 26 and 29)
- Emergency Generator (start/stop only) (SOLAS 74 R II-1/42&43)Hull corrosion and damages (Load Lines) (SOLAS 74 R I/11)
- Main engine& aux. engines (SOLAS 74 R II/26, 27 &28)
- Oily water separator 15 ppm alarm (MARPOL Annex I/16[1])
- Oil discharge monitor (ODM) (MARPOL Annex I/16)
- Charts corrected and proper scale (SOLAS 74 R V/20)
- Fire safety Control plan (SOLAS 74 R II-2/20)
- Ventilation inlets/outlets (SOLAS 74 R II-2/16.9 &48)
- Emergency training and drills (Log book rec. SOLAS 74 R III/18)
- Emergency lighting/batteries (SOLAS 74 R II/42 &43)
- Deck and hatches corrosion and damages (LL 1966)
- Steering gear – incl. auxiliary & emergency (Bridge inspection only – SOLAS 74 R V/19)
- Cleanliness in engine room (SOLAS 74 R II-1/26 and ILO 134)
- Cleanliness in accommodation (ILO 92 & 133)

1.6.2.7. explains that the Port State Control Inspections may be conducted on the following basis:

- initiative of the Port State Administration;
- the request of, or on the basis of, information regarding a ship provided by another Administration
- information regarding a ship provided by a member of the crew, a professional body, an association, a trade union or any other individual with an interest in the safety of the ship, its crew and passengers, or the protection of the marine environment.

1.6.2.8. explains that the PSC inspections may be on random, targeted or periodical basis. The following types of PSC inspections are used in PSC:

- Initial Inspection (random)
- More detailed inspection (escalated)
- Expanded inspection (targeted/periodical)

1.6.2.9. states that the definition of Inspection is: *"A visit on board a ship to check both the validity of the relevant certificates and other documents, and the overall condition of the ship, its equipment, and its crew."*

1.6.2.10. explains that the certificates and documents listed above should therefore be readily available and presented to the PSCO at his request during the PSC inspection

1.6.2.11. states that the definition of more detailed inspection is: *"An inspection conducted when there are clear grounds for believing that the condition of the ship, its equipment, or its crew does not correspond substantially with the particulars of the certificates"*

1.6.2.12. states that the definition of Clear grounds is: *"Evidence that the ship, its equipment, or its crew does not correspond substantially with the requirements of the relevant conventions or that the master or crew members are not familiar with essential shipboard procedures relating to the safety of ships or the prevention of pollution."*

1.6.2.13. outlines that —Clear grounds‖ to conduct a more detailed inspection include:

- the absence of principal equipment or arrangements required by the conventions;
- evidence from a review of the ship's certificates that a certificate or certificates are clearly invalid;

- evidence that documentation required by the conventions are not on board, incomplete, are not maintained or are falsely maintained;
- evidence from the PSCO‘s general impressions and observations that serious hull or structural deterioration or deficiencies exist that may place at risk the structural, watertight or weather tight integrity of the ship;
- evidence from the PSCO‘s general impressions or observations that serious deficiencies exist in the safety, pollution prevention or navigational equipment;
- information or evidence that the master or crew is not familiar with essential shipboard operations relating to the safety of ships or the prevention of pollution, or that such operations have not been carried out;
- indications that key crew members may not be able to communicate with each other or with other persons on board;
- the emission of false distress alerts not followed by proper cancellation procedures;
- receipt of a report or complaint containing
- information that a ship appears to be substandard.

1.6.2.14. explains that the PSCO during a more detailed inspection generally take the following into account:

- structure;
- machinery spaces;
- conditions of assignment of load lines;
- life-saving appliances;
- fire safety;
- regulations for preventing collisions at sea;
- Cargo Ship Safety Construction Certificate;
- Cargo Ship Safety Radio Certificates;
- equipment in excess of convention or flag State requirements;
- guidelines for discharge requirements under Annexes I and III of MARPOL 73/78 which includes:
  - inspection of crude oil washing (COW) operations;
  - inspection of unloading, stripping and prewash operations;
- guidelines for control of operational requirements which include:
  - muster list;
  - communication;

- fire drills;
- abandon ship drills;
- damage control plan and Shipboard Oil Pollution Emergency Plan;
- fire control plan;
- bridge operation;
- cargo operation;
- operation of the machinery;
- manuals, instructions etc.;
- oil and oily mixtures from machinery spaces;
- loading, unloading and cleaning procedures for cargo spaces of tankers;
- dangerous goods and harmful substances in packaged form;
- garbage;

▪ minimum manning standards and certification;
- STCW 78;
- ISM; and
- ISPS Code.

1.6.2.15. states that expanded inspection is an inspection conducted according to non-mandatory guidelines only once during 12 months period for certain types of ships and certain categories of age and size

1.6.2.16. explains that Oil tankers, bulk carriers, gas and chemical carriers and passenger ships are subject to expanded inspections once during a period of 12 months

1.6.2.17. outlines the IMO RESOLUTIONS pertaining to Port State Controls are as follows:

▪ A.9/Res.321 Procedures for the control of ships 12/11/1975
▪ A.12/Res.466 Procedures of port state control 19/11/1981
▪ A.15/Res.597 Amendments to the procedures for the control of ships 19/11/1987
▪ A.19/Res.787 Procedures for port state control 23/11/1995
▪ A 21/Res.882 Amendments to the procedures for port state control (Resolution A.787(19) 25/11/1999

1.6.2.18. states that the publication by IMO which gives the General Procedural Guidelines for Port State Control Officers are also of particular relevance to shipmaster

1.6.2.19. explains that a record of port State control inspections including safety-related details of many ships is available on the internet from the Equasis database and may be viewed by any member of the public

1.6.2.20. explains that Equasis forms part of the Quality Shipping campaign launched by the EU in 1997 which is formally supported by signatories from marine Administrations, classification societies, P&I clubs and the ITF

1.6.2.21. explains that more than 40 organizations provide information to Equasis and is used heavily by charterers and insurers as well as marine Administrations with port State control functions

1.7. **National legislation for implementing international agreements and conventions**

1.7.1. explains the process by which international agreements and conventions are ratified and implemented into national legislation

(End of the Training Program)