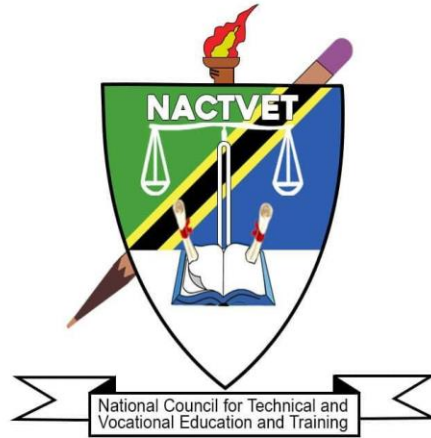


**THE NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND
TRAINING**



OCCUPATIONAL STANDARDS

OCCUPATION: MARINE ENGINEERING TECHNICIAN

LEVEL: NTA LEVEL 5

FEBRUARY 2024

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ABBREVIATIONS

ACB	Air Circuit Breaker
CBET	Competency-based Education and Training
DACUM	Developing A Curriculum
DG	Diesel Generator
FWG	Fresh Water Generator
MARPOL	International Convention for the Prevention of Pollution from Ships 73/78
MSB	Main Switchboard
NACTVET	National Council for Technical and Vocational Education and Training
NOS	National Occupational Standards
OS	Occupational Standards
PMS	Planned Maintenance System
PPE	Personal Protective Equipment
SOLAS	International Convention for Safety of Life at Sea
STCW	International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers as amended 1974
TET	Technical Education and Training
TVET	Technical and Vocational Education and Training

GLOSSARY OF TERMS

Circumstantial Knowledge:	Detailed knowledge, which allows the decision-making in regard to different circumstances and cross cutting issues.
Competence:	The ability to use knowledge, understanding, practical, and thinking skills to perform effectively to the workplace standards required in employment.
Competency:	A description of the ability one possesses when able to perform a given occupational task effectively and efficiently.
Competency-based Education:	An instructional programme that derives its content from validated tasks and bases assessment on the learner's performance.
Curriculum:	A description or composite of statements about "what is to be learned" by the trainee/student in a particular instructional programme; a product that states the "intended learning outcomes".
Educational/Training Programme:	The complete curriculum and instruction (what and how) that is designed to prepare a person for employment in a job or other particular performance situation.
Occupation:	A specific position requiring the performance of specific tasks - essentially the same tasks are performed by all employees having the same title. (Example: baker)
Occupational Area:	This is a broad grouping of related jobs. (Example: food service)
Occupational Standards:	Specific requirements of competences for personnel in a particular occupational area, including knowledge and relevant attitudes. They also act as performance working tools of assessment of the prescribed outcomes.
Occupational/Job Analysis:	A process used to identify the tasks that are important to employees in any given occupation.
Performance Criteria:	Indicate expected end results or outcomes in the form of evaluative statements.

Skills:	The ability to perform occupational tasks with a high degree of proficiency within a given occupation. Skill is conceived of as a composite of three completely interdependent components: cognitive, affective, and psychomotor.
Standards:	A set of statements, which, if proved true under working conditions, means that an individual is meeting an expected level and type of performance.
Task Analysis:	The process of analysing each task to determine the steps, circumstantial knowledge, attitudes, performance criteria, working tools and materials needed, as well as safety concerns required for the employees performing it.
Task:	A work activity that has a definite beginning and ending, is observable or measurable, consists of two or more definite steps, and leads to products, service, or decisions.
Underpinning knowledge:	Crucial knowledge that an individual must acquire in order to demonstrate competences that are associated in performing a given task.
Verification Process:	The process of having experts review and confirm the importance of the task (competency) statements identified through occupational analysis. Other questions, such as the degree of task learning difficulty are also frequently asked. This process is also sometimes referred to as validation.
Occupational Competence:	The application of knowledge and skills that consistently meet the standards required by the working conditions.

1.0. INTRODUCTION

Technical Education and Training (TET) is one of the most important education sub-sectors in Tanzania, responsible for developing a skilled workforce to support the country's industrialization economic agenda. Tanzania's *Development Vision 2025* intends to raise the country's economy to a middle-income status, with a high level of human development. This requires a skilled workforce that is aligned with the needs of the public and private sectors of the economy. The National Council for Technical and Vocational Education and Training (NACTVET) has begun the job of drafting Occupational Standards (OS) that will eventually be adopted as National Occupational Standards (NOS) for use in the delivery of TET that meets the needs of the labour market and the country's economic agenda.

Occupational Standards (OS) are performance criteria that are matched with labour market demands. Each of them describes the functions, performance standards, and understanding or knowledge underpinning a given occupation. They combine skills, knowledge, and attitudes to describe best practice. They are useful working tools for establishing job roles, personnel recruitment, supervision, and appraisal, as well as TET Standards. They are also helpful for benchmarking and harmonizing job qualifications on a national and international level. Standards, in general, provide a solid framework for high-quality TET that is labour market-relevant, current, and consistent in application across all public and private institutions.

However, it must be noted that Occupational Standards are different from Training /Education Standards. Occupational standards are defined in terms of activities performed by a person in a selected occupation (e.g., an electrical engineer designs electrical circuits, performs troubleshooting in electrical circuits, etc.), and are usually defined by Employers following procedures as agreed upon by all the stakeholders. On the other hand, Training and Education Standards are developed from the activities defined in the occupational standards, and they specify learning objectives to ensure that the necessary skills and knowledge are developed by a person to enable him/her to function at an agreed level in an occupation. Training and Education Standards are used to define curricula in training institutions. It is critical, however, to establish a direct link between the occupational standards and the training standards for both of them to respond collaboratively to the demands of the labour market.

For the purpose of TET delivery, Tanzania has adopted the Competence Based Education and Training (CBET) approach. The CBET approach focuses on providing learners with the skills and knowledge required to meet the occupational standards. Occupational standards are thus the starting point for developing competency-based training (CBET) programmes. Therefore, it is quite pertinent for TET institutions to use the relevant occupational standards as a benchmark for formulating their curricula.

Occupational Standards are developed based on a given occupation's current and future demands. As a result, they serve as a means of bridging the gap between the worlds of employment and technical education and training.

The document explains how the occupational standards were developed, as well as the scope, the occupational profile in the form of DACUM charts, and the Occupational Standards.

2.0. OCCUPATIONAL STANDARD DEVELOPMENT PROCESS

The process of developing these Occupational Standards involved both local and international expertise. The process began with an examination of major documents that guide Tanzanian skills development including the *10-year National Skills Development Strategy (2016-2026)*. NACTVET labour market reports were also used in the literature review to determine the skills demand in the Tanzanian labour market as a whole.

After the literature review, a team of experts in consultation with practitioners developed draft occupational standards. The draft document was used to develop an occupational profile for each occupation (DACUM Chart), which is attached as an **Appendix** to every Occupational Standard.

The draft occupational standards will be validated during stakeholders' forum. The information from stakeholders' forum will provide insight from the workplaces and professional bodies regarding trends and changes in the profession, including how well graduates are prepared for working in the occupation.

3.0. THE SCOPE AND OVERVIEW OF THE OCCUPATION STANDARDS FOR MARINE ENGINEERING TECHNICIAN

The standards cover a broad range of duties and tasks that can be performed by a Marine Engineering Technician. However, the occupational standards are not meant to replace individual

job descriptions. Instead, they are to be used for guidance in defining skill levels and knowledge for the technician in specific settings or positions. The Marine Engineering Technician may perform tasks in a number of key areas of the Occupational Standards, but not necessarily in all areas. For example, in large operations, other individuals may be employed or designated to perform specific tasks.

The Marine Engineering Technician shall operate, inspect, repair, and maintain all engine power equipment and emergency equipment except for the main engine of the ship in the engine room or on site, from simple engine room hygiene management and safety inspections, to navigation duty under the supervision of marine engineers. Generally, the Marine Engineering Technician performs the following duties:

- a) Engine room safety inspection
- b) Operation of the marine auxiliary system
- c) Hygienic management of engine rooms
- d) Operation and inspection of marine auxiliary boilers
- e) Operation and maintenance of marine pumps and pipeline systems
- f) Maintenance and servicing of deck machinery
- g) Operation and maintenance of marine generators and marine power stations
- h) Operation and maintenance of the fuel purification, installation and lighterage system
- i) Operation and maintenance of compressed air system
- J) Operation and maintenance of marine fresh water generators
- k) Vessel operation and personnel management
- l) Engineering watch

The Occupational Standards have been clustered into NTA qualification levels, i.e. NTA 4, 5 and 6.

4.0. VALIDITY PERIOD

Due to the rapid development of technology, the validity period of occupational standards is 3-5 years. The review will proceed in the same manner as the one before it, with new occupational standards being developed based on current trends of the labour market.

5.0. OCCUPATIONAL STANDARDS

5.1. OCCUPATIONAL STANDARDS FOR MARINE ENGINEERING TECHNICIAN - NTA 5

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTIES	CARRYOUT OPERATION AND INSPECTION OF MARINE AUXILIARY BOILERS	DUTY NO.	501
TASKS	CARRYOUT IGNITION AT COLD STATE AND STEAM RAISING OPERATION OF MARINE AUXILIARY BOILER	TASK NO.	5011
PERFORMANCE CRITERIA	The person performing this task must be able to complete the ignition at cold state and steam raising operation of marine auxiliary boiler in accordance with technical requirements and the manufacturer's operation manual.		
RANGE STATEMENT	The task can be performed in the ship engine room or marine engine operation training room under the supervision of the Marine Engineer. The working working tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation working working tools and equipment for this task; 2. Check whether the boiler body, fuel system, water supply system, ventilation equipment and combustion equipment are normal; 3. Check whether the opening and closing		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Judge whether the auxiliary parameters of the boiler are normal; 1.2 Adjust the water level and monitor whether the auxiliary system parameters are normal;	

positions and power on and off of boiler safety valve, steam stop valve (main steam valve), soot blowing valve, upper and lower drain valves, electrode chamber flushing valve and air valve are normal; 4. Turn on the rain switch of the control box, confirm that it is normal, and then supply the main power supply; 5. Check whether all pressure gauges, pressure controllers, automatic control systems and alarm systems are normal; 6. Conduct boiler ignition at cold state; 7. Conduct boiler ignition and steam raising operation; 8. Open the water supply cock and add sufficient water to the hot water well; 9. Check the quality of boiler water and transport it to different places as needed; 10. Turn off the ignition device; 11. Perform steam raising and shutdown operation; 12. Clean the working working tools, equipment and workplace; 13. Store the working working tools and equipment.	1.3 Determine whether the status of the furnace hall meets the requirements; 1.4 Conduct blowing out operation after shutting down the engine; 1.5 Handle boiler ignition, steam raising and shutdown operations. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Fuel combustion mechanism; 2.2 Heat transfer pathways. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Basic structure of auxiliary steam boilers; 3.2 Working principles of auxiliary steam boilers; 3.3 System composition of auxiliary steam boilers. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills in filling out work logs.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The ignition at cold state of the fuel auxiliary boiler is carried out in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working working tools; 2. Safe use of measuring instruments; 3. Occupational health and safety; 4. Equipment operating procedures and instructions; 5. Waste disposal methods.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTIES	CARRYOUT OPERATION AND INSPECTION OF MARINE AUXILIARY BOILERS	DUTY NO.	501
TASKS	CARRYOUT THE STEAM SUPPLY OPERATION FOR THE SHIP'S STEAM HEATING PIPELINE	TASK NO.	5012
PERFORMANCE CRITERIA	The person performing this task must be able to supply steam to the ship's steam heating pipeline in accordance with technical requirements and the manufacturer's operation manual.		
RANGE STATEMENT	The task can be performed in the ship engine room or marine engine operation training room under the supervision of the Marine Engineer. The working tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.; 4. Handheld infrared thermometer, etc.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation working tools and equipment for this task; 2. Close all valves first according to the inspection process; 3. Slowly open the steam valve, check according to the flow direction, and close the condensate discharge point when there is stream; 4. Open the steam valve to increase the parameters and check the pressure gauge; 5. Start the air valve; 6. Conduct steam heating operation management; 7. Shut down the air valve; 8. Clean the working tools, equipment and workplace;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Check the status of the boiler body and accessories; 1.2 Forcibly pull boiler safety valve; 1.3 Flush the water level gauge; 1.4 Warm up the pipeline and supply steam. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Working mechanism of the safety valve; 2.2 Water level linkage mechanism. 3.0 Theories	

9. Arrange and store the working tools and equipment.	The person performing this task must be able to explain the following: 3.1 Flushing of water level gauges for auxiliary steam boilers; 3.2 Upper discharge of auxiliary steam boilers. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills in filling out work logs.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The steam supply operation for the ship's steam heating pipeline is carried out in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring instruments; 3. Occupational health and safety; 4. Equipment operating procedures and instructions; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTIES	CARRYOUT OPERATION AND INSPECTION OF MARINE AUXILIARY BOILERS	DUTY NO.	501
TASKS	CARRYOUT THE INSPECTION OF MARINE AUXILIARY BOILER OPERATION	TASK NO.	5013
PERFORMANCE CRITERIA	The person performing this task must be able to manage the operating auxiliary boilers in accordance with technical requirements and the manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the ship engine room or marine engine operation and testing training room under the supervision of the Marine Engineer. The working tools and equipment to be used include: 1. Complete set of universal working tools; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation working tools and equipment for this task; 2. Check whether the pressure gauge of each component is normal; 3. Check whether there is corrosion in the external flue pipe and air duct; 4. Check the safety valves, ask the users and record to see if there is any air leakage with the safety valves; 5. Check if there is any line bonding that affects the activation status; 6. Check if the drain and exhaust pipes connected are in good condition and meet operating standards; 7. Check if there is any looseness in the cylinder; 8. Clean the working tools, equipment and		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Measure the heating temperature of the preheater, the working condition of the fuel injector, and the oil pressure of the oil pump, judge the burning quality of the boiler, and adjust the air pressure and volume; 1.2 Analyze the steam pressure and water level of the boiler, flush the water level gauge, discharge dirt from the boiler, and check the reflux of condensate; 1.3 Test the alarm system and monitor the automatic control system; 1.4 Check and adjust auxiliary system parameters.	

workplace; 9. Store working tools and equipment;	2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Excess air coefficient; 2.2 Boiler water quality control; 2.3 Principles of burning and water level control. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Burning system of auxiliary steam boiler; 3.2 Burning system of auxiliary steam boiler; 3.3 Types of alarms for auxiliary steam boilers; 3.4 Automatic control objects for auxiliary steam boilers. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills in filling out work logs.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The inspection of operation of auxiliary boilers is carried out in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring working tools; 3. Occupational health and safety; 4. Maintenance procedures and instructions; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTIES	CARRYOUT OPERATION AND INSPECTION OF MARINE AUXILIARY BOILERS	DUTY NO.	501
TASKS	SHUTDOWN OPERATION OF MARINE AUXILIARY BOILER	TASK NO.	5014
PERFORMANCE CRITERIA	The person performing this task must be able to shut down the marine auxiliary boilers in accordance with technical requirements and the manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the ship engine room or marine engine operation and testing training room under the supervision of the Marine Engineer. The working tools and equipment to be used include: 1. Complete set of universal working tools; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation working tools and equipment for this task; 2. Stop supplying fuel; 3. Turn off the air supply fan; 4. Close the outlet valves of each water pump one by one, and then completely stop the pump after it is basically closed; 5. Turn off the combustion system; 6. Place flue outlet baffles; 7. Clean the working tools, equipment and workplace; 8. Store working tools and equipment;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Replace heavy oil with light oil; 1.2 Avoid damage to the heating surface; 1.3 Check the switch status of each valve during shutdown; 1.4 Maintain during shutdown. 2.0 Principle The person performing this task must be able to explain the following: 2.1 Auxiliary boiler shutdown program; 2.2 Atmospheric pressure; 2.3 Physicochemical properties of different oil products. 3.0 Theories	

	The person performing this task must be able to explain the following: 3.1 Oil change method for auxiliary steam boilers; 3.2 Precautions for shutdown of auxiliary steam boilers; 3.3 Shutdown maintenance of auxiliary steam boilers. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills in filling out work logs.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The boiler shutdown of the marine auxiliary boiler is completed in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring working tools; 3. Occupational health and safety; 4. Maintenance procedures and instructions; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTIES	CARRYOUT OPERATION AND INSPECTION OF MARINE AUXILIARY BOILERS	DUTY NO.	501
TASKS	INSPECT THE WATER QUALITY OF MARINE AUXILIARY BOILER	TASK NO.	5015
PERFORMANCE CRITERIA	The person performing this task must be able to inspect the boiler water of the auxiliary boilers in accordance with technical requirements and the manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the ship engine room or marine engine operation and testing training room under the supervision of the Marine Engineer. The working tools and equipment to be used include: 1. Complete set of universal working tools; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.; 4. A set of medication for boiler water testing.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation working tools and equipment for this task; 2. Open the sampling valve; 3. Conduct formal sampling after removing residual water from the pipeline; 4. Injecting chemicals; 5. Conduct alkalinity and salinity tests; 6. Compare the data to check if it is within the standard value; 7. Clean instruments and equipment; 8. Store the working tools;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Take samples of the boiler water; 1.2 Test the boiler water samples. 2.0 Principle The person performing this task must be able to explain the following: 2.1 Principles of indicators for water quality control testing; 2.2 Principles of controlling chemical properties of drugs generated by lime scale. 3.0 Theories	

	The person performing this task must be able to explain the following: 3.1 Purpose of boiler water control for marine auxiliary boilers; 3.2 Main projects of boiler water control for marine auxiliary boilers; 3.3 Boiler water treatment chemicals. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills in filling out work logs.
DESCRIPTION OF THE END PRODUCT / SERVICE:	Boiler water quality inspection is conducted in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring working tools; 3. Occupational health and safety; 4. Maintenance procedures and instructions; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTIES	CARRYOUT OPERATION AND INSPECTION OF MARINE AUXILIARY BOILERS	DUTY NO.	501
TASKS	CARRYOUT THE MAINTENANCE OF ACCESSORIES FOR MARINE AUXILIARY BOILERS	TASK NO.	5016
PERFORMANCE CRITERIA	The person performing this task must be able to maintain the accessories of the marine auxiliary boiler in accordance with technical requirements and the manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the ship engine room or marine engine maintenance training room under the supervision of the Marine Engineer. The working tools and equipment to be used include: 1. Complete set of universal working tools; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc. 4. Handheld infrared thermometer, etc.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation working tools and equipment for this task; 2. Regularly check the water level indicator valve and check the pipeline for leakage; 3. Regularly clean the internal lime scale of the boiler and clean it with clean water; 4. Inspect the inside and outside of the boiler, such as whether there is corrosion in the welds and steel plates of the pressurized parts; 5. Check the enclosure and insulation layer; 6. Timely record the inspection and repair status in the boiler safety technology register; 7. Clean instruments and equipment;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Check the sealing and grinding method of valves; 1.2 Remove dust accumulation in boiler flue; 1.3 Juage and process the heat transfer surface defects. 2.0 Principle The person performing this task must be able to explain the following: 2.1 Sealing mechanism of the valve; 2.2 Basic principles for measuring heat exchange efficiency;	

8. Store the working tools.	2.3 Principle of equipment strength failure. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Good sealing effect of the boiler feed water valve; 3.2 Impact of ash accumulation on ship boilers; 3.3 Impact of heat exchange surface defects on marine boilers. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills in filling out work logs.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The boiler accessories are maintained in accordance with technical requirements and manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring working tools; 3. Occupational health and safety; 4. Maintenance procedures and instructions; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTIES	CARRYOUT MAINTENANCE OF MARINE PUMPS AND PIPELINE SYSTEMS.	DUTY NO.	502
TASKS	OPERATE BALLAST WATER SYSTEM	TASK NO.	5021
PERFORMANCE CRITERIA	The person performing this task must be able to operate the ballast water system in accordance with technical requirements and the manufacturer's operation manual.		
RANGE STATEMENT	The task can be performed in the marine engine room simulator/ship power station training room under the supervision of a Marine Engineer. The working tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, insulating glove, work clothes, earmuffs, etc.;; 4. Ship communication equipment, etc.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation working tools and equipment for this task; 2. Start and stop the ballast water pump; 3. Manage the running ballast water pump; 4. Use ballast water processing equipment; 5. Select the ballast water system pipeline for injecting, discharging, or transferring ballast water; 6. Sweep the ballast water tank; 7. Clean instruments and equipment; 8. Store the working tools.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Start and stop unloading of large centrifugal pumps; 1.2 Replace ballast water tanks; 1.3 Enable ballast water processing equipment; 1.4 Sweep the ballast water tank. 2.0 Principle The person performing this task must be able to explain the following: 2.1 Working principles of a centrifugal pump; 2.2 Basic principles of biological pollution; 2.3 Basic principles for the use of ballast water. 3.0 Theories The person performing this task must be able to	

	explain the following: 3.1 Requirements for discharging ballast water; 3.2 The pollution of ballast water; 3.3 Starting and stopping procedures and management points for ballast water pumps. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills in filling out work logs.
DESCRIPTION OF THE END PRODUCT / SERVICE:	Shore power is operated on ships in accordance with technical requirements and the manufacturer's manuals.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring instruments; 3. Occupational health and safety; 4. Equipment operating procedures and instructions; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTIES	CARRYOUT MAINTENANCE OF MARINE PUMPS AND PIPELINE SYSTEMS.	DUTY NO.	502
TASKS	OPERATE FIRE-FIGHTING WATER SYSTEM	TASK NO.	5022
PERFORMANCE CRITERIA	The person performing this task must be able to operate the fire-fighting water system in accordance with technical requirements and the manufacturer's operation manual.		
RANGE STATEMENT	The task can be performed in the ship electrician training room under the supervision of a Marine Engineer. The working tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, insulating glove, work clothes, earmuffs, etc.;; 4. Ship communication equipment, etc.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation working tools and equipment for this task; 2. Determine the startup programme of the fire pump based on the usage scenario; 3. Select fire pumps to replace pumps and system pipelines in emergency situations; 4. Ensure that the fire pump operates normally; 5. Test the fire pump and record it correctly; 6. Manage the fire pump and the priming pump; 7. Stop the fire pump and drain the water in the pipe; 8. Clean instruments and equipment; 9. Store the working tools.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Start up the fire pump programme based on different scenarios; 1.2 associate the bilge water system; 1.3 Test the fire pump. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Principles of using fire pump head; 2.2 Self-priming principle of centrifugal pumps. 3.0 Theories The person performing this task must be able to explain the following: 3.1 The correct starting and stopping procedures	

	for non-emergency use of fire pumps and procedures for emergency use; 3.2 The principles for selecting fire pumps as substitutes for pumps; 3.3 The hazards of residual water in the fire-fighting water system. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Test records filling skills.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The fire-fighting water system is operated and inspected in accordance with technical requirements and manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring instruments; 3. Occupational health and safety; 4. Maintenance procedures and instructions; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTIES	CARRYOUT OPERATION AND MAINTENANCE OF MARINE PUMPS AND PIPELINE SYSTEMS	DUTY NO.	502
TASKS	CARRYOUT OPERATION AND INSPECTION OF BILGE SEWAGE SYSTEM	TASK NO.	5023
PERFORMANCE CRITERIA	The person performing this task must be able to operate and inspect the bilge sewage system in accordance with technical requirements and the manufacturer's maintenance manual.		
RANGE STATEMENT	The task can be performed in the ship electrician training room under the supervision of a Marine Engineer. The working tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, insulating glove, work clothes, earmuffs, etc.; 4. Ship communication equipment, etc.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation working tools and equipment for this task; 2. Open the outlet valve and pipeline outlet valve of the bilge tank; 3. Start the oil discharge monitoring device; 4. Turn on the power switch; 5. Switch on the power supply; 6. Open the sewage valve and adjust the separator button; 7. Start the sewage pump equipment; 8. Process equipment pumping; 9. Turn off the equipment when the water is discharged by the pump; 10. Clean and maintain the separator; 11. Clean the equipment.		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Discharge oil-free sewage from the cargo hold; 1.2 Discharge oily wastewater; 1.3 Maintain the water-oil separator. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 The principle of oil-water separation; 2.2 Basic principles for the discharge of oily wastewater; 2.3 Working principles of a reciprocating pump; 2.4 Working principles of a single-screw pump;	

12. Store the instruments.	2.5 Equipment overhaul principles. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Schematic diagram and layout diagram of the ship bilge sewage system; 3.2 Structure and working principles of the reciprocating pump and single-screw pump; 3.3 Structure and working principles of oil-water separator; 3.4 Discharge requirements for oily wastewater. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Instrument reading skills.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The bilge sewage system is operated and inspected in accordance with technical requirements and manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring instruments; 3. Occupational health and safety; 4. Maintenance procedures and instructions; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTIES	CARRYOUT OPERATION AND MAINTENANCE OF MARINE PUMPS AND PIPELINE SYSTEMS	DUTY NO.	502
TASKS	CARRYOUT OPERATION AND INSPECTION OF THE DAILY SEA AND FRESH WATER SYSTEM	TASK NO.	5024
PERFORMANCE CRITERIA	The person performing this task must be able to operate and inspect the daily sea and fresh water system in accordance with technical requirements and the manufacturer's manual.		
RANGE STATEMENT	The task can be performed in engine rooms or in the site of the marine equipment under the supervision of marine engineers. The working tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation working tools and equipment for this task; 2. Check whether the external cleanliness of equipment such as water mist nozzles, light detectors and smoke detectors is in good condition; 3. Check whether the pipelines in the protection area of the fresh water warehouse are rusted; 4. Check for leakage in valves and water pumps; 5. Check whether the pressure gauge works normally; 6. Check whether the separation device circuit is normal; 7. Adjust the start and stop pressure of the supplementary water pump; 8. Supplement compressed air; 9. Clean and dismantle the supplementary water		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Set the start and stop pressure of the supplementary water pump; 1.2 Supplementing compressed air; 1.3 Disassemble and inspect the centrifugal vortex pump; 1.4 Clean up impurities inside the water tank; 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 The principle of the relationship between volume and pressure of air; 2.2 Standard principles for upper and lower limits of operating pressure relays.	

pump on time for inspection; 10. Clean the impurities in the pressure water tank. 11. Store the working tools.	3.0 Theories The person performing this task must be able to explain the following: 3.1 The working principle of the pressure water tank; 3.2 The structure and working principle of a centrifugal vortex pump; 3.3 Fault causes and troubleshooting methods for frequent startup. 4.0 Essential Skills 4.1 Disassembly and inspection skills; 4.2 Communication skills; 4.3 Teamwork skills; 4.4 Filling skills of overhaul records.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The daily sea and fresh water system is operated and inspected in accordance with technical requirements and manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safe use of disassembling working tools; 2. Correct use of measuring working tools; 3. Occupational health and safety; 4. Maintenance procedures and instructions; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTIES	CARRYOUT OPERATION AND MAINTENANCE OF MARINE PUMPS AND PIPELINE SYSTEMS	DUTY NO.	502
TASKS	CONDUCT MAINTENANCE OF MARINE PUMPS	TASK NO.	5025
PERFORMANCE CRITERIA	The person performing this task must be able to disassemble and inspect the reciprocating pump in accordance with technical requirements and the manufacturer's work manual.		
RANGE STATEMENT	The task can be performed in engine rooms or in the site of the marine equipment under the supervision of marine engineers. The working tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.; 4. Disassembling and inspection working tools for the reciprocating pump and piston ring immersion container; 5. Special working tools for disassembling and assembling the screw pump; 6. Feeler gauge, lead wire, vernier caliper, Lama, etc.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation working tools and equipment for this task; 2. Regularly check the outlet pressure, current, and vibration of the pump; 3. Fill in records for equipment operation and inspection on time; 4. Regularly inspect the temperature of the cooling water; 5. Regularly inspect whether the oil cup is filled with the lubricating oil, and replenish the lubricating oil as required; 6. Inspect whether the equipment and various sealing points are leaking and/or seeping; 7. Regularly inspect whether the operation of		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Reciprocating pump disassembly procedures and inspection essentials; 1.2 Gear pump disassembly procedures and inspection essentials; 1.3 Screw pump disassembly procedures and inspection essentials; 1.4 Centrifugal pump disassembly procedures and inspection essentials; 1.5 Injection pump disassembly procedures and inspection essentials.	

the main machine is stable and whether there is any abnormal noise; 8. Regularly inspect whether the reciprocating pump, gear pump, centrifugal pump and injection pump are functioning correctly; 9. Timely address any equipment defects and report the same; 10. Properly carry out the work of equipment cleaning;	2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Classification principle of marine pumps; 2.2 Principles of equipment disassembly and overhaul. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Reciprocating pump valve, piston ring, crank-link mechanism, reduction gear box, lubricating system; 3.2 Gear pump volumetric efficiency and clearance; 3.3 Three-screw pump axial force balancing measures; 3.4 Centrifugal pump operating performance, and balancing measures for the shaft seal, water seal cage, packing and axial force 3.5 Injection pump nozzle interval 4.0 Essential Skills 4.1 Overhaul skills; 4.2 Communication skills; 4.3 Teamwork skills; 4.4 Skills in filling out work logs.
DESCRIPTION OF THE END PRODUCT / SERVICE:	Marine pumps are maintained in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring instruments; 3. Occupational health and safety; 4. Equipment operating procedures and instructions; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTT TITLE	CARRYOUT MAINTENANCE AND SERVICING OF DECK MACHINERY	DUTY NO.	503
TASK TITLE	CARRYOUT MAINTENANCE AND SERVICING OF ANCHOR WINDLASSES	TASK NO.	5031
PERFORMANCE CRITERIA	The person performing this task must be able to maintain anchor windlasses in accordance with technical requirements and the manufacturer's workbook.		
RANGE STATEMENT	The task can be performed in engine rooms or in the site of the marine equipment under the supervision of marine engineers. The working tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.;; 4. Specialized working tools for hydraulic motor overhaul, compressed air, hydraulic oil, etc.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation working tools and equipment for the task; 2. Dismantle the appointed components, tank covers and dust covers, etc., and clean them up thoroughly. 3. Dredge the oil circuit, clean the filter, replace the oil line, oil filter and lubricating oil, etc. 4. Supplement handles, screws, nuts, oil nozzles and other machine parts, and replace individual quick-wear parts and sealing elements. 5. Fasten loosening parts of the equipment, adjust the tolerance clearance of the equipment, and replace individual quick-wear parts and sealing elements. 6. Inspect the machine and verify if it is in a		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Overhaul the hydraulic control valve; 1.2 Overhaul the hydraulic motor. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Hydraulic transmission mechanism and system composition theory; 2.2 Hydraulic equipment overhaul principles; 2.3 Hydraulic system overhaul principles. 3.0 Theories The person performing this task must be able to explain the following:	

good condition, and prevent severe wear; 7. Timely repair the equipment if it is damaged, and prevent deformation from affecting the operation. 8. Timely address any equipment defects and report the same; 9. Store the working tools;	3.1 Classification and working principles of hydraulic valves; 3.2 Precautions for overhaul of hydraulic valves and hydraulic motors; 3.3 Impact of hydraulic oil contamination on the hydraulic equipment; 3.4 Factors affecting the revolving speed and operating pressure of hydraulic motors; 3.5 Impact of incoming air on the hydraulic system. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Record filling skills.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The maintenance and servicing of anchor windlasses are performed in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring working tools; 3. Occupational health and safety; 4. International conventions and domestic laws and regulations; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CARRYOUT MAINTENANCE AND SERVICING OF DECK MACHINERY	DUTY NO.	503
TASK TITLE	CARRYOUT MAINTENANCE AND SERVICING OF WARPING WINCHES	TASK NO.	5032
PERFORMANCE CRITERIA	The person performing this task must be able to maintain warping winches in accordance with technical requirements and the manufacturer's workbook.		
RANGE STATEMENT	The task can be performed on the ship deck or in the site of the marine equipment under the supervision of marine engineers. The working tools and supplies to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.; 4. Feeler gauge, beef tallow.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation working tools and equipment for the task; 2. Inspect the anti-rust paint of the machine base, fixing bolts and fixing parts on a daily basis; 3. Inspect the hydraulic oil volume, and discharge the air in the hydraulic system; 4. Inspect the oil temperature, and analyze whether the hydraulic system has any vulnerability; 5. Check if any noise, vibration and heating of the operating components during operation; 6. Inspect the clutch and verify if it is malfunctioning during operation; 7. Inspect if there is any noise of the original electrical components; 8. Clean instruments and equipment;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Relieve the pressure of the hydraulic system; 1.2 Overhaul and reinstall the hydraulic auxiliary elements; 1.3 Inspect the clutch; 1.4 Adjust the braking force of the warping winch. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Equipment disassembly principle of the warping winch; 2.2 System equipment use principles;	

9. Store the working tools.	2.3 Clutch system overhaul principles. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Anchor winch hydraulic system control theory; 3.2 Performance of sound operating condition of hydraulic auxiliary elements; 3.3 Test and adjustment methods of the brake with braking force. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills in filling out work logs.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The maintenance and servicing of warping winches are performed in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring working tools; 3. Occupational health and safety; 4. Maintenance procedures and instructions; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CARRYOUT MAINTENANCE AND SERVICING OF DECK MACHINERY	DUTY NO.	503
TASK TITLE	CARRYOUT MAINTENANCE AND SERVICE OF CARGO WINCHES	TASK NO.	5033
PERFORMANCE CRITERIA	The person performing this task must be able to maintain cargo winches in accordance with technical requirements and the manufacturer's workbook.		
RANGE STATEMENT	The task can be performed on the ship deck or in the site of the marine equipment under the supervision of marine engineers. The working tools and supplies to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.;; 4. Hydraulic oil, compressed air.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation equipment and working tools for the task; 2. Inspect whether the power supply of the protective electric box is cut off; 3. Inspect whether the steel wire rope has any broken wire; 4. Inspect whether the drum's winding is correct; 5. Inspect whether the bolts on the rope end are fastened; 6. Inspect the corrosion of the contactor; 7. Overhaul the hydraulic pumps; 8. Inspect the integrity of hydraulic pumps; 9. Repair the hydraulic pumps; 10. Inspect the insulation of all equipment; 11. Clean the equipment, instruments and the site;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Overhaul and reinstall the hydraulic pumps; 1.2 Overhaul and reinstall the hydraulic pumps; 1.3 Determine the operating state of the hydraulic pump components. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Disassembly principles of hydraulic pumps; 2.2 Oil quality classification principles of hydraulic oils. 2.3 Equipment system composition principles. 3.0 Theories The person performing this task must be able to	

12. Store the working tools;	explain the following: 3.1 Structures and working principles of hydraulic pumps; 3.2 Hydraulic lifting system composition and working principles, and safety protection measures; 3.3 Precautions for overhaul of all types of hydraulic pumps. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills in filling out work logs.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The maintenance and service of cargo winches are carried out in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring working tools; 3. Occupational health and safety; 4. Maintenance procedures and instructions; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CARRYOUT MAINTENANCE AND SERVICING OF DECK MACHINERY	DUTY NO.	503
TASK TITLE	CARRYOUT MAINTENANCE AND SERVICE OF LIFEBOAT HOISTS	TASK NO.	5034
PERFORMANCE CRITERIA	The person performing this task must be able to maintain lifeboat hoists in accordance with technical requirements and the manufacturer's workbook.		
RANGE STATEMENT	The task can be performed on the ship deck or in the site of the marine equipment under the supervision of marine engineers. The working tools and supplies to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.; 4. Hydraulic oil, gearbox oil, beef tallow.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation equipment and working tools for the task; 2. Test and detect the general alarm equipment; 3. Carry out visual inspections for the lifeboat hoisting equipment, including the hoist hook, release mechanism, etc.; 4. Inspect the boat's structural condition, power supply system, operating system and propulsion system; 5. Inspect the radar responder; 6. Inspect the airtightness of the oil cylinder; 7. Replenish the lubricating oil for the moving parts of the boat davit; 8. Timely address any equipment defects and report the same; 9. Clean the equipment, instruments and the site;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Inspect the airtightness of the hydraulic oil cylinder; 1.2 Inspect the gearbox and replace the gearbox oil; 1.3 Replenish the lubricating oil for the moving parts of the boat davit. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Boat equipment structure composition principles; 2.2 Power system power supply principles; 2.3 Lifeboat use principles; 2.4 Marine engine equipment precaution	

10. Store the working tools;	principles; 2.5 Radar responder composition principles. 3.0 Theories The person performing this task must be able to explain the following: 3.1 Types of lifeboat release equipment; 3.2 Determination methods of sound oil cylinder airtightness; 3.3 Determination methods of oil quality of hydraulic oil and gearbox oil. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills in filling out work logs.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The maintenance and service of lifeboat hoists are carried out in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring working tools; 3. Occupational health and safety; 4. Maintenance procedures and instructions; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	CARRYOUT MAINTENANCE AND SERVICING OF DECK MACHINERY	DUTY NO.	503
TASK TITLE	CARRYOUT MAINTENANCE AND SERVICE OF HATCH COVER OPENING SYSTEM	TASK NO.	5035
PERFORMANCE CRITERIA	The person performing this task must be able to maintain lifeboat hoists in accordance with technical requirements and the manufacturer's workbook.		
RANGE STATEMENT	The task can be performed on the ship deck or in the site of the marine equipment under the supervision of marine engineers. The working tools and supplies to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.; 4. Hydraulic oil, beef tallow.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation equipment and working tools for the task; 2. Inspect whether the hatch bar depression layering is even and without damage and server deformation; 3. Ensure the strip seal of the hatch over is without corrosion; 4. Ensure the hatch cover's rolling wheels and rollers are without deformation, and replenish the lubricating oil; 5. Inspect the cushion of the hatch cover's presser and ensure it is in an appropriate and available state; 6. Inspect the hatch over's hydraulic equipment, and check if the gas sampling point is eroded; 7. Inspect if the mechanical ventilation equipment is sound;		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Inspect the airtightness of the hydraulic circuit connections; 1.2 Inspect the flexibility of the power transmission mechanism; 2.3 Replenish the lubricating oil for the moving parts. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Bilge flushing principles; 2.2 Ultrasonic wave test principles; 2.3 Equipment system composition principles; 2.4 Hatch cover disassembly principles.	

8. Inspect the airtightness and integrity of the ballast compartment water; 9. Inspect the bilge water suction port and observe if any filths, and verify its extent of cleanness; 10. Regularly carry out maintenance and fill out the schedule; 11. Clean the equipment, instruments and the site; 12. Store the working tools;	3.0 Theories The person performing this task must be able to explain the following: 3.1 The influence of vibration on the hydraulic circuit connections; 3.2 The jamming factors of the power transmission mechanism; 3.3 The influence factors of hydraulic pressure transmission. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills in filling out work logs.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The maintenance and service of hatch cover opening systems are performed in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring working tools; 3. Occupational health and safety; 4. Maintenance procedures and instructions; 5. Disposal methods of waste.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	OPERATE AIR-CONDITIONING AND VENTILATION SYSTEM	DUTY NO.	504
TASK TITLE	OPERATE AIR-CONDITIONING EQUIPMENT FOR HEATING, COOLING AND VENTILATION CONDITIONS	TASK NO.	5041
PERFORMANCE CRITERIA	The person performing this task must be able to operate air-condition equipment for heating, cooling and ventilation conditions in accordance with technical requirements and the manufacturer's operation manual.		
RANGE STATEMENT	The task can be performed in the marine engine room simulator or marine engine operation training room under the supervision of the Marine Engineer. The working tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Select appropriate operation equipment and working tools for the task; 2. Start the air-conditioning system; 3. Turn on the power supply switch, and regulate the corresponding air-conditioning control panel; 4. Set the air-conditioning temperature and humidity as required; 5. Inspect the air filter; 6. Inspect the state of the air filter, and carry out cleaning and replacement as appropriate; 7. Control the ventilation system; 8. Implement conditional ventilation based on the ship's requirements to change the air flow in the ship; 9. Set the air-conditioning mode; 10. Select different modes based on the		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Provide heating; 1.2 Provide cooling; 1.3 Provide ventilation. 2.0 Principles The person performing this task must be able to explain the following principles: 2.1 Air circulation principles; 2.2 Temperature and humidity control principles; 2.3 Air filtration principles; 2.4 Circulating system principles. 3.0 Theories The person performing this task must be able to	

geological location and local climate conditions, e.g.: Use the cooling mode in tropics, and use the heating mode in frigid zones.	explain the following: 3.1 The start procedure, operation management essentials and shutdown procedure of the air-conditioning under the operating condition of heating; 3.2 The start procedure, operation management essentials and shutdown procedure of the air-conditioning under the operating condition of cooling; 3.3 The start procedure, operation management essentials and shutdown procedure of the air-conditioning under the operating condition of ventilation; 3.4 Cooling theory and cooling system composition. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills in filling out work logs.
DESCRIPTION OF THE END PRODUCT / SERVICE:	The operation of air condition equipment for heating, cooling and ventilation conditions are conducted in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring instruments; 3. Occupational health and safety; 4. Equipment operating procedures and instructions; 5. Waste disposal methods.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	OCCUPATION CODE	
DUTY TITLE	OPERATE AIR-CONDITIONING AND VENTILATION SYSTEM	DUTY NO.	504
TASK TITLE	REGULATE TEMPERATURE IN THE LIVING AREA	TASK NO.	5042
PERFORMANCE CRITERIA	The person performing this task must be able to implement and complete the room temperature and air regulation in accordance with technical requirements and the manufacturer's operation manual.		
RANGE STATEMENT	The task can be performed in the marine engine room simulator or marine engine operation training room under the supervision of the Marine Engineer. The working tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.		
EVIDENCE REQUIREMENT			
PRACTICAL PERFORMANCE		UNDERPINNING KNOWLEDGE	
The person performing this task must be able to do the following: 1. Open the alarm control room's door of the main machine; 2. Inspect the operating state of the marine engine, and ensure correct operation of all the marine engine systems, including the generator, fan, refrigerant condenser, thermometer, etc. 3. Open the control panel of the ventilation and air-conditioning system in the living area; 4. Regulate the set values of the air flow and temperature. Understand that the operations shall be dependent on actual situations, as different systems and panels have different control modes and indicators; 5. Regulate the operating mode of the ventilation and air-conditioning system based on the numbers of personnel and cargos on the ship, weather and environmental conditions, etc., so as to		Detailed knowledge about: 1.0 Methods The person performing this task must be able to explain how to: 1.1 Carry out quantitative and qualitative regulation; 1.2 Identify the types of ventilation terminals; 1.3 Distinguish the thermal load of the air-conditioning compartment. 2.0 Principle The person performing this task must be able to explain the following principles: 2.1 Aerodynamic principles; 2.2 Thermal load regulation principles; 2.3 Condenser regulation principles; 2.4 Ventilation system composition and constitution principles; 3.0 Theories The person performing this task must be able to	

achieve the ideal temperature and humidity; 6. Inspect the filter and drainage system of the ventilation and air-conditioning system, and ensure their correct functioning and cleanness; 7. Replace the filter or clean the drainage system in accordance with the maintenance manual of the system; 8. Observe the safety specifications and operation requirements related to the ship in the entire process, so as to ensure safety and reliability.	explain the following: 3.1 Requirements of the marine air-conditioning equipment; 3.2 Quantitative and qualitative regulation; 3.3 Types of air-conditioning equipment; 3.4 Automatic control of marine air-conditioning equipment. 4.0 Essential Skills 4.1 Communication skills; 4.2 Teamwork skills; 4.3 Skills in filling out work logs.
DESCRIPTION OF THE END PRODUCT / SERVICE:	Temperature regulation in the air-conditioning compartment is carried out in accordance with technical requirements and the manufacturer's manual.
CIRCUMSTANTIAL KNOWLEDGE:	Detailed knowledge about: 1. Safety operation of operating working tools; 2. Safe use of measuring instruments; 3. Occupational health and safety; 4. Equipment operating procedures and instructions; 5. Waste disposal methods.

TABLE 1: DACUM CHARTS FOR MARINE ENGINEERING TECHNICIAN -NTA 5

DUTIES	TASKS	ENABLERS
1.0 Operation and inspection of marine auxiliary boilers	1.1 Ignition at cold state and steam raising operation of marine auxiliary boiler.	General skills and knowledge • Knowledge of ultrasonic flaw detection • Liquid and pneumatic technology • Knowledge of ship safety management system • Knowledge of the steam boiler structure and theory • Knowledge of routine operation of steam boilers • Knowledge of boiler water quality maintenance for steam boilers • Skills of steam boiler maintenance and servicing • Hytology and mechanics of materials • Mechanical mechanism and principles • Thermal engineering • Electrotechnics and electronics • Automatic control principles • Knowledge of operation manuals and work safety & maintenance Working tools and equipment • PPE, such as safety helmet, safety shoes, goggles, gloves and earmuffs • A complete set of general toolboxes; • Working tools specialized for removing chimney spots of boiler chimneys • Hand-held infrared thermometer, mobile fan, bench screw, safe explosion-proof light Materials
	1.2 Steam supply operation of the ship steam heating pipeline.	
	1.3 Operation inspection of marine auxiliary boiler.	
	1.4 Shutdown operation of marine auxiliary boiler.	
	1.5 Boiler water inspection of marine auxiliary boilers.	

	1.6 Maintenance of accessories for marine auxiliary boilers.	Valve spare parts, specialized materials for leakage stopping of heat transfer surfaces, abrasive paste, wood plate\, rubber pad, paperboard pad, beef tallow, etc. Employee qualification Safety consciousness, teamwork spirit, environment-friendly idea, honesty
2.0 Operation and maintenance of marine pumps and pipeline systems	2.1 Operation and inspection of ballast water system.	General skills and knowledge • Knowledge of ultrasonic flaw detection • Liquid and pneumatic technology • Knowledge of ship safety management system • Knowledge of structures and working principles of various types of marine pumps • Knowledge of start & shutdown and operation management of various types of marine pumps • Skills of maintenance and servicing of various types of marine pumps • Skills of routine operation and management of various water systems • Hytology and mechanics of materials • Fluid mechanics • Thermal engineering • Electrotechnics and electronics • Principles of automatic control • Knowledge of operation manuals and work safety & maintenance Working tools and equipment • PPE, such as safety helmet, safety shoes, goggles, gloves and earmuffs • A complete set of general toolboxes • Puller, feeler gauge, vernier caliper, beef tallow syringe • Hand-held infrared thermometer, mobile fan, bench screw, flashlight
	2.2 Operation and inspection of fire-fighting water system.	
	2.3 Operation and inspection of bilge sewage system.	
	2.4 Operation and inspection of the daily sea and fresh water system.	

	2.5 Maintenance of marine pumps.	Materials Pump spare parts of all types, filter, padding (packing), mechanical seal, lead wire, abrasive paste, cleaner (oil), wood plate, cleaning cloth, rubber pad, paperboard pad, beef tallow, etc. Employee qualification Safety consciousness, teamwork spirit, environment-friendly idea, honesty
3.0 Maintenance and servicing of deck machinery	3.1 Maintenance and servicing of anchor windlasses.	General skills and knowledge • Knowledge of ultrasonic flaw detection • Liquid and pneumatic technology • Knowledge of ship safety management system • Knowledge of hydraulic fundamentals and hydraulic transmission theory • Knowledge of maintenance and servicing for hydraulic valves, hydraulic pumps, hydraulic motors, hydraulic system accessories • Knowledge of mechanical drawing • Knowledge of marine engineering materials • Knowledge of engineering mechanics • Knowledge of mechanical mechanism and transmission • Basic thermomechanical knowledge • Electrical and electronic technology • Principles of automatic control • Knowledge of operation manuals and work safety & maintenance Working tools and equipment • PPE, such as safety helmet, safety shoes, goggles, gloves and earmuffs • A complete set of general toolboxes;
	3.2 Maintenance and servicing of warping winches.	
	3.3 Maintenance and servicing of cargo winches.	

	3.4 Maintenance and servicing of lifeboat hoists.	• A whole set of exclusive working tools of the air compressor • Flashlight, hammer, copper rod • Manual hoisting block, steel wire rope, lifting ring, etc. • Bench vice, mobile fan, safety explosion-proof light
	3.5 Maintenance and servicing of hatch cover opening system.	Materials Specialized spare parts for hydraulic pumps/hydraulic motors/hydraulic valves/hydraulic system accessories, base plate, pressured air, hydraulic oil, rubber pad, paperboard pad, beef tallow, etc. Employee qualification Safety consciousness, teamwork spirit, environment-friendly idea, honesty
4.0 Operation and adjustment and the air-conditioning and ventilation system	4.1 Start & shutdown operation and operating inspections on the air-conditioning equipment's heating, cooling and ventilation conditions.	General skills and knowledge • Knowledge of ultrasonic flaw detection • Liquid and pneumatic technology • Knowledge of ship safety management system • Vapor compression refrigeration theory and knowledge • Knowledge of heat exchanger structure and theory; • Knowledge of marine air-conditioning equipment structure and composition • Knowledge of mechanical drawing • Knowledge of marine engineering materials • Knowledge of engineering mechanics • Knowledge of mechanical mechanism and transmission • Basic thermomechanical knowledge • Electrical and electronic technology, etc.

	4.2 Temperature and air regulation in the living area.	• Knowledge of operation manuals and work safety & maintenance Working tools and equipment • PPE, such as safety helmet, safety shoes, goggles, gloves and earmuffs • A complete set of general toolboxes • Flashlight, brush cleaning rod. Materials Heat exchanger spare parts, air-conditioning filter screen, beef tallow, sealing strip, sound absorber, rust remover, leakage stopping bar, etc. Employee qualification Safety consciousness, teamwork spirit, environment-friendly idea, honesty
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