THE NATIONAL COUNCIL FOR TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING

OCCUPATIONAL STANDARDS

OCCUPATION: MARINE ENGINEERING TECHNICIAN

LEVEL: NTA LEVEL 4

FEBRUARY 2024

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ABBREVIATIONS

ACB	Air Circuit Breaker
CBET	Competency Based Education and Training
DG	Diesel Generator
FWG	Fresh Water Generator
MARPOL	International Convention for the Prevention of Pollution from Ships 73/18
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 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, 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 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 occupational standards were validated during stakeholders' forum held on 22nd and 23rd February 2024 at Morogoro. The information from stakeholders' forum provide insight from the workplaces, professional bodies, regulatory bodies and sector ministries 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 TECHNICIANS

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 auxiliary machineries 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 perform 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 4

<table>
<tr><td>OCCUPATION</td><td>MARINE ENGINEERING TECHNICIAN</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>CARRYOUT ENGINE ROOM SAFETY INSPECTION</td><td>DUTY NO.</td><td>401</td></tr>
<tr><td>TASK TITLE</td><td>CARRYOUT ROUTINE CABIN SAFETY INSPECTIONS</td><td>TASK NO.</td><td>4011</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to inspect machinery and equipment in engine rooms, decks and other areas in accordance with technical requirements and engine room codes of practice.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed in engine rooms or in the site of the marine equipment under the supervision of marine engineers.
The tools and equipment to be used include:
1. A complete set of general toolboxes (including open-ended wrench, adjustable wrench, inner hexagon wrench, screwdriver, etc.);
2. Flashlight, auscultation stick, hand-held infrared thermometer, etc.;
3. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENT</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Select appropriate operation tools and equipment for this task;
2. Check your equipment and observe the cabin passage for safety;
3. Inspect the internal equipment of the engine room according to the engine room watchkeeping routine;
4. Round check other areas of the engine room;
5. Round check the equipment on the deck and on the living area;
6. Record and report equipment</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Determine the position of relevant equipment according to the ship equipment layout; round check according to the engine room watchkeeping routine;
1.2 Record the basic parameters and conditions of relevant equipment according to the requirements of the Engine Department;
1.3 Take safety measures during inspection according to engine room operation procedures;
1.4 Report the inspection conditions, especially the</td></tr>
</table>

parameters and conditions according to procedures; 7. Verdict and report abnormal conditions.	abnormal situations, according to the duty regulations; **2.0 Principles** The person performing this task must be able to explain the following principles: 2.1 Regulations for safe operation of marine machinery; 2.2 Operating principles for marine turbine engines. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Operating procedures of engineering watch; 3.2 Operating procedures for ship safety and pollution prevention. **4.0 Essential Skills** 4.1 Effective communication skills; 4.2 Teamwork skills; 4.3 Tool skills; 4.4 Equipment parameter recording skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	Ship machinery and equipment are checked according to the requirements of safety management system, technical requirements and manufacturer's manual, and relevant parameters are recorded.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of working tools 2. Safe operation of instruments; 3. Reporting methods and procedures; 4. Occupational health and safety.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRYOUT ENGINE ROOM SAFETY INSPECTION	**DUTY NO.**	401
TASK TITLE	CARRYOUT ROUTINE ENCLOSED SPACE SAFETY INSPECTIONS	**TASK NO.**	4012
PERFORMANCE CRITERIA	The person performing this task must be able to carry out routine operations of the engine room, assist in confined space operation and inspect safe electricity consumption in accordance with technical requirements and engine room codes of practice.		
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 tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlights, ladders, etc.; 3. Warning and permission warning signs, etc.; 4. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.; 5. Cardiopulmonary pacemaker, first aid kits, oxygen bags, stretchers, etc.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate operation tools and equipment for this task; 2. Arrange toolbox meeting for climbing operations and closed cabin operations; 3. Carry out climbing operations according to requirements and inspection intervals, and assist in inspecting the surrounding environment of closed cabin operations; 4. Maintain uninterrupted communication between staff; 5. Carry out emergency treatment of personal injuries.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Determine the safety requirements for climbing operations and internal operations in confined spaces according to safety operation regulations and make relevant preparations; 1.2 Round check the surrounding area of the operation according to the safety inspection regulations; 1.3 Conduct emergency treatment of falling, suffocation, poisoning, heatstroke or other personal injuries of staff; 1.4 Contact operators according to the code of practice, and contact engineers and other relevant personnel in case of emergency. **2.0 Principles** The person performing this task must be able to explain

	the following principles: 2.1 Regulations for safety operation of marine engines; 2.2 Operation principle of marine engines. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Operating procedures of engineering watch; 3.2 Operating procedures of first aid. **4.0 Essential Skills** 4.1 Effective communication skills; 4.2 Teamwork skills; 4.3 Tool skills; 4.4 First aid skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The surrounding environment during climbing operation and internal operation in confined spaces such as engine room is inspected according to the requirements of ship system documents.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety inspection operation; 2. Basic first aid procedures; 3. Reporting methods and procedures; 4. Occupational health and safety.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRYOUT ENGINE ROOM SAFETY INSPECTION	**DUTY NO.**	401
TASK TITLE	CONDUCT SAFETY INSPECTION AGAINST ELECTRIC SHOCK	**TASK NO.**	4013
PERFORMANCE CRITERIA	The person performing this task must be able to conduct safe electrical inspection in accordance with technical requirements and engine room codes of practice.		
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 tools and equipment to be used include: 1. A complete set of general toolboxes and a complete set of electrician's tools; 2. Flashlights, insulation tapes, etc.; 3. Warning and permission warning signs, etc.; 4. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs, etc.; 5. cardiopulmonary resuscitator, first aid kits, oxygen bags, stretchers, etc.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate operation tools and equipment for this task; 2. Round check the electrical equipment of the ship and inspect the insulation layer; 3. Round check the maintenance site of electrical equipment; 4. Check for poor insulation, illegal use of electrical equipment, and possible electric shock during electrical equipment maintenance, and report those conditions according to procedures; 5. Maintain uninterrupted communication with staff; 6. Rescue electric shock personnel; 7. Recycle tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Round check electrical equipment and related maintenance places in accordance with regulations for safe use of electricity; 1.2 Isolate electric shock sites and electrical equipment according to operational specification; 1.3 Carry out first aid for electric shock personnel according to emergency regulations; 1.4 Contact operators according to the code of practice, and contact engineers and other relevant personnel in case of emergency. **2.0 Principles** The person performing this task must be able to

	explain the following principles: 2.1 Regulations for safe operation of Marine engines; 2.2 Principle of safety-first aid. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Operating procedures of engineering watch; 3.2 Basic first aid procedures; **4.0 Essential Skills** 4.1 Effective communication skills; 4.2 Teamwork skills; 4.3 Tool skills; 4.4 Skills of safe use of electricity; 4.5 First aid skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	A safe electrical shock inspection is conducted according to requirements of ship system documents, equipment technical requirements and manufacturer's operation manual.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of working tools; 2. Safety inspection operation; 3. Performing basic first aid procedures; 4. Reporting methods and procedures; 5. Occupational health and safety.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	CARRYOUT ENGINE ROOM SAFETY INSPECTION	**DUTY NO.**	401
TASK TITLE	CARRYOUT SAFETY INSPECTION OF SHIP MAINTENANCE	**TASK NO.**	4014
PERFORMANCE CRITERIA	The person performing this task must be able to conduct safety inspections of routine repair of engine room, cylinder lifting operation of main engines and dock repair operation in accordance with technical requirements and the engine room code of practice.		
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 tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Warning and permission warning signs, etc.; 4. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs (earplugs), etc.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate operation tools and equipment for this task; 2. Inspect the operating environment of routine repair of engine rooms, hanging cylinder of main engines and dock repair; 3. Inspect the sites of routine repair of engine rooms, hanging cylinder of main engines, dock repair, etc.; 4. Eliminate potential safety hazards to prevent personal injury, fire and explosion, and environmental pollution; 5. Report according to procedures. 6. Clean the tools, equipment and workplace; 7. Recycle tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Round check of the work places and surroundings according to the safe operating procedures for maintenance; 1.2 Isolate the sites on disassembly, cleaning, hoisting and hot work according to the operating procedures; 1.3 Identify potential injuries to staff, damage to machinery and environmental hazards caused by maintenance work in accordance with the safety regulations for operating in engine rooms. 1.4 Contact operators according to the code of practice, and contact engineers and other relevant personnel in case of emergency. **2.0 Principles** The person performing this task must be able to

	explain the following principles: 2.1 Safety operation rules for maintenance of marine equipment; 2.2 Principle of safety inspection of marine engines. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Ship maintenance procedures; 3.2 Emergency procedures of ship accidents. **4.0 Essential Skills** 4.1 Effective communication skills; 4.2 Teamwork skills; 4.3 Tool skills; 4.4 Auxiliary skills for ship repair.
DESCRIPTION OF THE END PRODUCT / SERVICE	Ship repair sites are inspected according to the requirements of ship safety management system and technical requirements.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of tools; 2. Safety inspection operation; 3. Reporting methods and procedures; 4. Occupational health and safety.

<table>
<tr><td>OCCUPATION</td><td>MARINE ENGINEERING TECHNICIAN</td><td>OCCUPATION CODE</td><td></td></tr>
<tr><td>DUTY TITLE</td><td>OPERATE MARINE AUXILIARY SYSTEM</td><td>DUTY NO.</td><td>402</td></tr>
<tr><td>TASK TITLE</td><td>START AND STOP WATER PUMPS OF THE SHIP</td><td>TASK NO.</td><td>4021</td></tr>
<tr><td>PERFORMANCE CRITERIA</td><td colspan="3">The person performing this task must be able to start the main marine pumps such as main marine water pumps, fresh water pumps, fire pumps and ballast pumps in accordance with technical requirements, manufacturer's operation manuals and the engine room code of practice.</td></tr>
<tr><td>RANGE STATEMENT</td><td colspan="3">The task can be performed in engine rooms or in the site of the marine equipment under the supervision of marine engineers.
The tools and equipment to be used include:
1. A complete set of general toolboxes;
2. Flashlight;
3. Main water pumps and control boxes of the ship;
4. Marine and fresh water piping system of ships;
5. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs (earplugs), etc.</td></tr>
<tr><td colspan="4">EVIDENCE REQUIREMENT</td></tr>
<tr><td colspan="2">PRACTICAL PERFORMANCE</td><td colspan="2">UNDERPINNING KNOWLEDGE</td></tr>
<tr><td colspan="2">The person performing this task must be able to do the following:
1. Select appropriate operation tools and equipment for this task;
2. Inspect marine and fresh water pumps, pipeline systems and coolers;
3. Start water pumps;
4. Inspect the working condition of water pumps and fresh water system;
5. Identify and report the abnormal condition of water pumps and coolers according to the procedure;
6. Clean the tools, equipment and workplace;
7. Store tools and equipment.</td><td colspan="2">Detailed knowledge about:
1.0 Methods
The person performing this task must be able to explain how to:
1.1 Round check of water pumps, coolers and surroundings according to regulations for safety operation;
1.2 Start water pumps according to the operating procedures and inspect the working condition of the system;
1.3 Record the situation of water pumps and coolers according to the management procedure of engine rooms;
1.4 Contact engineers and other relevant personnel according to the code of practice.

2.0 Principle
The person performing this task must be able to explain the following principles:
2.1 Operating rules for marine equipment;
2.2 Maintenance principles of ship equipment.</td></tr>
</table>

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Start-up process of water pumps. **4.0 Essential Skills** 4.1 Effective communication skills; 4.2 Teamwork skills; 4.3 Tool skills; 4.4 Environmental protection awareness.
DESCRIPTION OF THE END PRODUCT / SERVICE	The water pumps are started and inspected; and the operating condition is inspected according to the ship safety management system, and technical requirements, operating procedures and requirements of the equipment.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of working tools; 2. Reporting methods and procedures; 3. Occupational health and safety.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	OPERATE MARINE AUXILIARY SYSTEM	**DUTY NO.**	402
TASK TITLE	START OIL PUMPS OF THE SHIP	**TASK NO.**	4022
PERFORMANCE CRITERIA	The person performing this task must be able to start the main oil pumps of the ship, such as oil transfer pumps, main engine fuel pumps, lubricating oil pumps, stern shaft oil pumps and rudder oil pumps, in accordance with technical requirements, manufacturer's operation manuals and engine room code of practice.		
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 tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Main oil pumps and control boxes of the ship; 4. Marine oil circuit system; 5. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs (earplugs), etc.		
EVIDENCE REQUIREMENT			

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
The person performing this task must be able to do the following: 1. Select appropriate operation tools and equipment for this task; 2. Carry out the inspection of the environment, the oil circuit system and coolers before starting oil pumps; 3. Start oil pumps and check its operating condition; 4. Patrol oil pumps and fresh water system; 5. Identify and report the abnormal condition of oil pumps and coolers according to the procedure. 6. Clean the tools, equipment and workplace; 7. Store tools and equipment.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Patrol oil pumps, coolers and surroundings according to regulations for safety operation; 1.2 Start oil pumps according to the operating procedures and inspect the working condition; 1.3 Record the situation of oil pumps and coolers according to the management procedure of engine rooms; 1.4 Contact engineers and other relevant personnel according to the code of practice. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Operating rules for marine equipment; 2.2 Operation principle of ship maintenance. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Start-up process of oil pumps. 3.2 Maintenance procedure of marine oil pump. 4.0 Essential Skills 4.1 Effective communication skills; 4.2 Teamwork skills; 4.3 Tool skills; 4.4 Environmental protection awareness.
DESCRIPTION OF THE END PRODUCT / SERVICE	Oil pumps and oil circuit system are inspected according to the ship safety management system, technical requirements, operating procedures and requirements of the equipment.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Safety operation of working tools; 2. Operation of marine auxiliary equipment;

	3. Reporting methods and procedures; 4. Occupational health and safety.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	OPERATE MARINE AUXILIARY SYSTEM	**DUTY NO.**	402
TASK TITLE	OPERATE THE DAILY SEA AND FRESH WATER SYSTEM	**TASK NO.**	4023
PERFORMANCE CRITERIA	The person performing this task must be able to start the daily sea and fresh water system and the seawater desalination system in accordance with technical requirements, manufacturer's operation manuals and engine room codes of practice.		
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 tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Operate the daily sea and fresh water system; 4. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs (earplugs), etc.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate operation tools and equipment for this task; 2. Inspect the daily sea and fresh water system before starting; 3. Start the daily sea and fresh water system of the ship and inspect the working condition; 4. Inspect and start the seawater desalination system and check the working condition; 5. Identify and report the abnormal situation of the system according to the procedure. 6. Clean the tools, equipment and workplaces.	Detailed knowledge about: **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Inspect and start the daily seawater system and seawater desalination system according to the regulations for safety operation, and check the operation; 1.2 Record the daily sea and fresh water system of the ship according to the requirements; 1.3 Identify the abnormal conditions of daily sea and fresh water system according to the equipment management code of conduct; 1.4 Contact engineers and other relevant personnel according to the code of practice. **2.0 Principle** The person performing this task must be able to explain the following principles:

	2.1 Operating rules for marine equipment; 2.2 Maintenance principle of ship tools. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Start-up process of daily sea and fresh water system; 3.2 Equipment operation process. **4.0 Essential Skills** 4.1 Effective communication skills; 4.2 Teamwork skills; 4.3 Tool skills; 4.4 Environmental protection awareness.
DESCRIPTION OF THE END PRODUCT / SERVICE	The daily sea and fresh water system is inspected according to the ship safety management system, technical requirements, operating procedures and requirements of the equipment.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of working tools; 2. Operation of marine auxiliary equipment; 3. Reporting methods and procedures; 4. Occupational health and safety.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	OPERATE MARINE AUXILIARY SYSTEM	**DUTY NO.**	402
TASK TITLE	OPERATE THE BALLAST WATER SYSTEM OF THE ENGINE ROOM	**TASK NO.**	4024
PERFORMANCE CRITERIA	The person performing this task must be able to start the ballast water system and ballast water treatment system in accordance with technical requirements, manufacturer's operation manuals and engine room codes of practice.		
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 tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Marine ballast water system; 4. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs (earplugs), etc.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate operation tools and equipment for this task; 2. Receive the engineer's command and operate the ballast water system under the engineer's guidance; 3. Inspect and start the marine ballast water system; 4. Inspect the working condition of the marine ballast water system; 5. Identify and report the abnormal situation of the ballast water system according to the procedure. 6. Clean the tools, equipment and workplace;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Inspect and start ballast water system according to regulations for safety operation; 1.2 Inspect the system operation according to the equipment operation manuals; 1.3 Record the operating condition of the marine ballast water system according to the requirements; 1.4 Identify and report the abnormal conditions of the marine ballast water system according to the equipment management code of conduct; 1.5 Contact engineers and other relevant personnel according to the code of practice. **2.0 Principles**

	The person performing this task must be able to explain the following principles: 2.1 Operating rules for marine equipment; 2.2 Principle of the marine pressurized water treatment system. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Start-up process of the marine ballast water system 3.2 Operating rules of marine ballast water **4.0 Essential Skills** 4.1 Effective communication skills; 4.2 Teamwork skills; 4.3 Tool skills; 4.4 Environmental protection awareness.
DESCRIPTION OF THE END PRODUCT / SERVICE	The start-up of the ballast water system and ballast water treatment operations are conducted in accordance with technical requirements, operating procedures and the marine management system.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of tools 2. Operation of marine auxiliary equipment 3. Reporting methods and procedures; 4. Occupational health and safety.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	OPERATE MARINE AUXILIARY SYSTEM	**DUTY NO.**	402
TASK TITLE	OPERATE THE VENTILATION AND LIGHTING SYSTEMS OF THE ENGINE ROOM	**TASK NO.**	4025
PERFORMANCE CRITERIA	The person performing this task must be able to operate the ventilation and lighting systems of the engine room in accordance with technical requirements, manufacturer's operation manuals and engine room codes of practice.		
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 tools and equipment to be used include: 1. A complete set of general toolboxes; 2. Flashlight; 3. Operate the ventilation and lighting systems of the engine room; 4. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs (earplugs), etc.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate operation tools and equipment for this task; 2. Inspect and start the marine ventilation system, especially before the fan starts; 3. Inspect the working condition of the marine ventilation system; 4. Inspect the marine lighting system, including the emergency lighting system; 5. Identify and report the abnormal conditions of the ventilation and lighting systems in the engine room according to procedures. 6. Clean the tools, equipment and	Detailed knowledge about: **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Check and start the ventilation system of the engine room according to regulations for safety operation, and inspect the operation of the system; 1.2 Record the ventilation and lighting systems of the engine room according to the requirements; 1.3 Identify the abnormal situation of the ventilation and lighting systems in the engine room according to the equipment management code of conduct; 1.4 Contact engineers and other relevant personnel according to the code of practice. **2.0 Principle** The person performing this task must be able to explain

workplace;	the following principles: 2.1 Operating rules for marine equipment; 2.2 Principles of the ventilation and lighting system for the ship. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Start-up process of the ventilation system of the engine room; 3.2 Inspection process of the lighting system of the ship. **4.0 Essential Skills** 4.1 Effective communication skills; 4.2 Teamwork skills; 4.3 Tool skills; 4.4 Environmental protection awareness.
DESCRIPTION OF THE END PRODUCT / SERVICE	The ventilation and lighting systems are operated in accordance with technical requirements, operating procedures and the requirements of the ship management system.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Safety operation of tools; 2. Operation of marine auxiliary equipment; 3. Reporting methods and procedures; 4. Occupational health and safety.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MANAGE HYGIENIC CONDITION OF ENGINE ROOMS	**DUTY NO.**	403
TASK TITLE	CLEAN ENGINE ROOM AND EQUIPMENT	**TASK NO.**	4031
PERFORMANCE CRITERIA	The person performing this task must be able to clean the workplaces, machinery and equipment according to the engine room code of practice.		
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 tools and equipment to be used include: 1. Warning boards; 2. Flashlight; detergent; 3. Mops and buckets; 4. Personal protective equipment, such as safety helmets, safety shoes, plastic gloves, work clothe, earmuffs (earplugs), etc.		

EVIDENCE REQUIREMENT	
PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate operation tools and equipment for this task; 2. Round check the working environment of the engine room and confirm the scope to be cleaned; 3. Choose cleaning methods and cleaner; 4. Clean the engine room and equipment; 5. Dispose of waste, wastewater, etc.; 6. Report according to procedures; 7. Store tools and equipment as required.	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Carry out the sanitary inspection and cleaning of engine room environment and mechanical equipment according to regulations for safety operation; 1.2 Treat waste and wastewater according to the MARPO 73/78; 1.3 Record the cleaning according to the engine room management procedure; 1.4 Contact engineers and other relevant personnel according to the code of practice. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Health regulations for the working environment; 2.2 Hygienic principles for equipment cleaning.

	3.0 Theories The person performing this task must be able to explain the following: 3.1 Cleaning and storage of waste in the engine room 3.2 Cleaning process of the marine equipment **4.0 Essential Skills** 4.1 Effective communication skills; 4.2 Teamwork skills; 4.3 Skills of using tools and materials; 4.4 Environmental protection awareness.
DESCRIPTION OF THE END PRODUCT / SERVICE	The engine room and equipment are cleaned according to the requirements of the ship management system and operation specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Clean operation of the working environment 2. Cleaning operation of the ship equipment 3. Reporting methods and procedures; 4. Occupational health and safety.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MANAGE HYGIENIC CONDITION OF ENGINE ROOM S	**DUTY NO.**	403
TASK TITLE	CARRYOUT TREATMENT OF THE OIL EFFLUENT IN THE ENGINE ROOM	**TASK NO.**	4032
PERFORMANCE CRITERIA	The person performing this task must be able to collect and treat the oil effluent in the engine room according to the engine room code of practice.		
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 tools and equipment to be used include: 1. Warning boards and process cards; 2. Flashlight; valve-opening wrench; measuring scales; 3. Sewage pumps and sewage tanks; 4. Sewage treatment unit or sewage treatment device simulator; 5. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs (earplugs), etc.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	UNDERPINNING KNOWLEDGE
The person performing this task must be able to do the following: 1. Select appropriate operation tools and equipment for this task; 2. Receive the command of the engineer and treat the oil and sewage in the engine room under the engineer's guidance; 3. Inspect the sewage level and the sewage tank level in the engine room; 4. Inspect the sewage pumps and the sewage pipe system, start the sewage pumps, and check the running of the sewage pumps; 5. Inspect and start the sewage treatment device, and inspect the sewage level and the sewage tank level in the engine room; 6. Stop the sewage treatment unit;	Detailed knowledge about: **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Measure the sewage level in the engine room and inspect the sewage treatment system according to regulations for safety operation; 1.2 Collect and treat the sewage in the engine room according to operation procedures; 1.3 Record the sewage treatment in engine room according to engine room management procedures; 1.4 Contact engineers and other relevant personnel in engine rooms according to the code of practice. **2.0 Principle** The person performing this task must be able to explain the following principles: 2.1 Regulations for the prevention of pollution by

7. Report according to procedures; 8. Store tools and equipment.	ships; 2.2 Principles of sewage treatment. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Engine room sewage collection process; 3.2 Engine room sewage treatment process. **4.0 Essential Skills** 4.1 Effective communication skills; 4.2 Teamwork skills; 4.3 Skills of using tools and equipment; 4.4 Ship anti-pollution skills.
DESCRIPTION OF THE END PRODUCT / SERVICE	The sewage in the engine room is collected and treated according to ship management system requirements and operation specifications.
CIRCUMSTANTIAL KNOWLEDGE	Detailed knowledge about: 1. Operation of ship equipment; 2. Anti-pollution operation of ships; 3. Reporting methods and procedures; 4. Occupational health and safety.

OCCUPATION	MARINE ENGINEERING TECHNICIAN	**OCCUPATION CODE**	
DUTY TITLE	MANAGE HYGIENIC CONDITION OF ENGINE ROOM	**DUTY NO.**	403
TASK TITLE	COLLECT WASTE IN THE ENGINE ROOM	**TASK NO.**	4033
PERFORMANCE CRITERIA	The person performing this task must be able to operate the incinerators and burn away the refuse in accordance with technical requirements, manufacturer's operation manuals and engine room codes of practice.		
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 tools and equipment to be used include: 1. All kinds of waste or props; 2. Flashlight; 3. Waste container applicable to corresponding garbage; 4. Waste incinerator; 5. Personal protective equipment, such as safety helmet, safety shoes, gloves, work clothes, earmuffs (earplugs), etc.		

EVIDENCE REQUIREMENT

PRACTICAL PERFORMANCE	**UNDERPINNING KNOWLEDGE**
The person performing this task must be able to do the following: 1. Select appropriate operation tools and equipment for this task; 2. Inspect, classify and recycle the garb in the engine room, and pay special attention to the toxic and harmful waste with the special storage requirements; 3. Receive the command of the engineer and dispose of the waste in the engine room under the engineer's guidance; 4. Inspect and start the incinerators; 5. Classify and incinerate the waste according to the requirements of waste incineration; and pay special attention to the toxic and harmful waste with the special incineration requirements; batteries shall not be incinerated; 6. Manage incinerator operation;	**Detailed knowledge about:** **1.0 Methods** The person performing this task must be able to explain how to: 1.1 Inspect, classify and collect the waste in the engine room according to the requirements of the engine room; 1.2 Carry out engine room waste incineration operation in accordance with operational procedures; 1.3 Record the Waste incineration in the engine room according to engine room management procedures; 1.4 Contact other relevant personnel in engine rooms according to the code of practice. **2.0 Principles** The person performing this task must be able to explain the following principles:

7. Shut down the incinerators, and collect and treat the ash; 8. Report according to procedures; 9. Store the tools and equipment.	2.1 Regulations for the prevention of pollution by ships; 2.2 Principles of ship waste disposal. **3.0 Theories** The person performing this task must be able to explain the following: 3.1 Collection and classification process of the engine room waste; 3.2 Incineration and treatment process of the engine room waste. **4.0 Essential Skills** 4.1 Effective communication skills; 4.2 Teamwork skills; 4.3 Skills of using tools and equipment; 4.4 Environmental protection awareness.
DESCRIPTION OF THE END PRODUCT / SERVICE	The waste in the engine room is collected and treated according to ship management system requirements and operation specifications.
CIRCUMSTANTIAL KNOWLEDGE	**Detailed knowledge about:** 1. Operation of ship equipment; 2. Anti-pollution operation of ships; 3. Reporting methods and procedures; 4. Occupational health and safety.

APPENDIX: DACUM CHARTS FOR MARINE ENGINEERING TECHNICIAN - NTA LEVEL 4

DUTIES	TASKS	ENABLERS
1. Engine room safety inspection	1.1 Routine cabin safety inspections 1.2 Safety inspection of climbing heights and entering restricted spaces. 1.3 Safety inspection against electric shock. 1.4 Safety inspection of ship maintenance.	**General skills and knowledge** · Knowledge of ship safety management system · Circumstantial knowledge of watch patrol of marine engines · Safety knowledge of ship climbing operation · Safety knowledge of entering confined Spaces in ships · Safety inspection skills for preventing electric shock on ships · Safety inspection skills for ship maintenance · Knowledge of the ship structure and equipment · Work safety · Fire prevention and control · Prevention and first aid of personal injuries · Safety patrol recording and reports, etc. **Tools and equipment** · PPE, such as safety helmet, safety shoes, goggles, gloves and earmuffs · A complete set of general toolboxes · Flashlight and hand-held infrared thermometer · Safety nets and ladders · Sign boards: no closing, no traffic, no bullet train, no hot work, etc. **Materials** · Wooden board, wooden stick, rubber board, fencing panel, rope, rag, cleaner, etc. **Requirements for employees** · Safety consciousness, environment-friendly

		idea and teamwork spirit
2. Operation of the marine auxiliary system	2.1 Start water pumps of the ship. 2.2 Start oil pumps of the ship. 2.3 Operate the daily sea and fresh water system. 2.4 Operation of the ballast water system of the engine room. 2.5 Operate the ventilation and lighting systems of the engine room.	**General skills and knowledge** · Knowledge of ship safety management system · Operation skills of water pumps of the ship · Operation skills of oil pumps of the ship · Operation skills of daily marine and fresh water pumps · Operation skills of the ballast water system of the ship · Operation skills of the marine lighting equipment · Observation and recording of equipment parameters, etc. **Tools and equipment** · PPE, such as safety helmet, safety shoes, goggles, gloves and earmuffs · A complete set of general toolboxes · Hand-held infrared thermometer · Sounding ruler · valve-opening wrench · Water pumps, oil pumps, ballast water treatment system, engine room ventilation system and lighting system of the ship · Mobile ventilation equipment, lighting equipment, etc. **Materials** · Rag, cleaning agent, etc. **Requirements for employees** · Safety consciousness, environment-friendly idea and teamwork spirit
3. Hygienic management of engine rooms	3.1 Cleaning of the engine room and equipment. 3.2 Collection and treatment of the oil effluent in the engine room. 3.3 Collection and sorting of	**General skills and knowledge** · Knowledge of ship safety management system · Knowledge of the sanitation in the engine room · Knowledge of cleaning agent selection

	waste in the engine room.	· Cleaning skills of equipment and parts · Knowledge of ship sewage discharge · Operation skills of the oil and water treatment systems in the engine room · Knowledge of waste classification · Operation skills of incinerator · Regulations on the prevention of pollution of ships, etc. **Tools and equipment** · PPE, such as safety helmet, safety shoes, goggles, gloves and earmuffs · A complete set of general toolboxes · Flashlight, hand-held grinder · Vacuum cleaner, paint brush · Waste container · Oil-water separator and incinerator · Mobile ventilation equipment, lighting equipment, etc. **Materials** · Rag, cotton yarn, cleaning agent, kerosene, diesel, brush, wool grinding wheel, paint, ribbon, etc. **Requirements for employees** · Safety consciousness, environment-friendly idea and teamwork spirit