Competency Standard (CS)

Marine Engine Technician

Level-3

Light Engineering Sector

Competency Standard Code: CS-LE-MET-L3-EN-V1

National Skills Development Authority
Chief Advisor's Office
Government of the People's Republic of Bangladesh

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This Competency Standard for **Marine Engine Technician** is a document for the development of curricula, teaching and learning materials, and assessment tools. It also serves as the document for providing training consistent with the requirements of industry in order to meet the qualification of individuals who graduated through the established standard via competency-based assessment for a relevant job.

This document has been developed by NSDA in association with **Light Engineering Sector**, industry representatives, academia, related specialist, trainer and related employee.
Public and private institutions may use the information contained in this standard for activities benefitting Bangladesh.

Introduction

The NSDA aims to enhance an individual's employability by certifying completeness with skills. NSDA works to expand the skilling capacity of identified public and private training providers qualitatively and quantitatively. It also aims to establish and operationalize a responsive skills ecosystem and delivery mechanism through a combination of well-defined set of mechanisms and necessary technical supports.

Key priority economic growth sectors identified by the government have been targeted by NSDA to improve current job skills along with existing workforce to ensure required skills to industry standards. Training providers are encouraged and supported to work with industry to address identified skills and knowledge to enable industry growth and increased employment through the provision of market responsive inclusive skills training program. "**Marine Engine Technician**" is selected as one of the priority occupations of **Light Engineering** Sector. This standard is developed to adopt a demand driven approach to training with effective inputs from Industry Skills Councils (ISC's), employer associations and employers.

Generally, a competency standard informs curriculum, learning materials, assessment and certification of trainees enrolled in Skills training. Trainees who successfully pass the assessment will receive a qualification in the National Skills Qualification Framework (BNQF) under Bangladesh National Qualification Framework and will be listed on the NSDA's online portal.
This competency standard is developed to improve skills and knowledge in accordance with the job roles, duties and tasks of the occupation and ensure that the required skills and knowledge are aligned to industry requirements. A series of stakeholder consultations, workshops were held to develop this document.

The document also details the format, sequencing, wording and layout of the Competency Standard for an occupation which is comprised of Units of Competence and its corresponding Elements.

Overview

A **Competency Standard** is a written specification of the knowledge, skills and attitudes required for the performance of an occupation, trade or job corresponding to the industry standard of performance required in the workplace.
The purpose of a competency standards is to:

- provide a consistent and reliable set of components for training, recognising and assessing people's skills, and may also have optional support materials
- enable industry recognised qualifications to be awarded through direct assessment of workplace competencies
- encourage the development and delivery of flexible training which suits individual and industry requirements
- encourage learning and assessment in a work-related environment which leads to verifiable workplace outcomes

Competency standards are developed by a working group comprised of representative from NSDA, Key Institutions, ISC, and industry experts to identify the competencies required of an occupation in **Light Engineering Sector**.

Competency standards describe the skills, knowledge and attitude needed to perform effectively in the workplace. CS acknowledge that people can achieve technical and vocational competency in many ways by emphasizing what the learner can do, not how or where they learned to do it.
With competency standards, training and assessment may be conducted at the workplace or at training institute or any combination of these.
Competency standards consist of a number of units of competency. A unit of competency describes a distinct work activity that would normally be undertaken by one person in accordance with industry standards.

Units of competency are documented in a standard format that comprises of:

- unit title
- nominal duration
- unit code
- unit descriptor
- elements and performance criteria
- variables and range statement
- curricular content guide
- assessment evidence guide

Together, all the parts/components of a unit of competency:

- describe a work activity
- guide the assessor to determine whether the candidate is competent or not yet competent

The ensuing sections of this document comprise of a description of the relevant occupation, trade or job with all the key components of a unit of competency, including:

- a chart with an overview of all Units of Competency for the relevant occupation, trade or job including the Unit Codes and the Unit of Competency titles and corresponding Elements
- the Competency Standard that includes the Unit of Competency, Unit Descriptor, Elements and Performance Criteria, Range of Variables, Curricular Content Guide and Assessment Evidence Guide.

Competency Standards for National Skill Certificate –3 in Marine Engine Technician in Light Engineering Sector

Level Descriptors of Skills Sector, BNQF Level 1-6

Level & Job classification	Knowledge Domain	Skills Domain	Responsibility Domain
6-Mid-Level Manager/Sub Assistant Engineer	Comprehensive actual and theoretical knowledge within a specific work or study area with an awareness of the validity and limits of that knowledge, able to analyze, compare, relate and evaluate.	Specialised and wider range of cognitive and practical skills required to provide leadership in the development of creative solutions to defined problems. Communicate professional issues and solutions to the team and to external partners/users.	Work under broad guidance and self-motivation to execute strategic and operational plan/s. Lead lower-level management. Diagnose and resolve problems within and among work groups.
5-Supervisor	Broad knowledge of the underlying, concepts, principles, and processes in a specific work or study area, able to scrutinize and break information into parts/components by identifying motives or causes.	Broad range of cognitive and practical skills required to generate solutions to specific problems in one or more work or study areas. Communicate practice-related problems and possible solutions to external partners.	Work under guidance of management and self-direction to resolve specific issues. Lead and take responsibility for the work and actions of group/team members. Bridge between management.
4-Highly Skilled Worker	Broader knowledge of the underlying, concepts, principles, and processes in a specific work or study area, able to solve problems to new situations by comparing and applying acquired knowledge.	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying the full range of methods, tools, materials and information. Communicate using technical terminology and IT technology with partners and users as per workplace requirements.	Work under minimal supervision in specific contexts in response to workplace requirements. Resolve technical issues in response to workplace requirements and lead/guide a team/ group.
3-Skilled Worker	Moderately broad knowledge in a specific work or study area, able to perceive ideas and abstract from drawing and design according to workplace requirements.	Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools. Communicate with his team and limited external partners upholding the values, nature and culture of the workplace	Work or study under supervision with considerable autonomy. Participate in teams and responsible for group coordination.
2- Semi Skilled Worker	Basic understanding of underpinning knowledge in a specific work or study area, able to interpret and apply common occupational terms and instructions.	Skills required to carry out simple tasks, communicate with his team in the workplace presenting and discussing results of his work with required clarity.	Work or study under supervision in a structured context with limited scope of manipulation
1 - Basic Skilled Worker	Elementary understanding of ability to interpret the underpinning knowledge in a specific study area, able to interpret common occupational terms and instructions.	Specific Basic skills required to carry out simple tasks. Interpret occupational terms and present the results of own work within guided work environment/ under supervision.	Work under direct supervision in a structured context with limited range of responsibilities.

List of Abbreviations

CS	-	Competency Standard
ISC	-	Industry Skills Council
FPS	-	Foot, Pound and Second
LEISC	-	Light Engineering Industry Skills Councils
NSDA	-	National Skills Development Authority
MKS	-	Meter, Kilogram and Second
BNQF	-	Bangladesh National Qualification Framework
OSH	-	Occupational Safety and Health
PPE	-	Personal Protective Equipment
SCVC	-	Standards and Curriculum Validation Committee
STP	-	Skills Training Provider
SOP	-	Standard Operating Procedure
UoC	-	Unit of Competency
CNC	-	Computer & Numeric Control
MET	-	Marine Engine Technician
SWL	-	Safe Working Load
4 iR	-	4th Industrial Revolution

Approved by the Authority meeting, held on .....

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Competency Standards for National Skill Certificate – 3 in
Marine Engine Technician
Course Structure

SL.	Unit Code and Title		UoC Level	Nominal Hours
Generic Units of Competencies				**60**
1	GU-03-L2-V1	Communicate in the Workplace	2	20
2	GU-01-L3-V1	Apply Basic IT Skills	3	20
3	GU-04-L3-V1	Lead Small Team	3	20
Occupation Specific Units of Competencies				**280**
4	OU-LE-MET-01-L3-V1	Perform Inspection, Repairing and Servicing Engines	3	80
5	OU-LE-MET-02-L3-V1	Perform Engine Top Overhauling	3	120
6	OU-LE-MET-03-L3-V1	Repair and Service Turbocharger	3	60
7	OU-LE-MET-03-L3-V1	Maintain Records & Documentation	3	20
Learning Hours				**340**
Workplace Visit				**20**
Total Nominal Hours				**360**

Units & Elements at a Glance:

Generic Units of Competencies (60 hours)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
GU-03-L2-V1	Communicate in the Workplace	1. Receive verbal instructions. 2. Interpret verbal and written information/ instruction 3. Convey instructions using verbal and written forms of communication 4. Complete written documentation 5. Participate in work place meetings and discussion.	20
GU-01-L3-V1	Apply Basic IT Skills	1. Identify and use most commonly used IT tools 2. Operate computer 3. Work with word processing software 4. Use spread sheet to create /prepare worksheets 5. Use presentation packages to create / prepare presentation 6. Print the documents 7. Use the Internet and Access E-Mail	20
GU-04-L3-V1	Lead Small Team	1. Provide team leadership 2. Assign responsibilities 3. Set performance expectations for team members 4. Supervise team performance	20
Total Hours			**60**

Occupation Specific Units of Competencies (280 Hours)

Code	Unit of Competency	Elements of Competency	Hours
OU-LE-MET-01-L3-V1	Perform Inspection, Repairing and Servicing Engines	1. Prepare for work 2. Conduct engine system inspections and analyse results 3. Carry out repairing and servicing 4. Carry out performance test 5. Maintain workplace, tools, equipment and materials	80

OU-LE-MET-02-L3-V1	Perform Engine Top Overhauling	1. Prepare for overhauling 2. Interpret Fundamentals of marine engines 3. Inspect engine for top overhauling 4. Disassemble engine cylinder head 5. Overhaul cylinder head and its components 6. Assemble engine cylinder heads and its components 7. Maintain workplace, tools, equipment and materials	120
OU-LE-MET-03-L3-V1	Repair and Service Turbocharger	1. Prepare for work 2. Interpret Fundamentals of turbocharger 3. Identify faults of turbocharger and its components 4. Repair/service of turbocharger 5. Maintain workplace, tools, equipment and materials	60
OU-LE-MET-03-L3-V1	Maintain Records & Documentation	1. Prepare for work 2. Perform recording of maintenance and repairing 3. Record of servicing 4. Record engine running hours 5. Carryout inventory of spare parts/components 6. 6.Clean and store equipment	20
Total Hours			**280**

Generic Units of Competencies

Unit code and Title	GU-03-L2-V1: Communicate in the Workplace
Unit Descriptor	This unit covers the knowledge, skills and attitudes (KSAs) required to communicate in the workplace. It includes the use of verbal and written forms of communication to receive, interpret, convey, and document information/ instruction using appropriate communication equipment.
Nominal Hours	**20 Hours**
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables Training Components
1. Receive verbal instructions.	1.1 Instructions are accessed and interpreted; 1.2 Questions are asked to clarify understanding or gain more information; 1.3 Information/instruction is recorded.
2. Interpret verbal and written information/ instruction	2.1 **Written instructions** are interpreted; 2.2 Work **signage's** are properly responded.; 2.3 Routine written instructions are followed in sequence; 2.4 Feedback is given to workplace supervisor.
3. Convey instructions using verbal and written forms of communication	3.1 Relevant **communication** methods are used to transmit instructions; 3.2 Appropriate non-verbal communication is used; 3.3 Channels of communication are identified and followed; 3.4 Communication **tools and equipment** are operated and faults are identified and reported; 3.5 Information is conveyed using appropriate **forms**.
4. Complete written documentation	4.1 All required **documentation** is completed; 4.2 Workplace data are recorded; 4.3 Written information/instruction is passed to personnel.
5. Participate in work place meetings and discussions	4.1 Meetings are attended regularly and on time; 4.2 Meeting inputs are consistent with the meeting purpose and established protocols; 4.3 Opinions are expressed without interruption; 4.4 Meeting outputs are processed and implemented.
Range of Variables	
Variable	**Range** (may include but not limited to):
1. Written instructions	1.1 Supervisor's/Manager's Instructions 1.2 Memoranda 1.3 Rules and Regulations 1.4 Signage 1.5 Approved Work Plan 1.6 External communications
2. Workplace guidelines	2.1 Labor Policies and Guidelines

	2.2 Written Instructions 2.3 Operations Manual 2.4 Organizational Manuals 2.5 Quality Assurance Handbook
3. Signage	3.1 On-site direction signs 3.2 Common site warnings 3.3 Location signs 3.4 Traffic signs
4. Communication	4.1 Verbal instructions 4.2 Written instructions 4.3 Online communication
5. Tools and machinery	5.1 Telephone 5.2 Mobile Phone 5.3 Fax machines 5.4 Two-way radio 5.5 Computers 5.6 Forms 5.7 Memo
6. Forms	6.1 Memorandum 6.2 Requisitioning Form 6.3 Personnel Form 6.4 6.4. Safety Report Form
7. Documentation	7.1 Reports (Monthly, Quarterly, Half-Yearly, Annual) 7.2 Plans (Strategic Plan, Operational Plan, Monthly 7.3 Schedule) 7.4 Monitoring and Evaluation Report 7.5 7.4. Minutes of Meetings
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency	
1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 demonstrated knowledge of workplace procedures in receiving, interpreting and conveying verbal & written communication. 1.2 satisfied the requirements mentioned in the Performance Criteria and Range of Variables.
2. Underpinning Knowledge	2.1 Workplace Communication Policies, Standards and Procedures 2.2 Verbal and Non-verbal communication 2.3 Modes of Communication 2.4 Communication Equipment: Types, Uses and Faults 2.5 Channels of Communication;
3. Underpinning Skills	3.1 Receiving verbal instructions.

	3.2 Interpreting verbal and written information/ instruction 3.3 Conveying instructions using verbal and written forms of communication 3.4 Completing written documentation 3.5 Participating in workplace meetings and discussions.
4. Underpinning Attitude	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communicate with peers and seniors in workplace.
5. Resource Implications	The following resources must be provided: 5.1 Pens 5.2 Telephone 5.3 Computer 5.4 Writing materials 5.5 Online communication.
6. Methods of Assessment	Methods of assessment may include but not limited to: 6.1 Demonstration 6.2 Oral questioning 6.3 Written test 6.4 Portfolio.
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment centre; 7.2 Assessment should be done by NSDA certified assessor.

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code and Title	**GU-01-L3-V1: Apply Basic IT Skills**
Unit Descriptor	This unit covers the basic knowledge, skills and attitude required to apply basic IT skills. It specifically includes Identifying and use most commonly used IT Tools, operating computer, working with word processing software, use spread sheet to create /prepare worksheets, using presentation packages to create / prepare presentation, printing the documents and using the internet and access E-mail.
Nominal Hours	**20 Hours**
Elements of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables Training Components.
1. Identify and use most commonly used IT tools	1.1 Context of IT is interpreted; 1.2 Commonly used **IT tools** are identified; 1.3 Safe work practice and OSH Standards are followed.
2. Operate computer	2.1 **Peripherals** are checked and connected with computer as per standard; 2.2 Power cords / adapter are connected with computer and power outlets socket safely; 2.3 Computer is switched on gently; 2.4 PC **desktop / GUI settings** are arranged and customized as per requirement; 2.5 Files and folders are created, opened, copied, renamed, deleted and sorted as per requirement; 2.6 Properties of files and folders are viewed and searched; 2.7 Disks are defragmented, formatted as per requirement.
3. Work with word processing software	3.1 Word Processing software is selected and started; 3.2 Basic typing technique is demonstrated; 3.3 **Documents** are created as per requirement in personal use and office environment; 3.4 **Contents** are entered; 3.5 Documents are **formatted.**
4. Use spread sheet to create /prepare worksheets	4.1 Spreadsheet are selected and started; 4.2 Worksheets are created as per requirement in Personal use and office environment; 4.3 Data are entered; 4.4 **Functions** are used for calculating and editing logical operation; 4.5 Sheets are formatted as per requirement; 4.6 Charts are created; 4.7 Charts/ Sheets are previewed.

5. Use presentation packages to create / prepare presentation	5.1 Appropriate presentation software packages are selected and started; 5.2 Presentation is created as per requirement in personal use and office environment; 5.3 Image, Illustrations, text, table, symbols and media are entered as per requirements; 5.4 Presentations are formatted and animated; 5.5 Presentations are previewed.
6. Print the documents	6.1 Printer is connected with computer and power outlet properly; 6.2 Power is switched on at both the power outlet and printer; 6.3 Printer is installed and added; 6.4 Correct printer settings are selected and document is printed.
7. Use the Internet and Access E-Mail	7.1 Appropriate internet **browsers** are selected; 7.2 Search engines are used to access information; 7.3 Video / Information are Shared /downloaded / uploaded from / to web site/social media; 7.4 Web based resources are used; 7.5 Email services are identified and selected to create a new email address; 7.6 Document is prepared, attached and sent to different types of recipients; 7.7 Email is read, forwarded, replied and deleted as per requirement; 7.8 Custom email folders are created and manipulated; 7.9 Email message is printed.
Range of Variables	
Variable	**Range** (may include but not limited to):
1. IT tools	1.1 Phone 1.2 Cell Phone 1.3 TABs 1.4 Radio 1.5 Television 1.6 Computers 1.7 Laptops 1.8 Notebooks 1.9 Internet 1.10 Software 1.11 Satellite
2. Peripherals	2.1. Monitor 2.2. Keyboard 2.3. Mouse 2.4. Modem 2.5. Scanner 2.6. Printer

3. Desktop / GUI settings	3.1 Icons 3.2 Taskbar 3.3 View 3.4 Resolutions
4. Documents	4.1 Word documents 4.2 Standard CV / Bio-Data with different text & fonts, image and table. 4.3 Application / Official letter with proper paragraph and indenting, spacing, styles, Illustrations, Tables, Header & Footers and symbols. 4.4 Standard report / newspaper items with column, footnote and endnote, drop cap, indexing and page numbering.
5. Contents	5.1 Illustrations and styles 5.2 Text 5.3 Table 5.4 Symbols 5.5 Header & Footer
6. Formatted	6.1 Bold 6.2 Italic 6.3 Underline 6.4 Font size, colour, 6.5 Change case 6.6 Alignment and intend
7. Functions	7.1. Mathematics 7.2. Logical 7.3. Simple Statistical
8. Browsers	8.1 Internet Explorer 8.2 Firefox 8.3 Google Chrome 8.4 Opera 8.5 Safari 8.6 Omni Web
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 created, opened, copied, renamed, deleted and sorted files and folders as per requirement. 1.2 completed application software Installations as per standard 1.3 performed simple trouble shooting with Computer 1.4 created email accounts. 1.5 used email account for online platforms purpose.
2. Underpinning Knowledge	2.1 Basic competent of PC 2.2 IT and IT Tools

	2.3 Different type of software and application packages 2.4 Use of word processor, spread sheet and presentation software 2.5 Different type of math and logical functions 2.6 Computer Trouble Shooting 2.7 Techniques to access internet.
3. Underpinning Skills	3.1 Identifying and use IT Tools 3.2 Demonstrating typing on word processing software 3.3 Saving and retrieving documents on Word Processing software. 3.4 Demonstrated ability to create email accounts 3.5 Opening an email account and use it for different purpose. 3.6 Configured appropriate printer settings and printed the document.
4. Underpinning Attitudes	4.1 Commitment to occupational health and safety 4.2 Environmental concerns 4.3 Eagerness to learn 4.4 Tidiness and timeliness 4.5 Respect for rights of peers and seniors in workplace 4.6 Communication with peers and seniors in workplace.
5. Resource Implications	The following resources must be provided: 5.1 Workplace (simulated or actual) 5.2 IT Tools 5.3 Computers with word processing application 5.4 Internet connection 5.5 Presentations 5.6 Learning manuals.
6. Assessment methods	Assessment methods may include but noy limited to: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning 6.4 Portfolio
7. Context of Assessment	7.1 Competency assessment must be done in NSDA accredited assessment centre; 7.2 Assessment should be done by NSDA certified/ nominated assessor.
Accreditation Requirements Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.	

Unit Code and Title	GU-04-L3-V1: Lead Small Team
Unit Descriptor	This unit covers the knowledge, skills and attitudes required to lead small team. It specifically includes providing team leadership, assigning responsibilities, setting performance expectations for team members and supervising team performance.
Nominal Hours	**20 Hours**
Elements of Competency	**Performance Criteria** **Bold & Underlined** terms are elaborated in the Range of Variables
1. Provide team leadership	1.1 **Work requirements** are identified and presented to team members; 1.2 Reasons for instructions and requirements are communicated to team members; 1.3 **Team members' queries and concerns** are recognized, discussed and dealt with.
2. Assign responsibilities	2.1 Duties, and responsibilities are allocated having regard to the skills, knowledge and attitudes required to properly undertake the assigned task; 2.2 Duties are allocated having regard to individual preference, domestic and personal considerations, whenever possible.
3. Set performance expectations for team members	3.1 Performance expectations are established based on client needs and according to assignment requirements; 3.2 Performance expectations are based on individual team members' duties and area of responsibility; 3.3 Performance expectations are discussed and directed to implement in the workplace.
4. Supervise team performance	4.1 **Monitoring of performance** are taken place against defined performance criteria and / or assignment instructions and corrective action taken if required; 4.2 Team members are provided **feedback,** positive support and advice on strategies to overcome any deficiencies; 4.3 **Performance issues** which cannot be rectified or addressed within the team are referenced to appropriate personnel; 4.4 Team members are kept informed of any changes in the priority allocated to assignments or tasks which might impact on clients' / customers' needs and satisfaction; 4.5 Team operations are monitored to ensure that employer / client needs and requirements are met; 4.6 Follow-up communication is provided on all issues affecting the team; 4.7 All relevant documentation is completed.

Range of Variables	
Variable	**Range** (may include but are not limited to):
1. Work requirements	1.1 Client Profile 1.2 Assignment instructions
2. Team member's queries and concerns	2.1 Roster 2.2 Shift details
3. Monitoring of performance	3.1 Formal process 3.2 Informal process
4. Feedback	4.1 Formal process 4.2 Informal process 4.3 Sandwich process
5. Performance issues	5.1 Work output 5.2 Work quality 5.3 Team participation 5.4 Compliance with workplace protocols 5.5 Safety 5.6 Customer service
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet all requirements of current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment required evidence that the candidate: 1.1 maintained or improved individuals and / or team performance given a variety of possible scenario 1.2 assessed and monitored team and individual performance against set criteria 1.3 represented concerns of a team and individual to next level of management or appropriate specialist and to negotiate on their behalf 1.4 allocated duties and responsibilities, having regard to individual's knowledge, skills and attitude and the needs of the tasks to be performed 1.5 set and communicated performance expectations for a range of tasks and duties within the team and provided feedback to team members.
2. Underpinning knowledge	2.1 Company policies and procedures 2.2 Relevant legal requirements 2.3 How performance expectations are set 2.4 Methods of Monitoring Performance 2.5 Client expectations 2.6 Team members' duties and responsibilities.
3. Underpinning skills	3.1 Informal performance counselling skills 3.2 Team building skills 3.3 Negotiating skills.

4. Required attitudes	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communicate with peers and seniors in workplace.
5. Resource implications	The following resources must be provided: 5.1 Workplace (actual or simulated) 5.2 Tools, equipment and facilities appropriate to processes or activity 5.3 Materials relevant to the proposed activity 5.4 Equipment and outfits appropriate in applying safety measures 5.5 Relevant drawings, manuals, codes, standards and reference material.
6. Assessment methods	Assessment methods may include but not limited to: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning 6.4 Portfolio
7. Context of assessment	7.1 Competency assessment must be done in NSDA accredited assessment centre; 7.2 Assessment should be done by NSDA certified assessor.

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Occupation Specific Units of Competencies

Unit Code & Title	**OU-LE-MET-01-L3-V1: Perform Inspection, Repairing and Servicing Engines.**
Unit Descriptor	This unit covers the knowledge, skill and attitude required to perform inspection, repairing and servicing engine It includes the tasks of preparing for work, conducting engine system inspections and analysing results, carrying out repairing and servicing, carrying out performance, maintaining workplace, tools, equipment and materials.
Nominal Hours	**80 Hours**
Elements Of Competency	**Performance Criteria** **Bold & Underline** terms are elaborated in the Range of Variables
1. Prepare for work	1.1 **Safe work practices** are followed throughout the work process; 1.2 **Personal Proactive Equipment** (PPE) worn as required for the work performed; 1.3 Necessary **tools and equipment** are identified and collected in accordance with work requirement; 1.4 Necessary **materials** are collected in accordance with work requirement; 1.5 Rols of work are identified from Toolbox meeting as per workplace standard; 1.6 Precaution in relation to working with engine performance are observed.
2. Conduct engine system inspections and analyze results	2.1 Visual **inspection** is carried out to identify faults with load in accordance with workplace procedures; *2.2* Engine is started and run up to an operating temperature to inspect leaks, abnormal noises and vibration, smoke, pressures and temperature in accordance with instruction **manual;** 2.3 Inspection of the engine performance is carried out in accordance with instruction manual; 2.4 Inspection result is analyzed and compared with manufacturer/ component supplier specifications to indicate compliance or non-compliance; 2.5 **Faults** are detected as per inspection/checking
3. Carry out repairing and servicing	3.1 Repairing and servicing of the engine with its components are carried out based on analyzed checking result; 3.2 Damaged parts/components are replaced in accordance with manufacturer specification; 3.3 **Necessary adjustments** are done during the service in accordance with manufacturer/component supplier specifications; 3.4 Engine oil, oil filter, fuel filter are replaced according to job requirements/manufacturer instruction;

	3.5 Cylinder head bolts and other loose bolts are tightened with correct torque.
4. Carry out performance test	4.1 Complete servicing schedules documented in accordance with work place procedure; 4.2 Final inspection is undertaken to ensure protective guards and safety features in place; 4.3 Engine is started and run to check rpm, lubricating oil pressure and temperature, Jacket water temperature, engine noise and vibration at optimum performance; 4.4 Final inspection is carried out to ensure work is completed to customer expectations as per manufacturer instruction.
5. Maintain workplace, tools, equipment and materials	5.1 Work area is cleaned in accordance with workplace procedures; 5.2 Unused materials are stored for re-use or disposed following workplace procedures; 5.3 Waste and scrap materials are disposed with following workplace procedures; 5.4 Inventory of tools equipment are conducted and recorded as per checklist; 5.5 Tools and equipment are cleaned and stored as per manufacturer'srecommendationinappropriate location;
Range of Variable	
Variable	**Range** (May include but not limited to):
1. Safe work practices	1.1 Use PPE 1.2 Follow Lockout and Tagout (LOTO) Procedure 1.3 Use fire extinguisher 1.4 Response emergency situation 1.5 Identify hazard 1.6 Control hazards 1.7 Measure risk 1.8 Use first aid 1.9 Follow Safe Working Load (SWL) 1.10 Report uncontrolled hazards
2. Personal proactive equipment	2.1 Helmet 2.2 Safety Mask/respiratory 2.3 Hand Gloves. 2.4 Safety Shoes. 2.5 Boiler suits 2.6 Safety goggles 2.7 Ear muffs
3. Tools and equipment	3.1 Hand and power tools ▪ Socket wrench set ▪ Combination wrenches ▪ Different type screwdriver ▪ Different type of hammer

	▪ Required pliers set ▪ Oil filter remover 3.2 Torque wrench 3.3 Multi meter 3.4 Compression tester 3.5 Valve seat grinder 3.6 Injector tester 3.7 Engine hoist or chain block
4. Materials	4.1 Cotton waste 4.2 Spare parts/components 4.3 Emery paper 4.4 Lubricating oil 4.5 Diesel 4.6 Valve grinding paste 4.7 Gasket cement 4.8 Anti rust solutions
5. Inspection	5.1 Engine sound and vibration 5.2 Engine knocking 5.3 Idle engine speed 5.4 Engine parameter ▪ Engine RPM ▪ Oil pressure/level ▪ Lubricating oil pressure and temperature ▪ Jacket water temperature and pressure ▪ Sea cooling water pressure ▪ Exhaust temperature ▪ Scavenging air pressure and temperature ▪ Fuel oil pressure and temperature 5.5 Exhaust gas color 5.6 Cooling system pressure and temperature 5.7 Belt tension
6. Engine performance elements/components	6.1 Engine sump oil level 6.2 Fuel tank and loose fuel pipes 6.3 Fan belt tension and damage, 6.4 Engine coolant concentration and level 6.5 Leakage in lubricating system 6.6 Leakage in fuel oil system 6.7 Leakage in Cooling system 6.8 Loose and damage Exhaust pipes mount 6.9 Engine operating conditions and engine mounts 6.10 Mounting bolts
7. Faults	7.1 Lubricant system failure 7.2 Injection system failure 7.3 Engine valve leakage

	7.4 Compression weak 7.5 Cooling system failure 7.6 Fan belt tension and damage 7.7 Mounting bolts lose 7.8 Incorrect Idle speed 7.9 Excessive Mechanical noise and vibration 7.10 Engine mounting damage and variation of rpm 7.11 Leakage of cooling and lubricating system
8. Necessary adjustments	8.1 Variable rpm 8.2 Valve tappet clearance 8.3 Adjustment of different types of belts tension 8.4 Pressure adjustment of lubricating and fuel oil system 8.5 Fuel injection timing adjuster 8.6 Fuel rack or control rod 8.7 Cylinder head stud nut (torque adjustment) 8.8 Timing gear backlash adjuster 8.9 Throttle linkage adjustments 8.10 Idle speed adjustment screw 8.11 Cooling water flow adjuster (thermostatic valve)
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment requires evidence that the candidate 1.1 conducted inspection to detect faults 1.2 conducted adjustments 1.3 replaced engine oil, oil filter, fuel filter and faulty parts/components which are not repairable 1.4 performed repairing and servicing of engines.
2. Underpinning Knowledge	2.1 Basic engine working principles 2.2 Types and classifications of engines 2.3 Engine components and their functions 2.4 Engine systems and ancillary systems 2.5 Inspection procedures and techniques 2.6 Common engine faults and symptoms 2.7 Repair and servicing procedures 2.8 Servicing requirements and planned maintenance schedules (PMS) 2.9 Safety measures and environmental guidelines.

3. Underpinning Skill	3.1 Conducting visual and technical inspections 3.2 Diagnosing fault 3.3 Using measuring and testing equipment, 3.4 repairing and servicing engine as per inspection result. 3.5 adjusting and replacing relevant engine parts/components. 3.6 Applying lubrication and cleaning techniques 3.7 Reading and interpreting technical manuals and drawing 3.8 Using hand and power tools safely and efficiently 3.9 Following maintenance schedules and SOPs 3.10 Maintaining safe working practices 3.11 Carrying out test run.
4. Required Attitude	4.1 Commitment to occupational safety and health 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Eagerness to learn 4.5 Tidiness and timeliness 4.6 Environmental concerns 4.7 Respect for rights of peers and seniors at workplace 4.8 Communicate with peers and seniors at workplace.
5. Resource Implication	The following resources should be made available: 5.1 Workplace 5.2 Material relevant to the inspection and servicing of engines 5.3 Equipment, hand and power tooling appropriate to the inspection and servicing of engines 5.4 Specifications and work instructions.
6. Method of assessment	Competency must be assessed through: 6.1 Written Exam. 6.2 Demonstration 6.3 Oral Questioning/interview 6.4 Portfolio
7. Context for Assessment	7.1 Competency assessment must be done in NSDA accredited assessment centre; 7.2 Assessment should be done by a NSDA certified/nominated assessor.

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code & Tittle	**OU-LE-MET-02-L3-V1: Perform Engine Top Overhauling**
Unit Descriptor	This unit covers the knowledge, skill and attitude required to perform Top overhauling. It includes the tasks of preparing for overhauling, interpreting fundamentals of marine engine, inspecting engine for top overhauling, disassembling engine cylinder head, overhauling cylinder head and its components, assembling engine heads and its components and maintaining workplace, tools, equipment and materials
Nominal Hours	**120 Hours**
Elements of Competency	**Performance Criteria** **Bold & Underlined** are elaborated in the Range of Variables
1. Prepare for overhauling	1.1 **Safe work practices** are observed and personal protective equipment **(PPE)** worn as required for the work to be performed; 1.2 Necessary **tools and equipment** are identified and collected in accordance with work requirement; 1.3 Necessary **materials** are collected as per work requirement; 1.4 Rols of work are identified from Toolbox meeting as per workplace standard.
2. Interpret Fundamentals of marine engines	2.1 **Types of marine engines** are interpreted; 2.2 Working principles of different engines are interpreted; 2.3 **Associated parts/components** of engines are identified; 2.4 Functions of different parts/components are interpreted.
3. Inspect engine for top overhauling	3.1 Procedure for engine inspection is interpreted; 3.2 **Spare parts** of top overhauling are identified and prepared; 3.3 Running hour of engine for top overhauling is inspected as per manual; 3.4 SWL rating of **lifting devices**, are confirmed against the load to be lifted.
4. Disassemble engine cylinder head	4.1 logical sequence of disassembling of engine cylinder head is interpreted' 4.2 cylinder head is removed without causing any damages; 4.3 **Relevant parts/components** of cylinder head are disassembled without causing any damages; 4.4 Parts/components are cleaned for inspection as per requirement.
5. Overhaul cylinder head and its components	5.1 Sequence of overhauling of engine cylinder head is interpreted; 5.2 Condition of relevant parts/components of cylinder heads are inspected; 5.3 Inspection result is compared with the manuals data; 5.4 Parts/components are serviced or replaced as per requirement.
6. Assemble engine cylinder heads and its components	6.1 sequences of assembling of engine cylinder head are interpreted; 6.2 Relevant parts/components of cylinder head are assembled as per manuals without causing any damages;

	6.3 Cylinder head is checked for operation prior to start and after starting.
7. Maintain workplace, tools, equipment and materials	5.1 Work area is cleaned in accordance with workplace procedures; 5.2 Unused materials are stored for re-use or disposed following workplace procedures; 5.3 Waste and scrap materials are disposed with following workplace procedures; 5.4 Inventory of tools equipment are conducted and recorded as per checklist; 5.5 Tools and equipment are cleaned and stored as per manufacturer'srecommendationinappropriate location.

Range of Variables

Variable	**Range (**May include but not limited to):
1. Safe work practices	1.1 Use PPE 1.2 Follow Lockout and Tagout (LOTO) procedure 1.3 Use fire extinguisher 1.4 Response emergency situation 1.5 Identify hazard 1.6 Control hazards 1.7 Measure risk 1.8 Use first aid 1.9 Follow Safe Working Load (SWL) 1.10 Report uncontrolled hazards
2. Personal Protective Equipment	2.1 Hand Gloves. 2.2 Safety Shoes. 2.3 Boiler shoot 2.4 Safety goggles 2.5 Safety belt 2.6 Helmet
3. Tools and equipment	3.1 Hand tools ▪ Socket wrench set ▪ Combination wrenches ▪ Adjustable wrenches ▪ Screwdrivers ▪ Hammers ▪ Pliers set ▪ Torque wrench ▪ Scraper ▪ Drain plug remover ▪ Allen Key set ▪ Lubricating oil filter removing belt 3.2 Air gun 3.3 Valve spring opener 3.4 Torque wrench

	3.5 Multi meter 3.6 Compression tester 3.7 Valve seat grinder 3.8 Injector tester 3.9 Engine hoist or chain block 3.10 Hydraulic Jack for opening & tightening cylinder head bolt
4. Materials	4.1 Consumable items ▪ Kerosene ▪ Cotton waste ▪ Gasket set (spare) ▪ Lubricating oil ▪ Anti rust solutions ▪ Valve grinding paste (Medium and fine) ▪ Silicon paste ▪ Hand cleansing solution
5. Types of marine engines	5.1 **Based on Engine Cycle** ▪ Two-Stroke Engine ▪ Four-Stroke Engine 5.2 **Based on Engine Placement** ▪ Inboard Engine ▪ Outboard Engine 5.3 **Based on Application** ▪ Main Engine (Propulsion Engine) ▪ Auxiliary Engine (Generator Engine) 5.4 **Based on Cylinder Configuration** ▪ I-type (Inline) ▪ V-type ▪ Opposed Piston type Engine ▪ Redial Engine 5.5 **Based on Engine Speed** ▪ Low Speed Engine ▪ Medium Speed Engine ▪ High Speed Engine 5.6 **Other Specialized Marine Engines** ▪ Steam Turbine Engine ▪ Electric Propulsion System
6. Associated parts/components	6.1 **Cylinder Block and Components** ▪ Cylinder block ▪ Cylinder head ▪ Cylinder liner 6.2 **Moving Components** ▪ Piston ▪ Piston rings ▪ Piston pin (gudgeon pin) ▪ Connecting rod ▪ Crankshaft ▪ Flywheel 6.3 **Valve and Timing Mechanism** ▪ Inlet valve

	▪ Exhaust valve ▪ Valve seat ▪ Valve guide ▪ Camshaft ▪ Rocker arm ▪ Roto Cap ▪ Push rod ▪ Tappet (or cam follower) ▪ Timing gears or timing chain 6.4 **Fuel System** ▪ Fuel tank ▪ Fuel pump ▪ Fuel injector ▪ Fuel filter ▪ Fuel lines ▪ Injection timing components 6.5 **Air Intake and Exhaust System** ▪ Turbocharger ▪ Air filter ▪ Intercooler (aftercooler) ▪ Intake manifold ▪ Exhaust manifold ▪ Silencer/muffler ▪ Exhaust pipe 6.6 **Lubrication System** ▪ Oil pump ▪ Oil filter ▪ Oil strainer ▪ Oil cooler ▪ Oil sump (oil pan) ▪ Lubricating oil lines ▪ Pressure adjusting valve/screw 6.7 **Cooling System** ▪ Fresh water pump ▪ Sea water pump ▪ Heat exchanger ▪ Thermostatic Control Valve ▪ Thermostat ▪ Expansion tank ▪ Cooling jackets ▪ Suction strainer 6.8 **Starting System** ▪ Starting motor (electric starter or air starter) ▪ Batteries (for electric start) ▪ Air starting valve (for air start system) ▪ Starting air bottle (in large engines) ▪ Air Distributor ▪ Electrical/Air Strating Switch ▪ Instrument Air/Control Air ▪ Turning Gear Interlock 6.9 **Monitoring and Control Instruments**

	▪ Pressure gauges (oil, fuel, air) ▪ Temperature gauges (coolant, exhaust, oil) ▪ RPM indicator (tachometer) ▪ Alarm and safety shutdown system ▪ Engine control panel/Dash board 6.10 **Ancillary Systems** ▪ Governor (for speed control) ▪ Vibration damper ▪ Crankcase ventilation system ▪ Scavenge pump (in two-stroke engines)
7. Spare parts/components	7.1 Inlet and exhaust valve 7.2 Valve guide 7.3 Valve spring 7.4 Rocker arm 7.5 Rocker arm bush 7.6 Push rod 7.7 Cylinder head gasket 7.8 Cotter pin 7.9 Roto cap 7.10 Oil seal 7.11 Indicator cock
8. Lifting devices	8.1 Engine cradles 8.2 Slings 8.3 Shackles 8.4 Lifting Gear Device
9. Relevant parts/components of engine cylinder head	9.1 **Cylinder Block and Components** ▪ Cylinder block ▪ Cylinder head ▪ Cylinder liner 9.2 **Valve and Timing Mechanism** ▪ Inlet valve ▪ Exhaust valve ▪ Valve seat ▪ Valve guide ▪ Camshaft ▪ Rocker arm ▪ Roto Cap ▪ Push rod ▪ Tappet (or cam follower) ▪ Timing gears/timing chain mechanism
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent, recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical aspects of competency	Assessment requires evidence that the candidate: 1.1 inspected engine for top overhauling 1.2 disassembled engine cylinder head 1.3 identified faulty part/components of engine cylinder head 1.4 overhauled cylinder head and its components

	1.5 assembled engine cylinder heads and its components repaired engine cylinder heads and its components 1.6 carried out testing of the engine cylinder head.
2. Underpinning knowledge	2.1 Job safety analysis (JSA) 2.2 Job hazard analysis (JHA) 2.3 Types of marine engine 2.4 Working principle of marine engine 2.5 Inspect engine for top overhauling 2.6 Disassemble process engine cylinder head 2.7 Overhauling procedure of cylinder head and its components 2.8 Assembling techniques of engine cylinder heads and its components 2.9 Relevant Tools and equipment uses for engine cylinder head overhauling 2.10 Materials used for overhauling 2.11 Associated parts/components 2.12 Spare parts/components 2.13 Lifting devices 2.14 Relevant parts/components of engine cylinder head.
3. Underpinning skills	3.1 Using and interpretation of repair manual 3.2 Using proper tools for overhauling 3.3 inspecting and checking of component for top overhauling 3.4 Disassembling and assembling components 3.5 Applying the techniques of maintenance and servicing 3.6 Performing test run.
4. Required Attitude	4.1 Commitment to occupational safety and health 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace.
5. Resource implications	5.1 The following resources must be provided: 5.2 Workplace 5.3 Tools and equipment appropriate to maintain workplace 5.4 Materials relevant to the proposed activity 5.5 All tools, equipment, material and documentation required. 5.6 Relevant drawings, manuals, codes, standards and reference material
6. Method of assessment	Assessment methods may include but not limited to: 6.1 Written test 6.2 Demonstration 6.3 Oral Questioning/interview 6.4 Portfolio
7. Context for	7.1 Competency assessment must be done in NSDA accredited

assessment	assessment centre; 7.2 Assessment should be done by NSDA certified assessor.

Accreditation Requirements

Training Providers must be accredited by National Skills Development Authority (NSDA), the National Quality Assurance Body, or a body with delegated authority for quality assurance to conduct training and assessment against this unit of competency for credit towards the award of qualification under BNQF. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by NSDA.

Unit Code & Title	**OU-LE-MET-03-L3-V1: Repair and Service Turbocharger**
Unit Descriptor	This unit covers the knowledge, skill and attitude required to repair and service turbocharger. It includes the tasks of preparing for work, interpreting fundamentals of turbocharger, identifying faults of turbocharger and its components, repairing/servicing of turbocharger, maintaining workplace, tools, equipment and materials
Nominal Hours	**60 Hours**
Elements Of Competency	**Performance Criteria** **Bold and Underlined** terms are elaborated in the Range of Variables
1. Prepare for work	1.1 **Safe work practices** are observed throughout the work process; 1.2 **Personal Protective Equipment** (PPE*)* worn as required for the work performed; 1.3 Necessary **tools and equipment** are identified and collected in accordance with work requirement; 1.4 Necessary **materials** are collected in accordance with work requirement; 1.5 Precautions in relation to working with turbocharger are observed as per work procedure; 1.6 Rols of work are identified from Toolbox meeting as per workplace standard.
2. Interpret Fundamentals of turbocharger	2.1 **Types of turbochargers** are interpreted; 2.2 Working principles of turbocharger are interpreted; 2.3 **Associated parts/components** of turbocharger are identified; 2.4 Functions of different parts/components are interpreted.
3. Identify faults of turbocharger and its components	3.1 Visual checking is performed to identify the **conditions** of turbocharger based on standard procedure; 3.2 **Performance check** is carried to identify faults based on standard procedure at running condition; 3.3 **Faults** of the turbocharger are identified based on checking and testing.
4. Repair/service of turbocharger	4.1 Correct information is accessed and interpreted from instruction manuals; 4.2 Repairing and servicing of turbocharger and components are carried out as per instruction manuals; 4.3 **Specific Parts/components** of turbocharger are replaced as per instruction manuals; 4.4 Adjustments of turbocharger parts/components are done during the servicing as per instruction manuals; 4.5 Test run of turbo charger is carried out for correct operation. as per instruction manuals.
5. Maintain workplace, tools, equipment and	5.1 Work area is cleaned in accordance with workplace procedures; 5.2 Unused materials are stored for re-use or disposed following

materials	workplace procedures; 5.3 Waste and scrap materials are disposed with following workplace procedures; 5.4 Inventory of tools equipment are conducted and recorded as per checklist; 5.5 Tools and equipment are cleaned and stored as per manufacturer recommendation in appropriate location.

Range of Variable

Variable	**Range** (May include but not limited to):
1. Safe work practices	1.1 Use PPE 1.2 Follow Lockout and Tagout (LOTO) procedure 1.3 Use fire extinguisher 1.4 Response emergency situation 1.5 Identify hazard 1.6 Control hazards 1.7 Measure risk 1.8 Use first aid 1.9 Follow Safe Working Load (SWL) 1.10 Report uncontrolled hazards
2. Personal Protective Equipment	2.1 Boiler suit 2.2 Hand Gloves. 2.3 Safety goggles 2.4 Safety helmet 2.5 Safety belt 2.6 Safety Shoes 2.7 Ear muff 2.8 Mask /respirator
3. Tools and Equipment	3.1 Hand and power tools 3.2 Socket wrench set 3.3 Combination wrenches 3.4 Adjustable wrenches 3.5 Torque wrench 3.6 Lock ring pliers 3.7 Screwdrivers 3.8 Hammers 3.9 Pliers set 3.10 Wire brush 3.11 Scraper 3.12 Allen Key set 3.13 Circlip Remover 3.14 Cleaning brush 3.15 Vernier calliper 3.16 Depth gauge 3.17 Dial gauge

	3.18 Circlip opener 3.19 Air gun 3.20 Turbocharger Toolkits 3.21 Bearing puller 3.22 Rotor Puller 3.23 Rotor lifter 3.24 Dial gauge
4. Parts/components of turbocharger	4.1 Compressor housing 4.2 Compressor wheel (impeller) 4.3 Compressor inlet and outlet 4.4 Turbine housing 4.5 Turbine wheel (rotor) 4.6 Gas inlet and outlet ports/pipes 4.7 bearing housing /center housing 4.8 Shaft (rotor shaft) 4.9 Journal bearings / ball bearings/Bush bearing 4.10 Thrust bearings 4.11 Oil inlet and outlet ports 4.12 Seals (oil seals / labyrinth seals) 4.13 V-band clamp / bolts 4.14 Variable Geometric Turbocharger (VGT) vanes 4.15 Nozzle ring 4.16 Intercooler connection
5. Materials	5.1 Kerosene 5.2 Cotton waste 5.3 Turbine oil 5.4 Spare parts/components
6. Type of turbocharger	6.1 Constant pressure system 6.2 Impulse pressure system
7. Condition	7.1 Tightening of foundation bolts 7.2 Crack 7.3 Visual mark 7.4 Bellows is in proper place and operational 7.5 Proper fitting of silencer 7.6 Air inlet filter 7.7 Leakage of intercooler
8. Performance check	8.1 Abnormal sound and vibration 8.2 Exhaust gas temperature 8.3 Inlet air pressure and temperature 8.4 RPM of turbocharger 8.5 Any leakage of exhaust and inlet system
9. Faults	9.1 Oil leakage 9.2 Bearing failure 9.3 Blade damage (compressor or turbine)

	9.4 Casing cracks or damage 9.5 Turbocharger overspeed 9.6 Low air boosting pressure 9.7 Abnormal noise and vibration 9.8 Carbon deposit (turbine side) 9.9 Exhaust backpressure too high 9.10 Poor turbocharger response (lag) 9.11 Water or salt ingress 9.12 Dirty nozzle ring
10. Specific parts/components	10.1 Bearing set 10.2 Sealing set 10.3 Labyrinth ring 10.4 Snap ring//circlip 10.5 Nozzle ring 10.6 Diffuser 10.7 Inducer 10.8 Rotor Shaft 10.9 Turbine blade 10.10 Blower side compressor
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 identified turbocharger type, model, and manufacturer specifications 1.2 isolated the turbocharger system from the engine before beginning service work 1.3 inspected turbocharger components for wear, damage, cracks, or oil contamination 1.4 dismantled the turbocharger carefully using appropriate tools and procedures 1.5 checked for shaft play, impeller damage, bearing wear, and seal integrity 1.6 replaced worn or damaged parts/components such as bearings, seals, and gaskets 1.7 reassembled the turbocharger using correct torque settings and alignment procedures 1.8 tested the turbocharger for proper rotation, balance, and leak-free operation 1.9 installed the turbocharger back onto the engine securely and reconnect all lines 1.10 run the engine to verify turbocharger performance under various load conditions.
Underpinning Knowledge	2.1 Principle of turbocharging 2.2 Types of turbochargers 2.3 Turbocharger components 2.4 Working mechanism of turbocharger

	2.5 Air and exhaust flow dynamics 2.6 Lubrication and cooling systems 2.7 Common turbocharger faults and symptoms 2.8 Inspection and diagnosis techniques 2.9 Turbocharger dismantling and assembly procedures 2.10 Balancing requirements 2.11 Gasket and seal replacement 2.12 Use of appropriate tools and equipment 2.13 Maintenance standards and service schedules 2.14 Environmental regulations.
Underpinning Skill	3.1 Identifying and interpreting turbocharger specifications 3.2 Performing visual and physical inspections 3.3 Using precision measuring tools 3.4 Dismantling and assembling turbocharger components 3.5 Cleaning and preparing components for reassembly 3.6 Replacing worn or damaged parts 3.7 Checking and adjusting rotor balance 3.8 Testing turbocharger functionality 3.9 Applying lubrication and cooling systems correctly 3.10 Using hand and power tools safely and effectively 3.11 Recording service activities and findings 3.12 Following safety and environmental procedures 3.13 Communicating technical issues effectively.
Required Attitude	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace
Resources Implication	The following resources must be provided: 5.1 Workplace 5.2 A range of diesel fuel injection and components relevant to the application 5.3 Materials relevant to servicing diesel fuel injection systems 5.4 Equipment, hand and power tooling appropriate to servicing diesel fuel injection systems 5.5 Specifications and work instructions.
Method of assessment	Assessment methods may include but not limited to: 6.1 Written Test 6.2 Demonstration 6.3 Oral Questioning/interview 6.4 Portfolio

Context for Assessment	7.1 Competency assessment must be done in NSDA accredited assessment centre; 7.2 Assessment should be done by NSDA certified assessor.

Accreditation Requirements

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Unit Code & Title	**OU-LE-MET-04-L3-V1: Maintain Records & Documentation**
Unit Descriptor	This unit of competency describes the skills, knowledge and attitude required to maintain records and documentation. It includes tasks of preparing for work, performing recording of maintenance and repairing, recording of servicing, recording engine running hours, carrying out inventory of spare parts/components, clean and store equipment.
Nominal Hours	**20 Hours**
Elements Of Competency	**Performance Criteria** **Bold and Italic** terms are elaborated in the Range of Variables
1. Prepare for work	1.1 **Safe work practices** are followed throughout the work process; 1.2 **Personal Protective Equipment** (PPE***)*** worn as required for the work performed; 1.3 Necessary **tools and equipment** are identified and collected in accordance with work requirement; 1.4 Necessary **materials** are collected in accordance with work requirement; 1.5 Precaution in relation to working with fuel system components are observed as per work procedure; 1.6 Rols of work are identified from Toolbox meeting as per workplace standard.
2. Perform recording of maintenance and repairing	2.1 **Basic Information** are logged; 2.2 the work done is mentioned; 2.3 faults found are recorded; 2.4 parts/components used are recorded; 2.5 test results / engine condition are recorded; 2.6 Recommendations / follow-up are prepared for next opportunity; 2.7 Signature and verification are done by designated authority.
3. Record of servicing	3.1 **Basic equipment** information are recorded; 3.2 Service date and time is logged in a logbook; 3.3 Observations and conditions are noted as per company procedure; 3.4 Performed **service activities** are interpreted; 3.5 Spare parts/components used in servicing are recorded as per instruction manuals; 3.6 Service outcome / remarks are mentioned on prescribed form maintenance records or Planned Maintenance Schedule (PMS) are

	updated.
4. Record engine running hours	4.1 Hour Meter Reading (HMR) is checked as per standard procedure; 4.2 Engine start and stop times are logged in a logbook; 4.3 engine logbook or maintenance system are updated as per company procedure; 4.4 Accuracy is verified with the designated person; 4.5 Operating conditions (optional) is recorded as per standard procedure; 4.6 Any discrepancies are reported as per standard procedure.
5. Carryout inventory of spare parts/components	5.1 Spare parts/components are identified and listed as per company procedure; 5.2 Spare parts/components are labelled and categorized as per recommended procedure; 5.3 Physical stock is compared as per requirement; 5.4 Inventory records is updated; 5.5 Spare parts/components are inspected for damage or expiry; 5.6 Storage area is organized as per category of machinery and spares; 5.7 Issuance and replenishment are recorded in bin card.
6. Clean and store equipment	4.1 Waste materials are disposed of in accordance with work place requirements; 4.2 Cleaning of equipment is performed in accordance with standard procedure; 4.3 Tools and equipment are stored safely in appropriate location according to standard work place procedures.

Range Of Variable

Variable	**Range** (May include but not limited to):
1. Safe work practices	1.1 Use PPE 1.2 Follow Lockout and Tagout (LOTO) procedure 1.3 Use fire extinguisher 1.4 Response emergency situation 1.5 Identify hazard 1.6 Control hazards 1.7 Measure risk 1.8 Use first aid 1.9 Follow Safe Working Load (SWL) 1.10 Report uncontrolled hazards
2. PPE	2.1 Boiler suit 2.2 Hand Gloves. 2.3 Safety goggles 2.4 Safety helmet

	2.5 Safety belt 2.6 Safety Shoes 2.7 Ear muff 2.8 Mask /respirator
3. Tools and Equipment	3.1 Bin box 3.2 Hand trolly 3.3 Wooden /Plastics pallet 3.4 PC/Laptop 3.5 Printer
4. Basic information	4.1 Equipment name (e.g., Main Engine, Turbocharger, Fuel Pump) 4.2 Equipment specifications 4.3 Date and time of maintenance 4.4 Name of person/technician who performed the task
5. Materials	5.1 Pen/pencil 5.2 Paper 5.3 Cotton waste 5.4 Spare parts/components 5.5 Registered/Log book 5.6 Bin card
6. Basic equipment	6.1 Main engine 6.2 Turbocharger 6.3 Air compressor 6.4 Fuel pump 6.5 Fuel injector 6.6 Governor 6.7 Monitoring instruments 6.8 Vibration dampers
7. Service activities	7.1 Routine inspection and monitoring 7.2 Lubrication oil change and filter replacement 7.3 Fuel system maintenance and fuel filter or element replacement 7.4 Cooling system maintenance and clean strainer 7.5 Starting and stopping system check 7.6 Battery check and replace if necessary 7.7 Clean Heat exchanger 7.8 Air system servicing 7.9 Turbocharger cleaning and servicing 7.10 Cylinder head and valve overhaul 7.11 Piston and liner inspection and replace if necessary 7.12 Crankcase inspection and cleaning 7.13 Timing and adjustment 7.14 Exhaust system inspection

	7.15 Vibration and alignment check 7.16 Emergency and safety system checks 7.17 Record keeping and reporting
Evidence Guide The evidence must be authentic, valid, sufficient, reliable, consistent and recent and meet the requirements of the current version of the Unit of Competency.	
1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Performed recording of maintenance and repairing 1.2 Recorded of servicing 1.3 Recorded engine running hours 1.4 Carried out inventory of spare parts/components 1.5 Cleaned and store equipment.
2. Underpinning Knowledge	2.1 Understanding of Documentation Types 2.2 Recordkeeping Principles and Best Practices 2.3 Regulatory and Compliance Requirements 2.4 Data Entry and Recording Procedures 2.5 Confidentiality and Security of Records 2.6 Use of Digital Tools and Software 2.7 Communication and Reporting Skills 2.8 Standard Operating Procedures (SOP).
3. Underpinning Skill	3.1 Attention to Detail 3.2 Organizational Skills 3.3 Data Entry Skills 3.4 Computer Literacy 3.5 Time Management 3.6 Communication Skills (Written and Verbal) 3.7 Compliance and Standard Following 3.8 Analytical Thinking 3.9 Confidentiality Handling 3.10 Problem-Solving Skills.
4. Required Attitude	4.1 Commitment to occupational health and safety 4.2 Promptness in carrying out activities 4.3 Sincere and honest to duties 4.4 Environmental concerns 4.5 Eagerness to learn 4.6 Tidiness and timeliness 4.7 Respect for rights of peers and seniors in workplace 4.8 Communication with peers and seniors in workplace.
5. Resources Implication	The following resources must be provided: 5.1 Workplace 5.2 A range of diesel fuel injection and components relevant to the application 5.3 Materials relevant to servicing diesel fuel injection systems

	5.4 Equipment, hand and power tooling appropriate to servicing diesel fuel injection systems 5.5 Specifications and work instructions.
6. Method of assessment	Assessment methods may include but not limited to: 6.1 Written Test 6.2 Demonstration 6.3 Oral Questioning/interview 6.4 Portfolio
7. Context for Assessment	7.1 Competency assessment must be done in NSDA accredited assessment centre; 7.2 Assessment should be done by NSDA certified assessor.

Accreditation Requirements

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Development of Competency Standard

The Competency Standards for National Skills Certificate Level-3 in **Marine Engine Technician** is Developed by NSDA on 15-16 July, 2025.

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Validation of Competency Standard

The Competency Standards for National Skills Certificate Level-3 in **Marine Engine Technician** is Validated by SCVC on 22 July, 2025.

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