



Skills for Employment Investment Program (SEIP)

COMPETENCY STANDARD FOR MECHANICAL FITTING (*LIGHT ENGINEERING SECTOR*)

Finance Division, Ministry of Finance
Government of the People's Republic of Bangladesh

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Copyright

The Competency Standard for Mechanical Fitting 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 for individuals who graduated through the established standard via competency-based assessment to be suitably qualified for a relevant job.

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List of Abbreviations

General	
BMET	Bureau of Manpower Employment and Training
B-SEP	Bangladesh Skills for Employment and Productivity
BTEB	Bangladesh Technical Education Board
DTE	Directorate of Technical Education
ILO	International Labor Organization
ISC	Industry Skills Council
NPVC	National Pre-Vocation Certificate
NTVQF	National Technical and Vocational Qualifications Framework
PPP	Public Private Partnership
SCDC	Standards and Curriculum Development Committee
SEIP	Skills for Employment Investment Program
TVET	Technical Vocational Education and Training
UoC	Unit of Competency
Occupation Specific	
LPG	Liquefied petroleum gas
OHS	Occupational health and safety
PPE	Personal protective equipment
SOP	Standard operating procedure

Introduction

The Skills for Employment Investment Program (SEIP) Project of the Finance Division of the Ministry of Finance has embarked on a project which aims to qualitatively and quantitatively expand the skilling capacity of identified public and private training providers by establishing and operationalising a responsive skill ecosystem and delivery mechanism through a combination of well-defined set of funding triggers and targeted capacity support.

Among the many components of the project, one is to promote a Market Responsive Inclusive Skills Training Delivery programme. Key priority economic growth sectors identified by the government have been targeted by the project to improve current job skills along with up-skilling of the 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 programmes. Priority sectors were identified to adopt a demand driven approach to training with effective inputs from Industry Skills Councils (ISC's), employer associations and employers.

This document 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.

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 national and international subject-matter experts, SEIP, BTEB, ISC, and industry experts to identify the competencies required of an occupation in a particular sector.

Competency standards describe the skills, knowledge and attitude needed to perform effectively in the workplace. Competency standards acknowledge that people can achieve technical and vocational competency in many ways by emphasising 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 of a unit of competency:

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

Approval Sheet

Identification and validation of units of competency and elements for this occupation were made by experts within this sector. A series of meetings were held to accurately capture industry and employer needs and expectations, and develop the competency framework that would help to enhance the employability of the youth trained. This process started on 5 July 2018 and concluded with a validation workshop with working group on 27 August 2018.

Experts Involved

Industry and subject-matter experts who provided their valuable inputs to develop this competency standard [July - August 2018]:

Name	Organisation	Designation
Md. Abdul Halim	UCEP Mirpur Technical School	Instructor - CNC Unit
Md. Lavlu Mia	UCEP Mirpur Technical School	Instructor - CNC Unit
Md. Masud Rana	BITAC (Dhaka)	Executive Engineer
Md. Abdur Razzaque	Sunrise Engineering (Dhaka)	Chairman - ISC
Rupesh Chandra Roy	BCSIR	Director (Add-Charge)
Mozammel Mia	AUST (Dhaka)	Assistant Professor
Dr. N. R. Dhar	British Council - SD03	National Subject Matter Consultant – Light Engineering Sector

Validation Workshop

Competency standard validation workshop participants [held on 27 August 2018]:

Name	Organisation	Designation
Rupak Kanti Biswas	BTEB	Quality Assurance Officer
Md. Rakibul Hassan	MAWTS	Instructor - Mechanical Fitting
Md. Oli Ullah	MAWTS	Instructor - Mechanical Fitting
Md. Abdur Razzaque	SEIP-BTEB	Specialist-1 (Competency Standards)
Syed Nasir Ershad	SEIP	AEPD (Public-1)
Md. Ahsan Habib	SEIP	TVET Specialist
Mr. Mohiuzzaman	SEIP	Course Specialist
David King	British Council - SD03	Team Leader
Dr. N. R. Dhar	British Council - SD03	National Subject Matter Consultant – Light Engineering Sector

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

Committee Workshop

The National competency standards for National Skills Certificate in Mechanical Fitting, **NTVQF Level [INSERT LEVEL]** qualification is a document developed by the Skill for Employment Investment Programme (SEIP), Finance Division, Ministry of Finance. This standard has been developed by an industry expert group under guidance of SEIP. The standard was approved by the SCDC **[BTEB to insert date]** at NTVQF Cell, BTEB.

Respectable members of the SCDC:

Mechanical Fitting - Level [INSERT LEVEL]		

Course Structure

SL	Unit Code and Title		Level	Nominal Duration (Hours)
Generic Competencies (4 units of competency required)				
1	SEIP-LE-MF-01-G	Use basic mathematical concepts		24
2	SEIP-LE-MF-02-G	Carry out workplace interaction		8
3	SEIP-LE-MF-03-G	Operate in a team environment		16
4	SEIP-LE-MF-04-G	Apply basic IT skills		12
Sub-Total				60
Sector-specific Competencies (4 units of competency required)				
1	SEIP-LE-MF-01-S	Apply occupational health and safety (OHS) practice in the workplace		12
2	SEIP-LE-MF-02-S	Read and interpret sketches and drawings		16
3	SEIP-LE-MF-03-S	Use hand and power tools		16
4	SEIP-LE-MF-04-S	Apply quality system		16
Sub-Total				60
Occupation-specific Competencies (5 units of competency required)				
1	SEIP-LE-MF-01-O	Perform basic workshop practice		60
2	SEIP-LE-MF-02-O	Perform gas cutting and welding works		60
3	SEIP-LE-MF-03-O	Fabricate simple mechanical components		30
4	SEIP-LE-MF-04-O	Carry out bearing and seal maintenance and servicing		50
5	SEIP-LE-MF-05-O	Carry out drive component maintenance and servicing		40
Sub-Total				240
Total Nominal Learning Hours				360

Competency Chart

Units of Competency	Elements		
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Generic Specific (Basic) Competencies

Use basic mathematical concepts SEIP-LE-MF-01-G	Identify calculation requirements in the workplace	Select appropriate mathematical methods/concepts for the calculation	Use tools and instruments to perform calculations
Carry out workplace interaction SEIP-LE-MF-02-G	Interpret workplace communication and etiquette	Read and understand workplace documents	Participate in workplace meetings and discussions
	Practice professional ethics at work		
Operate in a team environment SEIP-LE-MF-03-G	Identify team goals and work processes	Identify own role and responsibilities within team	Communicate and co-operate with team members
	Practice problem solving within the team		
Apply basic IT skills SEIP-LE-MF-04-G	Identify and use most commonly used IT tools	Understand use of computer	Work with word processing application
	Work with spreadsheets	Access email and search the internet	

Sector-specific (Common) Competencies

Apply occupational health and safety (OHS) practice in the workplace SEIP-LE-MF-01-S	Identify OHS policies and procedures	Apply personal health and safety practices	Report hazards and risks
	Respond to emergencies		
Read and interpret sketches and drawings SEIP-LE-MF-02-S	Interpret information and specifications	Read and interpret sketches and drawings	
Use hand and power tools SEIP-LE-MF-03-S	Identify and inspect hand and power tools	Use hand tools properly and safely	Operate power tools properly and safely
	Clean and maintain hand and power tools		
Apply quality system SEIP-LE-MF-04-S	Work within quality system	Apply and monitor quality improvement system	Apply standard procedures for each job

Occupation-specific (Core) Competencies

Perform basic workshop practice SEIP-LE-MF-01-O	Prepare for work	Perform bench work	Perform lathe machine operations
	Apply heat treatment		
Perform gas cutting and welding works SEIP-LE-MF-02-O	Prepare for work	Carry out arc welding	Carry out gas welding and cutting
	Perform brazing	Perform soldering	Clean and maintain tools, equipment and machinery
Fabricate simple mechanical components SEIP-LE-MF-03-O	Prepare for work	Fabricate items	Fix fabricated items
	Clean and maintain tools, equipment and machinery		
Carry out bearing and seal maintenance and servicing SEIP-LE-MF-04-O	Prepare for work	Perform troubleshooting	Maintain and service bearings
	Maintain and service seals	Test bearings and seals	Clean and maintain tools, equipment and machinery
Carry out drive component maintenance and servicing SEIP-LE-MF-05-O	Prepare for work	Perform troubleshooting	Carry out drive components maintenance and servicing
	Test drive component	Clean and maintain tools, equipment and machinery	

Units and Elements Table

Generic – Compulsory (4 units of competency required)

Code	Unit of Competency	Elements of Competency	Duration (hours)
SEIP-LE-MF-01-G	Use basic mathematical concepts	<ol style="list-style-type: none"> 1. Identify calculation requirements in the workplace. 2. Select appropriate mathematical methods/concepts for the calculation. 3. Use tools and instruments to perform calculations. 	24
SEIP-LE-MF-02-G	Carry out workplace interaction	<ol style="list-style-type: none"> 1. Interpret workplace communication and etiquette. 2. Read and understand workplace documents. 3. Participate in workplace meetings and discussions. 4. Practice professional ethics at work. 	8
SEIP-LE-MF-03-G	Operate in a team environment	<ol style="list-style-type: none"> 1. Identify team goals and work processes. 2. Identify own role and responsibilities within team. 3. Communicate and co-operate with team members. 4. Practice problem solving within the team. 	16
SEIP-LE-MF-04-G	Apply basic IT skills	<ol style="list-style-type: none"> 1. Identify and use most commonly used IT tools. 2. Understand use of computer. 3. Work with word processing application. 4. Work with spreadsheets. 5. Access email and search the internet. 	12
Total Hours			60

Sector-specific – Compulsory (4 units of competency required)

Code	Unit of Competency	Elements of Competency	Duration (hours)
SEIP-LE-MF-01-S	Apply occupational health and safety (OHS) practice in the workplace	<ol style="list-style-type: none"> 1. Identify OHS policies and procedures. 2. Apply personal health and safety practices. 3. Report hazards and risks. 4. Respond to emergencies. 	12
SEIP-LE-MF-02-S	Read and interpret sketches and drawings	<ol style="list-style-type: none"> 1. Interpret information and specifications. 2. Read and interpret sketches and drawings. 	16
SEIP-LE-MF-03-S	Use hand and power tools	<ol style="list-style-type: none"> 1. Identify and inspect hand and power tools. 2. Use hand tools properly and safely. 3. Operate power tools properly and safely. 4. Clean and maintain hand and power tools. 	16
SEIP-LE-MF-04-S	Apply quality systems	<ol style="list-style-type: none"> 1. Work within quality system. 2. Apply and monitor quality improvement system. 3. Apply standard procedures for each job. 	16
Total Hours			60

Occupation-specific – Compulsory (5 units of competency required)

Code	Unit of Competency	Elements of Competency	Duration (hours)
SEIP-LE-MF-01-O	Perform basic workshop practice	<ol style="list-style-type: none"> 1. Prepare for work. 2. Perform bench work. 3. Perform lathe machine operations. 4. Apply heat treatment. 	60
SEIP-LE-MF-02-O	Perform gas cutting and welding works	<ol style="list-style-type: none"> 1. Prepare for work. 2. Carry out arc welding. 3. Carry out gas welding and cutting. 4. Perform brazing. 5. Perform soldering. 6. Clean and maintain tools, equipment and machinery. 	60
SEIP-LE-MF-03-O	Fabricate simple mechanical components	<ol style="list-style-type: none"> 1. Prepare for work. 2. Fabricate items. 3. Fix fabricated items. 4. Clean and maintain tools, equipment and machinery. 	30
SEIP-LE-MF-04-O	Carry out bearing and seal maintenance and servicing	<ol style="list-style-type: none"> 1. Prepare for work. 2. Perform troubleshooting. 3. Maintain and service bearings. 4. Maintain and service seals. 5. Test bearings and seals. 6. Clean and maintain tools, equipment and machinery. 	50
SEIP-LE-MF-05-O	Carry out drive component maintenance and servicing	<ol style="list-style-type: none"> 1. Prepare for work 2. Perform troubleshooting. 3. Carry out drive component maintenance and servicing. 4. Test drive components. 5. Clean and maintain tools, equipment and machinery. 	40
Total Hours			240

Generic Competencies

Unit Title:	Use basic mathematical concepts
Unit Code:	SEIP-LE-MF-01-G
Nominal Hours:	24 hours
Unit Descriptor:	This unit covers the skills, knowledge and attitudes required to perform computations using basic mathematical concepts in the workplace. It specifically includes identifying general calculation requirements, selecting appropriate mathematical method/concept, and forming and solving mathematical problems in the workplace using appropriate tools and instruments.
Elements of Competency	Performance Criteria (<u>bold and underlined</u> terms are elaborated in the Range of Variables)
1. Identify calculation requirements in the workplace	<p>1.1. <u>Calculation requirements</u> are identified from <u>workplace information</u>.</p> <p>1.2. Mathematical problems are constructed from workplace information.</p>
2. Select appropriate mathematical methods/concepts for the calculation	<p>2.1. <u>Appropriate method</u> is selected to carry out calculation requirements.</p> <p>2.2. Constructed mathematical problems are solved with appropriate method.</p>
3. Use tools and instruments to perform calculations	<p>3.1. <u>Tools and instruments</u> required for computation are identified.</p> <p>3.2. Calculation is performed using appropriate tools and instruments accurately.</p>

Range of Variables	
Variable	Range (<i>may include but not limited to</i>)
1. Calculation requirements	<p>1.1. Unit</p> <p>1.2. Area</p> <p>1.3. Height/ length/ breadth/ thickness</p> <p>1.4. Diameter</p> <p>1.5. Weight</p> <p>1.6. Capacity</p> <p>1.7. Time</p> <p>1.8. Temperature</p> <p>1.9. Material/data usage</p> <p>1.10. Speed</p> <p>1.11. Costing</p>

Range of Variables	
Variable	Range (may include but not limited to)
2. Workplace information	2.1. Floor environment 2.2. Design sheet 2.3. Specification sheet 2.4. Working chart/drawing 2.5. Standard operating procedure (SOP) 2.6. Job order
3. Appropriate method	3.1. Addition 3.2. Subtraction 3.3. Division 3.4. Multiplication 3.5. Conversion 3.6. Percentage and ratio calculation 3.7. Simple equation
4. Tools and instruments	4.1. Calculator 4.2. Cell phone 4.3. Computer 4.4. Ruler

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 must evidence that the candidate: <ol style="list-style-type: none"> 1.1. Identified calculation requirements from workplace information 1.2. Selected appropriate method to carry out the calculation requirements 1.3. Completed calculations using appropriate tools and instruments
2. Underpinning knowledge	<ol style="list-style-type: none"> 2.1. Numerical concepts 2.2. Basic mathematical methods such as addition, subtraction, multiplication, division and percentage 2.3. Mathematical language, symbols and terminology 2.4. Measuring units
3. Underpinning skills	<ol style="list-style-type: none"> 3.1. Constructing simple problems from workplace information 3.2. Solving problems using appropriate method, tools and instruments 3.3. Using appropriate tools and instruments

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.

4. Underpinning attitudes	4.1. Prompt in carrying out activities 4.2. Tidy and punctual 4.3. Respectful of peers, subordinates and seniors in the workplace 4.4. Safely use tools and equipment 4.5. Sincere and honest concerning duties
5. Resource implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Calculator 5.3. Cell phone 5.4. Computer/laptop/notebook 5.5. Measuring tape 5.6. Ruler 5.7. Projector 5.8. Stationary 5.9. Learning manual
6. Methods of assessment	Methods of assessment may include but is not limited to: 6.1. Written test 6.2. Oral test 6.3. Observation 6.4. Demonstration 6.5. Portfolio
7. Context of assessment	7.1. Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. 7.2. Assessment must be done by a suitably qualified/certified assessor.

Accreditation Requirements

Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any NTVQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.

Unit Title:	Carry out workplace interaction
Unit Code:	SEIP-LE-MF-02-G
Nominal Hours:	8 hours
Unit Descriptor:	This unit covers the skills, knowledge and attitudes required to carry out workplace interaction. It specifically includes workplace communication, etiquette, understanding workplace documents, workplace meetings and discussions, and professional ethics at work.
Elements of Competency	Performance Criteria (<u>bold and underlined</u> terms are elaborated in the Range of Variables)
1. Interpret workplace communication and etiquette	<p>1.1. Workplace codes of conduct are interpreted as per organisational guidelines.</p> <p>1.2. Appropriate lines of communication are maintained with supervisors and colleagues.</p> <p>1.3. Workplace interactions are conducted in a <u>courteous manner</u> to gather and convey information.</p> <p>1.4. <u>Workplace procedures and matters</u> are comprehended.</p>
2. Read and understand workplace documents	<p>2.1. Workplace documents are interpreted correctly.</p> <p>2.2. Visual information/symbols/signage are understood correctly and followed.</p> <p>2.3. Specific and relevant information are accessed from <u>appropriate sources</u>.</p> <p>2.4. Appropriate medium is used to transfer information and ideas.</p>
3. Participate in workplace meetings and discussions	<p>3.1. Team meetings are attended on time.</p> <p>3.2. Meeting procedures and etiquette are followed.</p> <p>3.3. Active participation is ensured, opinions are expressed and heard.</p> <p>3.4. Inputs are provided and interpreted in line with the meeting purpose.</p>
4. Practice professional ethics at work	<p>4.1. Responsibilities as a team member are performed.</p> <p>4.2. Tasks are performed in accordance with workplace procedures.</p> <p>4.3. Confidentiality is maintained.</p> <p>4.4. Inappropriate and conflicting situations are avoided.</p>

Range of Variables	
Variable	Range (<i>may include but not limited to</i>)
1. Courteous manner	1.1. Effective questioning 1.2. Active listening 1.3. Speaking skills 1.4. Writing skill 1.5. Email etiquette
2. Workplace procedures and matters	2.1. Notes 2.2. Arranging a meeting 2.3. Agenda 2.4. Simple reports such as progress and incident reports 2.5. Job sheets 2.6. Operational manuals 2.7. Brochures and promotional material 2.8. Visual and graphic materials 2.9. Standards 2.10. OHS information 2.11. Signs
3. Appropriate sources	3.1. Human Resources (HR) Department 3.2. Managers 3.3. Supervisors 3.4. Management Information System (MIS)

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 must evidence that the candidate: <ol style="list-style-type: none"> 1.1. Interpreted workplace communication and etiquette 1.2. Interpreted workplace instructions and symbols 1.3. Performed active participation in workplace meetings
2. Underpinning knowledge	<ol style="list-style-type: none"> 2.1. Workplace communication and etiquette 2.2. Workplace documents, signs and symbols 2.3. Meeting procedure and etiquette 2.4. Professional ethics
3. Underpinning skills	<ol style="list-style-type: none"> 3.1. Demonstrating workplace communication and etiquette 3.2. Interpreting workplace instructions and symbols 3.3. Demonstrating active participation in workplace meeting 3.4. Applying professional ethics at work

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.

4. Underpinning attitudes	4.1. Prompt in carrying out activities 4.2. Tidy and punctual 4.3. Respectful of peers, subordinates and seniors in the workplace 4.4. Concerned about the work environment 4.5. Sincere and honest concerning duties
5. Resource implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Workplace procedures 5.3. Standard operating procedure 5.4. Workplace documents, signs and symbols 5.5. Codes of conduct 5.6. Projector 5.7. Stationary 5.8. Learning manual
6. Methods of assessment	Methods of assessment may include but is not limited to: 6.1. Written test 6.2. Oral test 6.3. Observation 6.4. Demonstration 6.5. Portfolio
7. Context of assessment	7.1. Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. 7.2. Assessment must be done by a suitably qualified/certified assessor.

Accreditation Requirements

Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any NTVQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.

Unit Title:	Operate in a team environment
Unit Code:	SEIP-LE-MF-03-G
Nominal Hours:	16 hours
Unit Descriptor:	This unit covers the skills, knowledge and attitudes required to operate in a team environment. It specifically includes team goals and work processes, roles and responsibilities, team communication and problem solving within the team.
Elements of Competency	Performance Criteria (<u>bold and underlined</u> terms are elaborated in the Range of Variables)
1. Identify team goals and work processes	<p>1.1. Roles and objectives of the team are identified and interpreted.</p> <p>1.2. Roles and responsibilities of team members are identified and interpreted.</p>
2. Identify own role and responsibilities within team	<p>2.1. Personal role and responsibilities are identified within the team environment.</p> <p>2.2. Reporting relationships are interpreted within team and external to team.</p>
3. Communicate and co-operate with team members	<p>3.1. Other teammates' tasks are identified and support provided when requested.</p> <p>3.2. The team is encouraged through <u>sharing information</u> or expertise, working together to solve problems, and putting team success first.</p> <p>3.3. Views and opinions of other team members are interpreted and respected.</p>
4. Practice problem solving within the team	<p>4.1. Problems faced at the individual and team level are identified and showed insight into the root-causes of the problems.</p> <p>4.2. A range of solutions and courses of action are identified together with benefits, costs, and risks associated with each.</p> <p>4.3. The good ideas of others to help develop solutions are recognised and advice sought from those who have solved similar problems.</p> <p>4.4. It is looked beyond the obvious and not stopped at the first answers.</p>

Range of Variables	
Variable	Range <i>(may include but not limited to)</i>
1. Sharing information	1.1. Agenda 1.2. Minutes 1.3. Progress and incident reports 1.4. Operational manuals 1.5. Visual and graphic materials 1.6. Emails and SMS 1.7. Phone directory 1.8. Policy, procedure and standards 1.9. OHS information

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 must evidence that the candidate: 1.1 Identified own role and responsibilities within team 1.2 Communicated and co-operated with team members 1.3 Demonstrated problem solving within the team
2. Underpinning knowledge	2.1. Team goals and work processes 2.2. Roles and responsibilities 2.3. Finding problems and solving them
3. Underpinning skills	3.1. Identifying own role and responsibilities within team 3.2. Communicating and co-operating with team members 3.3. Demonstrating problem solving within the team
4. Underpinning attitudes	4.1. Active on teamwork 4.2. Prompt in carrying out activities 4.3. Tidy and punctual 4.4. Respectful of peers, subordinates and seniors in the workplace 4.5. Sincere and honest concerning duties
5. Resource implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Projector 5.3. Stationary 5.4. Learning manual

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.

6. Methods of assessment

Methods of assessment may include but is not limited to:

- 6.1. Written test
- 6.2. Oral test
- 6.3. Observation
- 6.4. Demonstration
- 6.5. Portfolio

7. Context of assessment

- 7.1. Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency.
- 7.2. Assessment must be done by a suitably qualified/certified assessor.

Accreditation Requirements

Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any NTVQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.

Unit Title:	Apply basic IT skills
Unit Code:	SEIP-LE-MF-04-G
Nominal Hours:	12 hours
Unit Descriptor:	This unit covers the skills, knowledge and attitudes required to apply basic IT skills in the workplace. It specifically includes identifying common IT tools, using computer, using word processing and spreadsheet applications, emailing and searching on internet.
Elements of Competency	Performance Criteria (<u>bold and underlined</u> terms are elaborated in the Range of Variables)
1. Identify and use most commonly used IT tools	<p>1.1. History of information technology (IT) is identified and summarised.</p> <p>1.2. Commonly used <u>IT tools</u> are identified and described.</p>
2. Understand use of computer	<p>2.1. Basic parts of a computer are identified.</p> <p>2.2. Turning on and off technique of a computer is performed.</p> <p>2.3. Working environment, functions and features of operating system is interpreted.</p> <p>2.4. Simple trouble-shooting techniques are applied.</p>
3. Work with word processing application	<p>3.1. Word processing application appropriate to perform activity is operated.</p> <p>3.2. Basic typing technique to document is applied.</p> <p>3.3. Word processing techniques to document are employed.</p> <p>3.4. Personal CV writing using suitable word processing techniques is practiced.</p> <p>3.5. Saving and retrieving technique of a document is used.</p>
4. Work with spreadsheets	<p>4.1. Spreadsheet working environment, functions and features are identified and interpreted.</p> <p>4.2. Data entry on spreadsheet appropriate to perform activity is performed.</p> <p>4.3. <u>Data manipulation techniques</u> to spreadsheet document are applied.</p> <p>4.4. Spreadsheet document is created and saved.</p>
5. Access email and search the internet	<p>5.1. Use of email account in online environment is explained.</p> <p>5.2. Writing and sending of workplace emails is completed.</p> <p>5.3. Different <u>browsers</u> to work online are identified and selected.</p> <p>5.4. Browse different web portals and apply proper search techniques.</p>

Range of Variables	
Variable	Range (may include but not limited to)
1. IT tools	1.1. Cell phone 1.2. Tablets 1.3. Computers, laptops, notebooks 1.4. Internet 1.5. Software 1.6. Satellite
2. Data manipulation techniques	2.1. Sum 2.2. Average 2.3. Count 2.4. Max 2.5. Min 2.6. If 2.7. Sort 2.8. Fill 2.9. Header 2.10. Footer 2.11. Print
3. Browsers	3.1. Internet Explorer 3.2. Firefox 3.3. Google Chrome 3.4. Opera 3.5. Safari 3.6. Omni Web 3.7. Microsoft Edge

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 must evidence that the candidate: <ol style="list-style-type: none"> 1.1. Identified commonly used IT tools 1.2. Performed simple trouble-shooting with computer 1.3. Performed typing on word processing software, saved and retrieved documents 1.4. Performed data entry with spreadsheet 1.5. Used email account for different online purposes
2. Underpinning knowledge	<ol style="list-style-type: none"> 2.1. IT and IT tools 2.2. Computer trouble-shooting 2.3. Techniques to access internet

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.

3. Underpinning skills	3.1. Demonstrating simple trouble-shooting with computer 3.2. Demonstrating typing on word processing software 3.3. Demonstrating data entry with spreadsheet 3.4. Opening email account and using it for different purposes
4. Underpinning attitudes	4.1. Active on teamwork 4.2. Prompt in carrying out activities 4.3. Tidy and punctual 4.4. Respectful of peers, subordinates and seniors in the workplace 4.5. Sincere and honest concerning duties
5. Resource implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Computer/laptop/notebook 5.3. IT tools 5.4. Software 5.5. Internet 5.6. Projector 5.7. Stationary 5.8. Learning manual
6. Methods of assessment	Methods of assessment may include but is not limited to: 6.1. Written test 6.2. Oral test 6.3. Observation 6.4. Demonstration 6.5. Portfolio
7. Context of assessment	7.1. Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. 7.2. Assessment must be done by a suitably qualified/certified assessor.

Accreditation Requirements

Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any NTVQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.

Sector-specific Competencies

Unit Title:	Apply occupational health and safety (OHS) practice in the workplace
Unit Code:	SEIP-LE-MF-01-S
Nominal Hours:	12 hours
Unit Descriptor:	This unit covers the skills, knowledge and attitudes required to apply occupational health and safety (OHS) practices in the workplace. It specifically includes identifying OHS policies and procedures, applying personal health and safety practices, reporting hazards and risks, and responding to emergencies.
Elements of Competency	Performance Criteria (<u>bold and underlined</u> terms are elaborated in the Range of Variables)
1. Identify OHS policies and procedures	<p>1.1. <u>OHS policies</u> and safe operating procedures are interpreted.</p> <p>1.2. Safety signs and symbols are identified and followed.</p> <p>1.3. Response, evacuation procedures and other contingency measures are interpreted correctly.</p>
2. Apply personal health and safety practices	<p>2.1. OHS policies and procedures are applied in the workplace including <u>personal protective equipment (PPE)</u>.</p> <p>2.2. Common health issues are recognised.</p> <p>2.3. Common safety issues are identified.</p>
3. Report hazards and risks	<p>3.1. Hazards and risks are identified.</p> <p>3.2. Hazards and risks assessment and controls are interpreted.</p>
4. Respond to emergencies	<p>4.1. Respond to alarms and warning devices.</p> <p>4.2. <u>Emergency response plans and procedures</u> are responded to.</p> <p>4.3. <u>First aid procedures</u> during emergency situations are identified.</p>

Range of Variables	
Variable	Range (<i>may include but not limited to</i>)
1. OHS policies	<p>1.1. Organisational OHS policies</p> <p>1.2. International OHS requirements</p> <p>1.3. Fire safety rules and regulations</p>
2. Emergency response plans and procedures	<p>2.1. Fire fighting procedures</p> <p>2.2. Earthquake response procedures</p> <p>2.3. Emergency response plans and procedures</p> <p>2.4. Medical and first aid</p>

Range of Variables	
Variable	Range (may include but not limited to)
3. First aid procedure	3.1. Washing of open wound 3.2. Washing chemically infected area 3.3. Applying bandage 3.4. Taking appropriate medicine
4. Personal protective equipment	4.1. Safety glasses 4.2. Ear plugs 4.3. Gloves 4.4. Apron 4.5. Helmet 4.6. Mask 4.7. Safety shoes

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 must evidence that the candidate: <ol style="list-style-type: none"> 1.1. Identified OHS policies and procedures 1.2. Applied personal health and safety practices (including PPE) 1.3. Reported hazards and risks 1.4. Responded to emergencies
2. Underpinning knowledge	<ol style="list-style-type: none"> 2.1. Workplace OHS policies and procedures 2.2. Work safety procedures 2.3. Emergency response procedures: <ol style="list-style-type: none"> 2.3.1. Fire fighting 2.3.2. Earthquake response 2.3.3. Accident response 2.4. Types of hazards (biological, chemical and physical) and their effects 2.5. OHS awareness 2.6. Personal protective equipment (PPE)
3. Underpinning skills	<ol style="list-style-type: none"> 3.1. Identifying OHS policies and procedures 3.2. Applying personal health and safety practices 3.3. Reporting hazards and risks 3.4. Responding to emergencies

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.

4. Underpinning attitudes	<ul style="list-style-type: none">4.1. Committed to occupational health and safety practices4.2. Communicates well with peers, subordinates and seniors in workplace4.3. Prompt in carrying out activities4.4. Tidy and punctual4.5. Sincere and honest concerning duties4.6. Responsible during emergencies
5. Resource implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none">5.1. Workplace (simulated or actual)5.2. Personal protective equipment (PPE)5.3. Firefighting equipment5.4. Emergency response manual5.5. First aid kits5.6. Stationary5.7. Learning manual
6. Methods of assessment	<p>Methods of assessment may include but is not limited to:</p> <ul style="list-style-type: none">6.1. Written test6.2. Oral test6.3. Observation6.4. Demonstration6.5. Portfolio
7. Context of assessment	<ul style="list-style-type: none">7.1. Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency.7.2. Assessment must be done by a suitably qualified/certified assessor.

Accreditation Requirements

Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any NTVQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.

Unit Title:	Read and interpret sketches and drawings
Unit Code:	SEIP-LE-MF-02-S
Nominal Hours:	16 hours
Unit Descriptor:	This unit covers the skills, knowledge and attitudes required to read and interpret sketches and drawings. It specifically includes interpreting information and specifications, and reading and interpreting sketches and drawings.
Elements of Competency	Performance Criteria (<u>bold and underlined</u> terms are elaborated in the Range of Variables)
1. Interpret information and specifications	1.1. Appropriate <u>manuals</u> for work activity are identified and collected. 1.2. Information and <u>specifications</u> in the manuals is interpreted and applied.
2. Read and interpret sketches and drawings	2.1. Relevant <u>sketches and drawings</u> are identified for job requirement. 2.2. Key <u>terms and abbreviations</u> are identified and interpreted. 2.3. <u>Signs and symbols</u> are identified and interpreted. 2.4. Schedules, dimensions, sketches, drawings and specifications are correctly read and interpreted.

Range of Variables	
Variable	Range (<i>may include but not limited to</i>)
1. Manuals	1.1. Buyers specification 1.2. Compliance 1.3. Maintenance procedure 1.4. Periodic maintenance 1.5. Quality assurance 1.6. Standard operating procedure (SOP)
2. Sketches and drawings	2.1. Technical 2.2. Measurement 2.3. Design
3. Specifications	3.1. Product 3.2. Performance 3.3. Method
4. Terms and abbreviations	4.1. Refers to all terms and abbreviations associated with the Light Engineering Sector
5. Signs and symbols	5.1. Includes all signs and symbols associated with the Light Engineering Sector

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 must evidence that the candidate: 1.1. Identified information and specifications 1.2. Read and interpreted sketches and drawings
2. Underpinning knowledge	2.1. Manuals 2.2. Units of measurement 2.3. Units of conversion 2.4. Sketch, drawings and specifications
3. Underpinning skills	3.1. Reading and identifying information and specifications (from manual) 3.2. Reading and interpreting sketches and drawings
4. Underpinning attitudes	4.1. Eager to learn 4.2. Tidy and punctual 4.3. Concerned about proper use of computer and peripherals 4.4. Concerned for other's rights 4.5. Sincere and honest concerning duties
5. Resource implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Computer/laptop/notebook 5.3. Software 5.4. Sketches and drawings 5.5. Specifications 5.6. Manuals 5.7. Stationary 5.8. Learning manual
6. Methods of assessment	Methods of assessment may include but is not limited to: 6.1. Written test 6.2. Oral test 6.3. Observation 6.4. Demonstration 6.5. Portfolio
7. Context of assessment	7.1. Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. 7.2. Assessment must be done by a suitably qualified/certified assessor.

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.

Accreditation Requirements

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Unit Title:	Use hand and power tools
Unit Code:	SEIP-LE-MF-03-S
Nominal Hours:	16 hours
Unit Descriptor:	This unit covers the skills, knowledge and attitudes required to use hand and power tools in the workplace. It specifically includes identifying and inspecting hand and power tools for usability, using and operating tools properly and safely, and cleaning and maintaining hand and power tools after use.
Elements of Competency	Performance Criteria (<u>bold and underlined</u> terms are elaborated in the Range of Variables)
1. Identify and inspect hand and power tools	<p>1.1. Appropriate hand and power tools are identified.</p> <p>1.2. Application of hand and power tools is recognized.</p> <p>1.3. Usability of hand and power tools is checked and verified.</p>
2. Use hand tools properly and safely	<p>2.1. Appropriate <u>hand tools</u> are selected.</p> <p>2.2. Safety precautions are ensured before using hand tools.</p> <p>2.3. Unsafe or faulty hand tools are identified and marked for repair.</p> <p>2.4. <u>Measuring tools</u> are checked and calibrated before use.</p> <p>2.5. Use hand tools properly and safely to perform work activity.</p>
3. Operate power tools properly and safely	<p>3.1. Appropriate <u>power tools</u> are selected.</p> <p>3.2. Power supply outlet and electrical cord are inspected and confirmed safe for use in accordance with established workplace safety requirements.</p> <p>3.3. Safety precautions are ensured before using power tools in accordance with manufacturer's operating specification.</p> <p>3.4. Proper sequence of operation applied for using power tools.</p> <p>3.5. Unsafe or faulty power tools are identified and marked for repair.</p> <p>3.6. Operate power tools properly and safely to perform work activity.</p>
4. Clean and maintain hand and power tools	<p>4.1. Dust and foreign matter is removed from hand and power tools in accordance to workplace standards.</p> <p>4.2. Condition of hand and power tools is checked after use and reported.</p> <p>4.3. Appropriate lubricant is applied after use and prior to storage.</p> <p>4.4. <u>Measuring tools</u> are checked and calibrated after use.</p> <p>4.5. Defective hand and power tools are inspected and repaired or replaced.</p> <p>4.6. Hand and power tools are stored and secured in accordance with workplace requirements.</p>

Range of Variables	
Variable	Range <i>(may include but not limited to)</i>
1. Hand tools	1.1. Hammer 1.2. Bench vice 1.3. Files 1.4. Punches 1.5. Chisels 1.6. Wrenches 1.7. Pliers 1.8. Scriber 1.9. Screwdrivers 1.10. Hacksaw 1.11. Socket spanners 1.12. Spanners 1.13. Vice grip 1.14. Wire cutters 1.15. Drill 1.16. Grinder 1.17. Clamps 1.18. Jacks
2. Power tools	2.1. Drills 2.2. Rivet gun 2.3. Grinders 2.4. Saws 2.5. Glue guns 2.6. Soldering iron
3. Measuring tools	3.1. Meters 3.2. Testers 3.3. Megger 3.4. Measuring tape 3.5. Hose level 3.6. Water level 3.7. Calliper 3.8. Steel rule 3.9. Protractor 3.10. Tri-square

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 must evidence that the candidate: 1.1. Identified and selected appropriate hand and power tools for work to be performed 1.2. Identified and used measuring and testing tools appropriate to work activity 1.3. Followed safety precautions when using hand and power tools 1.4. Operated power tools safely and pursuant to manufacturer's operating specification 1.5. Performed cleaning and maintenance of hand and power tools after use and prior to storing
2. Underpinning knowledge	2.1. Information on types of hand and power tools, their functions and use 2.2. Procedures for safely using hand and power tools
3. Underpinning skills	3.1. Identifying hand, power and measuring tools 3.2. Following safety precautions when using hand, power and measuring tools 3.3. Using hand and measuring tools correctly and safely in accordance with manufacturer's operating specification 3.4. Operating power tools correctly and safely in accordance with manufacturer's operating specification 3.5. Cleaning and maintaining hand and power tools after use 3.6. Applying appropriate lubricant on hand and power tools after use and prior to storing
4. Underpinning 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. Tidiness and timeliness 4.6. Concerned for proper use of tools
5. Resource implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Personal protective equipment (PPE) 5.3. Hand tools 5.4. Power tools 5.5. Measuring tools 5.6. Projector 5.7. Stationary 5.8. Learning manual

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.

6. Methods of assessment

Methods of assessment may include but is not limited to:

- 6.1. Written test
- 6.2. Oral test
- 6.3. Observation
- 6.4. Demonstration
- 6.5. Portfolio

7. Context of assessment

- 7.1. Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency.
- 7.2. Assessment must be done by a suitably qualified/certified assessor.

Accreditation Requirements

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Unit Title:	Apply quality system
Unit Code:	SEIP-LE-MF-04-S
Nominal Hours:	16 hours
Unit Descriptor:	This unit covers the knowledge, skills and attitudes required to apply quality systems and procedure in the workplace. It specifically includes identifying general quality procedures within a manufacturing environment, applying and monitoring a quality improvement system, and applying standard procedures for each job.
Elements of Competency	Performance Criteria (<u>bold and underlined</u> terms are elaborated in the Range of Variables)
1. Work within quality system	<p>1.1. Instructions and procedures relating to <u>quality improvement system</u> are identified and followed.</p> <p>1.2. Duties are performed in accordance with quality improvement system ensuring conformance to specifications.</p> <p>1.3. Defects are detected and reported to authority according to standard operating procedure.</p> <p>1.4. Quality service is delivered to customer in providing a product or service.</p>
2. Apply and monitor quality improvement system	<p>2.1. Performance measurement systems are identified.</p> <p>2.2. Specifications and standard operating procedure are identified and established.</p> <p>2.3. Performance is assessed at regular intervals.</p> <p>2.4. Defects are detected and reported to authority according to standard operating procedure.</p> <p>2.5. Process improvement procedures are contributed to and implemented.</p> <p>2.6. Improvement of internal/external customer and supplier relationships is contributed to.</p> <p>2.7. Performance of operation or quality of product or service is monitored to ensure customer satisfaction.</p>
3. Apply standard procedures for each job	<p>3.1. Concept of supplying product or service to meet the customer's requirements is understood and accordingly applied.</p> <p>3.2. Responsibility is taken for quality of own work.</p> <p>3.3. Quality system procedures for each job are followed.</p> <p>3.4. Conformance to specification is ensured in every case at all situations.</p>

Range of Variables	
Variable	Range <i>(may include but not limited to)</i>
1. Quality improvement system	1.1. Quality inspection 1.2. Quality control 1.3. Quality improvement 1.4. Total quality control 1.5. Quality assurance

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 must evidence that the candidate: 1.1 Followed quality system instructions and procedures 1.2 Maintained proper specifications and standards of product 1.3 Checked product for quality assurance 1.4 Detected defects and took corrective action 1.5 Applied and monitored quality improvement system 1.6 Applied standard procedures for each job 1.7 Ensured customer satisfaction
2. Underpinning knowledge	2.1. Quality system procedures 2.2. Product specifications 2.3. Quality assurance process 2.4. Performance measurement systems 2.5. Standard operating procedures 2.6. Record keeping
3. Underpinning skills	3.1. Identifying and explaining quality improvement system 3.2. Identifying product and process specifications and standards 3.3. Applying and monitoring quality improvement system 3.4. Detecting defects and faults in product 3.5. Implementing corrective action 3.6. Keeping records in accordance with standard operating procedure 3.7. Identifying and meeting customer requirements

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.

4. Underpinning attitudes	<ul style="list-style-type: none">4.1. Promptness in carrying out activities4.2. Sincere and honest to duties4.3. Tidy and punctual4.4. Active on teamwork4.5. Eager to learn4.6. Communicate with peers and seniors in the workplace4.7. Environmental concerns4.8. Concerned for proper use of tools4.9. Commitment to occupational health and safety
5. Resource implications	The following resources must be provided: <ul style="list-style-type: none">5.1. Workplace (simulated or actual)5.2. Specifications5.3. Standard operating procedure5.4. Quality improvement procedure5.5. Quality assurance protocol5.6. Sample products5.7. Projector5.8. Stationary5.9. Learning manual
6. Methods of assessment	Methods of assessment may include but is not limited to: <ul style="list-style-type: none">6.1. Written test6.2. Oral test6.3. Observation6.4. Demonstration6.5. Portfolio
7. Context of assessment	<ul style="list-style-type: none">7.1. Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency.7.2. Assessment must be done by a suitably qualified/certified assessor.

Accreditation Requirements

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Occupation-specific Competencies

Unit Title:	Perform basic workshop practice
Unit Code:	SEIP-LE-MF-01-O
Nominal Hours:	60 hours
Unit Descriptor:	This unit covers the skills, knowledge and attitudes required to perform basic workshop practice. It specifically includes preparing for work, performing bench work, perform lathe machine operations, and applying heat treatment.
Elements of Competency	Performance Criteria (<u>bold and underlined</u> terms are elaborated in the Range of Variables)
1. Prepare for work	<p>1.1. Read and interpret specifications and instructions.</p> <p>1.2. Identify and select appropriate personal protective equipment (PPE).</p> <p>1.3. Identify and select job specific <u>tools and equipment</u>.</p>
2. Perform bench work	<p>2.1. Bench working <u>materials</u> are collected in accordance with workplace specification</p> <p>2.2. Bench working <u>operations</u> are performed in accordance with job specifications.</p> <p>2.3. Work area, tools, equipment and materials are maintained and stored in accordance with standard operating procedure.</p>
3. Perform lathe machine operations	<p>3.1. <u>Lathe tools and equipment</u> are selected and checked for functionality and working condition.</p> <p>3.2. <u>Work piece and lathe setting</u> is carried out in accordance with job specifications.</p> <p>3.3. <u>Lathe machine operations</u> are carried out in accordance with job specifications and standard operating procedure.</p> <p>3.4. Work area, tools, equipment and materials are maintained and stored in accordance with standard operating procedure.</p>
4. Apply heat treatment	<p>4.1. Principles of heat treatment processes are identified and explained</p> <p>4.2. <u>Heat treatment tools and equipment</u> are selected and checked for functionality and working condition.</p> <p>4.3. <u>Heat treatment materials</u> are prepared in accordance with job specifications.</p> <p>4.4. <u>Heat treatment process</u> is carried out in accordance with job requirements and standard operating procedure.</p> <p>4.5. Work area, tools, equipment and materials are maintained and stored in accordance with standard operating procedure.</p>

Range of Variables	
Variable	Range (may include but not limited to)
1. Tools and equipment	<p>1.1. Tools:</p> <ul style="list-style-type: none"> 1.1.1. Scriber 1.1.2. File 1.1.3. Chisel 1.1.4. Ball peen hammer 1.1.5. Cross peen hammer 1.1.6. Drill bit 1.1.7. Hand hacksaw 1.1.8. Combination wrench 1.1.9. Mechanical pliers <p>1.2. Equipment:</p> <ul style="list-style-type: none"> 1.2.1. Workbench 1.2.2. Drill press (pedestal/bench) 1.2.3. Grinder 1.2.4. Bending machine
2. Materials	<ul style="list-style-type: none"> 2.1. Mild steel plate 2.2. Steel rod 2.3. Aluminium 2.4. Iron pipe 2.5. Cotton rags 2.6. Coolant oil 2.7. Grease 2.8. Lubricating oil 2.9. Cleaning solvent
3. Operations	<ul style="list-style-type: none"> 3.1. Lay outing 3.2. Sawing 3.3. Chiselling 3.4. Filing 3.5. Drilling 3.6. Reaming 3.7. Countersinking 3.8. Counter boring 3.9. Off-hand grinding 3.10. Hand tapping/threading

Range of Variables	
Variable	Range <i>(may include but not limited to)</i>
4. Lathe tools and equipment	4.1. Tools: <ul style="list-style-type: none"> 4.1.1. Combination wrenches 4.1.2. Socket wrenches 4.1.3. Pipe wrench 4.1.4. C-spanner 4.1.5. Centering gauge 4.1.6. Steel rule 4.1.7. Vernier calliper 4.1.8. Micrometre 4.1.9. Dial indicator 4.1.10. Machinist hammer 4.1.11. Plastic/rubber mallet 4.1.12. Flat screwdriver 4.1.13. Philips screwdriver 4.1.14. Hand hacksaw 4.2. Equipment: <ul style="list-style-type: none"> 4.2.1. Lathe machine (with accessories) 4.2.2. Drill press 4.2.3. Bench/pedestal grinder 4.2.4. Tool and cutter grinder 4.2.5. Work bench 4.2.6. Bench vice 4.2.7. Anvil
5. Work piece and lathe setting	<ul style="list-style-type: none"> 5.1. Workpiece measuring and checking 5.2. Workpiece chucking/clamping on lathe chuck 5.3. Workpiece centering 5.4. Workpiece levelling and alignment 5.5. Cutting tool grinding/sharpening 5.6. Grinding tool clamping 5.7. Lathe machine speed setting 5.8. Tool feed setting/adjusting 5.9. Machine coolant checking and operating 5.10. Machine guard checking and engaging

Range of Variables	
Variable	Range (may include but not limited to)
6. Lathe machine operations	6.1. Facing 6.2. Straight turning 6.3. Shoulder turning 6.4. Step turning 6.5. Grooving 6.6. Parting off operation 6.7. Taper turning
7. Heat treatment tools and equipment	7.1. Tools: 7.1.1. Mechanical pliers 7.1.2. Hammer 7.1.3. Thermometer 7.1.4. Pyrometer 7.1.5. Temperature meter 7.1.6. Tongs 7.1.7. Anvil 7.1.8. Quenching bucket 7.2. Equipment: 7.2.1. Heat treatment oven/furnace 7.2.2. Oxy-acetylene outfit 7.2.3. LPG equipment 7.2.4. Quenching unit
8. Heat treatment materials	8.1. Mild steel plate 8.2. Mild steel round bar 8.3. Carbon steel bar (round or square profile) 8.4. Quenching oil 8.5. Water 8.6. Carbon material (coal) 8.7. LPG gas 8.8. Acetylene 8.9. Oxygen
9. Heat treatment process	9.1. Heating 9.2. Annealing 9.3. Hardening 9.4. Tempering 9.5. Normalising

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 must evidence that the candidate: 1.1. Prepared for work 1.2. Performed bench work 1.3. Performed lathe machine operations 1.4. Carried out heat treatment process 1.5. Cleaned and maintained tools, equipment and materials
2. Underpinning knowledge	2.1. Tools and equipment 2.2. Maintenance procedures 2.3. Types and properties of bench work materials 2.4. Different types bench work and their application 2.5. Techniques and procedures of bench work operations 2.6. Lathe tools and equipment 2.7. Setting work piece and lathe procedure 2.8. Lathe machine operations 2.9. Principles of heat treatment process 2.10. Heat treatment processes and their application 2.11. Types and properties of heat treatment materials
3. Underpinning skills	3.1. Selecting and checking the function and working condition of tools and equipment 3.2. Identifying and collecting bench work materials 3.3. Performing bench work operations 3.4. Selecting and checking the function and working condition of lathe tools and equipment 3.5. Carrying out workpiece and lathe setting 3.6. Performing lathe machine operations 3.7. Gathering and checking the function and working conditions of heat treatment tools and equipment 3.8. Preparing heat treatment materials 3.9. Carrying out heat treatment process 3.10. Maintaining work area, tools, equipment and machinery
4. Underpinning attitudes	4.1. Tidy and punctual 4.2. Prompt in carrying out activities 4.3. Sincere and honest concerning duties 4.4. Active on teamwork 4.5. Eager to learn 4.6. Concerned for proper use of tools 4.7. Committed to occupational health and safety practices 4.8. Respectful of peers, subordinates and seniors in the workplace 4.9. Communicate with peers and seniors in the workplace

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.

5. Resource implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Personal protective equipment (PPE) 5.3. Tools and equipment 5.4. Materials 5.5. Job specifications 5.6. Manuals 5.7. Stationary 5.8. Learning manual
6. Methods of assessment	Methods of assessment may include but is not limited to: 6.1. Written test 6.2. Oral test 6.3. Observation 6.4. Demonstration 6.5. Portfolio
7. Context of assessment	7.1. Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. 7.2. Assessment must be done by a suitably qualified/certified assessor.

Accreditation Requirements

Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any NTVQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.

Unit Title:	Perform gas cutting and welding works
Unit Code:	SEIP-LE-MF-02-O
Nominal Hours:	60 hours
Unit Descriptor:	This unit covers the skills, knowledge and attitudes required to perform gas cutting and welding works. It specifically includes preparing for work, carrying out arc welding, carrying out gas welding and cutting, performing brazing, performing soldering, and cleaning and maintaining tools, equipment and machinery.
Elements of Competency	Performance Criteria (<u>bold and underlined</u> terms are elaborated in the Range of Variables)
1. Prepare for work	<p>1.1. Read and interpret specifications and instructions.</p> <p>1.2. Identify and select appropriate personal protective equipment (PPE).</p> <p>1.3. Identify and select job specific tools and equipment.</p>
2. Carry out arc welding	<p>2.1. Job specifications are interpreted in accordance with given welding plan/drawing.</p> <p>2.2. <u>Welding tools and equipment</u> are selected as per job requirements.</p> <p>2.3. <u>Welding materials and electrodes</u> are selected as per job requirements.</p> <p>2.4. <u>Welding joint, welding position</u> and process are identified as per job requirement.</p> <p>2.5. Welding is performed in accordance with job specifications and standard operating procedure.</p>
3. Carry out gas cutting and welding	<p>3.1. <u>Gas cutting and welding tools, equipment</u> are selected as per job requirements.</p> <p>3.2. <u>Gas cutting and welding materials</u> are identified and prepared in accordance with job requirements.</p> <p>3.3. Fusion gas welding is performed in accordance with job specifications and standard operating procedure.</p> <p>3.4. Welds are cleaned, checked for quality and <u>weld defects</u> are identified.</p> <p>3.5. Gas cutting procedure is performed in accordance with job requirements and standard operating procedure.</p> <p>3.6. Cleaning and removing of slag on cut ends of material is performed.</p> <p>3.7. Cutting defects are identified and corrective action is taken in accordance with workplace procedure.</p>

<p>4. Perform brazing</p>	<p>4.1. Appropriate flame is set on the welding torch in accordance with required brazing application.</p> <p>4.2. Suitable materials are brazed in accordance with job requirements.</p> <p>4.3. Joints are brazed in accordance with job requirements</p> <p>4.4. Appropriate brazing flux and brazing filler rods are used for brazing work.</p> <p>4.5. Brazed surface is cleaned, checked for quality and defects identified.</p>
<p>5. Perform soldering</p>	<p>5.1. Soldering tools and equipment are selected as per requirements.</p> <p>5.2. Soldering materials are identified and prepared.</p> <p>5.3. Soldering process is carried out in accordance with job requirements and standard operating procedure.</p> <p>5.4. Soldered surface is cleaned, checked for quality and defects rectified.</p>
<p>6. Clean and maintain tools, equipment and machinery</p>	<p>6.1. Tools, equipment and machinery is cleaned and maintained.</p> <p>6.2. Workplace is cleaned.</p> <p>6.3. Waste materials are disposed of correctly.</p> <p>6.4. Tools, equipment and machinery are stored safely pursuant to workplace guidelines.</p>

Range of Variables	
Variable	Range (may include but not limited to)
<p>1. Welding tools and equipment</p>	<p>1.1. Tools:</p> <ul style="list-style-type: none"> 1.1.1 Clamps 1.1.2 Chipping hammer 1.1.3 Pliers 1.1.4 Wire brush 1.1.5 Weld gauge 1.1.6 Job holding devices/fixture <p>1.2. Equipment:</p> <ul style="list-style-type: none"> 1.2.1. AC/DC welding machine 1.2.2. Drill press (pedestal/bench) 1.2.3. Bench grinder/pedestal grinder 1.2.4. Bending machine 1.2.5. Hydraulic press 1.2.6. Welding table

Range of Variables	
Variable	Range (may include but not limited to)
2. Welding materials and electrodes	<p>2.1. Materials:</p> <p>2.1.1. Mild steel plate</p> <p>2.1.2. Cast iron</p> <p>2.1.3. Wrought iron</p> <p>2.1.4. Aluminium</p> <p>2.1.5. Brass</p> <p>2.2. Electrodes:</p> <p>2.2.1. E-6010</p> <p>2.2.2. E-6011</p> <p>2.2.3. E-6013</p> <p>2.2.4. E-6021</p> <p>2.2.5. E-7018</p>
3. Welding joint	<p>3.1. Butt</p> <p>3.2. T</p> <p>3.3. Lap</p> <p>3.4. Corner</p> <p>3.5. Edge</p>
4. Welding position	<p>4.1. Fillet weld:</p> <p>4.1.1. 1F</p> <p>4.1.2. 2F</p> <p>4.1.3. 3F</p> <p>4.2. Grooved weld:</p> <p>4.2.1. 1G</p> <p>4.2.2. 2G</p> <p>4.2.3. 3G</p>

Range of Variables	
Variable	Range (may include but not limited to)
5. Gas cutting and welding tools and equipment	<p>5.1. Tools:</p> <p>5.1.1. Spark lighter</p> <p>5.1.2. Welding torch tip set</p> <p>5.1.3. Pressure regulating set with hose</p> <p>5.1.4. Clamps</p> <p>5.1.5. Chipping hammer</p> <p>5.1.6. Locking pliers</p> <p>5.1.7. Mechanical Pliers</p> <p>5.1.8. Vice grip</p> <p>5.1.9. Wire brush</p> <p>5.2. Equipment:</p> <p>5.2.1. Welding table</p> <p>5.2.2. Job holding devices/fixture</p> <p>5.2.3. Oxy-acetylene welding set</p> <p>5.2.4. LPG welding set</p> <p>5.2.5. Cutting outfit set</p> <p>5.2.6. Gas welding outfit set</p>
6. Gas cutting and welding materials	<p>6.1. Bimetal strips (Gauge 18)</p> <p>6.2. G.I sheet metal strips (Gauge 16)</p> <p>6.3. Flux (Borax)</p> <p>6.4. Filler rod (1/16", 3/32", 5/32" and 1/8" diameter)</p> <p>6.5. G.I. wire gauge 16</p> <p>6.6. Oxygen gas</p> <p>6.7. Acetylene gas</p>
7. Weld defects	<p>7.1. Lack of penetration</p> <p>7.2. Excess of penetration</p> <p>7.3. Porosity</p> <p>7.4. Crack</p> <p>7.5. Slag</p> <p>7.6. Inclusion</p> <p>7.7. Undercut</p> <p>7.8. Lack of fusion</p> <p>7.9. Dimension</p>
8. Type of flame	<p>8.1. Carburizing flame</p> <p>8.2. Neutral flame</p> <p>8.3. Oxidizing flame</p>

Range of Variables	
Variable	Range (may include but not limited to)
9. Suitable materials	9.1. Steel plates 9.2. Copper plates 9.3. Copper tubes 9.4. Steel tubes 9.5. Cast iron plates
10. Types joints	10.1. Lap 10.2. Butt 10.3. Fillet
11. Soldering tools and equipment	11.1. Soldering gun 11.2. Soldering iron (different wattage) 11.3. Desoldering pump 11.4. Clamps 11.5. Pliers 11.6. Wire brush 11.7. Soldering table 11.8. Job holding devices/fixture
12. Soldering Materials	12.1. Soldering paste 12.2. Solder wire 12.3. Solder bar 12.4. Soldering flux 12.5. Flux thinner 12.6. Flux rework pen 12.7. Solder mask

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 must evidence that the candidate: <ol style="list-style-type: none"> 1.1. Prepared for work 1.2. Performed welding 1.3. Performed fusion gas welding 1.4. Carried out brazing 1.5. Carried out soldering 1.6. Cleaned and maintained tools, equipment and machinery

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.

2. Underpinning knowledge	<ul style="list-style-type: none">2.1. Tools and equipment2.2. Drawings, plans and sketches2.3. Welding materials and electrodes2.4. Weld joints and positions2.5. Welding processes2.6. Arc welding2.7. Fusion gas welding2.8. Gas cutting and welding2.9. Brazing2.10. Soldering2.11. Quality assurance and defect identification2.12. Maintenance procedures
3. Underpinning skills	<ul style="list-style-type: none">3.1. Selecting and checking the function and working condition of tools and equipment3.2. Identifying and selecting welding materials and electrodes3.3. Identifying weld joints, positions and processes3.4. Performing arc welding3.5. Perform fusion gas welding3.6. Performing brazing3.7. Performing soldering3.8. Cleaning weld, brazed and soldered surface3.9. Carrying out quality assurance and identifying defects3.10. Maintaining work area, tools, equipment and machinery
4. Underpinning attitudes	<ul style="list-style-type: none">4.1. Tidy and punctual4.2. Prompt in carrying out activities4.3. Sincere and honest concerning duties4.4. Active on teamwork4.5. Eager to learn4.6. Concerned for proper use of tools4.7. Committed to occupational health and safety practices4.8. Respectful of peers, subordinates and seniors in the workplace4.9. Communicate with peers and seniors in the workplace

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.

5. Resource implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Personal protective equipment (PPE) 5.3. Tools and equipment 5.4. Welding materials and electrodes 5.5. Job specifications 5.6. Manuals 5.7. Stationary 5.8. Learning manual
6. Methods of assessment	Methods of assessment may include but is not limited to: 6.1. Written test 6.2. Oral test 6.3. Observation 6.4. Demonstration 6.5. Portfolio
7. Context of assessment	7.1. Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. 7.2. Assessment must be done by a suitably qualified/certified assessor.

Accreditation Requirements

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Unit Title:	Fabricate simple mechanical components
Unit Code:	SEIP-LE-MF-03-O
Nominal Hours:	30 hours
Unit Descriptor:	This unit covers the skills, knowledge and attitudes required to fabricate simple mechanical components. It specifically includes preparing for work, fabricating items, fixing fabricated items, and cleaning and maintaining tools, equipment and machinery.
Elements of Competency	Performance Criteria (<u>bold and underlined</u> terms are elaborated in the Range of Variables)
1. Prepare for work	<p>1.1. Read and interpret specifications and instructions.</p> <p>1.2. Identify and select appropriate personal protective equipment (PPE).</p> <p>1.3. Identify and select job specific <u>tools and equipment</u>.</p> <p>1.4. Identify and select job specific <u>materials</u>.</p>
2. Fabricate items	<p>2.1. Measure and mark materials as per job specifications and drawing.</p> <p>2.2. Cut/bend/roll/grind materials following standard operating procedure as per job requirement.</p> <p>2.3. Store fabricated items safely and securely as per job requirement.</p>
3. Fix fabricated items	<p>3.1. Prepare work surface for fixing item as per job requirement.</p> <p>3.2. Perform work to repair/fix fabricated item as per job requirement.</p> <p>3.3. Carry out visual inspection of completed job, if necessary.</p>
4. Clean and maintain tools, equipment and machinery	<p>4.1. Tools, equipment and machinery is cleaned and maintained.</p> <p>4.2. Workplace is cleaned.</p> <p>4.3. Waste materials are disposed of correctly.</p> <p>4.4. Tools, equipment and machinery are stored safely pursuant to workplace guidelines.</p>

Range of Variables	
Variable	Range (may include but not limited to)
1. Tools and equipment	1.1. Hammer 1.2. Chisel 1.3. Centre punch 1.4. Protector 1.5. Measuring instrument 1.6. Divider 1.7. Try square 1.8. Mallet 1.9. Snip
2. Materials	2.1. Sheets metals (GI, MS, SS) 2.2. Marking chalk 2.3. Marking thread 2.4. Nuts and bolts

Evidence Guide	
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1. Critical aspects of competency	Assessment must evidence that the candidate: <ol style="list-style-type: none"> 1.1. Prepared for work 1.2. Performed fabrication of items 1.3. Repaired/fixed fabricated items 1.4. Cleaned and maintained tools, equipment and machinery
2. Underpinning knowledge	<ol style="list-style-type: none"> 2.1. Tools and equipment 2.2. Drawings, plans and sketches 2.3. Calculations and measurements 2.4. Marking and laying out 2.5. Arc and gas welding 2.6. Painting 2.7. Quality assurance and defect identification 2.8. Maintenance procedures
3. Underpinning skills	<ol style="list-style-type: none"> 3.1. Identifying and selecting appropriate tools and equipment 3.2. Performing fabrication of items 3.3. Carrying out quality assurance and identifying defects 3.4. Carry out repair of fabricated items 3.5. Maintaining work area, tools, equipment and machinery

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.

4. Underpinning attitudes	<ul style="list-style-type: none">4.1. Tidy and punctual4.2. Prompt in carrying out activities4.3. Sincere and honest concerning duties4.4. Active on teamwork4.5. Eager to learn4.6. Concerned for proper use of tools4.7. Committed to occupational health and safety practices4.8. Respectful of peers, subordinates and seniors in the workplace4.9. Communicate with peers and seniors in the workplace
5. Resource implications	The following resources must be provided: <ul style="list-style-type: none">5.1. Workplace (simulated or actual)5.2. Personal protective equipment (PPE)5.3. Tools and equipment5.4. Materials5.5. Job specifications5.6. Manuals5.7. Stationary5.8. Learning manual
6. Methods of assessment	Methods of assessment may include but is not limited to: <ul style="list-style-type: none">6.1. Written test6.2. Oral test6.3. Observation6.4. Demonstration6.5. Portfolio
7. Context of assessment	<ul style="list-style-type: none">7.1. Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency.7.2. Assessment must be done by a suitably qualified/certified assessor.

Accreditation Requirements

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Unit Title:	Carry out bearing and seal maintenance and servicing
Unit Code:	SEIP-LE-MF-04-O
Nominal Hours:	50 hours
Unit Descriptor:	This unit covers the skills, knowledge and attitudes required to carry out bearing and seal maintenance and servicing. It specifically preparing for work, performing troubleshooting, maintaining and servicing bearings, maintaining and servicing seals, testing bearings and seals, and cleaning and maintaining tools, equipment and machinery.
Elements of Competency	Performance Criteria (<u>bold and underlined</u> terms are elaborated in the Range of Variables)
1. Prepare for work	<p>1.1. Read and interpret specifications and instructions.</p> <p>1.2. Identify and select appropriate personal protective equipment (PPE).</p> <p>1.3. Identify and select job specific tools and equipment.</p>
2. Perform troubleshooting	<p>2.1. <u>Bearing classification</u> and <u>types of bearings</u> are identified.</p> <p>2.2. Properties and application of plain bearings are described.</p> <p>2.3. Properties and application of different types of roller bearings is explained.</p> <p>2.4. <u>Types of load</u> experienced by bearings are identified and described.</p> <p>2.5. Bearing load analysis is applied on <u>bearing mounting</u>.</p> <p>2.6. <u>Common bearing faults</u> are identified.</p>
3. Maintain and service bearings	<p>3.1. <u>Tools, equipment and materials (bearing maintenance)</u> are identified.</p> <p>3.2. <u>Bearing removal and mounting</u> is carried out as per job requirement.</p> <p>3.3. <u>Bearing plays and clearances</u> are applied during mounting as per job requirement and manufacturer's specification.</p> <p>3.4. Lubricant is applied on bearings during mounting as per job requirement and manufacturer's specification.</p>
4. Maintain and service seals	<p>4.1. <u>Seal classification</u> and <u>types of seals</u> are identified.</p> <p>4.2. <u>Common seal faults</u> are identified.</p> <p>4.3. <u>Tools, equipment and materials (for seal maintenance)</u> are identified and prepared.</p> <p>4.4. <u>Gasket and seals removal and installation</u> is carried out as per job requirement.</p> <p>4.5. Lubricant is applied on seals during mounting as per job requirement and manufacturer's specification.</p>

5. Test bearings and seals	<p>5.1. Bearings are tested for correct operation as per job requirement and manufacturer's specification.</p> <p>5.2. Seals are tested for proper as per job requirement and manufacturer's specification.</p>
6. Clean and maintain tools, equipment and machinery	<p>6.1. Tools, equipment and machinery is cleaned and maintained.</p> <p>6.2. Workplace is cleaned.</p> <p>6.3. Waste materials are disposed of correctly.</p> <p>6.4. Tools, equipment and machinery are stored safely pursuant to workplace guidelines.</p>

Range of Variables	
Variable	Range (may include but not limited to)
1. Bearing classification	<p>1.1. Plain (sliding) bearing</p> <p>1.2. Anti-friction (rolling) bearing</p>
2. Types of bearings	<p>2.1. Types of plain (sliding) bearings:</p> <p>2.1.1. Sleeve (bush) bearing</p> <p>2.1.2. Journal bearing</p> <p>2.2. Anti-friction (rolling) bearings:</p> <p>2.2.1. Ball bearing</p> <p>2.2.2. Roller bearing</p>
3. Types of load	<p>3.1. Radial</p> <p>3.2. Axial</p> <p>3.3. Combined</p>
4. Bearing mounting	<p>4.1. Straddle</p> <p>4.2. Overhang</p>
5. Common bearing faults	<p>5.1. Abrasion due to presence of foreign materials</p> <p>5.2. Lack of lubrication</p> <p>5.3. Corrosion due to presence of water or moisture</p> <p>5.4. Faulty adjustment (too tight or loose)</p> <p>5.5. Faulty dismounting and mounting procedure</p>

Range of Variables	
Variable	Range (may include but not limited to)
6. Tools, equipment and materials (bearing maintenance)	<p>6.1. Tools:</p> <p>6.1.1. Combination wrenches</p> <p>6.1.2. Socket wrenches</p> <p>6.1.3. Open-ended wrenches</p> <p>6.1.4. Adjustable wrench</p> <p>6.1.5. Screwdrivers</p> <p>6.1.6. Ball peen hammer</p> <p>6.1.7. Rubber/plastic hammer</p> <p>6.1.8. Rubber mallet</p> <p>6.1.9. Mechanical pliers</p> <p>6.1.10. Vice grip</p> <p>6.1.11. Bearing sleeves</p> <p>6.1.12. Drift punch</p> <p>6.1.13. Bearing puller</p> <p>6.2. Equipment:</p> <p>6.2.1. Bearing heater</p> <p>6.2.2. Mandrel</p> <p>6.2.3. Hydraulic press</p> <p>6.2.4. Drill press</p> <p>6.2.5. Portable grinder</p> <p>6.2.6. Oxy-acetylene welding outfit</p> <p>6.3. Materials:</p> <p>6.3.1. Lubricating oil</p> <p>6.3.2. Grease</p> <p>6.3.3. Cotton rag</p> <p>6.3.4. Cleaning solvent</p>
7. Bearing mounting and removal	<p>7.1. Hammer and drift punch</p> <p>7.2. Puller</p> <p>7.3. Hydraulic press/jack</p> <p>7.4. Bearing heater</p>
8. Bearing plays and clearances	<p>8.1. Radial</p> <p>8.2. Axial</p>
9. Seal classification	<p>9.1. Static</p> <p>9.2. Dynamic</p>

Range of Variables	
Variable	Range (may include but not limited to)
10. Types of seals	10.1. Gaskets 10.2. O-rings 10.3. Packing 10.4. Shaft 10.5. Rod 10.6. Mechanical
11. Common seal faults	11.1. Premature wear due to presence of foreign materials 11.2. Incompatible system lubricant/fluid 11.3. Faulty mounting 11.4. Incorrect type/design/size of seal used 11.5. Excessive/abnormal system pressure 11.6. Excessive/abnormal system temperature 11.7. Excessive/abnormal system vibration
12. Tools, equipment and materials (seal maintenance)	12.1. Tools: 12.1.1. Combination wrenches 12.1.2. Socket wrenches 12.1.3. Open-ended wrenches 12.1.4. Adjustable wrench 12.1.5. Screwdrivers 12.1.6. Ball peen hammer 12.1.7. Rubber/plastic hammer 12.1.8. Mechanical pliers 12.1.9. Vice grip 12.1.10. Sleeves 12.1.11. Drift punch 12.1.12. Seal puller 12.2. Equipment: 12.2.1. Mandrel 12.2.2. Hydraulic press 12.2.3. Drill press 12.3. Materials: 12.3.1. Lubricating oil 12.3.2. Grease 12.3.3. Cotton rag 12.3.4. Cleaning solvent
13. Seal removal and installation	13.1. Hammer and drift punch 13.2. Special seal puller 13.3. Sleeve and hydraulic press 13.4. Lubricating seal during installation

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 must evidence that the candidate: 1.1. Prepared for work 1.2. Identified faults in bearings and seals 1.3. Carried out maintenance and servicing of bearing and seals 1.4. Tested bearings and seals for correct operation 1.5. Cleaned and maintained tools, equipment and machinery
2. Underpinning knowledge	2.1. Tools and equipment 2.2. Classification of bearings 2.3. Types of plain and roller bearings 2.4. Bearing loads 2.5. Bearing analysis 2.6. Common bearing faults 2.7. Bearing removal and mounting 2.8. Classification of seals 2.9. Types of seals 2.10. Common seal faults 2.11. Gasket and seal removal and installation 2.12. Testing procedures 2.13. Maintenance procedures
3. Underpinning skills	3.1. Identifying and selecting appropriate tools and equipment 3.2. Analysing bearing loads 3.3. Identifying common bearing faults 3.4. Performing bearing maintenance and servicing 3.5. Removal and mounting of bearings 3.6. Applying appropriate lubricant 3.7. Identifying common seal faults 3.8. Performing seal maintenance and servicing 3.9. Removing and installing of gaskets and seals 3.10. Carrying out testing of bearings and seals 3.11. Maintaining work area, tools, equipment and machinery

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.

4. Underpinning attitudes	<ul style="list-style-type: none">4.1. Tidy and punctual4.2. Prompt in carrying out activities4.3. Sincere and honest concerning duties4.4. Active on teamwork4.5. Eager to learn4.6. Concerned for proper use of tools4.7. Committed to occupational health and safety practices4.8. Respectful of peers, subordinates and seniors in the workplace4.9. Communicate with peers and seniors in the workplace
5. Resource implications	The following resources must be provided: <ul style="list-style-type: none">5.1. Workplace (simulated or actual)5.2. Personal protective equipment (PPE)5.3. Tools and equipment5.4. Materials5.5. Job specifications5.6. Manuals5.7. Stationary5.8. Learning manual
6. Methods of assessment	Methods of assessment may include but is not limited to: <ul style="list-style-type: none">6.1. Written test6.2. Oral test6.3. Observation6.4. Demonstration6.5. Portfolio
7. Context of assessment	<ul style="list-style-type: none">7.1. Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency.7.2. Assessment must be done by a suitably qualified/certified assessor.

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Unit Title:	Carry out drive component maintenance and servicing
Unit Code:	SEIP-LE-MF-05-O
Nominal Hours:	40 hours
Unit Descriptor:	This unit covers the skills, knowledge and attitudes required to carry out drive component maintenance and servicing. It specifically preparing for work, performing troubleshooting, maintaining and servicing drive components, testing drive components, and cleaning and maintaining tools, equipment and machinery.
Elements of Competency	Performance Criteria (<u>bold and underlined</u> terms are elaborated in the Range of Variables)
1. Prepare for work	<p>1.1. Read and interpret specifications and instructions.</p> <p>1.2. Identify and select appropriate personal protective equipment (PPE).</p> <p>1.3. Identify and select job specific tools and equipment.</p>
2. Perform troubleshooting	<p>2.1. Operating principles of <u>mechanical machines</u> and their drive components are explained.</p> <p>2.2. Types of <u>mechanical drive</u> are identified and described.</p> <p>2.3. Types of <u>machine motion transmission</u> are identified and described.</p> <p>2.4. <u>Operational problems</u> of mechanical drive components are identified and explained.</p> <p>2.5. <u>Common faults</u> of drive components are identified.</p>
3. Maintain and service drive components	<p>3.1. <u>Tools, equipment and materials</u> are selected and checked for function and working condition.</p> <p>3.2. <u>Operating condition</u> of drive components are checked as per manufacturer's specifications.</p> <p>3.3. Installation of drive components is performed.</p> <p>3.4. Alignment of drive components is checked and non-conformities rectified.</p> <p>3.5. Level of drive is checked and non-conformities are rectified as per manufacturer's specifications.</p> <p>3.6. <u>Component</u> replacement is carried out as per manufacturer's specifications.</p> <p>3.7. Preventive maintenance is carried out as per manufacturer's specifications.</p>
4. Test drive components	<p>4.1. Drive components are tested for correct operation.</p> <p>4.2. Adjustments, if necessary, are carried out as per job requirements and manufacturer's specifications.</p>
5. Clean and maintain tools, equipment and machinery	<p>5.1. Tools, equipment and machinery is cleaned and maintained.</p> <p>5.2. Workplace is cleaned.</p> <p>5.3. Waste materials are disposed of correctly.</p> <p>5.4. Tools, equipment and machinery are stored safely pursuant to workplace guidelines.</p>

Range of Variables	
Variable	Range (may include but not limited to)
1. Mechanical machines	<ul style="list-style-type: none"> 1.1. Pumps (water, oil, slurry) 1.2. Air compressors 1.3. Gas compressors 1.4. Furnace 1.5. Cranes 1.6. Conveyors 1.7. Boilers
2. Mechanical drive	<ul style="list-style-type: none"> 2.1. Shafts 2.2. Bearing 2.3. Coupling 2.4. Belt drives 2.5. Chain drives 2.6. Gear drives
3. Machine motion transmission	<ul style="list-style-type: none"> 3.1. Rotation to rotation shafts in line 3.2. Rotation to rotation shafts in parallel 3.3. Rotation to rotation shafts in an angle 3.4. Rotation to linear motion 3.5. Linear motion to rotation
4. Operation problems	<ul style="list-style-type: none"> 4.1. Excessive vibration 4.2. Noisy operation 4.3. Low power 4.4. Low capacity
5. Common faults	<ul style="list-style-type: none"> 5.1. Damaged/broken bearings 5.2. Very low operating speed 5.3. Over speeding 5.4. Overloading 5.5. Shaft nonalignment 5.6. Machine and components not levelled 5.7. Excessive vibration 5.8. Excessive operating temperature 5.9. Noisy operation

Range of Variables	
Variable	Range <i>(may include but not limited to)</i>
6. Tools, equipment and materials	6.1. Tools: <ul style="list-style-type: none"> 6.1.1. Wrenches 6.1.2. Screwdrivers 6.1.3. Punches (centre, drift) 6.1.4. Hammers (ball peen, rubber, plastic, mallet) 6.1.5. Spirit level 6.1.6. Piano wire (for levelling) 6.1.7. Bearing puller 6.2. Equipment: <ul style="list-style-type: none"> 6.2.1. Press (drill, hydraulic) 6.2.2. Grinding machine 6.2.3. Pneumatic torque wrench 6.2.4. Bench 6.2.5. Welding machine and cutting outfit (oxy-acetylene, arc) 6.3. Materials: <ul style="list-style-type: none"> 6.3.1. Gasket materials 6.3.2. O-rings 6.3.3. Lubricating oil 6.3.4. Grease 6.3.5. Welding rod 6.3.6. Cleaning solvent 6.3.7. Cotton rags
7. Operating condition	<ul style="list-style-type: none"> 7.1. Presence of corrosion 7.2. Dimension 7.3. Wear 7.4. Geometrical shape 7.5. Material deterioration

Range of Variables	
Variable	Range <i>(may include but not limited to)</i>
8. Component	<ul style="list-style-type: none"> 8.1. Shaft (plain, stepped, crankshaft, cam shaft) 8.2. Bearing 8.3. Coupling 8.4. Gasket 8.5. Seal 8.6. Chain 8.7. Sprocket 8.8. V-belt 8.9. Flat belt 8.10. Timing belt 8.11. Gears 8.12. Camshaft

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	<p>Assessment must evidence that the candidate:</p> <ul style="list-style-type: none"> 1.1. Prepared for work 1.2. Identified faults in drive components 1.3. Performed repair of drive components 1.4. Carried out preventive maintenance of drive components 1.5. Tested drive components for correct operation 1.6. Cleaned and maintained tools, equipment and machinery
2. Underpinning knowledge	<ul style="list-style-type: none"> 2.1. Tools and equipment 2.2. Types of drive components and transmissions 2.3. Operating principles of drive components and transmissions 2.4. Common faults in drive components 2.5. Drive component installation process 2.6. Alignment and levelling methods and techniques 2.7. Preventative maintenance procedures 2.8. Testing procedures 2.9. Maintenance procedures

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3. Underpinning skills	3.1. Identifying and selecting appropriate tools and equipment 3.2. Identifying faults of drive components 3.3. Performing installation of drive components 3.4. Checking alignment of drive components 3.5. Checking level of drive components 3.6. Identifying non-conformities and making adjustments 3.7. Carrying out testing of drive components 3.8. Maintaining work area, tools, equipment and machinery
4. Underpinning attitudes	4.1. Tidy and punctual 4.2. Prompt in carrying out activities 4.3. Sincere and honest concerning duties 4.4. Active on teamwork 4.5. Eager to learn 4.6. Concerned for proper use of tools 4.7. Committed to occupational health and safety practices 4.8. Respectful of peers, subordinates and seniors in the workplace 4.9. Communicate with peers and seniors in the workplace
5. Resource implications	The following resources must be provided: 5.1. Workplace (simulated or actual) 5.2. Personal protective equipment (PPE) 5.3. Tools and equipment 5.4. Materials 5.5. Job specifications 5.6. Manuals 5.7. Stationary 5.8. Learning manual
6. Methods of assessment	Methods of assessment may include but is not limited to: 6.1. Written test 6.2. Oral test 6.3. Observation 6.4. Demonstration 6.5. Portfolio
7. Context of assessment	7.1. Competency assessment must be done in a training institute or an actual or simulated workplace after completion of this unit of competency. 7.2. Assessment must be done by a suitably qualified/certified assessor.

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Accreditation Requirements

Training Providers must be accredited by Bangladesh Technical Education Board (BTEB), 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 any NTVQF qualification. Accredited providers assessing against this unit of competency must meet the quality assurance requirements set by BTEB.