



# **COMPETENCY STANDARDS & ASSESSMENT GUIDE FOR MACHINE SHOP PRACTICE**

**Skills for Employment Investment Program (SEIP)  
Finance Division, Ministry of Finance**

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The Competency Standards for Machine Shop Practices a document for the development of curricula, teaching and learning materials, and assessment tools. It also serves as the document for providing trainings consistent with the requirement of industry in order for individuals who passed through the set standard via assessment would be qualified and settled for a relevant job.

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## 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 operationalizing a responsive skill eco system 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 program. Key priority economic growth sectors identified by 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 the industry to address identified skills to enable industry growth and increased employment through the provision of market responsive inclusive skills training programs. Priority sectors were identified to adopt a demand driven approach to training with effective inputs from Industry Skills Councils (ISCs), Employer Associations and Employers.

This document is developed to improve skills in accordance with the job roles and skill sets of the occupation and ensure that the required skills are aligned to industry requirements.

The document details the format, sequencing, wording and layout of the Competency Standard for an occupation which comprised 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 a job or occupation or trade corresponding to the standard of performance required in the workplace.

Competency standard:

- Provides a consistent and reliable set of components for training, recognizing and assessing people's skills, and may have optional support materials.
- enables industry recognized qualifications to be awarded through direct assessment of workplace competencies
- encourages the development and delivery of flexible training which suits individual and industry requirements
- Encourages learning and assessment in a work-related environment, which leads to verifiable workplace outcomes.

A working group who comprised national and international process experts develops competency Standards and the participation of experts from the industry 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 vocational and technical 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 at training organization or any combination of these.

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:

- Reference to Industry Sector, Occupational Title and Occupational Description
- Unit code
- Unit title
- Unit descriptor
- Unit of Competency
- Elements and performance criteria
- Variables and range statement
- Evidence guides

Together all the parts of a Unit of Competency:

- Describe a work activity
- Guide the assessor in determining whether the candidate is competent.

Identification and validation of units of competency and elements for each occupation were made by experts of various light engineering companies through an industry consultative workshop held at the Bangladesh Engineering Industry Owners Association (BEIOA) on 28<sup>th</sup> of February 2016.

Profile of experts and facilitators who participated in the Competency Verification and Validation Workshop are given below:

**Competency Verification-Validation Experts:**

<b>Name</b>	<b>Company</b>	<b>Job Position/Expertise</b>
Al-Hajj AbulHasim	Nipun Engineering	Lathe machine operation expert
Sayed Hayder Ali	Asian Tools	Lathe machine operation expert
Md. Ali Akbar	Akbar Engineering Works	Milling machine operation expert
Khandaker Nasir Uddin	Gear Center Engineering	Milling machine operation expert
Md. Nazrul Islam	NH Welding Works	Welding expert
Md. Kamal Miah	Kamal Welding Works	Welding expert
Md. Riaz	Riaz Refrigeration Works	Refrigeration and Air Conditioning expert
Md. Abdul Awoal	Joyti Refrigeration Works	Refrigeration and Air Conditioning expert
Engr. Md. Faruk Hossain	Farmamekh Engineering	CAD-CAM expert
A.K. Azad	Azad Industry	CAD-CAM expert
Salim Ahmed	Salim Engineering Works	Master Craftsman expert
AnowarulHaqueAnswari	Anowar Engineering Works	Master Craftsman expert

**Workshop Facilitators:**

Md. Mohiuzzaman	SEIP	Course Specialist
EmeterioCedillo, Jr.	SEIP	International Specialist
Md. Atiar Rahman	SEIP	National Specialist

The ensuing sections of this document comprise a description of the respective occupation with all the key components of a Unit of Competency:

- A chart with an overview of all Units of Competency for the respective occupation including the Unit Codes and the Unit of Competency titles and corresponding Elements.
- The Competency Standards that include the Unit of Competency, Unit Descriptor, Elements and Performance Criteria, Range of Variables, Curricular Content Guide and Assessment Evidence Guide

## COMPETENCY PROFILE/CHART FOR MACHINE SHOP PRACTICE

### UNITS OF COMPETENCY

### ELEMENTS

#### A. Generic (Basic) Competencies

<b>PERFORM COMPUTATIONS USING BASIC MATHEMATICAL CONCEPTS</b> (SEIP-LIG-MSP-1-G)	Identify calculation requirements in the workplace.	Select appropriate mathematical methods/concepts for the calculation.	Use tool/instrument to perform calculations	
<b>APPLY OCCUPATIONAL HEALTH AND SAFETY (OHS) PRACTICES IN THE WORKPLACE</b> (SEIP-LIG-MSP-2-G)	Identify OHS policies and procedures	Apply personal health and safety practices	Report hazards and risks	Respond to emergencies
<b>COMMUNICATE IN ENGLISH IN THE WORKPLACE</b> (SEIP-LIG-MSP-3-G)	Read and understand Workplace documents in English	Write simple workplace written communications in English.	Listen and comprehend to English conversation	Perform conversations in English language
<b>OPERATE IN A SELF-DIRECTED TEAM.</b> (SEIP-LIG-MSP-4-G)	Identify team goals and processes.	Communicate and cooperate with team members.	Work as a team member	Solve problems as a team member

#### B. Sector Specific (Common) Competencies

<b>INTERPRET TECHNICAL DRAWINGS AND PLANS</b> (SEIP-LIG-MSP-1-S)	Select technical drawing.	Interpret technical drawings.	Store manuals, designs and plans	
<b>WORK WITH MECHANICAL HAND AND POWER TOOLS</b> (SEIP-LIG-MSP-2-S)	Inspect hand tools and power tools for usability	Use hand tools properly and safely	Operate power tools properly and safely	Clean/maintain hand tools and power tools after use
<b>CARRY OUT PRECISION CHECKS AND MEASUREMENTS</b> (SEIP-LIG-MSP-3-S)	Select the job to be measured	Select measuring and checking tool/instrument	Obtain measurements and checks	Record/communicate measurement and check results.
	Clean, maintain and store the measuring instruments.			

<b>APPLY QUALITY SYSTEMS AND PROCEDURES</b> (SEIP-LIG-MSP-4-S)	Work within quality system	Apply and monitor quality system improvements in the workplace.	Take responsibility for quality work.	Apply standard procedures for each job.
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### C. Occupation Specific (Core) Competencies

<b>CARRYOUT BENCH WORKING OPERATIONS</b> (SEIP-LIG-MSP-1-O)	Gather tools, equipment and materials for bench work.	Perform bench work.	Carry out drilling and reaming operations.	Carry out manual thread cutting and damage bolt and tap removal.
	Perform off-hand grinding operation	Clean, care maintain and store tools and equipment.		
<b>PERFORM DRILLING MACHINE OPERATIONS</b> (SEIP-LIG-MSP-2-O)	Prepare for drilling operation.	Grind drill bits.	Perform drilling operations.	Clean and store tools and equipment.
<b>PERFORM LATHE MACHINE OPERATIONS</b> (SEIP-LIG-MSP-3-O)	Prepare for lathe operations	Grind lathe cutting tools	Setup lathe works	Perform facing, straight, step, shoulder turning, grooving and parting-off operations.
	Perform taper and eccentric turning.	Perform thread cutting operations	Clean and store tools and equipment.	
<b>PERFORM MILLING MACHINE OPERATIONS</b> (SEIP-LIG-MSP-4-O)	Determine job requirement.	Perform indexing operation using index head.	Carryout plain, side face, gang and straddle milling operations	Carryout slot, key way, parting off, end, form and angular milling operations.
	Perform gear-cutting operation on milling machine	Clean and store the tools and equipment		
<b>PERFORM SHAPER MACHINE OPERATIONS</b> (SEIP-LIG-MAS-5-O)	Prepare for shaping operation	Grind shaper tools.	Carryout shaping operations.	Clean and store the tools and equipment.
<b>PERFORM PRECISION GRINDING MACHINE OPERATIONS</b> (SEIP-LIG-MSP-6- O)	Prepare for the precession grinding machine operations.	Carry out cylindrical grinding machine	Carry out surface grinding machine	Perform Universal tools and cutter grinding machine operations.
	Clean and store the tools and equipment.			

## Units & Elements at Glance:

### Generic (Basic) Competencies (30 hrs.)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
SEIP-LIG-MSP-1-G	Perform Computations Using Basic Mathematical Concepts	<ol style="list-style-type: none"> <li>1. Identify calculation requirements in the workplace</li> <li>2. Select appropriate mathematical methods/concepts for the calculation.</li> <li>3. Use tool/instrument to perform calculations</li> </ol>	10
SEIP-LIG-MSP-2-G	Apply Occupational Health and Safety (OHS) Practices in the Workplace	<ol style="list-style-type: none"> <li>1. Identify OHS policies and procedures</li> <li>2. Apply personal health and safety practices</li> <li>3. Report hazards and risks</li> <li>4. Respond to emergencies</li> </ol>	10
SEIP-LIG-MSP-3-G	Communicate in English in the Workplace	<ol style="list-style-type: none"> <li>1. Read and understand workplace documents in English</li> <li>2. Write simple workplace communications in English</li> <li>3. Listen and comprehend to English conversations</li> <li>4. Perform conversations in English language</li> </ol>	5
SEIP-LIG-MSP-4-G	Operate in a Self-Directed Team	<ol style="list-style-type: none"> <li>1. Identify team goals and work processes</li> <li>2. Communicate and cooperate with team members.</li> <li>3. Work as a team member</li> <li>4. Solve problems as a team member</li> </ol>	5
<b>Total Hour</b>			30



### Sector Specific (Common) Competencies (30 hrs.)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
SEIP-LIG-MSP-1-S	Interpret Technical Drawings and Plans	<ol style="list-style-type: none"> <li>1. Select technical drawing.</li> <li>2. Interpret technical drawings.</li> <li>3. Store manuals, designs and plans</li> </ol>	10
SEIP-LIG-MSP-2-S	Work with Mechanical Hand and Power Tools	<ol style="list-style-type: none"> <li>1. Inspect hand tools and power tools for usability</li> <li>2. Use hand tools properly and safely</li> <li>3. Operate power tools properly and safely</li> <li>4. Clean/maintain hand tools and power tools after use</li> </ol>	10
SEIP-LIG-MSP-3-S	Carry Out Precision Checks and Measurements	<ol style="list-style-type: none"> <li>1. Select the job to be checked and measured</li> <li>2. Select measuring and checking tool/instrument</li> <li>3. Obtain measurements and checks</li> <li>4. Record/communicate measurement and check results</li> <li>5. Clean, maintain and store measuring instruments.</li> </ol>	5
SEIP-LIG-MSP-3-S	Apply Quality System and procedures	<ol style="list-style-type: none"> <li>1. Work within quality system</li> <li>2. Apply and monitor quality system improvement in the workplace</li> <li>3. Take responsibility for quality work.</li> <li>4. Apply standard procedures for each job.</li> </ol>	5
Total Hours			<b>30</b>

### Occupation Specific (Core) Competencies (300 hrs.)

Code	Unit of Competency	Elements of Competency	Guided Learning Hours
SEIP-LIG-MSP-1-O	Carryout Bench Working Operations	<ol style="list-style-type: none"> <li>1. Gather tools, equipment and materials for bench work.</li> <li>2. Perform bench work.</li> <li>3. Carry out drilling and reaming operations</li> <li>4. Carry out manual thread cutting and damage bolt and tap removal</li> <li>5. Perform off-hand grinding operation</li> <li>6. Clean, care maintain and store tools and equipment.</li> </ol>	60
SEIP-LIG-MSP-2-O	Perform Drilling Machine Operations	<ol style="list-style-type: none"> <li>1. Prepare for drilling operation</li> <li>2. Grind drill bits</li> <li>3. Perform drilling operations</li> <li>4. Clean and store tools and equipment.</li> </ol>	20
SEIP-LIG-MSP-3-O	Perform Lathe Machine Operations	<ol style="list-style-type: none"> <li>1. Prepare for lathe operation</li> <li>2. Grind lathe cutting tools.</li> <li>3. Setup lathe works</li> <li>4. Perform facing, straight, step, shoulder turning, grooving and parting-off operations.</li> <li>5. Perform taper and eccentric turning.</li> <li>6. Perform threading cutting operation</li> <li>7. Clean and store tools and equipment.</li> </ol>	70

SEIP-LIG-MSP-4-O	Perform Milling Machine Operations	<ol style="list-style-type: none"> <li>1. Determine job requirement.</li> <li>2. Perform indexing operation using index head.</li> <li>3. Carryout plain, side face, gang and straddle milling operations.</li> <li>4. Carryout slot, key way, parting off, end, form and angular milling operations.</li> <li>5. Perform gear-cutting operation on milling machine.</li> <li>6. Clean and store the tools and equipment.</li> </ol>	80
SEIP-LIG-MSP-5-O	Perform Shaper Machine Operations	<ol style="list-style-type: none"> <li>1. Prepare for shaping operation</li> <li>2. Grind shaper tools.</li> <li>3. Carryout shaping operations.</li> <li>4. Clean and store the tools and equipment.</li> </ol>	30
SEIP-LIG-MSP-6-O	Perform Precision Grinding Machine Operations	<ol style="list-style-type: none"> <li>1. Prepare for precision grinding machine operations.</li> <li>2. Carry out cylindrical grinding machine operation</li> <li>3. Carry out surface grinding machine operation</li> <li>4. Perform universal tool and cutter grinding machine operations.</li> <li>5. Clean and store tools and equipment.</li> </ol>	40
<b>Total Hours</b>			<b>300</b>

## COMPETENCY STANDARDS: MACHINE SHOP PRACTICE

### A. The Generic (Basic Competencies)

<b>Unit of Competency:</b> <b>PERFORM COMPUTATIONS USING BASIC MATHEMATICAL CONCEPTS</b>	<b>Nominal Duration:</b> 10 hrs.	<b>Unit Code:</b> SEIP-LIG-MSP-1-G
<b>Unit Descriptor:</b> This unit of competency requires the knowledge, skills and attitude to perform computations using basic mathematical concepts in the workplace. It specifically includes the tasks of identifying calculation requirements in the workplace, selecting appropriate mathematical method/concept for the calculation and using appropriate instruments tools to carry out calculation.		

#### Elements and Performance Criteria:

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

Elements of Competency	Performance Criteria
1. Identify calculation requirements in the workplace	1.1 <b><u>Calculation requirements</u></b> are identified from <b><u>workplace information</u></b>
2. Select appropriate mathematical methods/concepts for the calculation.	2.1 <b><u>Appropriate method</u></b> is selected to carry out the calculation requirements
3. Use tool/instrument to perform calculations	3.1 Calculations are completed using appropriate <b><u>tools and instruments</u></b>

#### Range of variables:

Variable	Range
	May include but not limited to:
1. Calculation requirements.	1.1 Area 1.2 Height 1.3 Length/Breadth/thickness 1.4 Diameter 1.5 Weight 1.6 Capacity 1.7 Time 1.8 Temperature. 1.9 Material usage 1.10 Speed 1.11 Costing 1.12 Mass 1.13 Density
2. Workplace information	2.1 Mechanical Plan 2.2 Design 2.3 Working drawing 2.4 Verbal instructions

	2.5 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/instruments	4.1 Calculator 4.2 Computer

### Curricular Content Guide

1. Underpinning Knowledge	1.1 Numerical concept 1.2 Basic mathematical methods such as addition, subtraction, multiplication, division, and percentage. 1.3 Mathematical language, symbols and terminology. 1.4 Measuring units 1.5 Knowledge of computer application
2. Underpinning Skills	2.1 Adding numbers 2.2 Subtracting numbers 2.3 Multiplying numbers. 2.4 Dividing numbers. 2.5 Measuring of linear 2.6 Using of mathematical language, symbols, terminology and technology. 2.7 Measuring of different physical parameter. 2.8 Calculating geometrical parameters: angle, parallelism, perpendicularity, area and volume
3. Underpinning Attitudes	3.1 Commitment to occupational health and safety practices 3.2 Promptness in carrying out activities. 3.3 Tidiness and timeliness. 3.4 Respect to peers, sub-ordinates and seniors in workplace. 3.5 Environmental concern. 3.6 Sincerity and honesty
4. Resource Implications	The following resources must be provided. 4.1 Stationeries 4.2 Consumables 4.3 Calculators 4.4 Computers 4.5 Measuring tape

### Assessment Evidence Guide

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Identified calculation requirements from workplace information 1.2 Selected appropriate method to carry out the calculation 1.3 Completed calculations using appropriate tools/instruments
2. Methods of Assessment	Methods of assessment may include but not limited to:

	2.1 Written test 2.2 Oral questioning 2.3 Demonstration.
5. Context of Assessment	3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.

<b>Unit of Competency:</b> <b>APPLY OCCUPATIONAL HEALTH AND SAFETY (OHS) PRACTICES IN THE WORKPLACE</b>	<b>Nominal Duration:</b> 10 hrs.	<b>Unit Code:</b> SEIP-LIG-MSP-2-G
<b>Unit Descriptor:</b> This unit covers the knowledge, skills and attitudes required to apply occupational health and safety (OHS) practices in the workplace. It specifically includes the tasks of identifying OHS policies and procedures, applying personal health and safety practices, reporting hazards and risks and responding to emergencies.		

### Elements and Performance Criteria:

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

<b>Elements of Competency</b>	<b>Performance Criteria</b>
1. Identify OHS policies and procedures	1.1 <b><u>OHS policies</u></b> and safe operating procedures are read and understood. 1.2 Safety signs and symbols are identified and followed 1.3 Emergency response, evacuation procedures and other contingency measures are determined.
2. Apply personal health and safety practices	2.1 OHS policies and procedures are followed and practiced 2.2 <b><u>Personal Protective Equipment (PPEs)</u></b> are selected and used 2.3 Personal hygiene is maintained
3. Report hazards and risks	3.1 <b><u>Hazards and risks</u></b> are identified, assessed and controlled. 3.2 Incidents arising from hazards and risks are reported to authority 3.3 Corrective actions are implemented to correct unsafe conditions in the workplace
4. Respond to emergencies	4.1 Alarms and warning devices are explained 4.2 <b><u>Emergency response plans and procedures</u></b> are implemented 4.3 <b><u>First aid procedure</u></b> is applied during emergency situations

### Range of Variables

<b>Variable</b>	<b>Range</b>
1. OHS policies	May include but not limited to: 1.1 International OHS requirements 1.2 Bangladesh standards for OHS 1.3 Building Code 1.4 Fire Safety Rules and Regulations 1.5 Industry Guidelines
2. Personal Protective Equipment (PPE)	2.1 Apron 2.2 Gas Mask 2.3 Gloves 2.4 Safety shoes 2.5 Helmet

	<ul style="list-style-type: none"> <li>2.6 Face mask</li> <li>2.7 Goggles and safety glasses</li> <li>2.8 Ear plugs</li> <li>2.9 Sun block</li> <li>2.10 Chemical/Gas masks</li> </ul>
3. Hazards and risks	<ul style="list-style-type: none"> <li>3.1 Chemical hazards.</li> <li>3.2 Biological hazards.</li> <li>3.3 Physical Hazards. <ul style="list-style-type: none"> <li>3.3.1 Machine hazards.</li> <li>3.3.2 Materials hazards.</li> <li>3.3.3 Tools and Equipment hazards.</li> </ul> </li> </ul>
4. Emergency response plans and procedures	<ul style="list-style-type: none"> <li>4.1 Firefighting procedures</li> <li>4.2 Earthquake response procedures</li> <li>4.3 Evacuation procedures</li> <li>4.4 Medical and first aid</li> </ul>
5. First aid procedure	<ul style="list-style-type: none"> <li>5.1 Washing of open wound</li> <li>5.2 Washing chemically infected area</li> <li>5.3 Applying bandage</li> <li>5.4 Tourniquet</li> <li>5.5 Applying CPR (Cardiopulmonary Resuscitation)</li> <li>5.6 Taking appropriate medicine</li> </ul>

**Curricular Evidence Guide:**

1. Underpinning Knowledge	<ul style="list-style-type: none"> <li>1.1 OHS workplace policies and procedures.</li> <li>1.2 Work safety procedures.</li> <li>1.3 Emergency procedures. <ul style="list-style-type: none"> <li>1.3.1 Firefighting.</li> <li>1.3.2 Earthquake response.</li> <li>1.3.3 Explosion response.</li> <li>1.3.4 Accident response.</li> </ul> </li> <li>1.4 Types of hazards (biological, chemical and physical) and their effects.</li> <li>1.5 PPE types and uses.</li> <li>1.6 Personal hygiene practices.</li> <li>1.7 OHS awareness.</li> </ul>
2. Underpinning Skills	<ul style="list-style-type: none"> <li>2.1 Identifying OHS policies and procedures</li> <li>2.2 Following personal work safety practices</li> <li>2.3 Reporting hazards and risks</li> <li>2.4 Responding to emergency procedures</li> <li>2.5 Maintaining physical well-being in the workplace</li> <li>2.6 Performing First Aids.</li> <li>2.7 Performing basic firefighting accessories using fire extinguishers</li> <li>2.8 Applying basic First Aid procedures</li> </ul>
3. Underpinning Attitudes	<ul style="list-style-type: none"> <li>3.1 Commitment to occupational health and safety practices</li> <li>3.2 Communication with peers, sub-ordinates and seniors in workplace.</li> <li>3.3 Promptness in carrying out activities.</li> <li>3.4 Tidiness and timeliness.</li> </ul>



	<p>3.5 Respect of peers, sub-ordinates and seniors in workplace.</p> <p>3.6 Environmental concern.</p> <p>3.7 Sincere and honest to duties</p>
4. Resource Implications	<p>4.1 Workplace (simulated or actual)</p> <p>4.2 PPEs</p> <p>4.3 Firefighting equipment</p> <p>4.4 Emergency response manual</p> <p>4.5 First aid kits</p>

**Assessment Evidence Guide:**

1. Critical Aspects of Competency	<p>Assessment required evidence that the candidate:</p> <p>1.1 Followed OHS policies and procedures</p> <p>1.2 Selected and used personal protective equipment (PPE)</p> <p>1.3 Reported incidents arising from hazards and risks to authority</p> <p>1.4 Implemented emergency response plans and procedures</p> <p>1.5 Applied basic first aid procedure</p>
2. Methods of Assessment	<p>Methods of assessment may include but not limited to:</p> <p>2.1 Written test</p> <p>2.2 Demonstration</p> <p>2.3 Oral questioning</p>
3. Context of Assessment	<p>3.1 Competency assessment must be done in a training center or in an actual or simulated work place after completion of the training module.</p>

<b>Unit of Competency:</b> <b>COMMUNICATE IN ENGLISH IN THE WORKPLACE</b>	<b>Nominal Duration:</b> 5 hrs.	<b>Unit Code:</b> SEIP-LIG-MSP-3-G
<b>Unit Descriptor:</b> This unit covers the knowledge, skills and attitudes required to communicate in English in the workplace. It specifically includes work tasks of reading and understanding workplace documents in English, writing simple workplace written communications in English, listening and comprehending to English conversations and performing conversations in English.		

### Elements and Performance Criteria:

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

<b>Elements of Competency</b>	<b>Performance Criteria</b>
1. Read and understand workplace documents in English	1.1 Workplace documents are read and understood 1.2 Visual information is interpreted.
2. Write simple workplace communications in English	2.1 Simple <b><u>routine workplace documents</u></b> are prepared using key words, phrases, simple sentences and <b><u>visual aids</u></b> are prepared 2.2 Key information is written in the appropriate places in standard forms.
3. Listen and comprehend to English conversations	3.1 Active listening is demonstrated.
4. Perform conversations in English language	4.1 Conversation is performed in English with peers, customers and management to the required workplace standard.

### Range of Variables

<b>Variable</b>	<b>Range</b>
	May Include but not limited to:
1. Routine workplace documents	1.1 Agenda 1.2 Simple reports such as progress and incident reports 1.3 Job sheets 1.4 Operational manuals 1.5 Brochures and promotional material 1.6 Visual and graphic materials 1.7 Standards 1.8 OSH information 1.9 Signs
2. Visual aids	2.1 Maps 2.2 Diagrams 2.3 Forms 2.4 Labels 2.5 Graphs 2.6 Charts

### Curricular Evidence Guide:

1. Underpinning Knowledge	<p>1.1 Read workplace documents in English</p> <p>1.2 Write simple routine workplace documents in English</p> <p>1.3 Listen to conversation in English.</p> <p>1.4 Perform conversation in English.</p> <p>1.5 Interaction skills (i.e., teamwork, interpersonal skills, etc.).</p> <p>1.6 Job roles, responsibilities and compliances.</p>
2. Underpinning Skills	<p>2.1 Ability to read and understand workplace documents in English by using appropriate vocabulary and grammar, standard spelling and punctuation</p> <p>2.2 Ability to write simple routine workplace documents in English such as Schedules and agenda, job sheets and reports.</p> <p>2.3 Ability of listening in English and interpreting</p> <p>2.4 Ability to perform conversation in English with peers, customers and management to the required workplace standard.</p> <p>2.5 Work effectively with others.</p> <p>2.5.1 Listening and questioning skills</p> <p>2.5.2 Ability to follow simple directions</p>
3. Underpinning Attitudes	<p>3.1 Commitment to occupational health and safety practices</p> <p>3.2 Promptness in carrying out activities.</p> <p>3.3 Tidiness and timeliness.</p> <p>3.4 Respect of peers, sub-ordinates and seniors in workplace.</p> <p>3.5 Environmental concern.</p> <p>3.6 Sincere and honest to duties.</p>
4. Resource Implications	<p>The following resources must be provided:</p> <p>4.1 Work place Procedure</p> <p>4.2 Materials relevant to the proposed activity</p> <p>4.3 All tools, equipment, material and documentation required.</p> <p>4.4 Relevant specifications or work instructions</p>

#### Assessment Evidence Guide:

1. Critical Aspects of Competency	<p>Assessment required evidence that the candidate:</p> <p>1.1 Conversed in English with peers and customers</p> <p>1.2 Made reports of workplace documents.</p>
2. Methods of Assessment	<p>Methods of assessment may include but not limited to:</p> <p>2.1 Written test</p> <p>2.2 Demonstration</p> <p>2.3 Oral questioning</p>
3. Context of Assessment	<p>3.1 Competency assessment must be finished in a training center or in an actual or simulated work place after completion of the training module.</p>

<b>Unit of Competency:</b> <b>OPERATE IN A SELF-DIRECTED TEAM</b>	<b>Nominal Duration:</b> 5 hrs.	<b>Unit Code:</b> SEIP-LIG-MSP-4-G
<b>Unit Descriptor:</b> This unit covers the knowledge, skills and attitudes required to operate in a self-directed team. It specifically includes work tasks of identifying team goals and work processes, communicating and cooperating with team members, working and solving problems as a team member.		

**Elements and Performance Criteria:**

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

<b>Elements of Competency</b>	<b>Performance Criteria</b>
1. Identify team goals and work processes	1.1 Team goals and collaborative decision-making processes are elaborated. 1.2 Roles and responsibilities of team members are explained. 1.3 Relationships within team and with other workers are interpreted.
2. Communicate and cooperate with team members.	2.1 Effective interpersonal skills are used to interact with team members and to contribute to activities accomplished. 2.2 Formal and informal <b><u>forms of communication</u></b> are used effectively to support team achievement. 2.3 Diversity of attitudes is respected and valued in team functioning. 2.4 Views and opinions of other team members are understood and valued. 2.5 Workplace terminology is used correctly to assist communication.
3. Work as a team member	3.1 Duties, responsibilities and task requirements are identified and clarified with team. 3.2 Tasks are performed in accordance with specifications and workplace procedures. 3.3 Team member's support with other members are made to ensure achieving team goals. 3.4 Agreed reporting lines are followed in using standard operating procedure.
4. Solve problems as a team member	4.1 Current and potential problems faced by team are identified. 4.2 A solution to the problem is identified. 4.3 Problems are solved effectively and the outcome of the implemented solution is evaluated.

**Range of Variables**

<b>Variable</b>	<b>Range</b>
	May Include but not limited to:
1. Forms of communication	1.1 Agenda 1.2 Simple reports such as progress and incident reports 1.3 Job sheets

	<ul style="list-style-type: none"> <li>1.4 Operational manuals.</li> <li>1.5 Brochures and promotional material</li> <li>1.6 Visual and graphic materials</li> <li>1.7 Standards</li> <li>1.8 OSH information</li> <li>1.9 Signs</li> </ul>
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**Curricular Evidence Guide:**

1. Underpinning Knowledge	<ul style="list-style-type: none"> <li>1.1 Team goals and collaborative decision making processes</li> <li>1.2 Roles and responsibilities of team members</li> <li>1.3 Relationships within team and with other workers</li> <li>1.4 Effective interpersonal skills to interact with team members</li> <li>1.5 Effective formal and informal forms of communication</li> <li>1.6 Value of diversity in team functioning</li> <li>1.7 Correct use of workplace terminology</li> <li>1.8 Team's duties, responsibilities, authorities, objectives and task requirements</li> <li>1.9 Support mechanism to other members of team to ensure achievements of goals.</li> <li>1.10 Methods of identifying current and potential problems faced by a team</li> <li>1.11 Problems solving methods and evaluation of outcomes</li> </ul>
2. Underpinning Skills	<ul style="list-style-type: none"> <li>2.1 Identifying team goals and collaborative decision making processes</li> <li>2.2 Identifying roles and responsibilities of team members</li> <li>2.3 Identifying relationships within team and with other workers</li> <li>2.4 Using effective interpersonal skills to interact with team members and to contribute to activities accomplished</li> <li>2.5 Using formal and informal forms of communication</li> <li>2.6 Understanding and valuing views and opinions of other team members</li> <li>2.7 Performing tasks in accordance with specifications and workplace procedures.</li> <li>2.8 Supporting other members of the team to achieve team goal</li> <li>2.9 Identifying current and potential problems faced by the team</li> <li>2.10 Identifying solutions to the problem</li> <li>2.11 Solving problems effectively and evaluating the outcome of the implemented solution</li> </ul>
3. Underpinning Attitudes	<ul style="list-style-type: none"> <li>3.1 Teamwork</li> <li>3.2 Promptness in carrying out activities.</li> <li>3.3 Tidiness and timeliness.</li> <li>3.4 Respect of peers, sub-ordinates and seniors in workplace.</li> <li>3.5 Sincere and honest to duties</li> </ul>
4. Resource Implications	The following resources must be provided:

	4.1 Workplace (simulated or actual) 4.2 Pens 4.3 Papers 4.4 Work books 4.5 Learning manuals
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**Assessment Evidence Guide:**

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Identified team goals and work processes 1.2 Communicated and cooperated with team members. 1.3 Worked as a team member 1.4 Solved problems as a team member
2. Methods of Assessment	Methods of assessment may include but not limited to: 2.1 Written test 2.2 Demonstration 2.3 Oral questioning
3. Context of Assessment	3.1 Competency assessment must be finished in a training center or in an actual or simulated work place after completion of the training module.

## B. The Sector Specific (Common) Competencies

<b>Unit of Competency:</b> <b>INTERPRET TECHNICAL DRAWINGS AND PLANS</b>	<b>Nominal Duration:</b> 10 hrs.	<b>Unit Code:</b> SEIP-LIG-MSP-1-S
<b>Unit Descriptor:</b> This unit covers the knowledge, skills and attitudes required of a worker to interpret technical drawings and plans. It specifically includes the tasks of selecting technical drawing, interpreting technical drawings and storing manuals, designs and plans.		

### Elements and Performance Criteria:

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

<b>Elements of Competency</b>	<b>Performance Criteria</b>
1. Select technical drawing.	1.1 <b><u>Drawing</u></b> is selected and checked to ensure that it conforms to the job requirements. 1.2 Drawing is validated.
2. Interpret technical drawings.	2.1 Drawing components, assemblies are identified. 2.2 Dimensions are identified according to job requirement. 2.3 Clearances/tolerances are checked with work place standard. 2.4 <b><u>Instructions</u></b> are identified and followed accurately. 2.5 Material <b><u>specification</u></b> are identified. 2.6 Symbols in drawing are interpreted.
3. Store manuals, designs and plans	3.1 Manuals, designs and plans are collected and packed. 3.2 Manuals, designs and plans are stored to prevent damage, and to make available for further use.

### Range of Variables

<b>Variable</b>	<b>Range</b>
	May Include but not limited to:
1. Drawing	1.1 Technical drawing 1.2 Sketches
2. Instructions	2.1 Note 2.2 Instruction 2.3 Special instruction 2.4 Precaution
3. Specifications	3.1 Product specifications 3.2 Performance specifications 3.3 Method specifications

### Curricular Evidence Guide:

1. Underpinning Knowledge	1.1 OH requirements 1.2 Workplace standard 1.3 Sequence of drawing
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	1.4 Methods of checking
2. Underpinning Skills	2.1 Practicing workplace safety 2.2 Reading / interpreting information on the drawing, following data sheet, instruction and manuals, technical drawing 2.3 Performing measurement, calculation 2.4 Interpreting drawing 2.5 Perform checking 2.6 Keeping record
3. Underpinning Attitudes	3.1 Commitment to occupational health and safety practices 3.2 Communication with peers, sub-ordinates and seniors in workplace 3.3 Promptness in carrying out activities 3.4 Tidiness and timeliness 3.5 Respect of peers, sub-ordinates and seniors in workplace 3.6 Environmental concern 3.7 Sincere and honest to duties
4. Resource Implications	4.1 Workplace (simulated or actual) 4.2 Different types of construction manuals and literatures 4.3 Pens 4.4 Papers 4.5 Work books

**Assessment Evidence Guide:**

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Identified dimension according to job requirement 1.2 Maintained clearances and tolerances according to workplace requirement. 1.3 Interpreted drawing symbols.
2. Methods of Assessment	Competency should be assessed by: 2.1 Written examination 2.2 Demonstration 2.3 Oral questioning 2.4 Workplace observation 2.5 Portfolio
3. Context of Assessment	3.1 Competency assessment must be finished in a training center or in an actual or simulated work place after completion of the training module.



<b>Unit of Competency:</b> <b>WORK WITH MECHANICAL HAND AND POWER TOOLS</b>	<b>Nominal Duration:</b> 10 hrs.	<b>Unit Code:</b> SEIP-LIG-MSP-2-S
<b>Unit Descriptor:</b> This unit covers the knowledge, skills and attitudes required to work with mechanical hand and power tools. It specifically includes the tasks of inspecting hand tools and power tools for usability, using hand tools properly and safely, operating power tools properly and safely and cleaning/maintaining hand tools and power tools after use.		

**Elements and Performance Criteria:**

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

<b>Elements of Competency</b>	<b>Performance Criteria</b>
1. Inspect hand tools and power tools for usability	1.1 Appropriate tools are selected 1.2 Application of tools to job requirement is determined 1.3 Usability of tools are checked and verified 1.4 <b><u>Hand tools</u></b> and <b><u>power tools</u></b> are prepared. 1.5 Sources of power supply for power tools are identified and made ready for connection
2. Use hand tools properly and safely	2.1 Appropriate hand tools for the job is used 2.2 Proper and safe use/operation of hand tools is ensured 2.3 <b><u>Safety precautions</u></b> is observed when using hand tools 2.4 Unsafe or faulty tools are identified and marked for repair
3. Operate power tools properly and safely	3.1 Power supply outlet and electrical cord are inspected and confirmed safe for use in accordance with workplace safety requirements. 3.2 Proper sequence of operation is applied in using power tools to produce results. 3.3 Power tools are used in accordance to manufacturer's operating specification.
4. Clean/maintain hand tools and power tools after use	4.1 Dust and foreign matters are removed from power tools in accordance with workplace standard. 4.2 Condition of tools is checked after use 4.3 Appropriate lubricant is applied after use and prior to storage 4.4 <b><u>Measuring tools</u></b> are checked and calibrated. 4.5 Defective tools, instruments, power tools and accessories are inspected and corrected or replaced

**Range of Variables**

<b>Variable</b>	<b>Range</b> May include but not limited to:	
1. Hand tools	1.1 Ball peen hammer. 1.2 Cross peen hammer. 1.3 Straight peen hammer. 1.4 Mallet/soft, hammer.	1.29 Drill bits 1.30 Tap extruder. 1.31 Screw Extruder. 1.32 Hacksaw frame.

	1.5 Bench vise. 1.6 Soft jaw. 1.7 Rough file. 1.8 Medium file. 1.9 Smooth file. 1.10 Punches. 1.11 Chisels. 1.12 Wrenches. 1.13 Pliers. 1.14 Scriber. 1.15 Scraper. 1.16 Screw drivers. 1.17 Dividers. 1.18 Trammels. 1.19 Surface plate 1.20 Marking table. 1.21 Height gauge. 1.22 Layout tools. 1.23 Tap sets. 1.24 Die sets. 1.25 Tap handle 1.26 Die handle 1.27 Hacksaw 1.28 Paint Brushes	1.33 Hacksaw blade. 1.34 Rivet Gun 1.35 Sledge Hammers 1.36 Sockets 1.37 Spanners 1.38 Vice grip 1.39 Wire Cutters 1.40 Wood Planners 1.41 Hand drill machine. 1.42 Hand grinding machine. 1.43 Pedestal drill. 1.44 Powered screwdriver. 1.45 Hand shear. 1.46 Clamps 1.47 Jacks. 1.48 Soldering iron. 1.49 Allen wrenches. 1.50 Draft punches
2. Power tools	2.1 Power drills 2.2 Power rivet gun. 2.3 Hand grinders 2.4 Pneumatic wrenches 2.5 Press machine 2.6 Jack hammer	2.7 Planers 2.8 Pedestal drills
3. Safety precautions	3.1 Use of appropriate PPEs. 3.2 Proper hand, feet and eye coordination. 3.3 Safe condition of electrical outlets, cords and lamps. 3.4 Working environment. 3.5 Safe operating condition of hand tools and power tools. 3.6 Awareness to OHS requirements.	
4. Measuring tools	4.1 Measuring tape. 4.2 Steel rule 4.3 Meter rule 4.4 Outside & inside caliper. 4.5 Protractors' 4.6 Tri-square 4.7 Sprit level 4.8 Vernier caliper. 4.9 Micrometer 4.10 Simple protractor 4.11 Vernier protractor. 4.12 Limit gauges. 4.13 Snap gauges.	

**Curricular Evidence Guide:**

1. Underpinning Knowledge	<ul style="list-style-type: none"> <li>1.1 Types of tools, functions and uses.</li> <li>1.2 Types of Hand tools and their functions</li> <li>1.3 Types of Power tools, uses and safe handling method.</li> <li>1.4 Technical application of tools.</li> <li>1.5 Procedures the using of hand tools and power tools.</li> <li>1.6 Applying policies and procedures for occupational health and safety.</li> <li>1.7 Using of PPE.</li> <li>1.8 Introducing preventive maintenance.</li> <li>1.9 Storing procedures.</li> </ul>
2. Underpinning Skills	<ul style="list-style-type: none"> <li>2.1 Using appropriate hand tool for the job.</li> <li>2.2 Maintaining safety precautions when using hand tools.</li> <li>2.3 Using power tools correctly and safely in accordance to manufacturer is operating specification.</li> <li>2.4 Checking condition of tools after use.</li> <li>2.5 Applying appropriate lubricant on hand tools and power tools after use and prior to storage.</li> <li>2.6 Inspecting and correcting or replacing defective tools, instruments, power tools and accessories.</li> <li>2.7 Storing Tools and power tools safely in appropriate location.</li> </ul>
3. Underpinning Attitudes	<ul style="list-style-type: none"> <li>3.1 Commitment to occupational health and safety practices</li> <li>3.2 Communication with peers, sub-ordinates and seniors in workplace Promptness in carrying out activities</li> <li>3.3 Tidiness and timeliness</li> <li>3.4 Respect of peers, sub-ordinates and seniors in workplace.</li> <li>3.5 Environmental concern</li> <li>3.6 Sincere and honest to duties</li> </ul>
4. Resource Implications	<ul style="list-style-type: none"> <li>4.1 Workplace (simulated or actual)</li> <li>4.2 Different types of construction hand tools and power tools</li> <li>4.3 Pens</li> <li>4.4 Papers</li> <li>4.5 Work books</li> <li>4.6 Tools and power tools operating and maintenance manuals</li> </ul>

**Assessment Evidence Guide:**

1. Critical Aspects of Competency	<p>Assessment required evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Used appropriate hand tool for the job.</li> <li>1.2 Observed safety precautions when using hand tools.</li> <li>1.3 Used power tools safely in accordance to manufacturer's operating specification.</li> </ul>
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	<ul style="list-style-type: none"> <li>1.4 Checked the condition of tools after use.</li> <li>1.5 Applied appropriate lubricant on hand tools and power tools after use and prior to storage.</li> <li>1.6 Inspected and corrected or replaced defective tools, instruments, power tools and accessories.</li> <li>1.7 Stored tools and power tools safely in appropriate location.</li> </ul>
2. Methods of Assessment	<p>Competency should be assessed by:</p> <ul style="list-style-type: none"> <li>2.1 Written examination</li> <li>2.2 Demonstration</li> <li>2.3 Oral questioning</li> <li>2.4 Workplace observation</li> <li>2.5 Portfolio</li> </ul>
3. Context of Assessment	<ul style="list-style-type: none"> <li>3.1 Competency assessment must be finished in a training center or in an actual or simulated work place after completion of the training module.</li> </ul>

<b>Unit of Competency:</b> <b>CARRY OUT PRECISION CHECKS AND MEASUREMENTS</b>	<b>Nominal Duration:</b> 5 hrs.	<b>Unit Code:</b> SEIP-LIG-MSP-3-S
<b>Unit Descriptor:</b> This unit covers the knowledge, skills and attitudes required of a worker to use graduated measuring instrument in workplace. It specifically includes the tasks of selecting the job to be measured, selecting graduated measuring instrument, obtaining measurements, recording and communicating measurements, cleaning, maintaining and storing measuring instruments.		

**Elements and Performance Criteria:**

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

<b>Elements of Competency</b>	<b>Performance Criteria</b>
1. Select the job to be checked and measured	1.1 Job is selected for measuring and checking 1.2 Required <b><u>dimensional measurement</u></b> is determined in accordance with drawing/plan 1.3 Required <b><u>physical condition</u></b> is identified in accordance with drawing/plan and workplace specification 1.4 Required <b><u>geometrical dimension</u></b> is identified in accordance with drawing/plan and workplace specification 1.5 Job drawing is used to select the measuring instruments.
2. Select measuring and checking tool/instrument	2.1 Appropriate measuring instruments is selected in accordance with job requirement. 2.2 <b><u>Direct and indirect measuring instruments</u></b> and <b><u>checking instrument</u></b> are identified 2.3 Applications of measuring device is determined. 2.4 Usability and accuracy of measuring device is checked and verified. 2.5 Measuring device is prepared for measurement. 2.6 Fits, Tolerance, clearance and limits are identified according to job requirements.
3. Obtain measurements and checks	3.1 Measurements are obtained using appropriate measuring instrument. 3.2 <b><u>Systems of measurements</u></b> are identified and converted where necessary. 3.3 Measurement is kept in accordance with specification 3.4 Measurement is checked against job requirement 3.5 Physical conditions are checked in accordance with job requirements 3.6 Geometrical dimensions are checked in accordance with job specifications
4. Record/communicate measurement and check results	4.1 Measurements are recorded in accordance with workplace procedure 4.2 Measurement is interpreted, recorded and communicated to authority
5. Clean, maintain and store measuring instruments.	5.1 Dust and dirt are removed from the measuring instruments

	<p>5.2 Condition of measuring instruments are checked</p> <p>5.3 Appropriate lubricant is applied after use and prior to storage</p> <p>5.4 Measuring instruments are checked and calibrated</p> <p>5.5 Measuring instruments are stored in accordance with workplace procedure.</p>
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### Range of Variables

Variable	Range May include but not limited to:
1. Dimensional measurement	<p>1.1 Length</p> <p>1.2 Width</p> <p>1.3 Depth</p> <p>1.4 Diameter</p> <p>1.5 Radius</p> <p>1.6 Height</p>
2. Physical condition	<p>2.1 Roughness</p> <p>2.2 Color</p> <p>2.3 Smoothness</p> <p>2.4 Surface finish</p> <p>2.5 Flatness</p>
3. Geometrical dimension	<p>3.1 Parallelism</p> <p>3.2 Perpendicularity</p> <p>3.3 Angularity</p> <p>3.4 Concentricity</p> <p>3.5 Eccentricity</p> <p>3.6 Roundness</p> <p>3.7 Circularity</p>
4. Direct measuring instruments.	<p>4.1 Set squares</p> <p>4.2 Dial indicators</p> <p>4.3 Steel tape</p> <p>4.4 Steel rule</p> <p>4.5 Meter rule</p> <p>4.6 Calculator</p> <p>4.7 Vernier slide caliper</p> <p>4.8 Digital Vernier slide caliper</p> <p>4.9 Micrometer (inch/millimeter)</p> <p>4.10 Digital micrometer</p> <p>4.11 Vernier bevel protractor</p> <p>4.12 Sprit level</p> <p>4.13 AVO meter(analogue/digital)</p> <p>4.14 Thermometers</p> <p>4.15 Water meter</p> <p>4.16 Gas meter</p> <p>4.17 Simple protractor</p>
5. Indirect measuring instrument	<p>5.1 Outside caliper</p> <p>5.2 Inside caliper</p> <p>5.3 Bevel tri-square</p> <p>5.4 Telescoping gage</p> <p>5.5 Straight edge</p>

	5.6 Sine bar 5.7 Trammel
6. Checking instrument.	6.1 Plug gauge 6.2 Snap gauge 6.3 Screw pitch gauge 6.4 Slip gauges 6.5 Feeler gauges 6.6 Screw pitch gauge 6.7 Slip gauge 6.8 Tri-square 6.9 Center gauge 6.10 Bevel tri-square
7. Systems of measurements	7.1 ISO standard 7.2 English system 7.3 Metric system

### Curricular Content Guide

1. Underpinning Knowledge	1.1 Difference between measuring and checking 1.2 Types of measuring tools and their applications 1.3 Types of checking tools and their applications 1.4 Geometrical dimensions and tolerances 1.5 Method, procedure and techniques when taking linear Measurements 1.6 Methods, procedures and techniques when checking physical conditions of work pieces 1.7 Methods, procedures and techniques when Checking geometrical dimensions of work pieces 1.8 Measurement conversion systems 1.9 Workplace record keeping procedures 1.10 Preventive maintenance for measuring and checking tools 1.11 Calibration and adjustment procedures for measuring and checking tools
2. Underpinning Skills	2.1 Determining required dimensional measurements, physical conditions and geometrical dimensions in accordance with drawing/plan and workplace specification 2.2 Measuring and checking linear and geometrical dimensions within the required tolerance in accordance to specification 2.3 Checking physical conditions using appropriate checking tool 2.4 Identifying and converting systems of measurements where necessary. 2.5 Recording measurements in accordance with workplace procedure 2.6 Interpreting and communicating measurement to authority 2.7 Applying appropriate lubricant on measuring and

	<p>checking tools and instruments after use and prior to storage</p> <p>2.8 Checking condition of measuring instruments, calibrating and storing in accordance with workplace procedure</p>
3. Underpinning Attitudes	<p>3.1 Commitment to occupational health and safety practices</p> <p>3.2 Communication with peers, sub-ordinates and seniors in workplace.</p> <p>3.3 Promptness in carrying out activities.</p> <p>3.4 Tidiness and timeliness.</p> <p>3.5 Respect of peers, sub-ordinates and seniors in workplace.</p> <p>3.6 Environmental concern.</p> <p>3.7 Sincere and honest to duties.</p>
4. Resource Implications	<p>4.1 Workplace (simulated or actual)</p> <p>4.2 Different types of graduated measuring and checking instruments</p> <p>4.3 Pens</p> <p>4.4 Papers</p> <p>4.5 Work books</p> <p>4.6 Measuring tools operating and maintenance manual.</p>

### Assessment Evidence Guide

1. Critical Aspects of Competency	<p>Assessment required evidence that the candidate:</p> <p>1.1 Determined required dimensional measurements, physical conditions and geometrical dimensions in accordance with drawing/plan and workplace specification</p> <p>1.2 Measured and checked linear and geometrical dimensions within the required tolerance in accordance to specification</p> <p>1.3 Checked physical conditions using appropriate checking tool</p> <p>1.4 Identified and converted systems of measurements where necessary.</p> <p>1.5 Recorded measurements in accordance with workplace procedure</p> <p>1.6 Interpreted and communicated measurement to authority</p> <p>1.7 Applied appropriate lubricant on measuring and checking tools and instruments after use and prior to storage</p> <p>1.8 Checked condition of measuring instruments, calibrated and stored in accordance with workplace procedure</p>
2. Methods of Assessment	<p>Competency should be assessed by:</p> <p>2.1 Written examination</p> <p>2.2 Demonstration</p> <p>2.3 Oral questioning</p> <p>2.4 Workplace observation</p>



	2.5 Portfolio
3. Context of Assessment	3.1 Competency assessment must be finished in a training center or in an actual or simulated work place after completion of the training module.

<b>Unit of Competency:</b> <b>APPLY QUALITY SYSTEMS AND PROCEDURES</b>	<b>Nominal Duration:</b> 5 hrs.	<b>Unit Code:</b> SEIP-LIG-MSP-4-S
<b>Unit Descriptor:</b> This unit covers the knowledge, skills and attitudes required of a worker to apply quality systems and procedures. It specifically includes the tasks of working within quality system, applying and monitoring quality system improvement in the workplace, taking responsibility for self-quality and applying standard procedures for each job.		

**Elements and Performance Criteria:**

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

<b>Elements of Competency</b>	<b>Performance Criteria</b>
1. Work within quality system	1.1 Instructions and procedures are followed strictly and duties are performed in accordance with demand of <b><u>quality improvement system</u></b> . 1.2 Conformance to specifications is ensured. 1.3 Defects are detected and reported to authority according to standard operating procedures. 1.4 Customer's satisfaction is ensured in performing an operation or quality of product or services.
2. Apply and monitor quality system improvement in the workplace	2.1 Performance measurement systems are identified. 2.2 Performance is assessed at regular interval. 2.3 Specifications and standard operating procedures are identified and maintained. 2.4 Defects are detected and reported according to standard operating procedures. 2.5 Process improvement procedures are practiced. 2.6 Performance of operation or quality of product or service is monitored to ensure customer satisfaction.
3. Take responsibility for quality work.	3.1 Concept of supplying product or service to meet the <b><u>customer quality requirements</u></b> is understood and applied. 3.2 Responsibility is taken for quality of work.
4. Apply standard procedures for each job.	4.1 <b><u>Quality control and quality assurance</u></b> system procedures for each job are followed and practiced. 4.2 Conformance to specification is ensured in every case at all situations.

## Range of Variables

Variable	Range May include but not limited to:	
1. Quality improvement system	A system comprising some or all of the following elements: 1.1 Quality inspection 1.2 Quality control. 1.3 Quality improvement. 1.4 Quality assurance	
2. Customer quality requirements.	2.1 Fitness of product 2.2 Appearance 2.3 Durability. 2.4 Grade or quality design 2.5 Usability life span 2.6 conformance to Quality 2.7 Reliability 2.8 Maintainability	
3. Quality control and assurance	3.1 Quality control 3.1.1 Product 3.1.2 Reactive 3.1.3 Line function 3.1.4 Find the defects 3.1.5 Walk through 3.1.6 Testing 3.1.7 Inspection 3.1.8 Checkpoint Review	3.2 Quality Assurance 3.2.1 Process 3.2.2 Pro-active 3.2.3 Staff function 3.2.4 Prevent the defects 3.2.5 Quality audit 3.2.6 Defining process 3.2.7 Selection of tools 3.2.8 Training

## Curricular Evidence Guide

1. Underpinning Knowledge	1.1 The reasons why good quality should be maintained and poor quality should be eliminated 1.2 Meaning of the key terms - quality, quality assurance, quality control, quality inspection, quality improvement and total quality control. 1.3 Process and procedures for improving and maintaining quality 1.4 Procedures for addressing defects. 1.5 Record keeping within the quality improvement system in workplace 1.6 Factors, which affect successful implementation of the quality systems and procedures.
2. Underpinning Skills	2.1 Maintaining good quality 2.2 Eliminating poor quality 2.3 Understanding the meaning of the key terms - quality, quality assurance, quality control, quality inspection, quality improvement and total quality control.

	<ul style="list-style-type: none"> <li>2.4 Improving and maintaining quality</li> <li>2.5 Addressing defects and procedures</li> <li>2.6 Recording within the quality improvement system in workplace.</li> <li>2.7 Implementing quality systems and procedures</li> </ul>
3. Under pinning Attitudes	<ul style="list-style-type: none"> <li>3.1 Commitment to occupational health and safety practices</li> <li>3.2 Communication with peers, sub-ordinates and seniors in workplace.</li> <li>3.3 Promptness in carrying out activities.</li> <li>3.4 Tidiness and timeliness.</li> <li>3.5 Respect of peers, sub-ordinates and seniors in workplace.</li> <li>3.6 Environmental concern.</li> <li>3.7 Sincere and honest to duties.</li> </ul>
4. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>4.1 Workplace</li> <li>4.2 Tools and equipment appropriate to maintain workplace</li> <li>4.3 Materials relevant to the proposed activity</li> <li>4.4 Relevant drawings, manuals, codes, standards and reference material</li> </ul>

#### Assessment Evidence Guide:

1. Critical Aspects of Competency	<p>Assessment required evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Followed instructions and procedures strictly</li> <li>1.2 Performed duties in accordance with demand of quality system</li> <li>1.3 Ensured conformance to specifications</li> <li>1.4 Detected defects and reported to authority in accordance to standard operating procedures.</li> <li>1.5 Understood concept of supplying product or service to meet the customer quality requirements</li> <li>1.6 Took responsibility for quality of own work</li> <li>1.7 Followed quality control and quality assurance system procedures for each job</li> </ul>
2. Methods of Assessment	<p>Competency should be assessed by:</p> <ul style="list-style-type: none"> <li>2.1 Written examination</li> <li>2.2 Demonstration</li> <li>2.3 Oral questioning</li> <li>2.4 Workplace observation</li> <li>2.5 Portfolio</li> </ul>
3. Context of Assessment	<ul style="list-style-type: none"> <li>3.1 Competency assessment must be finished in a training center or in an actual or simulated work place after completion of the training module.</li> </ul>

### C. Occupation Specific (Core) Competencies

<b>Unit of Competency:</b> <b>CARRYOUT BENCH WORKING OPERATIONS</b>	<b>Nominal Duration:</b> 60 hrs.	<b>Unit Code:</b> SEIP-LIG-MSP-1-O
<b>Unit Descriptor:</b> This unit covers the knowledge, skills and attitudes required of a worker to perform bench-working operations. It specifically includes the tasks of gathering tools, equipment and materials for bench work, performing bench work, carrying out drilling and reaming operations, carrying out manual thread cutting and damage bolt, tap removal, performing off-hand grinding operation, cleaning, and store the tools and equipment.		

**Elements and Performance Criteria:**

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

<b>Elements of Competency</b>	<b>Performance Criteria</b>
1. Gather tools, equipment and materials for bench work.	1.1 <b><u>Personal Protective Equipment (PPE)</u></b> is selected and used. 1.2 <b><u>Tools, Equipment &amp; Materials</u></b> are selected for <b><u>bench work</u></b> and gathered as per job requirement specified in the drawing. 1.3 Layout is performed and marked in accordance with drawing.
2. Perform bench work.	2.1 Work piece are clamped on <b><u>work holding devices</u></b> to avoid damage and accident. 2.2 Work pieces are cut, chipped and filed within as specified in the drawing. 2.3 Broken or dull hacksaw blades, chisel and file are replaced according to requirements. 2.4 Measurement of work piece is checked according to standard work procedures.
3. Carry out drilling and reaming operations	3.1 Good drill bit and reamer is collected from the store. 3.2 Bench drill machine is prepared for drilling operation. 3.3 Drilling holes are performed according to recommended sequence. 3.4 Reaming holes are performed according to recommended sequence. 3.5 Coolant is used to reduce heat of drill and reamer and prevent damage.
4. Carry out manual thread cutting and damage bolt and tap removal	4.1 Tap is selected to cut internal <b><u>thread</u></b> and die is selected to cut external thread accordance with job requirement. 4.2 Work piece is held with support as required. 4.3 Thread is cut and checked by gage or mating screw given in the drawing. 4.4 Internal thread is cut in accordance with the recommended tapping Sequence. 4.5 External thread is cut in accordance with the recommended die operation sequence. 4.6 Coolant is used to reduce heat of drill and reamer and prevent damage. 4.7 Screw extractor as required removes damaged bolt and stud.

	4.8 Tap extractor as required removes damaged tap.
5. Perform off-hand grinding operation	5.1 Work piece is held and clamped in accordance with standard work procedures. 5.2 Appropriate grinder and grinding disc are selected as per job requirement. 5.3 Grinding operation is performed and conformed to the specifications of the work place requirement.
6. Clean, care maintain and store tools and equipment.	6.1 Hand tools and equipment are maintained and cleaned as per instruction manual. 6.2 Work place is cleaned in accordance with environmental requirement. 6.3 Tools and equipment are stored safely in appropriate location. 6.4 Waste materials are disposed in proper place.

### Range of Variables

Variable	Range May Include but not limited to:	
1. PPE	1.1 Safety helmet 1.2 Safety shoes 1.3 Hand gloves 1.4 Apron	
2. Tools, equipment & materials	2.1 <b>Hand Tools</b> 2.1.1 Tool box 2.1.2 Layout tools. 2.1.3 Hacksaw. 2.1.4 Chisel. 2.1.5 Files 2.1.6 Drills, reamer, tap and die. 2.1.7 Tap and screw extractors. 2.1.8 Tri-squire 2.2 <b>Measuring tools</b> 2.2.1 Steel rule. 2.2.2 Steel tape. 2.2.3 Meter rule 2.2.4 Vernier caliper. 2.2.5 Vernier height gauge. 2.2.6 Micrometer. 2.2.7 Vernier Bevel protector. 2.3 <b>Checking tools.</b> 2.3.1 Bevel tri-squire. 2.3.2 Straight edge. 2.3.3 Dial indicator 2.3.4 Slip gauge. 2.3.5 Plug gauge	2.3.7 Ring gauge 2.3.8 Filler gauge 2.3.9 Telescoping gauge 2.3.10 Screw gauge 2.3.11 Center gauge 2.3.12 Sine bar <b>2.4 Equipment.</b> 2.4.1 Marking table. 2.4.2 Drill press 2.4.3 Hand grinder 2.4.4 Surface plate 2.4.5 Surface gauge 2.4.6 Anvil. 2.4.7 Swage block <b>2.5 Materials</b> 2.5.1 Mild steel 2.5.2 Dead mild steel 2.5.3 Medium carbon steel. 2.5.4 High carbon steel 2.5.5 Alloy steel 2.5.6 Cast iron. 2.5.7 Brass 2.5.8 Copper 2.5.9 Bronze 2.5.10 Gun metal 2.5.11 Kerosene oil

	2.3.6 Snap gauge	2.5.12 Cutting fluid.
3. Bench work	3.1 Layout and marking 3.2 Cutting 3.3 Chipping 3.4 Filing 3.5 Drilling, 3.6 Reaming 3.7 Thread cutting. 3.8 Off-hand grinding. 3.9 Damage bolt and stud removing. 3.10 Broken tool removing. 3.11 Fitting. 3.12 Forging. 3.13 Assembling. 3.14 Cleaning 3.15 Maintenance	
4. Work holding devices	4.1 Clamps 4.2 Vices. 4.3 Surface plate. 4.4 Zig and fixture	
5. Thread	5.1 British standard Whitworth thread (BSW- 55 degree thread angle) 5.2 Metric standard thread (M-series 60 degree thread angle)	

### Curricular Evidence Guide

1. Underpinning Knowledge	1.1 Proper use of PPE 1.2 Types of bench works tools, equipment and materials and their function. 1.3 Methods of Machine setting 1.4 Types and use of work holding devices 1.5 Drawing interpretation 1.6 Procedure in Grinding operations and safety requirements 1.7 Types of twist drills and nomenclature 1.8 Techniques of drilling and reaming hole. 1.9 Types of bench working processes and techniques
2. Underpinning Skills	2.1 Selecting and using PPE 2.2 Selecting and gathering tools, equipment & materials 2.3 Preparing bench work machine, job holding devices and related tools and equipment. 2.4 Grinding appropriate disc is selected as per job requirement. 2.5 Extracting damage screw and tap. 2.6 Performing drill and ream hole. 2.7 Performing sawing, chipping, filing, tapping and reaming. 2.8 Cleaning. Tools & equipment.

	2.9 Disposing waste materials in designated place.
3. Underpinning Attitudes	3.1 Commitment to occupational health and safety practices 3.2 Communication with peers, sub-ordinates and seniors in workplace. 3.3 Promptness in carrying out activities. 3.4 Tidiness and timeliness. 3.5 Respect of peers, sub-ordinates and seniors in workplace. 3.6 Environmental concern.
4. Resource Implications	The following resources MUST be provided: 4.1 Workplace 4.2 Tools, equipment and facilities appropriate to processes or activity. 4.3 Materials relevant to the proposed activity. 4.4 Relevant drawings, manuals, codes, standards and reference material.

### Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Clamped work pieces using appropriate work holding devices to avoid damage and accidents. 1.2 Cut, chipped and filed work pieces in accordance with specification in the drawing. 1.3 Checked measurement of work piece according to standard procedure 1.4 Performed drilling of holes and reaming following recommended sequence. 1.5 Cut threads and checked thread using thread pitch gauge 1.6 Performed grinding operation in accordance with workplace procedures
2. Methods of Assessment	Competency should be assessed by: 2.1 Written examination 2.2 Demonstration 2.3 Oral questioning 2.4 Workplace observation 2.5 Portfolio
3. Context of Assessment	3.1 Competency assessment must be finished in a training center or in an actual or simulated work place after completion of the training module.



<b>Unit of Competency:</b> <b>Perform Drilling Machine Operations</b>	<b>Nominal Duration:</b> 20 hrs.	<b>Unit Code:</b> SEIP-LIG-MSP-2-O
<b>Unit Descriptor:</b> This unit covers the knowledge, skills and attitudes required to perform drilling machine operation. It specifically includes the tasks of grinding drill bits, preparing for drilling operation, performing drilling operation, cleaning and storing tools and equipment.		

**Elements and Performance Criteria:**

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

<b>Elements of Competency</b>	<b>Performance Criteria</b>
1. Prepare for drilling operation	1.1 Appropriate <b><u>types of Drilling Machines</u></b> selected for different lathe operations. 1.2 <b><u>Different parts and accessories</u></b> of drill machine are identified. 1.3 Drilling machine mechanical feature, RPM, cutting speed and federate are demonstrated according to the machine specifications. 1.4 <b><u>Drill bits</u></b> and job materials are selected and collected according to the requirements of the operations. 1.5 Drawings are interpreted to produce component in accordance with job specifications. 1.6 Machine guards and coolant devices are checked in accordance with job requirement. 1.7 Work piece and drill bits are setup and clamped to required level of accuracy using instruments/equipment according to work site procedures. 1.8 Safe work practices are observed and personal protective equipment ( <b><u>PPEs</u></b> ) are worn as required for the work performed.
2. Grind drill bits	2.1 Bench/pedestal grinding machine is selected for drill grinding operation 2.2 Bench/pedestal grinding machine is set for drill grinding manually or using drill grinding attachment. 2.3 Grinding abrasive wheel is dressed by wheel dresser. 2.4 <b><u>Twist drill parts</u></b> are identified. 2.5 <b><u>Drill grinding parameters</u></b> are demonstrated. 2.6 Different <b><u>profile angles</u></b> are grounded according to standard specifications. 2.7 Ground drill is checked and measured using drill gauge.
3. Perform drilling operations	3.1 Appropriate types of drill machine, tools and equipment are selected for drilling operations. 3.2 Cutting feed and RPM are selected according to the job specifications. 3.3 Component drawing is interpreted and specifications are identified 3.4 Work piece and drill bits are selected, collected and

	<p>set according to the requirement.</p> <p>3.5 Drilling operation is performed following the sequence of operation</p> <p>3.6 Job is checked/measured in conformance with specification using appropriate techniques, drill gauge, <u>measuring tools, materials, tools and equipment.</u></p>
4. Clean and store tools and equipment.	<p>4.2 Workplace, tools and equipment are cleaned and maintained in accordance with workplace requirements</p> <p>4.3 Waste materials are disposed in proper place.</p> <p>4.4 Tools, equipment and finished products are stored safely in accordance with workplace procedures</p>

### Range of Variables

Variable	Range May Include but not limited to:
1. Types of drilling machine	<p>1.1 Hand/Breast drilling machine</p> <p>1.2 Pedestal drilling machine</p> <p>1.3 Tap controlled drilling machine</p> <p>1.4 Upright sensitive drill press</p> <p>1.5 Radial arm drill press</p> <p>1.6 Multiple spindle-drilling machine.</p> <p>1.7 Micro-drill press</p> <p>1.8 Turret type drilling machine</p> <p>1.9 Semi-universal drilling machine</p> <p>1.10 Universal drilling machine</p> <p>1.11 Portable drilling machine</p> <p>1.12 Sensitive drilling machine</p> <p style="padding-left: 20px;">a) Bench mounting</p> <p style="padding-left: 20px;">b) Floor mounting</p> <p>1.13 Upright drilling machine</p> <p style="padding-left: 20px;">a) Round column section</p> <p style="padding-left: 20px;">b) Box column section</p> <p>1.14 Radial drilling machine</p> <p style="padding-left: 20px;">a) Plain radial drilling machine</p> <p style="padding-left: 20px;">b) Semi-universal radial drilling machine</p> <p style="padding-left: 20px;">c) Universal radial drilling machine</p> <p>1.15 Multiple drilling machine</p> <p>1.16 Gang drilling machine</p> <p>1.17 Automatic drilling machine</p> <p style="padding-left: 20px;">a) Vertical drilling machine</p> <p style="padding-left: 20px;">b) Deep hole drilling machine</p>
2. Different parts of drilling machine	<p>2.1 Stepped pulley for speed changing</p> <p>2.2 Belt</p> <p>2.3 Belt guard</p> <p>2.4 Driving motor</p> <p>2.5 Motor controls</p> <p>2.6 Spindle lock</p> <p>2.7 Depth gauge and stop</p>

	<ul style="list-style-type: none"> <li>2.8 Feed handle</li> <li>2.9 Chuck</li> <li>2.10 Spindle axis</li> <li>2.11 Work table</li> <li>2.12 Work table locking handle</li> <li>2.13 Column</li> <li>2.14 Base</li> </ul>
3. Accessories	<ul style="list-style-type: none"> <li>3.1 Drill machine vice</li> <li>3.2 Drill keyed chuck</li> <li>3.3 Drill key less chuck</li> <li>3.4 Pin chuck</li> <li>3.5 Drill stand</li> <li>3.6 Tilting drill vice</li> <li>3.7 Circular base vice</li> <li>3.8 Taper sleeve and socket</li> <li>3.9 Drill drift</li> <li>3.10 Fixed angle plate</li> <li>3.11 Adjustable angle plate</li> <li>3.12 Drill grinding gauge</li> <li>3.13 Drill grinding attachment</li> <li>3.14 V- blocks</li> <li>3.15 Parallel strips</li> <li>3.16 Tool maker clamps</li> <li>3.17 Machine jacks</li> </ul>
4. Drill bits.	<ul style="list-style-type: none"> <li>4.1 Twist drill bits</li> <li>4.2 Wood or brad point bits</li> <li>4.3 Masonry bit</li> <li>4.4 Multi-purpose bit</li> <li>4.5 Glass or tile bit</li> <li>4.6 Countersink bit</li> </ul>
5. PPE	<ul style="list-style-type: none"> <li>5.1 Dust mask</li> <li>5.2 Eye glass</li> <li>5.3 Goggles</li> <li>5.4 Safety shoes</li> <li>5.5 Apron</li> </ul>
6. Twist drill parts	<ul style="list-style-type: none"> <li>6.1 Shank</li> <li>6.2 Land</li> <li>6.3 Flutes</li> <li>6.4 Cutting face</li> <li>6.5 Flank</li> <li>6.6 Chisel edge</li> <li>6.7 Cutting edge</li> <li>6.8 Cutting face</li> <li>6.9 Margin</li> <li>6.10 Web/core</li> <li>6.11 Web thickness</li> <li>6.12 Helix angle</li> <li>6.13 Relief angle</li> <li>6.14 Rake angle</li> <li>6.15 Clearance angle</li> </ul>

	6.16 Lip 6.17 Lip length 6.18 Point angle 6.19 Face 6.20 Flank 6.21 Heel
7. Tools and Equipment	7.1 Tools 7.1.1 Clamps 7.1.2 Soft hammer. 7.1.3 Pliers. 7.1.4 Bras 7.1.5 Job holding devices/fixture 7.1.6 Adjustable wrench 7.1.7 Tap and die handle 7.1.8 Chuck key 7.1.9 Drill bits 7.1.10 Reamer 7.2 Equipment 7.2.1 3- Jaw chuck 7.2.2 Hand grinder 7.2.3 Face plate 7.2.4 Taping attachment 7.2.5 Packing pieces 7.2.6 V-block with clamps 7.2.7 Zig and fixture
8. Materials	8.1 Mild steel 8.2 Cast iron 8.3 Brass 8.4 Aluminum
9. Measuring tools	9.1 Steel rule 9.2 Digital Vernier Caliper 9.3 Micrometer 9.4 Dial indicator 9.5 Screw pitch gauge 9.6 Center gauge
10. Drill grinding parameters	10.1 Lips at equal angle 10.2 Lips of equal lengths 10.3 Lips having both equal angles and equal lengths
11. Profile angles	11.1 Rake angle 11.2 Clearance angle 11.3 Point angle

### Curricular Evidence Guide

1. Underpinning Knowledge	1.1 Types of Drilling Machine 1.2 Different parts and accessories of Drill Machine 1.3 Drilling machine mechanical feature, RPM, cutting speed and feed rate
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	<ul style="list-style-type: none"> <li>1.4 Drill bits and job materials specifications</li> <li>1.5 Drawings interpretation procedures/methods</li> <li>1.6 Machine guards and coolant devices operation</li> <li>1.7 Procedure of setting up and clamping of work pieces and drill bits</li> <li>1.8 Observing safe work practices, types, and application of Personal Protective Equipment (PPE).</li> <li>1.9 Drill grinding parameters</li> </ul>
2. Underpinning Skills	<ul style="list-style-type: none"> <li>2.1 Setting bench/pedestal grinding machine for drill grinding manually or using drill-grinding attachment.</li> <li>2.2 Dressing of grinding wheel using wheel dresser.</li> <li>2.3 Demonstrating twist drill nomenclature</li> <li>2.4 Demonstrating drill grinding parameters</li> <li>2.5 Grinding different profile angles in accordance with standard specifications.</li> <li>2.6 Checking and measuring ground drill using drill gauge.</li> <li>2.7 Selecting cutting speed (RPM), feed rate in accordance with the job specifications.</li> <li>2.8 Interpreting component drawing and identifying specifications</li> <li>2.9 Selecting and collecting work piece and drill bits and setting in accordance with workplace requirement.</li> <li>2.10 performing Drilling operation following the sequence of operation</li> <li>2.11 Checking/measuring job in conformance to specification using appropriate techniques, drill gauge, measuring tools, materials, tools and equipment.</li> </ul>
3. Underpinning Attitudes	<ul style="list-style-type: none"> <li>3.1 Commitment to occupational health and safety practices</li> <li>3.2 Communication with peers, sub-ordinates and seniors in workplace.</li> <li>3.3 Promptness in carrying out activities.</li> <li>3.4 Tidiness and timeliness.</li> <li>3.5 Respect of peers, sub-ordinates and seniors in workplace.</li> <li>3.6 Environmental concern.</li> </ul>
4 Resource Implications	<p>The following resources MUST be provided:</p> <ul style="list-style-type: none"> <li>4.1 Workplace.</li> <li>4.2 Tools, equipment and facilities appropriate to processes or activity</li> <li>4.3 Materials relevant to the proposed activity.</li> <li>4.4 Equipment and outfits appropriate in applying safety measures.</li> <li>4.5 Relevant drawings, manuals, codes, standards and reference material.</li> </ul>

**Assessment Evidence Guide:**

1. Critical Aspects of Competency	<p>Assessment required evidence that the candidate:</p> <ol style="list-style-type: none"> <li>1.1 Set bench/pedestal grinding machine for manual drill grinding or using drill grinding attachment.</li> <li>1.2 Dressed abrasive wheel using wheel dresser.</li> <li>1.3 Ground drill bit with different profile angles in accordance with the standard specifications.</li> <li>1.4 Checked and measured grounded drill bit using drill gauge.</li> <li>1.5 Selected cutting speed (RPM) and feed rate in accordance with the job specifications.</li> <li>1.6 Interpreted component drawing and identified specifications</li> <li>1.7 Selected, collected and set up work piece and drill bits in accordance with the job requirement.</li> <li>1.8 Performed drilling operation in accordance with the sequence of operation in producing the required specification of the product.</li> <li>1.9 Checked and measured job in conformance to specification using appropriate techniques, drill gauge, measuring tools, materials, tools and equipment.</li> </ol>
2. Methods of Assessment	<p>Competency should be assessed by:</p> <ol style="list-style-type: none"> <li>2.1 Written examination</li> <li>2.2 Demonstration</li> <li>2.3 Oral questioning</li> <li>2.4 Workplace observation</li> <li>2.5 Portfolio</li> </ol>
3. Context of Assessment	<ol style="list-style-type: none"> <li>3.1 Competency assessment must be finished in a training center or in an actual or simulated work place after completion of the training module.</li> </ol>

<b>Unit of Competency:</b> <b>PERFORM LATHE MACHINE OPERATIONS</b>	<b>Nominal Duration:</b> 70 hrs.	<b>Unit Code:</b> SEIP-LIG-MSP-3-O
<b>Unit Descriptor:</b> This unit covers the knowledge, skills and attitudes required of a machinist to perform lathe machine operation. It specifically includes the tasks of preparing for lathe operation, setting up lathe works, performing facing, straight turning, step turning, shoulder turning, grooving and parting-off operation and performing taper, eccentric turning, performing external and internal threading operation.		

**Elements and Performance Criteria:**

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

<b>Elements of Competency</b>	<b>Performance Criteria</b>
1. Prepare for lathe operation	1.1 Appropriate <b><u>type of lathe machines</u></b> selected for different lathe operations. 1.2 <b><u>Different parts of lathe machine</u></b> are identified. 1.3 Lathe accessories are used appropriately to the requirements of the operations. 1.4 Cutting speed and feed rate are selected according to the job specifications. 1.5 Drawings are interpreted to produce component in accordance with the job specifications. 1.6 Job materials are selected and collected according to the job specifications. 1.7 Cutting <b><u>tools and equipment</u></b> are selected in accordance with the requirements of the operation. 1.8 Sequence of operation is determined to produce component in accordance with required specifications 1.9 <b><u>PPEs</u></b> are selected and used. 1.10 Safe work practices are maintained and personal protective equipment (PPE) are worn as required for the job performed.
2. Grind lathe cutting tools.	2.1 Drawings are interpreted in accordance with tool grinding specifications 2.2 Tool holding devices and tool blanks are selected in accordance with the requirements of the operation. 2.3 Pedestal/bench grinding machine and accessories are selected in accordance with tool grinding requirements 2.4 Grinding wheels are selected, inspected and dressed in accordance with worksite procedures. 2.5 Grinding machine is adjusted in accordance with worksite procedures. 2.6 Tool blank is held and clamped accordingly to avoid damage or accident. 2.7 Coolant is used to reduce heat of tool and prevent damage. 2.8 Grinding of tool blank following the <b><u>profile angles</u></b> of Lathe cutting tools is performed in accordance with

	specifications mentioned in the drawing.
3. Setup lathe works	<p>3.1 Work piece is centered and clamped on chuck to required level of accuracy using tools and equipment in accordance with work procedures.</p> <p>3.2 Work piece is setup and clamped to required level of accuracy using instruments/equipment according to work procedures.</p> <p>3.3 Cutting tool is set in accordance with the requirement of the operation.</p> <p>3.4 <b><u>Lathe accessories</u></b> are used appropriately to the requirements of the jobs.</p> <p>3.5 RPM is set in accordance with the job diameter.</p> <p>3.6 Machine guards and coolant devices are checked according to work requirement.</p>
4. Perform facing, straight, step, shoulder turning, grooving and parting-off operations.	<p>4.1 Cutting speed, RPM, feed rate and depth of cut are calculated as per job requirement.</p> <p>4.2 Machine performance is checked in accordance with the job requirement.</p> <p>4.3 Coolant is applied to prevent over heating of work piece and cutting tool.</p> <p>4.4 Straight, step, and shoulder turning is performed after facing to produce component in accordance with specifications in the drawing and finished using the lathe turning tool.</p> <p>4.5 Grooving operation is performed after turning and to produce component in accordance with specifications in the drawing and finished using lathe grooving tool.</p> <p>4.6 Parting-off operation is performed after all operation is completed and produce job in accordance with specification in the drawing.</p> <p>4.7 Job is checked/measured in conforming to specification using appropriate techniques, measuring tools and equipment.</p>
5. Perform taper and eccentric turning.	<p>5.1 Cutting speed, RPM, feed rate and depth of cut are calculated as per <b><u>taper</u></b> and <b><u>eccentric</u></b> operation.</p> <p>5.2 Machine performance is checked in line with the job requirement.</p> <p>5.3 Coolant is applied to prevent over heating of work piece and cutting tool.</p> <p>5.4 <b><u>Taper turning methods</u></b> are used in accordance with the job specifications.</p> <p>5.5 Taper turning operation is performed using form tool, compound slide, offsetting tailstock and taper turning attachment and to produce component in accordance with the specifications in the drawing.</p> <p>5.6 <b><u>Eccentric turning method</u></b> is selected in accordance with the job requirement.</p> <p>5.7 Eccentric turning is performed in accordance with specifications in the drawing.</p>



	5.8 Job is checked and measured in conforming to the specification by using appropriate techniques, measuring tools and equipment.
6. Perform threading cutting operation	<p>6.1 Cutting speed, RPM, feed rate and depth of cut are calculated as per job requirement.</p> <p>6.2 Different <b>types of thread</b> are cut in accordance with the specifications outlined in the drawing.</p> <p>6.3 Machine performance is checked in accordance with the job requirement.</p> <p>6.4 Coolant is applied to prevent over heating of work piece and cutting tool.</p> <p>6.5 External and internal V-threads are cut in accordance with specifications in the drawing.</p> <p>6.6 External and internal ACME (29 &amp; 30 degree)-threads are cut in accordance with the specifications in the drawing.</p> <p>6.7 Square-threads are cut in accordance with the specifications in the drawing.</p> <p>6.8 Job is checked and measured in accordance with by using appropriate techniques, measuring tools and equipment.</p>
7. Clean and store tools and equipment.	<p>7.1 Workplace, Tools, equipment are cleaned and maintained in accordance with workplace requirements.</p> <p>7.2 <b>Preventive maintenance</b> schedules are applied in accordance with workplace requirement.</p> <p>7.3 Waste materials are disposed in proper place.</p> <p>7.4 Tools, equipment and finished products are stored safely in accordance with workplace procedures</p>

### Range of Variables

Variable	Range May Include but not limited to:	
1. Types of lathe machine.	<p>1.1 Center lathe/engine lathe/bench lathe.</p> <p>1.2 Tool room lathe.</p> <p>1.3 Turret lathe and capstan lathe.</p> <p>1.4 Multi spindle lathe.</p> <p>1.5 CNC lathe</p>	
2. Different parts of lathe machine	<p>2.1 Headstock.</p> <p>2.2 Tailstock</p> <p>2.3 Bed.</p> <p>2.4 Carriage.</p> <p>2.5 Lead screw.</p> <p>2.6 Feed-Mechanism.</p> <p>2.7 Headstock</p> <p>2.8 Tailstock</p> <p>2.9 Bed</p> <p>2.10 Bed slide ways.</p> <p>2.11 Carriage.</p>	<p>2.18 Lead screw.</p> <p>2.19 Feed-shaft.</p> <p>2.20 Tray.</p> <p>2.21 Nut for retaining chuck and face plate.</p> <p>2.22 Change speed leavers.</p> <p>2.23 Change leavers for feed and screw cutting.</p> <p>2.24 Reversing lever for</p>

	2.12 Apron. 2.13 Cross-slide. 2.14 Compound slide. 2.15 Tool post. 2.16 Driving pulley cover. 2.17 Starting handle.	feed shaft and lead screw. 2.25 Chasing dial. 2.26 Gap bed. 2.27 Cover for feed shaft and lead screw driving gear. 2.28 Lever for screw-cutting nut. 2.29 Lever for engaging feed. 2.30 Main switch panel.
3. Tools and Equipment	3.1 Tools 3.1.1 Clamps 3.1.2 Soft hammer. 3.1.3 Pliers 3.1.4 Brass 3.1.5 Job holding devices/fixture 3.1.6 Adjustable wrench 3.1.7 Hand grinder 3.1.8 Chuck key  3.2 Equipment 3.2.1 3- Jaw chuck 3.2.2 4- Jaw independent chuck 3.2.3 Taper attachment. 3.2.4 Face plate 3.2.5 Lathe centers 3.2.6 Mandrel 3.2.7 Packing pieces 3.2.8 V-block with clamps	
4. PPE	4.1 Dust mask 4.2 Eye glass 4.3 Goggles 4.4 Safety shoes 4.5 Apron	
5. Profile angles	5.1 Back/rake angle. 5.2 Front clearance angle. 5.3 Side rake angle 5.4 Side clearance angle. 5.5 End cutting-edge angle. 5.6 Side cutting-edge angle.	
6. Lathe accessories	6.1 3- and 4-jaw chucks 6.2 Lathe center 6.3 Drill chucks 6.4 Knurling tools 6.5 Boring bar 6.6 Face plate 6.7 Drive plate 6.8 Ball Bearing center	6.9 Steady rest. 6.10 Follower rest 6.11 Lathe dog 6.12 Dead center 6.13 Live center 6.14 Carbide lathe tool 6.15 Quick release vice
7. Taper jobs	7.1 Self-holding taper	

	7.2 Self-releasing taper
8. Eccentric jobs	8.1 Cam shaft 8.2 Crank shaft 8.3 Off-center job
9. Taper turning methods.	9.1 Form tool methods 9.2 Compound slide methods. 9.3 Setting over the tailstock. 9.4 Taper turning with attachment.
10. Eccentric turning methods	10.1 Using 3-jaw universal chuck packing a piece to offset. 10.2 Using 4-jaw independent chuck
11. Types of thread	11.1 British standard whit worth threads. Thread angle- 55 degrees. 11.2 Metric threads. Thread angles- 60 degrees. 11.3 Acme threads. Thread angle- 29 degrees. 11.4 Acme threads. Thread angle- 30 degrees. 11.5 Square threads. Thread angle- 90 degrees. 11.6 Buttress threads. Thread angle- 90/45 degrees. 11.7 Knuckle threads. Thread angle- 30 degrees
12. Preventive maintenance	12.1 Oil and grease the machine sliding parts, daily, weekly and monthly. 12.2 Coolant tank schedule cleaning. 12.3 Electrical fixture & connections regularly Checkup. 12.4 Cleaning the table and vise after each operation.

### Curricular Evidence Guide

1. Underpinning Knowledge	1.1 Selection procedure of <b>type of lathe machine</b> for different lathe operations. 1.2 Different parts of lathe machine 1.3 Method of identifying lathe accessories appropriate to the requirements of the operations. 1.4 Cutting speed and feed rate selection procedure according to the job specifications. 1.5 Method of interpreting drawings to produce component to the job specifications. 1.6 Job materials selection and collection procedure according to the job specifications. 1.7 Determining sequence of operation to produce component to the specified requirement.
2. Underpinning Skills	2.6 Performing straight, step, and shoulder turning after facing and producing component as per specifications in the drawing and finishing using lathe turning tool. 2.7 Performing grooving operation after turning and producing component as per specifications in the drawing and finishing using lathe-grooving tool. 2.8 Performing parting-off operation after completing all operation and produce job in accordance with specification in the drawing.

	<p>2.9 Performing taper turning operation using form tool, compound slide, off-setting tailstock and taper turning attachment and to produce component in accordance with specifications in the drawing.</p> <p>2.10 Performing eccentric turning operation in accordance with specifications in the drawing</p> <p>2.11 Performing external and internal V-thread cutting in accordance with specifications in the drawing.</p> <p>2.12 Performing external and internal acme (29 &amp; 30 degree)-threads cutting in accordance with specifications in the drawing.</p> <p>2.13 Performing square-thread cutting in accordance with specifications in the drawing.</p>
3. Underpinning Attitudes	<p>3.1 Commitment to occupational health and safety practices</p> <p>3.2 Communication with peers, sub-ordinates and seniors in workplace.</p> <p>3.3 Promptness in carrying out activities.</p> <p>3.4 Tidiness and timeliness.</p> <p>3.5 Respect of peers, sub-ordinates and seniors in workplace.</p> <p>3.6 Environmental concern.</p>
4. Resource Implications	<p>The following resources MUST be provided:</p> <p>4.1 Workplace.</p> <p>4.2 Tools, equipment and facilities appropriate to processes or activity</p> <p>4.3 Materials relevant to the proposed activity.</p> <p>4.4 Equipment and outfits appropriate in applying safety measures.</p> <p>4.5 Relevant drawings, manuals, codes, standards and reference material.</p>

### Assessment Evidence Guide:

1. Critical Aspects of Competency	<p>Assessment required evidence that the candidate:</p> <p>1.1 Performed straight, step, and shoulder turning after facing in accordance with specifications in the drawing</p> <p>1.2 Performed grooving operation after turning in accordance with the specifications in the drawing</p> <p>1.3 Performed parting-off operation and produce job in accordance with specification in the drawing.</p> <p>1.4 Performed taper turning operation using form tool, compound slide, offsetting tailstock and taper turning attachment to produce component in accordance with specifications in the drawing.</p> <p>1.5 Performed eccentric turning operation in accordance with specifications in the drawing.</p> <p>1.6 Performed external and internal V-thread cutting in</p>
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	<p>accordance with specifications in the drawing.</p> <p>1.7 Performed external and internal ACME (29 &amp; 30 degree) - cutting in accordance with specifications in the drawing.</p> <p>1.8 Performed square-threads cutting in accordance with specifications in the drawing.</p>
2. Methods of Assessment	<p>Competency should be assessed by:</p> <p>2.1 Written examination</p> <p>2.2 Demonstration</p> <p>2.3 Oral questioning</p> <p>2.4 Workplace observation</p> <p>2.5 Portfolio</p>
3. Context of Assessment	<p>3.1 Competency assessment must be finished in a training center or in an actual or simulated work place after completion of the training module.</p>

<b>Unit of Competency:</b> <b>PERFORM MILLING MACHINE OPERATIONS</b>	<b>Nominal Duration:</b> 80hrs.	<b>Unit Code:</b> SEIP-LIG-MSP-4-O
<b>Unit Descriptor:</b> This unit covers the knowledge, skills and attitudes required to perform milling machine operation. It specifically includes the tasks of determining job requirement, performing indexing operation, using index head, carrying out plain, side, face, gang and straddle milling operations, carrying out slot, key way, parting off, end, form and angular milling operations, performing gear cutting operation on milling machine and cleaning and storing the tools and equipment.		

**Elements and Performance Criteria:**

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

<b>Elements of Competency</b>	<b>Performance Criteria</b>
1. Determine job requirement.	1.1 <b><u>Types of milling machine</u></b> is selected in accordance with workplace/work order requirements. 1.2 Machine is lubricated, handled and used in accordance with the instruction of machine manual. 1.3 Milling <b><u>accessories and attachment</u></b> are used in accordance with the requirements of the operation. 1.4 Required material and <b><u>milling cutters</u></b> are selected according to job requirements. 1.5 Cutting fluid is used in accordance with manufacturer's instruction. 1.6 <b><u>Operating parameters</u></b> of milling machine are identified in accordance to work requirements. 1.7 Safe work practices are maintained and personal protective equipment ( <b><u>PPEs</u></b> ) are worn at work
2. Perform indexing operation using index head.	2.1 Index head is selected, collected and checked 2.2 Different parts of index head are identified, checked and tested 2.3 Index head is set on milling machine in accordance with instruction of manual. 2.4 Different types of indexing methods are identified and calculated in accordance with identified indexing formula 2.5 Different indexing methods are performed in accordance with job requirement and specifications
3. Carryout plain, side face, gang and straddle milling operations.	3.1 Drawings and specification are interpreted in relation to plain, side face, gang and straddle milling operation. 3.2 Milling machine, accessories, attachment, cutter, tools, equipment, materials and cutting fluid are used appropriately. 3.3 Sequence of operation is determined to perform milling work according to specifications. 3.4 Machine performance is checked in line with the

	<p>job requirement.</p> <p>3.5 Plain, side, face, gang and straddle milling operation are performed in accordance with the job requirement.</p> <p>3.6 Job is checked/measured in accordance with specifications and using appropriate techniques, measuring tools and equipment.</p>
<p>4. Carryout slot, key way, parting off, end, form and angular milling operations.</p>	<p>4.1 Drawings and specification are interpreted in relation to slot, key way, parting off, end, form and angular milling operation.</p> <p>4.2 Milling machine, accessories, attachment, cutter, tools, equipment, materials and cutting fluid are used to the requirements of the operation.</p> <p>4.3 Sequence of operation is determined to perform milling work according to specifications.</p> <p>4.4 Machine performance is checked in line with the job requirement.</p> <p>4.5 Slot, key way, parting off, end, form and angular milling operation are performed according to the job requirement.</p> <p>4.6 Job is checked/measured according to specification and appropriate techniques, measuring tools and equipment are used.</p>
<p>5. Perform gear-cutting operation on milling machine.</p>	<p>5.1 Drawings and specification are interpreted in relation to different gear cutting milling operation.</p> <p>5.2 Milling machine, accessories, attachment, <b><u>gear teeth form cutters</u></b>, tools, equipment, materials and cutting fluid are used as appropriate to the requirements of the operation.</p> <p>5.3 Sequence of operation is determined to perform milling work according to specifications.</p> <p>5.4 Machine performance is checked in accordance with the job requirement.</p> <p>5.5 <b><u>Gear teeth nomenclature</u></b> and formulas are calculated for the different types of gear.</p> <p>5.6 <b><u>Different types of gear</u></b> cutting operations are performed according to the job requirement.</p> <p>5.7 Job is checked/measured according to specification and appropriate techniques, measuring tools and equipment are used.</p>
<p>6. Clean and store the tools and equipment.</p>	<p>6.1 Workplace, tools, equipment and milling machine are cleaned.</p> <p>6.2 <b><u>Preventive maintenance</u></b> schedules are applied</p> <p>6.3 Waste materials are disposed in proper place.</p> <p>6.4 Tools, equipment and finished products are stored safely in appropriate location</p>

## Range of Variables

Variable	Range May include but not limited to:
1. Types of milling machine.	1.1 Bed type milling machine 1.1.1 Simplex milling machine. 1.1.2 Duplex milling machine. 1.1.3 Triplex milling machine. 1.2 Column and knee type milling. 1.2.1 Hand milling machine 1.2.2 Plain milling machine. 1.2.3 Universal milling machine. 1.2.4 O-universal milling machine. 1.2.5 Vertical milling machine. 1.3 Plainer type milling machine. 1.4 Special types milling machine. 1.4.1 Tracer controlled milling machine. 1.4.2 Thread cutting milling machine. 1.4.3 CNC milling machine.
2. Milling accessories	2.1 Machine vise. 2.2 Swivel base. 2.3 Angle plate. 2.4 Dividing plate. 2.5 Adapter plate. 2.6 3-Jaw universal chuck. 2.7 Support back plate. 2.8 Stepped clamping shoe. 2.9 Collet chuck. 2.10 3-Jaw drill chuck. 2.11 Shell end mill arbor. 2.12 Boring and facing head. 2.13 Short arbor. 2.14 Long arbor. 2.15 Adaptor with collect chuck. 2.16 Quick release vice.
3. Milling attachment	3.1 Vertical milling attachment. 3.2 Arbor support. 3.3 Right angle head. 3.4 Angle attachment set. 3.5 T-slot cleaner. 3.6 Stainless steel T-slot shop brush. 3.7 Chip hook. 3.8 Wiper kit. 3.9 Milling machine drawbar. 3.10 Quill feed handle. 3.11 Milling machine-tooling package. 3.12 Index head. 3.13 Rotary table/ circular milling attachment. 3.14 Rack milling attachment. 3.15 Horizontal milling attachment. 3.16 Grinding milling attachment.



	3.17 Gear hobbling attachment.	
4. Milling cutters.	4.1 Arbor type cutters. 4.1.1 Side and face cutter. 4.1.2 Slotting cutter. 4.1.3 Single angle cutter. 4.1.4 Double angle cutter. 4.1.5 Convex cutter. 4.1.6 Cone cave cutter 4.1.7 Slitting saw cutter. 4.1.8 Corner radios cutter. 4.1.9 Shell end mill cutter. 4.1.10 Face milling cutter. 4.1.11 Involute gear cutter. 4.1.12 Gear hob cutter. 4.1.13 Slab milling. 4.1.14 Staggered tooth cutter. 4.1.15 Inserted blade cutter. 4.1.16 Inserted carbide tips cutter. 4.1.17 Woodruff cutter. 4.2 Shank type cutters 4.2.1 Taper shank cutter. 4.2.2 Parallel shank cutter. 4.2.3 T-slot cutter. 4.2.4 Slot drill 4.2.5 End mill cutter. 4.2.6 Milling bits. 4.2.7 Carbide end mill. 4.2.8 Roughing end mill. 4.2.9 Dovetail cutter. 4.2.10 Ball nose cutter.	
5. Operating parameters	5.1 RPM 5.2 Cutting speed 5.3 Feed 5.4 Depth of cut 5.5 Milling methods	
6. PPE	6.1 Dust mask. 6.2 Machine goggles. 6.3 Safety shoes. 6.4 Apron	
7. Gear teeth form cutters	The set of eight cutters and their necessary No. of teeth cutting ability given below: 7.1 No. 1 will cut wheel from 135 teeth to a rack 7.2 No. 2 will cut wheel from 55 teeth to a 134 teeth 7.3 No. 3 will cut wheel from 35 teeth to a 54 teeth 7.4 No. 4 will cut wheel from 26 teeth to a 34 teeth 7.5 No. 5 will cut wheel from 21 teeth to a 26 teeth 7.6 No. 6 will cut wheel from 17 teeth to a 20 teeth 7.7 No. 7 will cut wheel from 14 teeth to a 16 teeth 7.8 No. 8 will cut wheel from 12 teeth to a 13 teeth	
8. Gear teeth nomenclature.	8.1 Addendum	8.16 Face

	8.2 Dedendum 8.3 Pressure angle 8.4 Addendum circle 8.5 Dedendum circle 8.6 Circular pitch 8.7 Tooth thickness 8.8 Pitch diameter 8.9 Working depth 8.10 Whole depth 8.11 Addendum angle 8.12 Dedendum angle 8.13 Center distance 8.14 Top land 8.15 Face width	8.17 Flank 8.18 Bottom land 8.19 Clearance 8.20 Clearance circle 8.21 Fillet radii 8.22 Diametral pitch 8.23 Module 8.24 Outside diameter 8.25 Root diameter 8.26 Nominal diameter 8.27 Base diameter 8.28 Line of action 8.29 Involute and cycloid curve
9. Different types of gear.	9.1 Spur gear 9.2 Helical or serial gear 9.3 Bevel gear 9.4 Worm and worm gear 9.5 Rack and pinion	
10. Preventive maintenance	10.1 Oil and grease the machine sliding parts, daily, weekly and Monthly 10.2 Coolant tank schedule cleaning 10.3 electrical fixture & connections regularly Check up 10.4 Cleaning the table and vise after each operation.	

### Curricular Evidence Guide

1. Underpinning Knowledge	1.1 Procedure on selecting different types of milling machine in accordance with work requirements 1.2 Methods of machine lubrication, handling and operation in accordance with instruction of machine manual. 1.3 Proper use and operation of Milling accessories and attachment 1.4 Selection of material and milling cutters 1.5 Use of cutting fluids 1.6 Operating parameters of milling machine 1.7 Different types of indexing methods and their methods of calculation in accordance with the different indexing formula 1.8 Drawings and specification in relation to plain, side face gang and straddle milling operation. 1.9 Milling machine, accessories, attachment, cutter, tools, equipment, materials and cutting fluid. 1.10 Procedure of determining sequence of operation when perform milling work according to specifications. 1.11 Procedure of checking Machine performance
2. Underpinning Skills	2.1 Performing different indexing methods in

	<p>accordance with job requirement of the specifications.</p> <p>2.2 Performing plain, side, face, gang and straddle milling operation in accordance with the job requirement.</p> <p>2.3 Performing slot, key way, parting off, end, form and angular milling operation in accordance with job requirement.</p> <p>2.4 Calculating gear teeth nomenclature and formulas for the different types of gear.</p> <p>2.5 Performing different types of gear cutting operations in accordance with the job requirement.</p> <p>2.6 Checking and measuring of work piece in conformance with specification using appropriate techniques, measuring tools and equipment.</p> <p>2.7 Applying preventive maintenance schedules in accordance to the machine manufacturer's requirement.</p>
3. Underpinning Attitudes	<p>3.1 Commitment to occupational health and safety practices</p> <p>3.2 Communication with peers, sub-ordinates and seniors in workplace.</p> <p>3.3 Promptness in carrying out activities.</p> <p>3.4 Tidiness and timeliness.</p> <p>3.5 Respect of peers, sub-ordinates and seniors in workplace.</p> <p>3.6 Environmental concern.</p>
4. Resource Implications	<p>The following resources must be provided:</p> <p>4.1 Workplace</p> <p>4.2 appropriate Tools, equipment and facilities</p> <p>4.3 Materials relevant to the proposed activity.</p> <p>4.4 Equipment and outfits appropriate in applying safety measures.</p> <p>4.5 Relevant drawings, manuals, codes, standards and reference material.</p>

**Assessment Evidence Guide:**

1. Critical Aspects of Competency	<p>Assessment required evidence that the candidate:</p> <p>1.1 Performed different indexing methods in accordance with job requirement specifications.</p> <p>1.2 Performed plain, side, face, gang and straddle milling operation in accordance with the job requirement.</p> <p>1.3 Performed Slot, key way, parting off, end, form and angular milling operation in accordance with the job requirement.</p> <p>1.4 Calculated gear teeth nomenclature and formulas for the different types of gear.</p>
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	<p>1.5 Performed different types of gear cutting operations according to the job requirement.</p> <p>1.6 Checked and measured job in conformance to specification using appropriate techniques, measuring tools and equipment.</p> <p>1.7 Applied Preventive maintenance schedules in accordance with machine manufacturer's requirements.</p>
2. Methods of Assessment	<p>Competency should be assessed by:</p> <p>2.1 Written examination</p> <p>2.2 Demonstration</p> <p>2.3 Oral questioning</p> <p>2.4 Workplace observation</p> <p>2.5 Portfolio</p>
3. Context of Assessment	<p>3.1 Competency assessment must be finished in a training center or in an actual or simulated work place after completion of the training module.</p>

<b>Unit of Competency:</b> <b>PERFORM SHAPER MACHINE OPERATIONS</b>	<b>Nominal Duration:</b> 30 hrs.	<b>Unit Code:</b> SEIP-LIG-MSP-5-O
<b>Unit Descriptor:</b> This unit covers the knowledge, skills and attitudes required of a machinist to perform shaper machine operation. It specifically includes the tasks of preparing for shaping operation, grinding shaper tools, carrying out shaping operations, carrying out shaping operations and cleaning and storing the tools and equipment.		

**Elements and Performance Criteria:**

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

<b>Elements of Competency</b>	<b>Performance Criteria</b>
1. Prepare for shaping operation	1.1 <b><u>Shaper machine types, main and auxiliary parts and accessories</u></b> are identified 1.2 Shaper machine function, <b><u>quick return mechanism, principle and specifications</u></b> are demonstrated 1.3 Cutting speed, feed rate, and depth of cut are selected in accordance with the job specifications. 1.4 Drawings are interpreted in accordance with job specifications. 1.5 Materials and cutting tools are selected and collected in accordance with job specifications. 1.6 Sequence of operation is determined to produce component in accordance with job requirements 1.7 Safe work practices are maintained and personal protective equipment ( <b><u>PPEs</u></b> ) are worn in accordance with workplace requirements.
2. Grind shaper tools.	2.1 Drawings are interpreted in conformance with the design and specifications. 2.2 Tool holding devices and tool blanks are selected in accordance with requirements of the operation. 2.3 Pedestal/bench grinding machine and accessories are selected in accordance with lathe tool grinding requirements 2.4 Grinding abrasive wheels are selected, inspected and dressed according to worksite procedures. 2.5 Grinding machine is adjusted in accordance with worksite procedures. 3.7 Tool blank is held or clamped to avoid damage and accident 3.8 Coolant is used to reduce heat of tool and prevent damage. 3.9 Grinding of tool blank to the required <b><u>profile angle</u></b> of single point cutting tool is performed in accordance with specification for cutting horizontal, vertical and inclined surfaces.
3. Carryout shaping operations.	3.1 Drawings and specification are interpreted in relation to the shaping operation.

	<p>3.2 Shaper machine, accessories, single point cutting tools, equipment, materials, cutting fluid, tools and equipment are used in accordance with the requirements of the operation.</p> <p>3.3 Sequence of operation in shaping work is determined in accordance with specifications.</p> <p>3.4 Machine performance is checked in accordance with job requirement.</p> <p>3.5 <b>Shaping operations</b> are performed in accordance with the job requirement.</p> <p>3.6 Job is checked and measured in conformance with specification using appropriate techniques, measuring tools and equipment.</p>
4. Clean and store the tools and equipment.	<p>4.1 Workplace, tools, equipment and shaper machine are cleaned.</p> <p>4.2 <b>Preventive maintenance</b> schedules are applied in accordance to workplace requirement.</p> <p>4.3 Waste materials are disposed in proper place.</p> <p>4.4 Tools, equipment and finished products are stored safely in appropriate location.</p>

### Range of Variables

Variable	Range
	May include but not limited to:
1. Shaper machine types	<p>1.1 Based on type of mechanism employed for the movement of the cutting tool i.e. tool carrying ram the shapers are classified into three types:</p> <p>1.1.1 Crank type</p> <p>1.1.2 Gear type</p> <p>1.1.3 Hydraulic type</p> <p>1.2 According to position and movement of ram the shapers are classified into three types:</p> <p>1.2.1 Horizontal type</p> <p>1.2.2 Vertical type</p> <p>1.2.3 Travelling head type</p> <p>1.3 Shapers are classified into two types based on design of the worktable:</p> <p>1.3.1 Standard shaper</p> <p>1.3.2 Universal shaper</p> <p>1.4 Based on type of cutting stroke employed these are classified into:</p> <p>1.4.1 Push type</p> <p>1.4.2 Draw type</p>
2. Main parts of shaper machine.	<p>2.1 Ram</p> <p>2.2 Tool head</p> <p>2.3 Base</p> <p>2.4 Column</p> <p>2.5 Table</p> <p>2.6 Saddle</p> <p>2.7 Cross rail</p>

	2.8 Quick return mechanism	
3. Auxiliary parts of shaper machine.	3.1 Base 3.2 Adjustable sliding support 3.3 Table 3.4 Vice 3.5 Tool post 3.6 Clapper box 3.7 Tool feed handle 3.8 Graduated collar 3.9 Ram clamping nut 3.10 Scale indicator	3.11 Clutch handle 3.12 Cross traverse handle 3.13 Ram 3.14 Tool slide 3.15 Swivel base 3.16 Saddle 3.17 Cross rail 3.18 Cross rail elevating screw 3.19 Frame 3.20 Driving motor.
4. Shaper accessories	4.1 Machine vise 4.2 Angle plate 4.3 Index plate 4.4 Clamp 4.5 T – bolt 4.6 Stop pin 4.7 V-block 4.8 Adjustable stop	
5. Parts of quick return mechanism	5.1 Ram 5.2 Ram locking lever 5.3 Hand wheel for stroke adjustment 5.4 Tool 5.5 Bevel gears 5.6 Link arm 5.7 Fixed center 5.8 Screwed spindle 5.9 Rocker arm 5.10 Crank pin 5.11 Slotted lever 5.12 Bull gear 5.13 Bevel gears 5.14 Pinion 5.15 Crank adjusting screw	
6. Principle of shaping operation	6.1 The arm is in reciprocating motion to push cutting tool back and forward across the work piece. 6.2 Cutting stroke arm move 220 degrees 6.3 Return stroke arm quick return to 140 degrees	
7. Specification of shaping machine	7.1 Max. length of stroke of Ram 7.2 Types of drive 7.3 Power input 7.4 Floor space required 7.5 Weight of the machine 7.6 Cutting to return stroke ratio 7.7 Feed	
8. PPE	8.1 Dust mask. 8.2 Machine goggles. 8.3 Safety shoes. 8.4 Apron	

9. Profile angle	<ul style="list-style-type: none"> <li>9.1 Back/rake angle.</li> <li>9.2 Front clearance angle</li> <li>9.3 Side rake angle</li> <li>9.4 Side clearance angle</li> <li>9.5 End cutting edge angle</li> <li>9.6 Side cutting-edge angle.</li> </ul>
10. Shaping operations	<ul style="list-style-type: none"> <li>10.1 Horizontal plain surface</li> <li>10.2 Vertical plain surface</li> <li>10.3 Inclined surface</li> <li>10.4 Grooved surface</li> <li>10.5 Slotted surface</li> <li>10.6 Internal splines and gear teeth</li> <li>10.7 Blind hole, key way, spline and gear teeth.</li> </ul>
11. Preventive maintenance	<ul style="list-style-type: none"> <li>11.1 Oiling and greasing the machine sliding parts on daily, weekly or monthly basis</li> <li>11.2 Cleaning coolant tank</li> <li>11.3 Checking up electrical fixture &amp; connections regularly</li> <li>11.4 Cleaning the table and vice after each operation.</li> </ul>

### Curricular Evidence Guide

1. Underpinning Knowledge	<ul style="list-style-type: none"> <li>1.1 Shaper machine types, main and different parts and accessories</li> <li>1.2 Shaper machine functions, quick return mechanism, principle and specifications of shaper machine</li> <li>1.3 Cutting speed, feed rate, and depth of cut selection procedures.</li> <li>1.4 Methods of interpreting Drawings</li> <li>1.5 Selection procedure of job materials and cutting tools</li> <li>1.6 Method of determining sequence of operation.</li> <li>1.7 Safe work practices and personal protective equipment (PPE) used when performing shaping operations</li> </ul>
2. Underpinning Skills	<ul style="list-style-type: none"> <li>2.1 Determining sequence of operation to produce component to the specifications of requirement.</li> <li>2.2 Grinding of tool blank in accordance with the profile angles of shaping single point cutting tool</li> <li>2.3 Interpreting drawings and specification</li> <li>2.4 Using shaper machine, accessories, single point cutting tools, equipment, materials, cutting fluid, tools and equipment appropriate to the requirements of the operation.</li> <li>2.5 Determining sequence of operation to perform shaping work in accordance with specifications.</li> <li>2.6 Checking machine performance in conformance with the job requirement.</li> <li>2.7 Performing shaping operations in accordance with the job requirement.</li> <li>2.8 Checking and measuring the job in conformance</li> </ul>



	with specification and using appropriate techniques, measuring tools and equipment
3. Underpinning Attitudes	<p>3.1 Commitment to occupational health and safety practices</p> <p>3.2 Communication with peers, sub-ordinates and seniors in workplace.</p> <p>3.3 Promptness in carrying out activities.</p> <p>3.4 Tidiness and timeliness.</p> <p>3.5 Respect of peers, sub-ordinates and seniors in workplace.</p> <p>3.6 Environmental concern.</p>
4. Resource Implications	<p>The following resources must be provided:</p> <p>4.1 Workplace</p> <p>4.2 Appropriate Tools, equipment and facilities</p> <p>4.3 Materials relevant to the proposed activity.</p> <p>4.4 Equipment and outfits appropriate in applying safety measures.</p> <p>4.5 Relevant drawings, manuals, codes, standards and reference material.</p>

**Assessment Evidence Guide:**

1. Critical Aspects of Competency	<p>Assessment required evidence that the candidate:</p> <p>1.1 Performed different indexing methods in accordance with job requirement of the specifications.</p> <p>1.2 Performed plain, side, face, gang and straddle milling operation in accordance with the job requirement.</p> <p>1.3 Performed slot, key way, parting off, end, form and angular milling operation in accordance to the job requirement.</p> <p>1.4 Calculated gear teeth nomenclature and solved formulas for the different types of gear.</p> <p>1.5 Performed different types of gear cutting operations in accordance with the job requirement.</p> <p>1.6 Checked/measured job in conformance with specification and using appropriate techniques, measuring tools and equipment.</p> <p>1.7 Applied preventive maintenance schedules in accordance with machine manufacturer's requirement.</p>
2. Methods of Assessment	<p>Competency should be assessed by:</p> <p>2.1 Written examination</p> <p>2.2 Demonstration</p> <p>2.3 Oral questioning</p> <p>2.4 Workplace observation</p> <p>2.5 Portfolio</p>
3.1 Context of Assessment	<p>3.1 Competency assessment must be finished in a training center or in an actual or simulated work place after completion of the training module.</p>

<b>Unit of Competency:</b> <b>PERFORM PRECISION GRINDING MACHINE OPERATIONS</b>	<b>Nominal Duration:</b> 40 hrs.	<b>Unit Code:</b> SEIP-LIG-MSP-6-O
<b>Unit Descriptor:</b> This unit covers the knowledge, skills and attitudes required to perform precision grinding machine operations. It specifically includes the tasks of preparing for precision grinding machine operations, carrying out cylindrical grinding machine operation, carrying out surface grinding machine operation, performing universal tools and cutter grinding machine operations, cleaning, storing tools and equipment.		

**Elements and Performance Criteria:**

(Terms in the performance criteria that are written in **bold and underlined** are elaborated in the range of variables).

<b>Elements of Competency</b>	<b>Performance Criteria</b>
1. Prepare for precision grinding machine operations.	1.1 Different <b><u>types of grinding machine</u></b> are identified and made ready. 1.2 <b><u>Different parts of the grinding machine</u></b> are identified. 1.3 RPM, cutting speed, feed rate and depth of grind are determined. 1.4 Grinding machine <b><u>accessories and attachment</u></b> are identified and set 1.5 Different <b><u>abrasive/grinding wheels</u></b> are identified, selected and balanced according to the <b><u>abrasive wheel specifications.</u></b> 1.6 Machine is degreased, selected, handled and operated according to the machine instruction manual. 1.7 Electrical switches of machines are identified. 1.8 <b><u>PPE's</u></b> are selected and used.
2. Carry out cylindrical grinding machine operation	2.1 Cylindrical grinding machine are selected and set according to the job requirement. 2.2 Grinding wheels are selected, balanced, and dressed according to the requirement. 2.3 Cylindrical work piece is set between live and revolving centers. 2.4 RPM, cutting speed, feed rate and depth of cut are calculated as per job requirement. 2.5 Machine performance is checked in conformance with job requirement. 2.6 Coolant is applied to prevent over heating of work piece and cutting tool. 2.7 Cylindrical grinding operation is performed in accordance with workplace requirement. 2.8 Job is checked and measured in conformance with specification and appropriate techniques, <b><u>measuring tools, and equipment are used.</u></b>
3. Carry out surface grinding machine operation	3.1 Surface grinding machine are selected and set in accordance with the job requirement. 3.2 Grinding wheels are selected, balanced, and dressed

	<p>in accordance with the job requirement.</p> <p>3.3 Work piece is set on the machine vise/magnetic vise.</p> <p>3.4 RPM, cutting speed, feed rate and depth of cut are calculated as per job requirement.</p> <p>3.5 Machine performance is checked in conformance with the job requirement.</p> <p>3.6 Coolant is applied to prevent over heating of the work piece and grinding wheel.</p> <p>3.7 Surface grinding operation is performed in accordance with workplace requirement.</p> <p>3.8 Job is checked and measured in conformance with specification and appropriate techniques, measuring tools, and equipment are used.</p>
4. Perform universal tool and cutter grinding machine operations.	<p>4.1 Universal tools and cutter grinding machine are selected and set in according with the job requirement.</p> <p>4.2 Grinding wheels are selected, balanced, and dressed according to the job requirement.</p> <p>4.3 <b>Cutting tools</b> and cutters are set on the machine vise/universal vise.</p> <p>4.4 RPM, cutting speed, feed rate and depth of cut are calculated as per job requirement.</p> <p>4.5 Machine performance is checked in conformance with the job requirement.</p> <p>4.6 Coolant is applied to prevent over heating of the work piece and grinding wheel.</p> <p>4.7 Universal tools and cutter grinding operation is performed in accordance with the work place requirement.</p> <p>4.8 Job is checked and measured in conformance with specification and appropriate techniques, measuring tools, and equipment are used.</p>
5. Clean and store tools and equipment.	<p>5.1 Workplace, tools, equipment and shaper machine are cleaned.</p> <p>5.2 <b>Preventive maintenance</b> schedules are applied in accordance with workplace requirement.</p> <p>5.3 Waste materials are disposed in proper place.</p> <p>5.4 Tools, equipment and finished products are stored safely in appropriate location</p>

### Range of Variables

Variable	Range
1. Types of grinding machine	<p>May include but not limited to:</p> <p>1.1 Hand grinding machine.</p> <p>1.2 Bench grinding machine.</p> <p>1.3 Pedestal grinding machine.</p> <p>1.4 Cylindrical grinding machine.</p> <p>1.5 Surface grinding machine.</p> <p>1.6 Universal tools and cutter grinding machine.</p>

	<ul style="list-style-type: none"> <li>1.7 Internal grinding machine.</li> <li>1.8 Center less grinding machine.</li> <li>1.9 Universal grinding.</li> <li>1.10Crankshaft grinding machine.</li> <li>1.11Honing machine.</li> </ul>
2. Different parts of grinding machine	<ul style="list-style-type: none"> <li>2.1 Bed</li> <li>2.2 Work head</li> <li>2.3 Wheel head</li> <li>2.4 Tail stock</li> <li>2.5 Upper table</li> <li>2.6 Lower table</li> <li>2.7 Base</li> </ul>
3. Accessories and attachment	<ul style="list-style-type: none"> <li>3.1 Swivel base motor work head</li> <li>3.2 Travers operated tail stock</li> <li>3.3 Standard grinding wheel</li> <li>3.4 Wheel dresser holder</li> <li>3.5 Coolant supply unit</li> <li>3.6 Lubricant supply unit</li> <li>3.7 Table swivel indicator</li> <li>3.8 Diamond dressing tools</li> <li>3.9 Tools and tool box</li> </ul>
4. Abrasive	<ul style="list-style-type: none"> <li>4.1 Natural <ul style="list-style-type: none"> <li>4.1.1 Emery</li> <li>4.1.2 Corundum</li> <li>4.1.3 Diamond</li> </ul> </li> <li>4.2 Artificial <ul style="list-style-type: none"> <li>4.2.1 Silicon carbide (Si C)</li> <li>4.2.2 Aluminum oxide (Al<sub>2</sub> O<sub>3</sub>)</li> <li>4.2.3 Cubic Boron</li> <li>4.2.4 Nitride (CBN)</li> </ul> </li> </ul>
5. Grinding wheels	<ul style="list-style-type: none"> <li>5.1 Straight</li> <li>5.2 Recessed one side</li> <li>5.3 Recessed two sides</li> <li>5.4 Offset</li> <li>5.5 Countersunk dovetail</li> <li>5.6 Tapered one side</li> <li>5.7 Tapered two sides</li> <li>5.8 Ring (cylindrical)</li> <li>5.9 Straight cup</li> <li>5.10 Double cup</li> <li>5.11 Flaring cup</li> <li>5.12 Dish saucer (saw gummer)</li> <li>5.13 Cutting off and slitting</li> <li>5.14 Supper diamond</li> </ul>
6. Abrasive wheel specifications	<ul style="list-style-type: none"> <li>6.1 WA46-K5V17</li> <li>W - Prefix</li> <li>A - Abrasive (Aluminum oxide)</li> <li>46 - Grain size</li> <li>K- Grade</li> </ul>

	5- Structure V - Bond type (Vitrified) 17- suffix
7. PPE	7.1 Dust mask. 7.2 Machine goggles. 7.3 Safety shoes. 7.4 Apron
8. Measuring tools	8.1 Steel rule 8.2 Vernier caliper 8.3 Vernier height gauge 8.4 Dial indicator 8.5 Bevel tri-square
9. Equipment	9.1 Machine vise. 9.2 Universal vise. 9.3 Universal chuck. 9.4 Wheel balancer. 9.5 Work steadies. 9.6 Permanent magnetic chuck 9.7 Radius wheel dresser 9.8 Angular wheel dresser
10. Cutting tools	10.1 Drill bits. 10.2 Single point cutting tools (Lathe & shaper) tools 10.3 Milling cutters
11. Preventive maintenance	11.1 Oil and grease the machine sliding parts, daily, weekly and monthly 11.2 Coolant tank schedule cleaning 11.3 Electrical fixture and connections regularly check up 11.4 Cleaning the table and vice after each operation.

### Curricular Evidence Guide

1. Underpinning Knowledge	1.1 RPM, cutting speed, feed rate and depth of grind 1.2 Procedure for setting up a grinding machine accessories and attachment 1.3 Grinding machine accessories and attachment 1.1 Types of abrasives/grinding wheels 1.2 Grinding machine performance 1.3 Operation of cylindrical grinding machine 1.4 Procedure of surface grinding operation 1.5 Procedure of universal tools and cutter grinding operation 1.6 Types of coolant 1.7 Functions of coolant 1.8 Types of checking and measuring instruments 1.9 Use of checking and measuring instruments applied in RAC operation 1.10 Checking/measuring work piece for conformance to specification using appropriate techniques, measuring tools, and equipment.
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2. Underpinning Skills	<ul style="list-style-type: none"> <li>2.1 Determining RPM, cutting speed, feed rate and depth of grind</li> <li>2.2 Identifying and setting grinding machine accessories and attachment</li> <li>2.3 Identifying, different abrasive/grinding wheels, selecting, and balancing according to the abrasive wheel specifications.</li> <li>2.4 Checking machine performance conforming to the job requirement.</li> <li>2.5 Performing cylindrical grinding operation according to the work place requirement.</li> <li>2.6 Performing surface grinding operation according to the work place requirement.</li> <li>2.7 Performing universal tools and cutter grinding operation in accordance to workplace requirement</li> <li>2.8 Applying coolant to prevent over heating of work piece and cutting tool.</li> <li>2.9 Checking/measuring Job for conformance to specification using appropriate techniques, measuring tools, and equipment.</li> </ul>
3. Underpinning Attitudes	<ul style="list-style-type: none"> <li>3.1 Commitment to occupational health and safety practices</li> <li>3.2 Communication with peers, sub-ordinates and seniors in workplace.</li> <li>3.3 Promptness in carrying out activities.</li> <li>3.4 Tidiness and timeliness.</li> <li>3.5 Respect of peers, sub-ordinates and seniors in workplace.</li> <li>3.6 Environmental concern.</li> </ul>
4. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>4.1 Workplace</li> <li>4.2 Tools, equipment and facilities appropriate to processes or activity.</li> <li>4.3 Materials relevant to the proposed activity.</li> <li>4.4 Equipment and outfits appropriate in applying safety measures.</li> <li>4.5 Relevant drawings, manuals, codes, standards and reference material.</li> </ul>

### Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Determined RPM, cutting speed, feed rate and depth of grind 1.2 Identified and set grinding machine accessories and attachment 1.3 Identified, different abrasive/grinding wheels selected and balanced according to the abrasive wheel specifications. 1.4 Checked machine performance conforming to the job requirement. 1.5 Performed cylindrical grinding operation according to the work place requirement. 1.6 Performed surface grinding operation according to the work place requirement. 1.7 Performed universal tools and cutter grinding operation in accordance to workplace requirement 1.8 Applied coolant to prevent over heating of work piece and cutting tool. 1.9 Checked/measured Job for conformance to specification using appropriate techniques, measuring tools, and equipment.
2. Methods of Assessment	Competency should be assessed by: 2.1 Written examination 2.2 Demonstration 2.3 Oral questioning 2.4 Workplace observation 2.5 Portfolio
3. Context of Assessment	3.1 Competency assessment must be finished in a training center or in an actual or simulated work place after completion of the training module.

### End of Competency Standard

# **Assessment Guide**

## **A Framework for Effective Assessment**

### **Machine Shop Practice**



## *How to Use this Assessment Guide*

- This Assessment Guide presents need-to-know information for Assessors and others who want to know more about the assessment process. A handy Table of Contents Guide on the next page shows you where to look.
- If you want the basics of assessment, its key terms and definitions, in a Question & Answer (Q&A) format, see Section One.
- If you want a knowledge of who does what, the key roles and responsibilities involved in assessment, see Section Two.
- If you want a “toolbox” of tools and templates, that you can select from depending on your assessment need, see Section Three.
- If you want to look at working samples of completed assessment tools, see the Appendices.

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# Assessment Guide

## Section One: Objectives linked to Key Terms & Definitions

### *Define assessment.*

Assessment is a systematic process of collecting proof or evidence on whether or not a candidate has demonstrated competence in the performance of a work-related activity/task that is directly linked to a performance standard. The assessment confirms that the individual can perform to the standard expected in the workplace and/or the nationally approved competency standard.

### *Give an example of assessment.*

A helpful example in this regard is the driving test. The driver must prove his competence to drive by demonstrating to the driving assessor his ability to do so. The driving assessor uses a checklist to assess the candidate and make the necessary recommendations, based on the evidence he has collected in observing the candidate's driving. S/He either records/recommends that the candidate is **competent** or **not yet competent**.

### *What is the purpose of assessment?*

The Purpose of Assessment is to confirm that a trainee can perform competently to the standards expected in the workplace.

### *What is Assessment based on?*

- An effective Assessment is based on a Competency Standard.
- A Competency Standard describes the skills, knowledge, and attitudes needed to perform effectively in the workplace, not the classroom.

### *Define the term "competency."*

Competency is the ability to do a task successfully. Aspects of competency include:

- The capacity to perform tasks to the required standard consistently
- The ability to respond to different needs in the workplace
- The ability to plan and integrate a variety of tasks to attain a work outcome

*Describe what makes up a competency standard.*

It must be noted that a competency standard is made up of individual units of competency that include elements of competency as well as the performance criteria needed to accomplish them.

*Define the term “Assessment tool.”*

An assessment tool is, in effect, an evidence-gathering tool. It contains both the instrument used for the assessment and instructions for gathering evidence in the assessment process. As an assessment instrument it contains the context and conditions for the assessment; tasks to be administered to the learner; an outline of the evidence to be gathered for the learner; the criteria for judging the evidence; and the necessary housekeeping records for recording and reporting requirements.

*Describe the difference between Conventional Testing & Competency Based Assessment.*

Conventional Testing	CBT Assessment
<ul style="list-style-type: none"> <li>• Emphasis on knowledge/memorization</li> <li>• Teachers/Training Providers have main role</li> <li>• Theory &amp; practical Tests can become outdated</li> <li>• High cost &amp; central control</li> <li>• Relatively inflexible</li> </ul>	<ul style="list-style-type: none"> <li>• Based on competency standards</li> <li>• Involve industry partners in crucial role</li> <li>• Assessment based on demonstration of work skills rather than classroom knowledge</li> <li>• Flexible delivery</li> <li>• Competencies widely recognized</li> <li>• Guidelines &amp; Templates used</li> </ul>

*Describe briefly what makes up an assessment system.*

An Assessment System must be understood as a well-coordinated set of documented policies and procedures, including assessment materials and tools, that ensure assessments are consistently valid, reliable, flexible, fair, and safe.

*Define the purpose of the Assessor role.*

The role of Assessor is the heart and soul of effective competency based assessment. Without this pivotal role, determining the competency of the trainee is mere guesswork.

Note:

- The Industry Assessor will be asked to provide specs and practical demonstration tests from his workplace that will provide the evidence for determining competency.
- The importance of this input cannot be overemphasized for it best matches and tests the required performance criteria from the Standard.

*Describe the basic questions that an Assessor must ask when planning an Assessment.*

#### **Planning an Assessment: What Needs to Happen?**

- Determine which Units of Competency need to be assessed?
- Determine what Assessment Methods will be used?
- Determine what evidence-based tools (specs) need to be developed by the Assessor to guide the assessment?
- Determine how long it will take?
- Determine when the assessment will occur?
- Determine where the assessment will take place?
- Determine how it will be recorded?

*Give some Assessor Requirements/Competencies.*

## Requirements/Competencies of an Assessor-

- The ability to use assessment tools to gather evidence effectively is essential, adjusting the language where necessary to reflect the language/literacy/numeracy levels of the workplace and not to exceed them in order to ensure learner understanding. This will also entail an ability to respond to learner needs such as responding to learner disability.
- The skill to develop specifications and practical tests, based on performance criteria, that provide evidence of competency that will fast track the assessment process.
- The ability to clearly demonstrate current industry skills and competencies relevant to the Standard.
- The Assessor is selected/appointed by Industry to act as an Assessor because of his proven competencies.
- Knows what needs to be done to assess the performance criteria
- Demonstrates a high level of expertise in the technical area to be examined
- Can provide constructive feedback

*Define the challenges of the Assessor Role.*

### Assessor Role: Challenges

- Needs to be objective and unbiased
- Must have interpersonal skills to relax nervous candidates or deal with those who are aggressive or emotional
- Must have ability to deal with those who have literacy problems or difficult dialect

*Review some basic need-to-know elements concerning assessment.*

### Assessment Basics: Need to Know Elements

- Assessment to be conducted by Industry Assessor selected by industry
- Industry assessor must be familiar with units of competency outlined in the course standards
- Industry Assessor should drafts specs that reflect industry requirements for trainees and that are based on critical aspects of competency
- Industry assessor is responsible for making final judgment of **competent** or **not yet competent**
- Trainer will assist industry assessor

- Trainees must demonstrate competence based on the units of competency outlined in the standards
- All resources related to units of competency must be made available prior to the assessment event, e.g., tools, equipment, materials

*Describe the trainer’s role in the assessment process.*

The Trainer acts as a primary resource for the Assessor and acts as a Facilitator.

Trainer ensures:

- All industry required tools, equipment, and materials are available for the assessment
- The training venue is booked and has sufficient space for demonstrations/tasks
- That all logistics such as admission slips, signature sheets, and records are readily available for distribution and collection
- That all teaching materials and Standard documents and Assessment tools are ready for the Assessor

*Discuss the importance of principles of assessment and what is involved.*

**Principles of Assessment Table**

Key Principles	Relevance/Meaning
<b>Valid</b>	Ensures assessment aligned with the Unit of Competency and is based on evidence that shows the learner can demonstrate skills and knowledge in other similar contexts (workplace)
<b>Reliable</b>	Evidence presented for assessment is consistently interpreted regardless of the Assessor
<b>Flexible</b>	Assesses competencies held by the learner regardless of where they have been acquired; reflects the individual learner’s needs
<b>Fair</b>	The individual learner’s needs or disability is considered in the assessment process; the learner is provided with information about the assessment process and given the opportunity to challenge the result of the assessment if warranted
<b>Safe</b>	The assessor has inspected the venue for assessment and determined that it is safe for all involved and that emergency evacuations are in place if needed



*Define the term “evidence.”*

Evidence is information that is gathered and matched against a Unit of Competency to provide proof of competency.

*State the different forms of evidence that can be collected.*

Different forms of evidence that can be collected are-

- **Direct** such as demonstration test, or observation of Candidate
- **Indirect** such as Candidate’s self-assessment or third party reports such as an employer interview

*Describe and outline what is involved in “rules of evidence” and why they are important.*

Rules of Evidence Table

Rules of Evidence	Meaning
<b>Valid</b>	The assessor is given assurance that the learner possesses the skills, knowledge, and attitudes described in the Unit of Competency and related assessment requirements
<b>Sufficient</b>	The assessor is assured that the quality, quantity, and relevance of the evidence is sufficient to enable a judgment to be made on the learner’s competency
<b>Authentic</b>	The assessor is assured that the evidence provided for assessment is the learner’s own work
<b>Current</b>	The assessor is assured that the assessment evidence demonstrates current competency of the learner. This evidence must be from the present or very recent past.

*Describe the purpose of evidence gathering tools.*

The Purpose of evidence gathering tools are-

- To help candidates understand what is expected of them

- To provide a focus for the assessment
- To identify what is needed to verify competency

*State the use of the evidence guide.*

The evidence guide provides useful advice on Unit of Competency assessment and must be read in conjunction with the performance criteria, required underpinning skills/knowledge/attitudes, range statement, and the critical aspects of competency for the Standard.

*State why assessment evidence is important.*

Evidence is the information gathered that provides proof that the performance criteria of a unit of competency has been met. Evidence can take many forms:

- **Observation:** watching the trainee perform
- **Questioning:** asking the trainee questions
- **Demonstration of specific skills:** seeing how the trainee performs a procedure or creates a final product
- **Examining** previous work the trainee has done

*Describe the kinds of Assessment Methods that can be used for Evidence gathering purposes.*

Various kinds of Assessment Methods can be used for Evidence gathering purposes. A wide range of assessment methods are available for Evidence- gathering purposes. Assessment methods are not limited to those listed below. The greater the range of assessment methods applied, the better the accuracy of the assessment.

Assessment Methods Table

Methods	Examples
Direct Observation of Candidate	Actual real-time activities in the workplace Work activities in a simulated workplace/training center

Questioning	Written questions; interviews; self-evaluation with questions; verbal questioning; questionnaires
Evidence compiled by Candidate	Portfolio; collection of work samples; products with supporting documentation; logbooks; information about life experience
Methods	Examples
Review of Product	Work samples and products; products as a result of a demonstration test/spec
Third Party Feedback	Reports/testimonials from Employers and Supervisors; evidence of training; interviews with Employers and Supervisors

**Advice to the Assessor:** use these methods and examples as a means of making your assessment valid, reliable, flexible, fair, and safe.

*Define the term “evidence gathering tools” and give some examples of these tools.*

Evidence gathering tools are the actual instruments that the Assessor uses to collect evidence. Evidence may be collected through:

- Demonstration of work activity
- Observation Checklist
- Question List
- Third party reports e.g. supervisor to verify consistent performance
- Review of candidate’s portfolio
- Verifying the Candidate’s capacity to deal with contingencies (unexpected things that come up)
- Written test

*Define the term “portfolio.”*

A collection of evidence that may be presented by the Candidate to an Assessor to prove the Candidate's competence at a job or task.

What are some examples of Portfolio Evidence?

- Training results and certificates
- Training workbooks
- References from employers
- Job description and work experience
- Photos and videos
- Work journals
- Awards
- Work samples
- Letters and memos

*Outline a 6-step method for preparing an evidence plan.*

#### **Steps in Preparing an Evidence Plan (Sequence of Steps to Follow)-**

The Evidence Plan is the most important planning tool for an Assessor. A good evidence plan generates a list of the evidence that the Assessor must gather when conducting the assessment for a specific Unit of Competency. The following 6-Point Method for preparing an Evidence Plan provides a useful sequence of inter-related steps to follow:

1. Select Unit of Competency for assessment
2. Read full Unit of Competency
3. Identify evidence requirements based on:
  - a. Elements and Performance Criteria
  - b. Dimensions of Competence
  - c. Underpinning skills knowledge
  - d. Critical aspects of competency
4. Develop a list of evidence requirements
5. Identify best ways of collecting evidence (tools)
6. Document evidence plan

*Outline the steps (sequence of activities) involved in developing an assessment tool.*

Following are the steps (sequence of activities) involved in developing an assessment tool:

1. Select the Unit of Competency
2. Read the Unit of Competency
3. Identify the required evidence: critical aspects of competency
4. Identify the evidence gathering method
5. Complete the evidence plan
6. Select the appropriate template
7. Complete the template
8. Check the evidence gathering tools against the evidence plan and Unit of Competency
9. Check the tool with another Assessor for his opinion

*Describe the four dimensions of competency.*

**Task Skills:** the capacity to perform tasks in the workplace and demonstrate competence that meets the required Standard;

**Task Management Skills:** the ability to plan and integrate several tasks simultaneously that achieve a desired work outcome such as those skills involved in budgeting for a work operation, securing supplies and equipment for the work operation, completing the task in a timely, cost-effective manner, and ensuring safety practices are followed throughout;

**Contingency Management Skills:** the ability to respond to crises and breakdowns in the workplace, such as accidents and emergency situations that are unanticipated and require immediate action and resolution;

**Job/Role Environment Skills:** the capacity to own the responsibilities and expectations of the work environment that involves working with others effectively and participating in creating a work culture where all can contribute their best within the parameters of their job role

# Assessment Guidelines

## Section Two: Roles and Responsibilities

### *The Assessment System: Planning Guide for the Assessor*

An Assessment System must be understood as a well-coordinated set of documented policies and procedures, including assessment materials and tools, that ensure assessments are consistently valid, reliable, flexible, fair, and safe.

*Competency Assessment is a systematic process of collecting proof or evidence on whether or not a candidate has demonstrated competence in the performance of a work-related activity/task that is directly linked to a performance standard. The assessment confirms that the individual can perform to the standard expected in the workplace and/or the nationally approved competency standard.*

Each **Unit of Competency** contained in a Standard describes a distinct part of a Mason's work and job profile. Within each Unit of Competency, the following components appear:

- Unit Title
- Unit Descriptor
- Elements of Competency
- Performance Criteria
- Range of Variables
- Evidence Guide

As a prelude to conducting assessments, the Assessor must be thoroughly familiar with all of the particulars and details of the Unit of Competency that is being assessed. This is a "must" for the role of the Assessor. He must be especially familiar with the Evidence Guide for gathering critical information.

The three sample assessment tools found below focus on the critical aspects of competency that can provide the required evidence to determine competency- the evidence guide. These sample assessment tools are as follows:

- Demonstration Checklist
- Observation Checklist
- Oral Questions Checklist

### **The duties of the Assessor include:**

- Covering all of the key elements of the Unit of Competency under assessment
- Applying rigorously the Evidence Guide for the Unit of Competency as this contains the method and context of assessment, resources required for the assessment, the critical aspects of competency, and the required underpinning knowledge, skills, and attitudes
- Developing specifications (specs) for the task sheet for Demonstration as required
- Requiring the candidate to perform project tasks that cover interrelated units of competency- known as a “clustering.”
- Making what can be termed “reasonable adjustments” for candidates with disabilities or for example, those candidates with regional dialects that prove difficult to understand

Note: These “reasonable adjustments” may involve reconfiguring a simulated workplace site so that a candidate’s disability does not impede the assessment process, or for example, finding someone who can understand a regional dialect and assist the Assessor with essential communication skills.

## *Roles and Responsibilities of Assessor*

Prior to any assessment, the Assessor should follow the specific instructions below to ensure a well-planned assessment event. In most cases s/he will be assisted by a Trainer. Nevertheless, s/he should make certain that good preparation has taken place for the assessment event.

1. Visit the assessment venue or workplace to ensure an adequate work area or platform containing:
  - Sufficient space for working- ensure square meters of work space enough for task to be carried out effectively and safely
  - Fire extinguisher and safety equipment within reach
  - Emergency procedures in place
  - All necessary tools, equipment, and materials ready at hand
  - All necessary machinery in good working order
2. Assessment is drawn and extracted from the relevant Unit of Competency based on an approved Standard and on an Evidence plan that clearly focuses on critical aspects of competency.
3. The duration of time to assess the demonstration is clearly indicated, for example, 3 hours. This information is shared with the Candidate along with other pertinent information such as the sequence of tasks that he must follow, and the fact that he will be closely observed as the tasks are performed.

4. After the Candidate has performed the task, the Assessor will provide feedback to the Candidate on his performance.
5. The responsibility on finally deciding whether or not the Candidate was Competent or Not Yet Competent belongs to the accredited Assessor.
6. At the conclusion of the assessment, the Assessor will provide feedback on whether or not the Candidate was Competent or Not Yet Competent. S/He will also share information on next steps. These next steps include where to obtain the certificate related to the assessment or, if unsuccessful, how to re-try for competency within a specified period of time.

## *Roles and Responsibilities of Trainer*

Prior to the assessment, you will have studied and become familiar with the Competency Standard for the industry occupation. You will also have met with or contacted the Assessor beforehand and discussed preparations and arrangements for the assessment. Your role will be to facilitate the assessment process and ensure all necessary resources are available, assisting the Assessor wherever possible. For example, once a draft spec has been produced by the Assessor, you will ensure it is fully consistent with the evidence plan and copied appropriately for use by both the Assessor and Candidate.

In addition to a confirming a suitable training venue and time, you will ensure that:

- Sufficient space is allotted for task work- square meters of work space enough for demonstration tasks to be carried out effectively and safely
- Fire extinguisher and safety equipment within reach if necessary
- Emergency procedures in place
- All necessary tools, equipment, and materials ready at hand
- All necessary machinery in good working order

Your duties include:

- **notifying** the Assessor and candidates of planned assessment events and their location
- **advising and assisting** the Assessor on planned assessment events
- **collecting** admission slips and signature sheets for assessment events
- **ensuring** all required forms and reporting mechanisms are in place and ready for distribution to the Assessor and to the Candidate
- **ensuring** all requisite forms are duly signed and forwarded to the SEIP Office, or certifying body
- **responding** to candidate queries and concerns such as re-assessment procedures
- **reconfiguring** workplace simulations so that candidates with disabilities are able to participate fully and without impediment



- **working** closely with the SEIP contact to ensure a successful assessment event

## *Roles and Responsibilities of Candidate*

Prior to the assessment, you will have studied and become familiar with the Competency Standard for your industry.

1. Initially, you will be given information on the task you are to perform, and the estimated time you will require to perform it. These tasks are based on the critical aspects of competency related to the performance criteria within the approved Competency Standard.

Given the necessary instructions, and/or a task-related spec and the necessary tools, materials, and equipment, you will carry out and complete a work task. You will observe that there is:

- Sufficient space for working- square meters of work space enough for task to be carried out effectively and safely
- Fire extinguisher and safety equipment within reach if necessary
- Emergency procedures in place
- All necessary tools, equipment, and materials ready at hand
- All necessary machinery in good working order

2. Assessment is drawn and extracted from the relevant Unit of Competency based on the approved Competency Standard and on an Evidence plan (proof of competence) developed by the Assessor that clearly focuses on critical aspects of competency. The Evidence plan will be based on critical assessment tools such as demonstration/task; observation; oral questions.

3. The duration of time to assess the demonstration should be clearly indicated, for example, 3 hours. This information will be given to you along with other pertinent information such as the procedure or sequence of tasks that you must follow. It is important to note that you will be closely observed and assessed throughout the duration of your demonstration. You will be given time to ask questions and request clarification. You will also be given 10 minutes to familiarize yourself with the resources to be used in the assessment.

4. Based on your performance in demonstrating the task, you will be assessed by the Assessor to be Competent or Not Yet Competent. Regardless of the result you will be given feedback from the Assessor on your performance and the next steps.

5. After you have performed the task, the Assessor will provide feedback to you on your performance.

6. The responsibility on finally deciding whether or not you are Competent or Not Yet Competent belongs to the accredited Assessor.

7. At the conclusion of the assessment, the Assessor will provide feedback on whether or not you have been assessed to be **Competent** or **Not Yet Competent**. Both your signatures will be required on the Assessment Form. You will also be allowed to make comments on the Assessor's decision. The Assessor will then share information on next steps. These next steps include where to obtain the certificate related to the successful assessment or, if unsuccessful, how to re-try for competency within a specified period of time.

## Section Three: Tools and Templates

This toolbox of Tools and Templates offers a wide range of assessment tools that will facilitate evidence gathering and other assessment-related needs. Evidence gathering, however, should not be limited to these tools and templates alone. The toolbox should be revised or expanded as necessary, to include other tools and templates that are deemed relevant.

- Demonstration Checklist
- Observation Checklist
- Oral Questions Checklist
- Evidence Plan (Overall Summary)
- Assessor Job Sheet and Specifications (Spec) Form
- Competency Assessment Results
- Assessor Planning Checklist Tool
- All About Questioning Techniques for Use in Assessment
- Quick Guide to Conducting Competency Assessments
- Assessor's Quick Start

# Demonstration Checklist

<b>Candidate's name:</b>			
<b>Assessor's name:</b>			
<b>Qualification:</b>			
<b>Project-Based Assessment Title</b>			
<b>Units of competency covered:</b>			
<b>Date of assessment:</b>			
<b>Time of assessment:</b>			
<b>Instructions for demonstration</b>			
Please see attached Instruction for Demonstration (Candidate/Assessor)			
<b>Supplies and Materials</b> ▪ Please refer to attached specific instruction	<b>Tools and equipment</b> • Please refer to attached specific instruction		
	✓ to show if evidence is demonstrated		
<b>During the demonstration of skills, did the candidate:</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## Observation Checklist

Candidate's name:		
Assessor's name:		
Date of Assessment:		
Unit of Competency:		
Code:		
Name of Workplace/Training Center		
Procedure to Follow:	Observe Candidate's performing the task, and following the spec- if a spec is provided	
During the demonstration of skills, did the Candidate do the following (List steps that reflect critical aspects of competency from performance criteria of Unit of Competency):		
	<b>YES</b>	<b>NO</b>
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
<b>Candidate's performance was:</b>	<b>COMPETENT</b>	<b>NOT YET COMPETENT</b>
<b>Feedback to Candidate:</b>		
<b>Candidate's Signature:</b>		Date:
<b>Assessor's Signature:</b>		Date:

## Oral Questions Checklist

Candidate's name:	
Assessor's name	
Date of Assessment:	
Assessment Venue:	
Unit of Competency:	
Reference Standard:	

The List of Questions below must be pegged to the competency demonstration test and may involve related specs for each Unit of Competency tested. Underpinning skills for Knowledge may also be reviewed for competent/non yet competent.

List of Questions	Satisfactory Response	

Indicate Y or N in the box provided	YES	NO
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		

Feedback to Candidate:

Candidate's overall performance was (circle):	Satisfactory	Not Satisfactory
The Candidate's underpinning knowledge was (circle):	Satisfactory	Not Satisfactory

Assessor Signature:	Date:
Candidate Signature:	Date:



# Assessor Job Sheet and Specifications (Spec) Form

This Spec is in reference to the \_\_\_\_\_ Standard, and has been developed by an Industry Representative/Assessor.

The Result\* indicates either C for Competent, or NYC for Not Yet Competent.

Unit of Competency	Elements Reviewed	Critical Aspects of Competency Covered	Result*: C/NYC

JOB #1 Procedure for Developing Specification (Spec): List the steps involved in performing the task/spec successfully. It will cover, in logical order, the critical aspects of competency listed above that will determine if the candidate is **Competent** or **Not Yet Competent**.

1.	
2.	
3.	
4.	
5.	

Tools and Equipment Required for Spec completion: List all tools, equipment, and materials required in completing Job #1:

Tools	Equipment	Materials

Assessor Name:

Date:



## Competency Assessment Results

Candidate's name:	
Assessor's name	
Qualification Title:	
Date of Assessment:	
Assessment Venue:	
Reference Standard:	
Unit of Competency:	

Assessment Unit	Competent	Not Yet Competent

Assessor's Recommendation and Comments:

Overall Assessment:

**Yes:** The Candidate successfully met the required evidence/standards and demonstrated all of the competencies necessary for certification in the Qualification and Units of Competency listed above.

**No:** The Candidate did not meet the evidence requirements. Re-assessment is recommended.

Assessor Signature:	Date:
Candidate Signature:	Date:
Assessment Center Manager Signature:	

## ASSESSMENT PLANNING CHECKLIST TOOL

Assessor's name:	
Date:	

**Directions: Circle the 'Yes' or 'No' response to each item.**

1.	The Assessor is familiar with the unit(s) of competency being assessed	Yes	No
2.	The Assessor has verified that the workplace or training center has the correct equipment, machinery, tools, and materials necessary to complete all of the relevant aspects of the unit of competency	Yes	No
3.	The Assessor has ensured that all materials and equipment were assembled and arranged in advance.	Yes	No
4.	The Assessor has all the necessary tools, templates, and specifications needed to assess the trainee including a variety of assessment tools covering practical demonstration, observation, oral question, and (where necessary) written tests relevant to the competency specified in the standard	Yes	No
5.	The Assessor has met with the trainer prior to the assessment event to discuss his/her role.	Yes	No
6.	The Assessor will discuss the performance test with the trainee and address any concerns prior to giving the test	Yes	No
7.	The Assessor will discuss and record with the trainee the results of their performance	Yes	No

**Action to be taken on "No" responses:**

## *General Guidelines for Effective Questioning*

- Keep questions short and focused on one key concept
- Ensure that questions are structured
- Test the questions to check that they are not ambiguous
- Use `open-ended questions such as `what if...?' and `why...?' questions, rather than closed questions
- Keep questions clear and straight forward and ask one at a time
- Use words that the candidate is able to understand
- Look at the candidate when asking questions
- Check to ensure that the candidate fully understands the questions
- Ask the candidate to clarify or re-phrase their answer if the assessor does not understand the initial response
- Confirm the candidate's response by repeating the answer back in his/her own words
- Encourage a conversational approach with the candidate when appropriate, to put him or her at ease
- Use questions or statements as prompts for keeping focused on the purpose of the questions and the kind of evidence being collected
- Use language at a suitable level for the candidate
- Listen carefully to the answers for opportunities to find unexpected evidence
- Follow up responses with further questions, if useful, to draw out more evidence or to make links between knowledge areas
- Compile a list of acceptable responses to ensure reliability of assessments

## *Recording responses*

When using oral questioning, you may need a tool that has a structured approach (see below) and also enables you to record a candidate's responses. If the candidate's response is insufficient the assessor should record why on the recording sheet or checklist. This provides information that can be used later, if necessary, to explain to the candidate where he or she needs to develop their skills and/or knowledge to achieve the required competence.

Recording sheet for oral questioning (template)

Candidate's Name		
Assessor or Observer's Name		
Unit of Competency)		
Code		
Date of Assessment		
Location		
Task/Procedure		
Questions to be Answered by candidate	Response/Answer*	Satisfactory (Yes/No)
What would you do if ...		
What would you do if ...		
What would you do if ...		
How do you ...		
What are ...		
Why did you... (Clarification)		
Follow up Questions		
The candidate's knowledge was:	Satisfactory Unsatisfactory	
Feedback to candidate:		
Candidate signature:		Date:
Assessor/Observer's Signature:		Date:

## ASSESSOR GUIDE TO CONDUCTING COMPETENCY ASSESSMENTS

1. BEFORE THE ASSESSMENT	2. DAY OF ASSESSMENT	3. DURING THE ASSESSMENT	4. POST ASSESSMENT
<p>- Review unit(s) of competency to be assessed especially evidence to be collected against performance criteria</p> <p>- Ensure the workplace or training center complies with all safety requirements and that high risk areas are clearly marked</p> <p>- Identify/request essential assessment resources:</p> <ul style="list-style-type: none"> <li>• tools and equipment</li> <li>• supplies and materials</li> <li>• personal protective equipment</li> <li>• print resources and rating sheets</li> <li>• Have trainees contacted if they have to bring any resources for the assessment, e.g. logbook</li> </ul>	<p>-Verify attendance through signed attendance sheet</p> <p>- Provide overview of what is to happen throughout day</p> <p>Orient the trainees to:</p> <ul style="list-style-type: none"> <li>• purpose of assessment</li> <li>• qualification to be assessed</li> <li>• assessment procedures to be followed</li> <li>• address needs of trainees and provide information on evidence requirements and assessment process</li> <li>• make all announcements just before start of assessment</li> </ul>	<p>Give clear instructions to trainees on what they are required to do:</p> <ul style="list-style-type: none"> <li>• time limits and expectations</li> <li>• all equipment and tools must be of the same quality for all trainees</li> <li>• written and verbal instructions translated into local dialects as needed</li> <li>• encourage questions</li> <li>• avoid providing any assistance to trainees during assessment</li> <li>• stop process if accident imminent</li> <li>• keep focused on evidence being valid, reliable, fair, flexible, and safe</li> <li>• Record details of evidence collected</li> </ul>	<p>Provide feedback on outcome of assessment process re:</p> <ul style="list-style-type: none"> <li>• give clear feedback on assessment decision</li> <li>• provide information on overcoming any gaps in competency assessment</li> <li>• provide opportunity to discuss assessment process and outcome</li> </ul> <p><b>Prepare required assessment reports:</b></p> <ul style="list-style-type: none"> <li>• all rating sheets signed by trainee as well as Assessor</li> <li>• maintain records of assessment procedures, evidence collected, and assessment outcome</li> <li>• verify assessment results/outcomes with training center</li> </ul> <p><b>Prepare</b></p> <p>recommendations for issuance of national certificate</p>

## *Assessor's Quick Start*

1. Identify the Unit(s) of Competency from the Program Standard that you are going to assess.
2. Review the Critical Aspects of Competency from the Unit of Competency that will be the basis of your Evidence Guide.
3. Select the Assessment Tools that you will use to gather evidence.
  - i. Demonstration Checklist
  - ii. Observation Checklist
  - iii. Oral Questions Checklist
4. Create spec sheet(s) for the Unit of Competency to be examined.
5. Review the assessment procedure with the Candidate and ask if there are any questions.
6. Complete the assessment using the assessment tools in the order above. You are free to use other tools as well if you wish.
7. Determine whether Candidate is **Competent** or **Not-Yet-Competent**
8. Complete all necessary record sheets.
9. Give feedback to the Candidate.

# *Demonstration Checklist: Carry Out Bench Working Operations*

<b>Candidate's name:</b>			
<b>Assessor's name:</b>			
<b>Qualification:</b>	Machine shop Practice		
<b>Project-Based Assessment Title</b>			
<b>Units of competency covered:</b>	Carry Out Bench Working Operations (SEIP-LIG-MSP-1-0)		
<b>Date of assessment:</b>			
<b>Time of assessment:</b>			
<b>Instructions for demonstration</b>			
<b>Please see attached Instruction for Demonstration (Candidate/Assessor)</b>			
<b>Supplies and Materials</b> ▪ Please refer to attached specific instruction	<b>Tools and equipment</b> • Please refer to attached specific instruction		
			✓ to show if evidence is demonstrated
<b>During the demonstration of skills, did the candidate:</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
1. Clamp work pieces using appropriate work holding devices to avoid damage and accidents.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Cut, chip, and file work pieces in accord with drawing spec.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Check measurement of work piece according to standard procedure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Perform drilling of holes and reaming following recommended sequence.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Cut threads and check thread using thread pitch gauge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Perform grinding operation in accord with workplace procedures.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## *Observation Checklist: Carry Out Bench Working Operations*

Candidate's name:		
Assessor's name:		
Date of Assessment:		
Unit of Competency:	Carry Out Bench Working Operations	
Code:	SEIP-LIG-MSP-1-0	
Name of Workplace/Training Center		
Procedure to Follow:	Observe Candidate's performing the task, and following the spec- if a spec is provided	
During the demonstration of skills, did the Candidate do the following (List steps that reflect critical aspects of competency from performance criteria of Unit of Competency):		
	<b>YES</b>	<b>NO</b>
1. Clamp work pieces using appropriate work holding devices to avoid damage and accidents.		
2. Cut, chip, and file work pieces in accord with drawing spec.		
3. Check measurement of work piece according to standard procedure.		
4. Perform drilling of holes and reaming following recommended sequence.		
5. Cut threads and check thread using thread pitch gauge.		
6. Perform grinding operation in accord with workplace procedures.		
<b>Candidate's performance was:</b>	<b>COMPETENT</b>	<b>NOT YET COMPETENT</b>
<b>Feedback to Candidate:</b>		
<b>Candidate's Signature:</b>		Date:
<b>Assessor's Signature:</b>		Date:



## *Oral Questions Checklist: Carry Out Bench Working operations*

Candidate's name:	
Assessor's name:	
Date of Assessment:	
Assessment Venue:	
Unit of Competency:	Carry Out Bench Working Operations
Reference Standard:	Machine shop Practice

The List of Questions below must be pegged to the competency demonstration test and may involve related specs for each Unit of Competency tested. Underpinning skills for Knowledge may also be reviewed for Competent/Not Yet Competent designation.

List of Questions	Satisfactory Response
-------------------	-----------------------

Indicate Y or N in the box provided	YES	NO
1. How often should tools and equipment be cleaned?		
2. To what extent are environmental concerns important?		
3. Can you identify at least 10 functions/activities in bench work?		
4. Can you describe two kinds of threads used in bench work?		
5. Can you describe off-hand grinding?		

**Feedback to Candidate:**

The Candidate's overall performance was (circle): Satisfactory/ Not Satisfactory

The Candidate's underpinning knowledge was (circle): Satisfactory/ Not Satisfactory

<b>Assessor Signature:</b>	<b>Date:</b>
<b>Candidate Signature:</b>	<b>Date:</b>

## *Demonstration Checklist: Perform Drilling Machine Operations*

<b>Candidate's name:</b>			
<b>Assessor's name:</b>			
<b>Qualification:</b>	Machine shop Practice		
<b>Project-Based Assessment Title</b>			
<b>Units of competency covered:</b>	Perform Drilling Machine Operations (SEIP-LIG-MSP-2-0)		
<b>Date of assessment:</b>			
<b>Time of assessment:</b>			
<b>Instructions for demonstration</b>			
<b>Please see attached Instruction for Demonstration (Candidate/Assessor)</b>			
<b>Supplies and Materials</b> ▪ Please refer to attached specific instruction		<b>Tools and equipment</b> • Please refer to attached specific instruction	
			✓ to show if evidence is demonstrated
During the demonstration of skills, did the candidate:			<b>Yes</b> <b>No</b> <b>N/A</b>
1. Set bench/pedestal grinding machine for manual drill grinding or using drill grinding attachment.			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
2. Dress abrasive wheel using wheel dresser.			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
3. Grind drill bit with different profile angles in accord with standard specifications.			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
4. Check and measure ground drill bit using drill gauge.			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
5. Select cutting speed (RPM) and feed rate in accord with job specs.			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
6. Interpret component drawing and identified specs.			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
7. Select, collect, and set up work piece and drill bits in accord with job requirement.			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
8. Perform drilling operation in accord with operation sequence in producing the required specification of the product.			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
9. Check and measure job in conformance to specification using appropriate techniques, drill gauge, measuring tools, materials, tools and equipment.			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
•			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
•			<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

## Observation Checklist: Perform Drilling Machine Operations

<b>Candidate's name:</b>		
<b>Assessor's name:</b>		
<b>Date of Assessment:</b>		
<b>Unit of Competency:</b>	Perform Drilling Machine Operations	
<b>Code:</b>	<b>(SEIP-LIG-MSP-2- 0)</b>	
<b>Name of Workplace/Training Center</b>		
<b>Procedure to Follow:</b>	Observe Candidate's performing the task, and following the spec- if a spec is provided	
During the demonstration of skills, did the Candidate do the following (List steps that reflect critical aspects of competency from performance criteria of Unit of Competency):		
	<b>YES</b>	<b>NO</b>
1. Set bench/pedestal grinding machine for manual drill grinding or using drill grinding attachment.		
2. Dress abrasive wheel using wheel dresser.		
3. Grind drill bit with different profile angles in accord with standard specifications.		
4. Check and measure ground drill bit using drill gauge.		
5. Select cutting speed (RPM) and feed rate in accord with job specs.		
6. Interpret component drawing and identified specs.		
7. Select, collect, and set up work piece and drill bits in accord with job requirement.		
8. Perform drilling operation in accord with operation sequence in producing the required specification of the product.		
9. Check and measure job in conformance to specification using appropriate techniques, drill gauge, measuring tools, materials, tools and equipment.		
<b>Candidate's performance was:</b>	<b>COMPETENT</b>	<b>NOT YET COMPETENT</b>
<b>Feedback to Candidate:</b>		
<b>Candidate's Signature:</b>		<b>Date:</b>
<b>Assessor's Signature:</b>		<b>Date:</b>

## Oral Questions Checklist: Perform Drilling Machine Operations

Candidate's name:	
Assessor's name:	
Date of Assessment:	
Assessment Venue:	
Unit of Competency:	<b>Perform Drilling Machine Operations</b>
Reference Standard:	<b>Machine Shop Practice</b>

The List of Questions below must be pegged to the competency demonstration test and may involve related specs for each Unit of Competency tested. Underpinning skills for Knowledge may also be reviewed for Competent/Not Yet Competent designation.

List of Questions	Satisfactory Response
-------------------	-----------------------

Indicate Y or N in the box provided	YES	NO
1. Can you identify essential personal protective equipment for performing drilling machine operations?		
2. To what extent is the interpretation of job specifications important and why?		
3. Can you describe three common profile angles?		
4. Can you identify at least 10 types of drilling machines?		
5. Can you identify the several different parts of a drilling machine?		

**Feedback to Candidate:**

The Candidate's overall performance was (circle):                      Satisfactory/   Not Satisfactory

The Candidate's underpinning knowledge was (circle):                      Satisfactory/   Not Satisfactory

<b>Assessor Signature:</b>	<b>Date:</b>
<b>Candidate Signature:</b>	<b>Date:</b>

## *Demonstration Checklist: Perform Lathe Machine Operations*

<b>Candidate's name:</b>			
<b>Assessor's name:</b>			
<b>Qualification:</b>	<b>Machine Shop Practice</b>		
<b>Project-Based Assessment Title</b>			
<b>Units of competency covered:</b>	Perform Lathe Machine Operations (SEIP-LIG-MSP-3-0)		
<b>Date of assessment:</b>			
<b>Time of assessment:</b>			
<b>Instructions for demonstration</b>			
<b>Please see attached Instruction for Demonstration (Candidate/Assessor)</b>			
<b>Supplies and Materials</b> ▪ Please refer to attached specific instruction	<b>Tools and equipment</b> • Please refer to attached specific instruction		
			✓ to show if evidence is demonstrated
During the demonstration of skills, did the candidate:	<b>Yes</b>	<b>No</b>	<b>N/A</b>
1. Perform straight, step, and shoulder turning after facing in accord with drawing specs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Perform grooving operation after turning in accord with drawing specs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Perform parting-off operation and produce job in accord with drawing specs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Perform taper turning operation using form tool, compound slide, off-setting tailstock and taper turning attachment to produce component in accord with drawing specs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Perform eccentric turning operation in accord with drawing specs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Perform external and internal V-thread cutting in accord with drawing specs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Perform external and internal ACME (29 & 30 degree) cutting in accord with drawing specs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Perform square thread cutting in accord with drawing specs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## *Observation Checklist: Perform Lathe Machine Operations*

<b>Candidate's name:</b>		
<b>Assessor's name:</b>		
<b>Date of Assessment:</b>		
<b>Unit of Competency:</b>	<b>Perform Lathe Machine Operations</b>	
<b>Code:</b>	<b>(SEIP-LIG-MSP-3- 0)</b>	
<b>Name of Workplace/Training Center</b>		
<b>Procedure to Follow:</b>	Observe Candidate's performing the task, and following the spec- if a spec is provided	
During the demonstration of skills, did the Candidate do the following (List steps that reflect critical aspects of competency from performance criteria of Unit of Competency):		
	<b>YES</b>	<b>NO</b>
1. Perform straight, step, and shoulder turning after facing in accord with drawing specs.		
2. Perform grooving operation after turning in accord with drawing specs.		
3. Perform parting-off operation and produce job in accord with drawing specs.		
4. Perform taper turning operation using form tool, compound slide, off-setting tailstock and taper turning attachment to produce component in accord with drawing specs.		
5. Perform eccentric turning operation in accord with drawing specs.		
6. Perform external and internal V-thread cutting in accord with drawing specs.		
7. Perform external and internal ACME (29 & 30 degree) cutting in accord with drawing specs.		
8. Perform square thread cutting in accord with drawing specs.		
<b>Candidate's performance was:</b>	<b>COMPETENT</b>	<b>NOT YET COMPETENT</b>
<b>Feedback to Candidate:</b>		
<b>Candidate's Signature:</b>		<b>Date:</b>
<b>Assessor's Signature:</b>		<b>Date:</b>

# Oral Questions Checklist: Perform Lathe Machine Operations

Candidate's name:	
Assessor's name:	
Date of Assessment:	
Assessment Venue:	
Unit of Competency:	<b>Perform Lathe Machine Operations</b>
Reference Standard:	<b>Machine shop Practice</b>

The List of Questions below must be pegged to the competency demonstration test and may involve related specs for each Unit of Competency tested. Underpinning skills for Knowledge may also be reviewed for Competent/Not Yet Competent designation.

List of Questions	Satisfactory Response
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Indicate Y or N in the box provided	YES	NO
1. To what extent and why is a commitment to occupational safety and health important?	<input type="checkbox"/>	<input type="checkbox"/>
2. Can you identify at least 5 profile angles?	<input type="checkbox"/>	<input type="checkbox"/>
3. Can you describe 4 taper turning methods?	<input type="checkbox"/>	<input type="checkbox"/>
4. Can you describe 4 important preventive maintenance procedures?	<input type="checkbox"/>	<input type="checkbox"/>
5. What types of chucks are used in eccentric turning methods?	<input type="checkbox"/>	<input type="checkbox"/>

**Feedback to Candidate:**

The Candidate's overall performance was (circle):      Satisfactory/ Not Satisfactory

The Candidate's underpinning knowledge was (circle): Satisfactory/ Not Satisfactory

Assessor Signature:	Date:
Candidate Signature:	Date:

## *Demonstration Checklist: Perform Milling Machine Operations*

<b>Candidate's name:</b>			
<b>Assessor's name:</b>			
<b>Qualification:</b>	<b>Machine shop Practice</b>		
<b>Project-Based Assessment Title</b>			
<b>Units of competency covered:</b>	Perform Milling Machine Operations (SEIP-LIG-MSP-4-0)		
<b>Date of assessment:</b>			
<b>Time of assessment:</b>			
<b>Instructions for demonstration</b>			
<b>Please see attached Instruction for Demonstration (Candidate/Assessor)</b>			
<b>Supplies and Materials</b> ▪ Please refer to attached specific instruction	<b>Tools and equipment</b> • Please refer to attached specific instruction		
	✓ to show if evidence is demonstrated		
<b>During the demonstration of skills, did the candidate:</b>	<b>Yes</b>	<b>No</b>	<b>N/A</b>
1. Perform different indexing methods in accord with job specs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Perform plain, side, face, gang, and straddle milling operation in accord with job requirement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Perform slot, key way, parting off, end, form, and angular milling operation in accord with job requirement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Calculate gear teeth nomenclature and formulas for different types of gear.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Perform different types of gear cutting operations according to job requirement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Check and measure job in conformance to spec using appropriate techniques, measuring tools, and equipment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Apply preventive maintenance schedules in accord with manufacturer's requirement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



## *Observation Checklist: Perform Milling Machine Operations*

<b>Candidate's name:</b>		
<b>Assessor's name:</b>		
<b>Date of Assessment:</b>		
<b>Unit of Competency:</b>	<b>Perform Milling Machine Operations</b>	
<b>Code:</b>	<b>(SEIP-LIG-MSP-4- 0)</b>	
<b>Name of Workplace/Training Center</b>		
<b>Procedure to Follow:</b>	Observe Candidate's performing the task, and following the spec- if a spec is provided	
During the demonstration of skills, did the Candidate do the following (List steps that reflect critical aspects of competency from performance criteria of Unit of Competency):		
	<b>YES</b>	<b>NO</b>
1. Perform different indexing methods in accord with job specs.		
2. Perform plain, side, face, gang, and straddle milling operation in accord with job requirement.		
3. Perform slot, key way, parting off, end, form, and angular milling operation in accord with job requirement.		
4. Calculate gear teeth nomenclature and formulas for different types of gear.		
5. Perform different types of gear cutting operations according to job requirement.		
6. Check and measure job in conformance to spec using appropriate techniques, measuring tools, and equipment.		
7. Apply preventive maintenance schedules in accord with manufacturer's requirement.		
<b>Candidate's performance was:</b>	<b>COMPETENT</b>	<b>NOT YET COMPETENT</b>
<b>Feedback to Candidate:</b>		
<b>Candidate's Signature:</b>	<b>Date:</b>	

<b>Assessor's Signature:</b>	<b>Date:</b>
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## *Oral Questions Checklist: Perform Milling Machine Operations*

Candidate's name:	
Assessor's name:	
Date of Assessment:	
Assessment Venue:	
Unit of Competency:	<b>Perform Milling Machine Operations</b>
Reference Standard:	<b>Machine Shop Practice</b>

The List of Questions below must be pegged to the competency demonstration test and may involve related specs for each Unit of Competency tested. Underpinning skills for Knowledge may also be reviewed for Competent/Not Yet Competent designation.

List of Questions	Satisfactory Response
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Indicate Y or N in the box provided	YES	NO
1. What are the operating parameters (such as cutting speed) for milling machine operations?		
2. Can you identify several types of milling cutters?		
3. Can you give several examples of gear teeth nomenclature?		
4. Can you identify 5 different types of gear?		
5. Why is it important to apply preventive maintenance schedules in accord with the machine manufacturer's requirement?		

**Feedback to Candidate:**

The Candidate's overall performance was (circle):      Satisfactory/ Not Satisfactory

The Candidate's underpinning knowledge was (circle): Satisfactory/ Not Satisfactory

<b>Assessor Signature:</b>	<b>Date:</b>
<b>Candidate Signature:</b>	<b>Date:</b>

# *Demonstration Checklist: Perform Shaper Machine Operations*

<b>Candidate's name:</b>			
<b>Assessor's name:</b>			
<b>Qualification:</b>	Machine shop Practice		
<b>Project-Based Assessment Title</b>			
<b>Units of competency covered:</b>	Perform Shaper Machine Operations (SEIP-LIG-MSP-5-0)		
<b>Date of assessment:</b>			
<b>Time of assessment:</b>			
<b>Instructions for demonstration</b>			
<b>Please see attached Instruction for Demonstration (Candidate/Assessor)</b>			
<b>Supplies and Materials</b> ▪ Please refer to attached specific instruction	<b>Tools and equipment</b> • Please refer to attached specific instruction		
			✓ to show if evidence is demonstrated
During the demonstration of skills, did the candidate:	<b>Yes</b>	<b>No</b>	<b>N/A</b>
1. Perform different indexing methods in accord with spec job requirement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Perform plain, side, face, gang, and straddle milling operation in accord with job requirement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Perform slot, key way, parting off, end, form, and angular milling operation in accord with job requirement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Calculate gear teeth nomenclature and solve formulas for different types of gear.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Perform different types of gear cutting operations in accord with job requirement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Check/measure job in conformance to spec using appropriate techniques, measuring tools and equipment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Apply preventive maintenance schedules in accord with machine manufacturer's requirement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## *Observation Checklist: Perform Shaper Machine Operations*

<b>Candidate's name:</b>		
<b>Assessor's name:</b>		
<b>Date of Assessment:</b>		
<b>Unit of Competency:</b>	<b>Perform Shaper Machine Operations</b>	
<b>Code:</b>	<b>(SEIP-LIG-MSP-5- 0)</b>	
<b>Name of Workplace/Training Center</b>		
<b>Procedure to Follow:</b>	Observe Candidate's performing the task, and following the spec- if a spec is provided	
During the demonstration of skills, did the Candidate do the following (List steps that reflect critical aspects of competency from performance criteria of Unit of Competency):		
	<b>YES</b>	<b>NO</b>
1. Perform different indexing methods in accord with spec job requirement.		
2. Perform plain, side, face, gang, and straddle milling operation in accord with job requirement.		
3. Perform slot, key way, parting off, end, form, and angular milling operation in accord with job requirement.		
4. Calculate gear teeth nomenclature and solve formulas for different types of gear.		
5. Perform different types of gear cutting operations in accord with job requirement.		
6. Check/measure job in conformance to spec using appropriate techniques, measuring tools and equipment.		
7. Apply preventive maintenance schedules in accord with machine manufacturer's requirement.		
<b>Candidate's performance was:</b>	<b>COMPETENT</b>	<b>NOT YET COMPETENT</b>
<b>Feedback to Candidate:</b>		
<b>Candidate's Signature:</b>		<b>Date:</b>
<b>Assessor's Signature:</b>		<b>Date:</b>

# Oral Questions Checklist: Perform Shaper Machine Operations

Candidate's name:	
Assessor's name:	
Date of Assessment:	
Assessment Venue:	
Unit of Competency:	<b>Perform Shaper Machine Operations</b>
Reference Standard:	<b>Machine shop Practice</b>

The List of Questions below must be pegged to the competency demonstration test and may involve related specs for each Unit of Competency tested. Underpinning skills for Knowledge may also be reviewed for Competent/Not Yet Competent designation.

List of Questions	Satisfactory Response
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Indicate Y or N in the box provided	YES	NO
1. To what extent and why are profile angles important to master?		
2. Why is it essential to have a preventive maintenance schedule?		
3. Can you describe some common shaping operations such as slotted surface and others?		
4. What are several important specifications for a shaping machine?		
5. Can you describe a method for determining sequence of operations to produce a component to spec requirements?		

<b>Feedback to Candidate:</b>
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The Candidate's overall performance was (circle):      Satisfactory/ Not Satisfactory

The Candidate's underpinning knowledge was (circle): Satisfactory/ Not Satisfactory

<b>Assessor Signature:</b>	<b>Date:</b>
<b>Candidate Signature:</b>	<b>Date:</b>

## *Demonstration Checklist: Perform Precision Grinding Machine Operations*

<b>Candidate's name:</b>			
<b>Assessor's name:</b>			
<b>Qualification:</b>	Machine Shop Practice		
<b>Project-Based Assessment Title</b>			
<b>Units of competency covered:</b>	Perform Precision Grinding Machine Operations (SEIP-LIG-MSP-6-0)		
<b>Date of assessment:</b>			
<b>Time of assessment:</b>			
<b>Instructions for demonstration</b>			
<b>Please see attached Instruction for Demonstration (Candidate/Assessor)</b>			
<b>Supplies and Materials</b> ▪ Please refer to attached specific instruction	<b>Tools and equipment</b> • Please refer to attached specific instruction		
			✓ to show if evidence is demonstrated
During the demonstration of skills, did the candidate:	<b>Yes</b>	<b>No</b>	<b>N/A</b>
1. Determine RPM, cutting speed, feed rate, and depth of grind.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Identify and set grinding machine accessories and attachments.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Identify different abrasive/grinding wheels selected and balanced according to abrasive wheel specs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Check machine performance conforming to job requirement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Perform cylindrical grinding operation according to workplace requirement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Perform surface grinding operation according to workplace requirement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Perform universal tools and cutter grinding operation according to workplace requirement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Apply coolant to prevent overheating of work piece and cutting tool.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Check/measure job for conformance to spec using appropriate techniques, measuring tools, and equipment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
•	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## *Observation Checklist: Perform Precision Grinding Machine Operations*

<b>Candidate's name:</b>		
<b>Assessor's name:</b>		
<b>Date of Assessment:</b>		
<b>Unit of Competency:</b>	<b>Perform Precision Grinding Machine Operations</b>	
<b>Code:</b>	<b>(SEIP-LIG-MSP-6- 0)</b>	
<b>Name of Workplace/Training Center</b>		
<b>Procedure to Follow:</b>	Observe Candidate's performing the task, and following the spec- if a spec is provided	
During the demonstration of skills, did the Candidate do the following (List steps that reflect critical aspects of competency from performance criteria of Unit of Competency):		
	<b>YES</b>	<b>NO</b>
1. Determine RPM, cutting speed, feed rate, and depth of grind.		
2. Identify and set grinding machine accessories and attachments.		
3. Identify different abrasive/grinding wheels selected and balanced according to abrasive wheel specs.		
4. Check machine performance conforming to job requirement.		
5. Perform cylindrical grinding operation according to workplace requirement.		
6. Perform surface grinding operation according to workplace requirement.		
7. Perform universal tools and cutter grinding operation according to workplace requirement.		
8. Apply coolant to prevent overheating of work piece and cutting tool.		
9. Check/measure job for conformance to spec using appropriate techniques, measuring tools, and equipment.		
<b>Candidate's performance was:</b>	<b>COMPETENT</b>	<b>NOT YET COMPETENT</b>
<b>Feedback to Candidate:</b>		
<b>Candidate's Signature:</b>		<b>Date:</b>
<b>Assessor's Signature:</b>		<b>Date:</b>

## *Oral Questions Checklist: Perform Precision Grinding Machine Operations*

Candidate's name:	
Assessor's name:	
Date of Assessment:	
Assessment Venue:	
Unit of Competency:	<b>Perform Precision Grinding Machine Operations</b>
Reference Standard:	<b>Machine Shop Practice</b>

The List of Questions below must be pegged to the competency demonstration test and may involve related specs for each Unit of Competency tested. Underpinning skills for Knowledge may also be reviewed for Competent/Not Yet Competent designation.

List of Questions	Satisfactory Response
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Indicate Y or N in the box provided	YES	NO
1. To what extent are timeliness and tidiness important in a job operation and why?	<input type="checkbox"/>	<input type="checkbox"/>
2. How often should conformance to specification be checked and measured?	<input type="checkbox"/>	<input type="checkbox"/>
3. What are 3 common cutting tools?	<input type="checkbox"/>	<input type="checkbox"/>
4. When should a coolant be applied to a work piece or cutting tool?	<input type="checkbox"/>	<input type="checkbox"/>
5. Can you describe how to perform a cylindrical grinding operation?	<input type="checkbox"/>	<input type="checkbox"/>

<b>Feedback to Candidate:</b>
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The Candidate's overall performance was (circle):      Satisfactory/ Not Satisfactory

The Candidate's underpinning knowledge was (circle): Satisfactory/ Not Satisfactory

Assessor Signature:	Date:
Candidate Signature:	Date: