COMPETENCY STANDARDS & ASSESSMENT GUIDE
FOR
MASTER CRAFTSMANSHIP

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

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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 or 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 28th of February 2016.

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

EXPERTS INVOLVED:

Competency Verification-Validation Experts:

Name	Company	Job Position/Expertise
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

Anowarul Haque Answari	Anowar Engineering Works	Master Craftsman expert

Workshop Facilitators:

EmeterioCedillo, Jr.	SEIP	International Specialist
Md. Mohiuzzaman	SEIP	Course 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 Master Craftsmanship

UNITS OF COMPETENCY	ELEMENTS			
Generic (Basic) Competencies				
Perform Computations Using Basic Mathematical Concepts (SEIP-LIG-MAS-1-G)	Identify calculation requirements in the workplace.	Select appropriate mathematical methods/concepts for the calculation.	Use tool/instrument to perform calculations	
Apply Occupational Health And Safety (OH&S) Practices In The Workplace (SEIP-LIG-MAS-2-G)	Identify OHS policies and procedures	Apply personal health and safety practices	Report hazards and risks	Respond to emergencies
Communicate In English In The Workplace (SEIP-LIG-MAS-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
Operate In A Self-Directed Team (SEIP-LIG-MAS-4-G)	Identify team goals and processes.	Communicate and cooperate with team members.	Work as a team member	Solve problems as a team member
Sector Specific (Common) Competencies				
Interpret Technical Drawings And Manuals SEIP-LIG-MAS-1-S)	Select technical drawing.	Interpret technical drawings.	Interpret operation and maintenance manuals	
Work With Mechanical Hand and Power Tools (SEIP-LIG-MAS-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
Carry Out Precision Checks and Measurements (SEIP-LIG-MAS-3-S)	Select the job to be checked and measured	Select measuring and checking tool/instrument	Obtain measurements and checks	Record/communicate measurement and check results
	Clean, maintain and store measuring instruments.			
Apply Quality Systems and Procedures (SEIP-LIG-MAS-4-S)	Work within quality system	Apply and monitor quality system improvements in the workplace.	Hold responsible for work quality	Apply standard procedures for each job.

Occupation Specific (Course) Competencies

Apply Fundamentals Of Welding Metallurgy (SEIP-LIG-MAS-1-O)	Identify the mechanical properties of metals	Explain the chemical properties of steel	Describe the effects of heat to the chemical properties in steels	Demonstrate application of heat treatment processes.
	Clean and store the tools and equipment.			
Perform Welding (SEIP-LIG-MAS-2-O)	Identify welding symbols and select electrodes.	Carry out SMAW in 5G and 6G position.	Carry out MIG and TIG welding in 3G and 4G position	Perform plasma cutting
	Clean, maintain and store tools, equipment, materials and finished products.			
Perform Lathe Machine Operation (SEIP-LIG-MAS-3-O)	Perform taper turning using attachment	Cut multi start acme and squire thread	Cut single start worm	Perform eccentric turning
	Clean and store tools and equipment.			
Perform Milling Machine Operation (SEIP-LIG-MAS-4-O)	Determine job requirement.	Perform boring using boring attachment.	Perform external and internal key way milling.	Cut helical and bevel gear .
	Cut rack and pinion	Clean and store the tools and equipment		
Perform Grinding Machine Operation (SEIP-LIG-MAS-5-O)	Operate grinding machine.	Carry out cylindrical grinding machine	Carry out surface grinding machine	Perform Universal tools and cutter grinding machine.
	Clean and store the tools and equipment.			
Perform Supervisory Function (SEIP-LIG-MAS-6-O)	Demonstrate management skills	Demonstrate leadership skills	Deal with conflict management with subordinates	Apply Production Planning and Control (PPC) in the workplace.

Units & Elements at Glance:

Generic (Basic) Competencies (30 hrs.)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
SEIP-LIG-MAS-1-G	Perform Computations Using Basic Mathematical Concepts	1.Identify calculation requirements in the workplace 2.Select appropriate mathematical methods/concepts for the calculation. 3.Use tool/instrument to perform calculations	10
SEIP-LIG-MAS-2-G	Apply Occupational Health and Safety (OH&S) Practices in the Workplace	1. Identify OHS policies and procedures 2. Apply personal health and safety practices 3. Report hazards and risks 4. Respond to emergencies	10
SEIP-LIG-MAS-3-G	Communicate in English in the Workplace	1. Read and understand workplace documents in English 2. Write simple workplace communications in English 3. Listen and comprehend to English conversations 4. Perform conversations in English language	5
SEIP-LIG-MAS-4-G	Operate in a Self-Directed Team	1. Identify team goals and work processes 2. Communicate and cooperate with team members. 3. Work as a team member. 4. Solve problems as a team member	5
Total Hour			**30**

Sector Specific (Common) Competencies (30 hrs.)

Code	Unit of Competency	Elements of Competency	Duration (Hours)
SEIP-LIG-MAS-1-S	Interpret Technical Drawings and Manuals	1. Select technical drawing 2. Interpret technical drawings. 3. Interpret operation & maintenance manuals	10
SEIP-LIG-MAS-2-S	Work with Mechanical Hand and Power Tools	1. Inspect hand tools and power tools for usability 2. Use hand tools properly and safely 3. Operate power tools properly and safely 4. Clean/ maintain hand tools and power tools after use	10
SEIP-LIG-MAS-3-S	Carry Out Precision Checks and Measurements	1. Select the job to be checked and measured 2. Select measuring and checking tool/instrument 3. Obtain measurements and checks 4. Record/communicate measurement and check results 5. Clean, maintain and store measuring instruments.	5
SEIP-LIG-MAS-3-S	Apply Quality Systems and Procedures	1. Work within quality system 2. Apply and monitor quality system improvement in the workplace 3. Hold responsible for work quality 4. Apply standard procedures for each job.	5
Total Hours			**30**

Occupation Specific (Core) Competencies (300 hrs.)

Code	Unit of Competency	Elements of Competency	Guided Learning Hours
SEIP-LIG-MAS-1-O	Apply Fundamentals of Welding Metallurgy	1. Identify the mechanical properties of metals 2. Explain the chemical properties of steel 3. Describe the effects of heat to the chemical properties in steels 4. Demonstrate application of heat treatment processes 5. Clean and store the tools and equipment.	60
SEIP-LIG-MAS-2-O	Perform Welding	1. Identify welding symbols and select electrodes. 2. Carry out SMAW in 5G and 6G position. 3. Carry out MIG and TIG welding in 3G and 4G position. 4. Perform plasma cutting 5. Clean, maintain and store tools, equipment, materials and finished products.	20
SEIP-LIG-MAS-3-O	Perform Lathe Machine Operation	1. Perform taper turning using attachment 2. Cut multi start acme and squire thread 3. Cut single start worm 4. Perform eccentric turning. 5. Clean and store tools and equipment.	70
SEIP-LIG-MAS-4-O	Perform Milling Machine Operation	1. Determine job requirement. 2. Perform boring using boring attachment. 3. Perform external and internal key way milling. 4. Cut helical and bevel gear. 5. Cut rack and pinion 6. Clean and store the tools and equipment.	80
SEIP-LIG-MAS-5-O	Perform Grinding Machine Operation	1. Operate grinding machine. 2. Carry out cylindrical grinding machine. 3. Carry out surface grinding machine 4. Perform Universal tools and cutter grinding machine.	30

		5. Clean and store the tools and equipment.	
SEIP-LIG-MAS-6-O	Perform Supervisory Function	1. Demonstrate Management Skills 2. Demonstrate Leadership Skills 3. Deal with conflict management with subordinates 4. Apply Production Planning and Control (PPC) in the workplace	40
Total Hours			**300**

COMPETENCY STANDARDS: MASTER CRAFTSMANSHIP

A: The Generic (Basic Competencies)

Unit of Competency: **PERFORM COMPUTATIONS USING BASIC MATHEMATICAL CONCEPTS**	**Nominal Duration:** 10 hrs.	**Unit Code:** SEIP-LIG-MAS-1-G
Unit Descriptor: 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 **Calculation requirements** are identified from **workplace information.**
2. Select appropriate mathematical methods/concepts for the calculation.	2.1 **Appropriate method** is selected to carry out the calculation requirements.
3. Use tool/instrument to perform calculations	3.1 Calculations are completed using appropriate **tools and instruments.**

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 safety and health 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

	requirements 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 questions 2.3 Demonstration.
5. 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.

Unit of Competency: **APPLY OCCUPATIONAL HEALTH AND SAFETY (OHS) PRACTICES IN THE WORKPLACE**	**Nominal Duration:** 10 hrs.	**Unit Code:** SEIP-LIG-MAS-2-G
Unit Descriptor: This unit covers the knowledge, skills and attitudes required to apply occupational health and safety (OH&S) 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).

Elements of Competency	Performance Criteria
1. Identify OHS policies and procedures	1.1 **OHS policies** 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 **Personal Protective Equipment (PPE)** is selected and used. 2.3 Personal hygiene is maintained.
3. Report hazards and risks	3.1 **Hazards and risks** 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 responded. 4.2 **Emergency response plans and procedures** are implemented. 4.3 **First aid procedure** is applied during emergencies.

Range of Variables

Variable	Range May include but not limited to:
1. OHS policies	1.1 International OHS requirements 1.2 Bangladesh standards for OHS 1.3 Building Code 1.4 Fire Safety Rules and Regulations 1.5 Light Engineering Industry Guidelines
2. Personal Protective Equipment (PPE)	2.1 Apron 2.2 Gas Mask 2.3 Gloves 2.4 Safety shoes 2.5 Helmet 2.6 Face mask

	2.7 Overalls 2.8 Goggles and safety glasses 2.9 Ear plugs 2.10 Sun block 2.11 Chemical/Gas masks
3. Hazards and risks	3.1 Chemical hazards. 3.2 Biological hazards. 3.3 Physical Hazards. 3.3.1 Machine hazards. 3.3.2 Materials hazards. 3.3.3 Tools and Equipment hazards.
4. Emergency response plans and procedures	4.1 Firefighting procedures 4.2 Earthquake response procedures 4.3 Evacuation procedures 4.4 Medical and first aid
5. First aid procedure	5.1 Washing of open wound 5.2 Washing chemically infected area 5.3 Applying bandage 5.4 Tourniquet 5.5 Applying CPR (Cardiopulmonary Resuscitation) 5.6 Taking appropriate medicine

Curricular Evidence Guide:

1. Underpinning Knowledge	1.1 OHS workplace policies and procedures. 1.2 Work safety procedures. 1.3 Emergency procedures. 1.3.1 Firefighting. 1.3.2 Earthquake response. 1.3.3 Explosion response. 1.3.4 Accident response. 1.4 Types of hazards (biological, chemical and physical) and their effects. 1.5 PPE types and uses. 1.6 Personal hygiene practices. 1.7 OHS awareness.
2. Underpinning Skills	2.1 Identifying OHS policies and procedures 2.2 Following personal work safety practices 2.3 Reporting hazards and risks 2.4 Responding to emergency procedures 2.5 Maintaining physical well-being in the workplace 2.6 Performing first aid. 2.7 Performing basic firefighting accessories using fire extinguishers 2.8 Applying basic first aid procedures
3. Underpinning Attitudes	3.1 Commitment to occupational health and safety practice 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 PPEs 4.3 Firefighting equipment 4.4 Emergency response manual 4.5 First aid kits

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Followed OHS policies and procedures 1.2 Selected and used personal protective equipment (PPE) 1.3 Reported incidents arising from hazards and risks to authority 1.4 Emergency response plans and procedures are implemented 1.5 Applied basic first aid procedure
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.

Unit of Competency: COMMUNICATE IN ENGLISH IN THE WORKPLACE	Nominal Duration: 5 hrs.	Unit Code: SEIP-LIG-MAS-3-G
Unit Descriptor: This unit covers the knowledge, skills and attitudes required to apply English communication 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).

Elements of Competency	Performance Criteria
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 **routine workplace documents** are prepared using key words, phrases, simple sentences and **visual aids** 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

Variable	Range 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	1.1 Read workplace documents in English 1.2 Write simple routine workplace documents in English 1.3 Listen to conversation in English. 1.4 Perform conversation in English. 1.5 Interaction skills (i.e., teamwork, interpersonal skills, etc.). 1.6 Job roles, responsibilities and compliances.
2. Underpinning Skills	2.1 Ability to read and understand workplace documents in English by using appropriate vocabulary and grammar, standard spelling and punctuation 2.2 Ability to write simple routine workplace documents in English such as Schedules and agenda, job sheets, operational manuals and brochures and promotional material. 2.3 Ability of listening in English and interpreting 2.4 Ability to perform conversation in English with peers, customers and management to the required workplace standard. 2.5 Work effectively with others. 2.5.1 Listening and questioning skills 2.5.2 Ability to follow simple directions
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 of peers, sub-ordinates and seniors in workplace. 3.5 Environmental concern. 3.6 Sincere and honest to duties.
4. Resource Implications	The following resources must be provided: 4.1 Work place Procedure 4.2 Materials relevant to the proposed activity 4.3 All tools, equipment, material and documentation required. 4.4 Relevant specifications or work instructions

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Converse in English with peers and customers 1.2 Made reports of workplace documents in English
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.

Unit of Competency: **OPERATE IN A SELF-DIRECTED TEAM**	**Nominal Duration:** 5 hrs.	**Unit Code:** SEIP-LIG-MAS-4-G
Unit Descriptor: This unit covers the knowledge, skills and attitudes required to work as a team member. 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).

Elements of Competency	Performance Criteria
1. Identify team goals and work processes	1.1 Team goals and collaborative decision-making processes are identified. 1.2 Roles and responsibilities of team members are identified. 1.3 Relationships within team and with other workers are identified.
2. Communicate and cooperate with team members.	2.1 Effective interpersonal skills are used to interact with team members and to contribute to activities and objectives. 2.2 Formal and informal **forms of communication** are used effectively to support team achievement. 2.3 Diversity 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, authorities, objectives and task requirements are identified and clarified with team. 3.2 Tasks are performed in accordance with organizational and team requirements, specifications and workplace procedures. 3.3 Team member's support with other members are made to ensure team achieves goals, awareness and requirements. 3.4 Agreed reporting lines are followed 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

Variable	Range 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 1.4 Operational manuals 1.5 Brochures and promotional material

	1.6 Visual and graphic materials 1.7 Standard 1.8 OSH information 1.9 Signs

Curricular Evidence Guide:

1. Underpinning Knowledge	1.1 Team goals and collaborative decision making processes 1.2 Roles and responsibilities of team members 1.3 Relationships within team and with other workers 1.4 Effective interpersonal skills to interact with team members 1.5 Effective formal and informal forms of communication 1.6 Value of diversity in team functioning. 1.7 Correct use of workplace terminology 1.8 Team's duties, responsibilities, authorities, objectives and task requirements 1.9 Support mechanism to other members of team to ensure achievements of goals. 1.10 Methods of identifying current and potential problems faced by a team 1.11 Effectively problems solving methods and evaluation of outcomes
2. Underpinning Skills	2.1 Identifying team goals and collaborative decision making processes 2.2 Identifying roles and responsibilities of team members 2.3 Identifying relationships within team and with other workers 2.4 Using effective interpersonal skills to interact with team members and to contribute to activities and objectives 2.5 Using formal and informal forms of communication 2.6 Understanding and valuing views and opinions of other team members 2.7 Performing tasks in accordance with organizational and team requirements, specifications and workplace procedures. 2.8 Supporting other members of the team to ensure team achieves goals, awareness and requirements. 2.9 Identifying current and potential problems faced by the team 2.10 Identifying solutions to the problem 2.11 Solving problems effectively and evaluating the outcome of the implemented solution
3. Underpinning Attitudes	3.1 Teamwork 3.2 Promptness in carrying out activities 3.3 Tidiness and timeliness 3.4 Respect of peers, sub-ordinates and seniors in workplace 3.5 Sincere and honest to duties
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

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

Unit of Competency: **INTERPRET TECHNICAL DRAWINGS AND PLANS**	**Nominal Duration:** 10 hrs.	**Unit Code:** SEIP-LIG-MAS-1-S
Unit Descriptor: This unit covers the knowledge, skills and attitudes required of a worker to translate 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).

Elements of Competency	**Performance Criteria**
1. Select technical drawing	1.1 **Drawing** 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 in accordance with workplace standard 2.4 **Instructions** are identified and followed accurately. 2.5 Material **specifications** are interpreted 2.6 Symbols in drawing are interpreted.
3. Interpret operation & maintenance manuals	3.1 Operation and maintenance manuals are collected and interpreted 3.2 Operation and maintenance manuals are followed when operating and maintaining lathe machine

Range of Variables

Variable	***Range*** May Include but not limited to:
1. Drawing	1.1 Technical drawing 1.2 Sketches 1.3 Manuals
2. Instructions	2.1 Note 2.2 Instruction 2.3 Special instruction 2.4 Precaution
3. Specifications	3.1 Product specifications 3.2 Method specifications 3.3 Material specifications

Curricular Evidence Guide:

1. Underpinning Knowledge	1.1 Technical drawing interpretation 1.2 Sequence of drawing 1.3 Methods of checking and applying drawing for work 1.4 Drawing selection and checking method to ensure conformity to the job requirements. 1.5 Drawing components, assemblies 1.6 Identification of dimensions according to job requirement 1.7 Procedure of checking clearances/tolerances 1.8 Work instructions 1.9 Material specifications 1.10 Drawing symbols interpretation 1.11 Use of operation and maintenance manuals
2. Underpinning Skills	2.1 Practicing workplace safety 2.2 Interpreting drawing, following operation and maintenance manuals, 2.3 Performing jobs in accordance with the drawing 2.4 Performing calculation as per drawing 2.5 Selecting and checking of drawing to ensure conformity to the job requirements. 2.6 Identifying drawing components and assemblies 2.7 Identifying dimensions according to job requirement 2.8 Checking clearances/tolerances in accordance with workplace standard 2.9 Following operation and maintenance manuals when operating and maintaining lathe machine
3. Underpinning Attitudes	3.1 Care in the use of drawings/manuals 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 Sincere and honest to duties.
4. Resource Implications	The following resources must be provided: 4.1 Workplace (simulated or actual) 4.2 Relevant drawing/manuals 4.3 Pens 4.4 Papers 4.5 Work books 4.6 Learning manuals

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 1.4 Interpreted operation & maintenance manuals
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.

Unit of Competency: **WORK WITH MECHANICAL HAND AND POWER TOOLS**	**Nominal Duration:** 10 hrs.	**Unit Code:** SEIP-LIG-MAS-2-S
Unit Descriptor: 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).

Elements of Competency	Performance Criteria
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 **Hand tools** and **power tools** are prepared. 1.5 Sources of power supply for power tools are identified
2. Use hand tools properly and safely	2.1 Appropriate hand tool for the job is used 2.2 Proper and safe use/operation is applied in the different types of hand tools 2.3 **Safety precautions** 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 established workplace safety requirements. 3.2 Proper sequence of operation is applied in using power tools to produce results. 3.3 Power tools are used safely 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 to 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 **Measuring tools** are checked and calibrated. 4.5 Defective tools, instruments, power tools and accessories are inspected and corrected or replaced

Range of Variables

Variable	Range 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 instruments	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	1.1 Types of tools, functions and use 1.2 Types of Hand tools and their proper use and techniques 1.3 Types of Power tools, use and safe handling method 1.4 Technical application of tools 1.5 Procedures in the use of hand tools and power tools 1.6 Policies and procedures for occupational health and safety 1.7 Use of PPE 1.8 Handling of tools and equipment 1.9 Reporting and documentation 1.10 Preventive maintenance 1.11 Methods and techniques 1.12 Quality procedures 1.13 Storage procedures
2. Underpinning Skills	2.1 Using appropriate hand tool for the job. 2.2 Observing safety precautions when using hand tools. 2.3 Using power tools correctly and safely in accordance to manufacturer is operating specification. 2.4 Checking condition of tools after use. 2.5 Applying appropriate lubricant on hand tools and power tools after use and prior to storage. 2.6 Inspecting and correcting or replacing defective tools, instruments, power tools and accessories. 2.7 Storing Tools and power tools safely in appropriate location.
3. Underpinning Attitudes	3.1 Commitment to occupational health and safety practices 3.2 Communication with peers, sub-ordinates and seniors in workplace. Promptness in carrying out activities. 3.3 Tidiness and timeliness. 3.4 Respect of peers, sub-ordinates and seniors in workplace. 3.5 Environmental concern. 3.6 Sincere and honest to duties.
4. Resource Implications	4.1 Workplace (simulated or actual) 4.2 Different types of hand tools and power tools 4.3 Pens 4.4 Papers 4.5 Work books 4.6 Tools and power tools operating and maintenance manuals

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Using appropriate hand tool for the job. 1.2 Observing safety precautions when using hand tools.

	1.3 Used power tools safely in accordance to manufacturer's operating specification. 1.4 Checking the condition of tools after use. 1.5 Appling appropriate lubricant on hand tools and power tools after use and prior to storage. 1.6 Inspecting and corrected or replaced defective tools, instruments, power tools and accessories. 1.7 Storing tools and power tools safely in appropriate location.
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.

Unit of Competency: **CARRY OUT PRECISION CHECKS AND MEASUREMENTS**	**Nominal Duration:** 5 hrs.	**Unit Code:** SEIP-LIG-MAS-3-S
Unit Descriptor: This unit covers the knowledge, skills and attitudes required to use graduated measuring instrument in the light engineering sector 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).

Elements of Competency	Performance Criteria
1. Select the job to be checked and measured	1.1 Job is selected for measuring and checking 1.2 Required **dimensional measurement** is determined in accordance with drawing/plan 1.3 Required **physical condition** is identified in accordance with drawing/plan 1.4 Required **geometrical dimension** is identified in accordance with drawing/plan 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 **Direct and indirect measuring instruments** and **checking instrument** 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	4.1 Measurements are obtained using appropriate measuring instrument. 4.2 **Systems of measurements** are identified and converted where necessary. 4.3 Measurement is kept accurately in accordance to specification 4.4 Measurement is checked against job requirement 4.5 Physical conditions are checked in accordance with job requirements 4.6 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 5.2 Condition of measuring instruments are checked

	5.3 Appropriate lubricant is applied after use and prior to storage 5.4 Measuring instruments are checked and calibrated 5.5 Measuring instruments are stored in accordance with workplace procedure.

Range of Variables

Variable	**Range** May include but not limited to:
1. Dimensional measurement	1.1 Length 1.2 Width 1.3 Depth 1.4 Diameter 1.5 Radius 1.6 Height
2. Physical condition	2.1 Roughness 2.2 Color 2.3 Smoothness 2.4 Surface finish 2.5 Flatness
3. Geometrical dimension	3.1 Parallelism 3.2 Perpendicularity 3.3 Angularity 3.4 Concentricity 3.5 Eccentricity 3.6 Roundness 3.7 Circularity
4. Direct Measuring Instruments.	4.1 Set Squares 4.2 Dial Indicators 4.3 Steel Tape 4.4 Steel Rule 4.5 Meter Rule 4.6 Calculator 4.7 Vernier Slide Caliper 4.8 Digital Vernier Slide Caliper 4.9 Micrometer (inch/millimeter) 4.10 Digital Micrometer 4.11 Vernier Bevel Protector 4.12 Sprit level 4.13 AVO Meter(analogue/digital) 4.14 Thermometers 4.15 Water meter 4.16 Gas meter 4.17 Simple protractor
5. Indirect measuring instrument	5.1 Outside Caliper 5.2 Inside Caliper 5.3 Bevel Tri-Square 5.4 Telescoping Gage

	5.5 Straight Edge 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 checking tools

	and instruments after use and prior to storage 2.8 Checking condition of measuring instruments, calibrating and storing in accordance with workplace procedure
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 graduated measuring and checking instruments 4.3 Pens 4.4 Papers 4.5 Work books 4.6 Measuring tools operating and maintenance manual.

Assessment Evidence Guide

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Determined required dimensional measurements, physical conditions and geometrical dimensions in accordance with drawing/plan and workplace specification 1.2 Measured and checked linear and geometrical dimensions within the required tolerance in accordance to specification 1.3 Checked physical conditions using appropriate checking tool 1.4 Identified and converted systems of measurements where necessary. 1.5 Recorded measurements in accordance with workplace procedure 1.6 Interpreted and communicated measurement to authority 1.7 Applied appropriate lubricant on measuring and checking tools and instruments after use and prior to storage 1.8 Checked condition of measuring instruments, calibrated and stored in accordance with workplace procedure
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.

Unit of Competency: **APPLY QUALITY SYSTEMS AND PROCEDURES**	**Nominal Duration:** 5 hrs.	**Unit Code:** SEIP-LIG-MAS-4-S
Unit Descriptor: This unit covers the knowledge, skills and attitudes required 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, holding responsibility for quality work 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).

Elements of Competency	Performance Criteria
1. Work within quality system	1.1 Instructions and procedures are followed strictly and duties are performed in accordance with demand of **quality improvement system.** 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 established and identified. 2.4 Defects are detected and reported according to standard operating procedures. 2.5 Process improvement procedures are applied 2.6 Quality of product is checked and verified.
3. Hold responsible for work quality	3.1 Concept of supplying product or service to meet the **customer quality requirements** is understood and accordingly applied. 3.2 Responsibility is taken for quality work.
4. Apply standard procedures for each job.	4.1 **Quality control and quality assurance** system procedures for each job are followed. 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	2.1 Appropriateness Of Product

requirements.	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 quality 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 implementi0n 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. 2.4 Improving and maintaining quality 2.5 Addressing defects and procedures 2.6 Recording within the quality improvement system in workplace. 2.7 Implementing quality systems and procedures
3. Under pinning 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	The following resources must be provided: 4.1 Workplace 4.2 Tools and equipment appropriate to maintain workplace 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 Followed instructions and procedures strictly 1.2 Performed duties in accordance with demand of quality system 1.3 Ensured conformance to specifications 1.4 Detected defects and reported to authority in accordance to standard operating procedures. 1.5 Understood concept of supplying product or service to meet the customer quality requirements 1.6 Held responsible for quality work 1.7 Followed quality control and quality assurance system procedures for each job
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.

C: Occupation Specific (Core) Competencies

Unit of Competency: **APPLY FUNDAMENTALS OF WELDING METALLURGY**	**Nominal Duration:** 60 hrs.	**Unit Code:** SEIP-LIG-MAS-1-O
Unit Descriptor: This unit covers the knowledge, skills and attitudes required of a worker to demonstrate application of metallurgy in metal trades. It specifically includes the tasks of identifying the mechanical properties of metals, explaining the chemical properties of steel, describing the effects of heat to the chemical properties in steels, demonstrating application of heat treatment processes 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).

Elements of Competency	Performance Criteria
1. Identify the mechanical properties of metals	1.1 Structure of metals and alloys are identified 1.2 **Mechanical properties** of metals are identified 1.3 **Steel micro-structure** is explained
2. Explain the chemical properties of steel	2.1 **Chemical properties** of steel are explained 2.2 **Types of carbon steel** are identified 2.3 Application of the different types of carbon steels are described in relation to welding processes
3. Describe the effects of heat to the chemical properties in steels	3.1 **Chemical effects** of elements to steel properties are described 3.2 Affected **elements** in steel are identified 3.3 Iron Carbon diagram is explained
4. Demonstrate application of heat treatment processes	4.1 Application of heat treatment is explained. 4.2 **Heat treatment processes** are described. 4.3 Annealing of carbon steel is performed in accordance with workplace procedures 4.4 Hardening of carbon steel is carried out in accordance with workplace procedures 4.5 Tempering of carbon steel is performed in accordance with workplace procedure 4.6 **Heat treatment tools and equipment** are identified. 4.7 **PPE**s are selected and used when performing heat treatment processes
5. Clean and store the tools and equipment.	5.1 Hand tools and equipment are maintained and cleaned as per instruction manual. 5.2 Work place is cleaned in accordance with environmental requirement. 5.3 Tools and equipment are stored safely in appropriate location according to standard workshop procedures. 5.4 Waste materials are disposed in proper place.

Range of Variables

Variable	Range May Include but not limited to:
1. Mechanical properties.	1.1 Brittleness 1.2 Ductility 1.3 Elasticity 1.4 Elongation 1.5 Hardness 1.6 Malleability 1.7 plasticity 1.8 Strength 1.9 Toughness 1.10 Fatigue strength 1.11 Melting temperature
2. Steel micro-structure	2.1 Ferrite 2.2 Cementite 2.3 Pearlite 2.4 Marten site 2.5 Austenite
3. Chemical properties	3.1 Oxidation 3.2 Reduction 3.3 Ionization 3.4 Metallic bond 3.5 Carburization
4. Types of carbon steel	4.1 Dead mild steel 4.2 Mild steel 4.3 Medium carbon steel 4.4 High carbon steel
5. Chemical effects	5.1 Corrosion due to oxidation 5.2 Reduction 5.3 Hardness 5.4 Toughness 5.5 Brittleness
6. Elements	6.1 Carbon 6.2 Sulphur 6.3 Phosphorous 6.4 Silicon. 6.5 Manganese 6.6 Chromium 6.7 Molybdenum

	6.8 Nickel 6.9 Aluminum
7. Heat-treatment process	7.1 Annealing process 7.1.1 Normalizing 7.1.2 Stress reliving 7.2 Hardening process 7.2.1 Heating 7.2.2 Quenching 7.2.3 Tempering. 7.3 Case Hardening process 7.3.1 Carburizing 7.3.2 Heating 7.3.3 Quenching 7.3.4 Tempering
8. Heat treatment tools and equipment.	8.1 Gas Fired Oven Or Muffle Furnace 8.2 Electric Muffle Furnace 8.3 Quenching Bath 8.4 Salt Birth Furnace (Seger Cones Or Sentinels) 8.5 Pyrometer. 8.6 Brinell Hardness Tester 8.7 Rockwell Hardness Tester 8.8 Long Tang 8.9 Crucibles 8.10 Metal Carry Basket
9. PPE	9.1 Safety Helmet 9.2 Safety Shoes 9.3 Hand Gloves 9.4 Apron

Curricular Evidence Guide

1. Underpinning Knowledge	1.1 Mechanical properties of metals 1.2 Chemical properties of steel 1.3 Types of carbon steel 1.4 Application of the different types of carbon steels 1.5 Chemical effects of elements to steel properties 1.6 Types and application of heat treatment 1.7 Procedure of performing different types heat treatment processes 1.8 PPEs used when performing heat treatment processes 1.9 Hand tools and equipment maintenance 1.10 Storage procedures 1.11 Workplace work place cleaned procedures 1.12 Workplace waste materials disposal procedures

2. Underpinning Skills	2.1 Identifying mechanical properties of metals 2.2 Explaining chemical properties of steel 2.3 Identifying types of carbon steel 2.4 Describing application of the different types of carbon steels in relation to welding processes 2.5 Describing chemical effects of elements to steel properties 2.6 Demonstrating application of heat treatment 2.7 Applying heat treatment processes 2.8 Selecting PPEs and using when performing heat treatment processes 2.9 Maintaining and cleaning hand tools and equipment and storing in accordance with workplace procedure 2.10 Cleaning work place and disposing waste materials in accordance with OHS requirement
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	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 Identified heat treatment tools and equipment 1.2 Selected and used PPEs when performing heat treatment processes 1.3 Performed annealing process of carbon steel in accordance with workplace procedures 1.4 Carried out hardening of a carbon steel in accordance with workplace procedures 1.5 Performed tempering of a carbon steel in accordance with workplace procedure
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.

Unit of Competency: **PERFORM WELDING**	**Nominal Duration:** 20 hrs.	**Unit Code:** SEIP-LIG-MAS-2-O
Unit Descriptor: This unit covers the knowledge, skills and attitudes required of a Master craftsmanship to perform welding. It specifically includes the tasks of identifying welding symbols and selecting the right type of electrodes, carrying out shielded metal arc welding (SMAW) in 5G and 6G in positions, carrying out MIG & TIG welding in 3G & 4G in position. Performing plasma cutting, and cleaning, maintenance and keeping of tools, equipment, materials and finished products.		

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 welding symbols and select electrodes.	1.1 Different **welding symbols** are identified and interpreted according to drawing. 1.2 Drawing symbols are demonstrated according to the welding diagram and drawings. 1.3 Welding symbol charts are interpreted. 1.4 **Classification of electrodes** are demonstrated. 1.5 Electrodes are selected according to requirements of the job specifications. 1.6 Electrodes are kept in electrode drying oven about 2-3 hours at 260 degree Celsius. 1.7 **PPE** is selected & used. 1.8 Safe work practices observed and personal protective equipment (PPE) worn as required for the work performed
2. Carry out SMAW in 5G and 6G position.	2.1 Routine maintenance is performed and SMAW welding machine is prepared in accordance with the requirement of the welding job. 2.2 Mild steel pipe is marked, V-groove is cut and fixed in horizontal position 2.3 Welding is performed in5G position in accordance with job requirement 2.4 Mild steel pipe is marked, V-groove is cut and fixed in 45 degree position 2.5 Welding is performed in accordance with **welding joint and position** in 6G. 2.6 Welding area guards, work table/floor, dust collection devices are checked according to worksite requirements. 2.7 Welds are cleaned, checked for quality and defects are identified. 2.8 **Defects** are rectified to meet the standards of job specifications.
3. Carry out MIG and TIG welding in 3G and 4G position.	3.1 Routine maintenance is performed and MIG & TIG welding machine are prepared in accordance with the requirement of the welding job. 3.2 MIG & TIG welding machine**, Tools and equipment** are

	selected according to the requirements. 3.3 **Base metals** and **MIG**&**TIG weld areas** are prepared as per requirement. 3.4 **Shielding gases** are selected for MIG & TIG welding. 3.5 Mild steel plate is marked, V-groove is cut and set to vertical and overhead fixed position. 3.6 Welding is performed in 3G and 4G position in accordance with job requirement 3.7 Welding area guards, work table/floor, dust collection devices are checked according to worksite procedure. 3.8 Welds are cleaned, checked for quality and defects are identified.
4. Perform plasma cutting	4.1 Routine maintenance is performed and Plasma cutting machine is prepared. 4.2 Plasma cutting machine is selected according to the job requirements. 4.3 Plasma gas torch is set for cutting materials as per requirement. 4.4 Plasma gas cutting performance is checked to conform with the job requirement. 4.5 Plasma cutting is performed as per job requirement. 4.6 Rough edges after cutting are removed, cleaned, checked for quality and defects are identified and corrective action is taken in accordance with standard cutting procedures.
5. Clean, maintain and store tools, equipment, materials and finished products.	5.1 Tools, equipment and machines are cleaned and maintained. 5.2 Workplace is cleaned. 5.3 Waste materials are disposed in its designated/proper place. 5.4 Tools, equipment and finished products are stored safely in an appropriate location in accordance with workplace procedures.

Range of Variable

Variable	**Range** May Include but not limited to:
1. Welding symbols	1.1 Fillet 1.2 Square Butt 1.3 Single V- Butt 1.4 Double V- Butt 1.5 Single U 1.6 Single bevel 1.7 Flush/Flat Contour 1.8 Convex Contour 1.9 Concave Contour 1.10 Grinding Finish 1.11 Machine finish

	1.12 Chipping finish
2. Classification of Electrodes	2.6 According to the coating of flux for mild steel welding. 2.7 According to the higher resistance. 2.8 Non- consumable electrodes. 2.9 Flus cored wire. 2.10 Arc welding electrodes
3. PPE	3.1 Dust musk 3.2 Eye shield 3.3 Goggles 3.4 Safety shoes 3.5 Apron 3.6 Helmet 3.7 Leather gloves 3.8 Full sleeve leather jacket 3.9 Protected green lenses
4. Welding joint and position	4.1 F – Means fillet welded joint. 4.2 G –means groove welded joint. These two joint having 4 (four) in position. Pos. No. – 1 is flat position. Pos. No. – 2 is Horizontal position. Pos. No. – 3 is Vertical position. Pos. No. – 4 is Overhead position. Example- 1F is indicates the flat position of fillet joint. 1G indicates the flat position of groove joint and so on.
5. Defects	5.1 Lack of penetration 5.2 Excess of penetration 5.3 Porosity 5.4 Crack 5.5 Slag 5.6 Inclusion 5.7 Undercut 5.8 Lack of fusion 5.9 Notches 5.10 Irregular shape 5.11 Dimension
6. Tools and equipment	6.1 Clamps 6.2 Chipping hammer 6.3 Pliers 6.4 3wire brass 6.5 Weld gauge 6.6 Welding table 6.7 Job holding devices/fixture 6.8 Hand grinder 6.9 Hand drill
7. Base metal	7.1 MS Plates 3 mm – 12 mm thickness 7.2 MS pipe dia. 6 inch- 8 inch.

	7.3 Stainless steel 7.4 Stainless pipe
8. MIG welds area	8.1 Direction of travel. 8.2 Shielding gas 8.3 Contact tube 8.4 Wire electrode (consumable) 8.5 Molten metal 8.6 Solidified weld metal 8.7 Work piece 8.8 Electrical arc 8.9 Copper shoe
9. TIG welds area	9.1 GTAW head 9.2 Power 9.3 Shielding gas 9.4 Contact tube 9.5 Tungsten electrode (non-consumable) 9.6 Weld bead 9.7 Direction of weld 9.8 Filler rod 9.9 Electrical arc 9.10 Copper shoe
10. Shielding gas	10.1 Inert gas- Argon, helium 10.2 Reactive gases – nitrogen, oxygen or carbon dioxide. 10.3 Mixtures of inert and reactive gases. 10.4 Plasma gas

Curricular Evidence Guide

1. Underpinning Knowledge	1.1 Different welding symbols are identifying and interpreting according to drawing. 1.2 Drawing symbols are demonstrating according to the welding diagram and drawings. 1.3 Welding symbol charts are interpreting. 1.4 Classification of electrodes are demonstrating. 1.5 Electrode are selecting according to requirements of the job specifications. 1.6 Electrodes are kept electrode-drying oven about 2-3 hours at 260 degree Celsius. 1.7 PPE is selecting& using. 1.8 Safe work practices observed and personal protective equipment (PPE) worn as required for the work performing. 1.9 Plasma cutting machine are selected according to the requirements. 1.10 MIG & TIG welding machine, Tools and equipment are selecting according to the requirements.
2. Underpinning Skills	2.1 Checking welding machine performance in conformance to the job requirement.

	2.2 Performing welding in positions 1G, 2G, 3G & 4G as per the job requirement and the work. 2.3 Marking mild steel plate is cut v-groove and set vertical and overhead in fixing position during welding 3G & 4G position. 2.4 Welding is performing as per the job requirement and the work in accordance 3G & 4G position. 2.5 Welding is performing as per the job requirement and the work in accordance 5G position. 2.6 Welding is performing as per the job requirement and the work in accordance to the welding joint and position of 6G position. 2.7 Plasma cutting is performing as per the job requirement. 2.8 Routine maintenance is performing and preparing the welding machine for requirement of the welding job. 2.9 Welding job is marking, cutting and setting as per the requirement. 2.10 Welding equipment and holding devices are setting up and adjusting in accordance with the job requirements. 2.11 Welding area guards, work table/floor, dust collection devices are checking according to worksite procedure.
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	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 Equipment and outfits appropriate in applying safety measures. 4.5 Relevant drawings, manuals, codes, standards and reference material.

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Checked welding machine performance in conformance to the job requirement. 1.2 Performed Welding in 1G, 2G, 3G, 4G positions 1.3 Cleaned and checked welds for quality and defects are identified

	1.4 Rectified defects to meet job specifications/standards. 1.5 Marked, cut and set welding job as per job requirement. 1.6 Performed 6G position welding in accordance with job requirement and welding joint standard 1.7 Performed welding in accordance to 3G & 4G positions 1.8 Performed Plasma cutting as per the job requirement. 1.9 Setup and adjust welding equipment and holding devices in accordance with the job requirements.
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.

Unit of Competency: **PERFORM LATHE MACHINE OPERATION**	**Nominal Duration:** 70 hrs.	**Unit Code:** SEIP-LIG-MAS-3-O
Unit Descriptor: This unit covers the knowledge, skills and attitudes required of a Master craftsmanship (machinist) to perform lathe machine operation. It specifically includes the tasks performing taper turning, cut multi-start acme and squire threads, cut single- start worm, eccentric turning and clean and store 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).

Elements of Competency	Performance Criteria
1. Perform taper turning using attachment	1.1 Appropriate types of **lathe machine**, **tools and equipment** are selected for taper turning operations. 1.2 Taper turning attachment is installed with the compound slide of the lathe machine to **set up the taper attachment.** 1.3 Cutting speed and feed are selected according to the job specifications. 1.4 Component drawing is interpreted and specifications identified 1.5 Job **materials** are selected and collected according to the job specifications. 1.6 Single point cutting tools are selected according to the requirements of the operation. 1.7 Taper turning operation is performed following the sequence of operation in producing the required specification of the product. 1.8 Job is checked/measured in conformance to specification using appropriate techniques, **measuring tools** and equipment.
2. Cut multi start acme and squire thread	2.1 RPM, cutting speed, feed rate and depth of cut are calculated as per job requirement. 2.2 Machine performance is checked in conformance with the job requirement. 2.3 Coolant is applied to prevent over heating of work piece and cutting tool. 2.4 Acme and squire thread cutting tools are selected according to the requirements. 2.5 Multi-start acme threads cutting is performed to cut threads to specifications is per drawing. 2.6 Multi-start square threads cutting is performed to cut threads to specifications as per drawing. 2.7 Job is checked/measured in conformance to specification using appropriate techniques, measuring tools and equipment.
3. Cut single start worm	3.1 RPM, cutting speed, feed rate and depth of cut are calculated as per job requirement.

	3.2 Machine performance is checked in conformance to job requirement. 3.3 Coolant is applied to prevent over heating of work piece and cutting tool. 3.4 Worm thread cutting tools are selected according to the requirements. 3.5 Single-start worm threads cutting is performed in accordance with specifications as per drawing. 3.6 Work piece is checked/measured for conformance to specification using appropriate techniques, measuring tools and equipment.
4. Perform eccentric turning.	4.1 RPM cutting speed, feed rate and depth of cut are calculated as per **eccentric job** requirement. 4.2 Machine performance is checked to conform to the job requirement. 4.3 Coolant is applied to prevent over heating of work piece and cutting tool. 4.4 **Eccentric turning method** is selected according to the job requirement. 4.5 Eccentric turning is performed in accordance with specifications in the drawing 4.6 Job is checked/measured for conformance to specification using appropriate techniques, measuring tools and equipment. 4.7 Safe work practices are observed and personal protective equipment (**PPE**) worn at work
5. Clean and store tools and equipment.	5.1 workplace, Tools, equipment are cleaned and maintained in accordance with workplace requirements 5.2 Waste materials are disposed in proper place. 5.3 Tools, equipment and finished products are stored safely in accordance with workplace procedures

Range of Variables

Variable	**Range** May Include but not limited to:
1. Lathe machine	1.1 Engine lathe 1.2 Center lathe
2. Tools and Equipment	2.1 Tools 2.1.1 Clamps 2.1.2 Soft hammer. 2.1.3 Pliers. 2.1.4 Bras 2.1.5 Job holding devices/fixture 2.1.6 Adjustable wrench 2.1.7 Hand grinder

	2.1.8 Chuck key 2.2 Equipment 2.2.1 3- Jaw chuck 2.2.2 4- Jaw independent chuck 2.2.3 Taper attachment. 2.2.4 Face plate 2.2.5 Lathe centers 2.2.6 Mandrel 2.2.7 Packing pieces 2.2.8 V-block with clamps
3. Set up the taper attachment	3.1 Adjusting the guide bar parallel to the way 3.2 Removing the feed screw from the cross slide 3.3 Setting the taper angle 3.4 Checking the work piece
4. Materials	4.1 Mild steel 4.2 Cast iron 4.3 Brass 4.4 Aluminum
5. Measuring tools	5.1 Steel rule 5.2 Digital Vernier caliper 5.3 Micrometer 5.4 Dial indicator 5.5 Screw pitch gauge 5.6 Center gauge
6. Eccentric jobs	6.1 Cam shaft 6.2 Crank shaft 6.3 Off-center job
7. Eccentric turning methods	7.1 Using 3-jaw universal chuck packing a piece to offset. 7.2 Using 4-jaw independent chuck
8. PPE	8.1 Dust mask 8.2 Eye glass 8.3 Goggles 8.4 Safety shoes 8.5 Apron

Curricular Evidence Guide

1. Underpinning Knowledge	1.1 Appropriate types of lathe machine, tools and equipment selection for taper turning operations. 1.2 Taper turning attachment set up and operation 1.3 Procedure of taper attachment on the lathe 1.4 Cutting speed and feed selection procedure 1.5 Drawings/specification interpretation procedure 1.6 Job materials selection as per job specifications. 1.7 Single point cutting tools selection according to the requirements of the operation.

	1.8 Eccentric turning methods and process
2. Underpinning Skills	2.1 Selecting single point cutting tools according to the requirements of the operation. 2.2 Performing taper turning operation following the sequence of operation in producing the required specification of the product. 2.3 Checking/measuring the work piece for conformance to specification using appropriate techniques, measuring tools and equipment. 2.4 Selecting acme and squire thread cutting tools in accordance with work requirements. 2.5 Performing multi-start acme thread cutting to specifications in the drawing. 2.6 Selecting worm thread cutting tools according to the requirements. 2.7 Performing single-start worm thread cutting to cut threads to specifications as per drawing. 2.8 Performing eccentric turning to produce component to specifications in the drawing, finished by the lathe-turning tool, and finished by the lathe-turning tool.
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	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 Equipment and outfits appropriate in applying safety measures. 4.5 Relevant drawings, manuals, codes, standards and reference material.

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Selected single point cutting tools according to the requirements of the operation. 1.2 Performed taper turning operation following the sequence of operation in producing the required specification of the product.

	1.3 Checked/measured the work piece for conformance to specification using appropriate techniques, measuring tools and equipment. 1.4 Selected acme and squire thread cutting tools in accordance with work requirements. 1.5 Performed multi-start acme thread cutting to specifications in the drawing. 1.6 Selected worm thread cutting tools according to the requirements. 1.7 Performed single-start worm thread cutting to cut threads to specifications as per drawing. 1.8 Performed eccentric turning to produce component to specifications in the drawing and finished by the lathe-turning tool.
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.

Unit of Competency: **PERFORM MILLING MACHINE OPERATION**	**Nominal Duration:** 80 hrs.	**Unit Code:** SEIP-LIG-MAS-4-O
Unit Descriptor: This unit covers the knowledge, skills and attitudes required of a master craftsmanship (machinist) to perform milling machine operation. It specifically includes the tasks of determining job requirement, performing boring by using boring head, performing external and internal key way milling, cutting helical and bevel gear, and cutting rack and pinion.		

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. Determine job requirement.	1.1 Operations for boring, external and internal key way, helical gear, bevel gear, rack and pinion are identified from working drawings and specifications. 1.2 Milling accessories and attachment are used where appropriate to the requirements of the operation. 1.3 Sequence of operation is determined to produce the product according to specifications. 1.4 Required **material** is selected according to job requirements. 1.5 Cutting fluid is used in accordance with manufacturer's instruction 1.6 **Milling cutters** are selected according to the requirements of the job and the operation. 1.7 **PPE** is selected and used. 1.8 Safe work practices are observed and personal protective equipment (PPE)is worn at work
2. Perform boring using boring attachment.	2.1 Horizontal/vertical machine is set up with a vise on the table and boring attachment/boring head is installed using horizontal/vertical arbor. 2.2 Different parts boring head are identified and explained its functions 2.3 RPM cutting speed, feed and depth of cut are calculated as per job requirement. 2.4 Machine performance is checked conforming to the job requirement. 2.5 Coolant is applied to prevent over heating of work piece and cutting tool. 2.6 Boring operation is performed using boring attachment with conventional milling methods to produce a pre-determined drill hole 2.7 Job is checked/measured for conformance to specification using appropriate techniques, **measuring tools, and equipment.**
3. Perform external and internal key way milling.	3.1 Vertical milling machine is set up with a vise on the table and an end-milling cutter on the vertical arbor or adopter for cutting external key way.

	3.2 RPM, cutting speed, feed rate and depth of cut are calculated as per job requirement. 3.3 Machine performance is checked in conformance to the job requirement. 3.4 Coolant is applied to prevent over heating of work piece and cutting tool. 3.5 External key way is performed to produce key on shaft 3.6 Slot milling attachment is set up to cut internal key way using a key way fly cutter using a horizontal/ vertical milling machine. 3.7 Job is checked/measured in conformance to specification using appropriate techniques, measuring tools and equipment.
4. Cut helical and bevel gear.	4.1 Set up the horizontal/vertical machine with index head on the table and set gear cutter on the horizontal/vertical arbor as per requirement. 4.2 **Gear teeth nomenclature**, formula, **pressure angle**, **gear form cutter set** are identified and explained 4.3 RPM, cutting speed, feed rate, depth of cut, gear formula are calculated as per job requirement. 4.4 Machine performance is checked in conformance with the job requirement 4.5 Coolant is applied to prevent over heating of work piece and cutting tool. 4.6 Helical and bevel gear cutting is performed as per the job requirement. 4.7 Job is checked/measured in conformance to specification using appropriate techniques, measuring tools, and equipment.
5. Cut rack and pinion	5.1 Set up the horizontal/vertical machine with index head on the table and install gear cutter on the horizontal/vertical arbor as per requirement. 5.2 Gear teeth nomenclature, formula, pressure angle, gear form cutter set are identified and explained 5.3 RPM, cutting speed, feed depth of cut, gear formula are calculated as per job requirement. 5.4 Machine performance is checked in conformance with the job requirement 5.5 Coolant is applied to prevent over heating of work piece and cutting tool. 5.6 Rack and pinion gear cutting is performed as per the job requirement. 5.7 Job is checked/measured in conformance withdrawing/specification using appropriate techniques, measuring tools, and equipment.
6. Clean and store the tools and equipment.	6.1 Workplace, tools, equipment and milling machine are cleaned. 6.2 Waste materials are disposed in proper place.

	6.3 Tools, equipment and finished products are stored safely in appropriate location in according with workplace policy.

Range of Variables

Variable	**Range** May include but not limited to:	
1. Materials	1.1 Mild steel 1.2 Medium carbon steel 1.3 Cast iron 1.4 Brass 1.5 Aluminum 1.6 Gun metal 1.7 Bronze	
2. Milling cutters	2.1 Boring milling cutter set 2.2 Gear form milling cutter 2.3 End milling cutter	
3. PPE	3.1 Dust musk. 3.2 Machine goggles. 3.3 Safety shoes. 3.4 Apron	
4. Measuring tools	4.1 Steel rule 4.2 Vernier caliper 4.3 Vernier height gauge 4.4 Dial indicator 4.5 Bevel tri-square. 4.6 Gear teeth Vernier caliper	
5. Tools & equipment.	5.1 Tools 5.1.1 Vise handle. 5.1.2 Parallel bar. 5.1.3 Soft hammer. 5.1.4 Wrenches. 5.2 Equipment 5.2.1 Machine vise. 5.2.2 Universal vise. 5.2.3 Collect chuck. 5.2.4 Adaptor. 5.2.5 Short and long arbor. 5.2.6 Drawbar. 5.2.7 Vertical milling attachment. 5.2.8 Slot milling attachment.	
6. Gear teeth nomenclature	6.1 Addendum 6.2 Dedendum 6.3 Pressure angle 6.4 Addendum circle 6.5 Dedendum circle 6.6 Circular pitch 6.7 Tooth thickness	6.16 Face 6.17 Flank 6.18 Bottom land 6.19 Clearance 6.20 Clearance circle 6.21 Fillet radius 6.22 Diametral pitch

	6.8 Pitch diameter 6.9 Working depth 6.10 Whole depth 6.11 Addendum angle 6.12 Dedendum angle 6.13 Center distance 6.14 Top land 6.15 Face width	6.23 Module 6.24 Outside diameter 6.25 Root diameter 6.26 Nominal diameter 6.27 Base diameter 6.28 Line of action 6.29 Involute and cycloid curve.
7. Pressure angle	7.1 -14.5 degrees pressure angle. 7.2 – 20 degree pressure angle.	
8. Gear form cutters set	The set of eight cutters and their necessary No. of teeth cutting ability. - No. 1 will cut wheel from 135 teeth to a rack. - No. 2 will cut wheel from 55 teeth to a 134 teeth. - No. 3 will cut wheel from 35 teeth to a 54 teeth. - No. 4 will cut wheel from 26 teeth to a 34 teeth. - No. 5 will cut wheel from 21 teeth to a 26 teeth. - No. 6 will cut wheel from 17 teeth to a 20 teeth. - No. 7 will cut wheel from 14 teeth to a 16 teeth. - No. 8 will cut wheel from 12 teeth to a 13 teeth.	

Curricular Evidence Guide

1. Underpinning Knowledge	1.1 horizontal/vertical milling machine operation 1.2 Procedure of installing boring attachment/boring head using horizontal/vertical arbor. 1.3 Procedure of performing boring operation using boring attachment with conventional milling methods 1.4 Procedure of performing external key way cutting to produce key on a shaft 1.5 slot milling attachment Setting up procedure 1.6 Procedure of cutting internal key way using a key way fly cutter 1.7 Horizontal/vertical machine setting up procedure 1.8 Operation and application of index head 1.9 Helical and bevel gear cutting methods and techniques 1.10 Rack and pinion gear cutting 1.11 machine performance Checking 1.12 Use and purpose of coolant
2. Underpinning Skills	2.1 Setting up the horizontal/vertical machine with a vise on the table and installed boring attachment/boring head using horizontal/vertical arbor. 2.2 Performing boring operation using boring attachment with conventional milling methods to produce a pre-determined drill hole 2.3 Performing external key way cutting to produce key on shaft 2.4 Setting up slot milling attachment to cut internal key

	way using a key way fly cutter using a horizontal/ vertical milling machine. 2.5 Setting up the horizontal/vertical machine with index head on the table and set gear cutter on the horizontal/vertical arbor as per requirement. 2.6 Performing Helical and bevel gear cutting as per the job requirement. 2.7 Performing rack and pinion gear cutting as per the job requirement. 2.8 Checking machine performance in conformance with the job requirement 2.9 Applying coolant to prevent over heating of work piece and cutting tool. 2.10 Checking/measuring Job in conformance with drawing/ specification using appropriate techniques, measuring tools, and equipment.
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	The following resources must be provided: 4.1 Workplace 4.2 appropriate Tools, equipment and facilities 4.3 Materials relevant to the proposed activity. 4.4 Equipment and outfits appropriate in applying safety measures. 4.5 Relevant drawings, manuals, codes, standards and reference material.

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Set up the horizontal/vertical machine with a vise on the table and installed boring attachment/boring head using horizontal/vertical arbor. 1.2 Performed boring operation using boring attachment with conventional milling methods to produce a pre-determined drill hole 1.13 Performed external key way cutting to produce key on shaft 1.14 Set up slot milling attachment to cut internal key way

	using a key way fly cutter using a horizontal/ vertical milling machine. 1.15 Set up the horizontal/vertical machine with index head on the table and set gear cutter on the horizontal/vertical arbor as per requirement. 1.16 Performed Helical and bevel gear cutting as per the job requirement. 1.17 Performed rack and pinion gear cutting as per the job requirement. 1.18 Checked machine performance in conformance with the job requirement 1.19 Applied coolant to prevent over heating of work piece and cutting tool. 1.20 Job is checked/measured in conformance with drawing/ 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.

Unit of Competency: PERFORM GRINDING MACHINE OPERATION	Nominal Duration: 30 hrs.	Unit Code: SEIP-LIG-MAS-5-O
Unit Descriptor: This unit covers the knowledge, skills and attitudes required of a Master craftsmanship (machinist) to perform grinding machine operation. It specifically includes work tasks of operate grinding machine, carry out cylindrical grinding machine, carry out surface grinding machine, perform universal tools and cutter grinding machine and clean and store 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).

Elements of Competency	Performance Criteria
1. Operate grinding machine.	1.1 Different **types of grinding machine** are identified. 1.1 **Different parts of the grinding machine** are identified. 1.2 RPM, cutting speed, feed rate and depth of grind are determined. 1.3 Grinding machine **accessories and attachment** are identified and set 1.4 Different **abrasive/grinding wheels** are identified, selected and balanced according to the **abrasive wheel specifications.** 1.5 Machine is degreased, selected, handled and operated according to the machine instruction manual. 1.6 Machine electrical connection switches are identified. 1.7 **PPE** is selected and used.
2. Carry out cylindrical grinding machine.	2.1 Cylindrical grinding machine are selected and set according to the job requirement. 2.2 Grinding wheels are selected, balanced, and dressed according the requirement. 2.3 Cylindrical work piece is set between live and revolving center. 2.4 RPM, cutting speed, feed rate and depth of cut are calculated as per job requirement. 2.5 Machine performance is checked conforming to the job requirement. 2.6 Coolant is applied to prevent over heating of work piece and cutting tool. 2.7 Cylindrical grinding operation is performed according to the work place requirement. 2.8 Job is checked/measured for conformance to specification using appropriate techniques, **measuring tools, and equipment.**
3. Carry out surface grinding machine	3.1 Surface grinding machine are selected and set according to the job requirement. 3.2 Grinding wheels are selected, balanced, and dressed according the job requirement. 3.3 Work piece is set on the machine vise/magnetic vise. 3.4 RPM, cutting speed, feed rate and depth of cut are

	calculated as per job requirement. 3.5 Machine performance is checked conforming to the job requirement. 3.6 Coolant is applied to prevent over heating of the work piece and grinding wheel. 3.7 Surface grinding operation is performed according to the work place requirement. 3.8 Job is checked/measured for conformance to specification using appropriate techniques, **measuring tools,** and **equipment.**
4. Perform Universal tools and cutter grinding machine.	4.1 Universal tools and cutter grinding machine are selected and set according to the job requirement. 4.2 Grinding wheels are selected, set balanced, and dressed according the job requirement. 4.3 **Cutting tools** and cutters are set on the machine vise/universal vise. 4.4 RPM, cutting speed, feed rate and depth of cut are calculated as per job requirement. 4.5 Machine performance is checked conforming to the job requirement. 4.6 Coolant is applied to prevent over heating of the work piece and grinding wheel. 4.7 Universal tools and cutter grinding operation is performed according to the work place requirement. 4.8 Job is checked/measured for conformance to specification using appropriate techniques, measuring tools, and equipment.
5. Clean and store the tools and equipment.	5.1 Tools, equipment and milling machine are cleaned. 5.2 Work place is cleaned. 5.3 Waste materials are disposed in proper place. 5.4 Tools, equipment and finished job are stored safely in appropriate location according to standard place and procedures.

Range of Variables

Variable	**Range** May include but not limited to:
1. Types Of Grinding Machine	1.1 Hand Grinding Machine. 1.2 Bench Grinding Machine. 1.3 Pedestal Grinding Machine. 1.4 Cylindrical Grinding Machine. 1.5 Surface Grinding Machine. 1.6 Universal Tools and Cutter Grinding Machine. 1.7 Internal Grinding Machine. 1.8 Centerless Grinding Machine. 1.9 Universal Grinding.

	1.10 Crankshaft Grinding Machine. 1.11 Honing Machine.
2. Different Parts of Grinding Machine	2.1 Bed 2.2 Work head 2.3 Wheel head 2.4 Tail stock 2.5 Upper table 2.6 Lower table 2.7 Base
3. Accessories and Attachment	3.1 Swivel base motor work head 3.2 Travers operated tail stock 3.3 Standard grinding wheel 3.4 Wheel dresser holder 3.5 Coolant supply unit 3.6 Lubricant supply unit 3.7 Table swivel indicator 3.8 Diamond dressing tools 3.9 Tools and tool box
4. Abrasive	4.1 Natural 4.1.1 Emery 4.1.2 Corundum 4.1.3 Diamond 4.2 Artificial 4.2.1 Silicon carbide (SiC) 4.2.2 Aluminum oxide (Al2O3) 4.2.3 Cubic Boron 4.2.4 Nitride
5. Grinding wheels	5.1 Straight 5.2 Recessed one side 5.3 Recessed two sides 5.4 Offset 5.5 Countersunk dovetail 5.6 Tapered one side 5.7 Tapered two sides 5.8 Ring (cylindrical) 5.9 Straight cup 5.10 Double cup 5.11 Flaring cup 5.12 Dish saucer (saw gummer) 5.13 Cutting off and slitting 5.14 Supper diamond
6. Abrasive wheel specifications	6.1 WA46-K5V17 W - Prefix A- Abrasive (Aluminum oxide) 46-Grain size K- Grade 5- Structure

	V - Bond type (Vitrified) 17- suffix
7. PPE	7.1 Dust musk. 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 Radios 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

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.
2. Underpinning Skills	2.1 Determining RPM, cutting speed, feed rate and depth of grind 2.2 Identifying and setting grinding machine accessories and

	attachment 2.3 Identifying, different abrasive/grinding wheels, selecting, and balancing according to the abrasive wheel specifications. 2.4 Checking machine performance conforming to the job requirement. 2.5 Performing cylindrical grinding operation according to the work place requirement. 2.6 Performing surface grinding operation according to the work place requirement. 2.7 Performing universal tools and cutter grinding operation in accordance to workplace requirement 2.8 Applying coolant to prevent over heating of work piece and cutting tool. 2.9 Checking/measuring Job for conformance to specification using appropriate techniques, measuring tools, and equipment.
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	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 Equipment and outfits appropriate in applying safety measures. 4.5 Relevant drawings, manuals, codes, standards and reference material.

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.

Unit of Competency: **PERFORM SUPERVISORY FUNCTION**	**Nominal Duration:** 40 hrs.	**Unit Code:** SEIP-LIG-MAS-6-O
Unit Descriptor: This unit covers the knowledge, skills and attitudes required of a master craftsman to perform supervisory function. It specifically includes the tasks of demonstrating management skills, demonstrating leadership skills, dealing with conflict management with subordinates and demonstrating production planning and Control (PPC) in the work place.		

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. Demonstrate Management Skills	1.1 **Management functions** are defined. 1.2 Shop management planning, organizing, coordinating and directing functions are demonstrated. 1.3 Staff **motivational needs** are identified. 1.4 Shop management problems are identified and controlled. 1.5 **Production input** are selected and gathered.
2. Demonstrate Leadership Skills	2.1 Leadership skills of a supervisor is demonstrated. 2.2 Leadership is shown to encourage, enhance, motivate for team commitment. 2.3 Situational leadership skills model are demonstrated. 2.4 Participative leadership skills and techniques are shared to the subordinates. 2.5 Tools and techniques for leadership are designed to improve performance. 2.6 Effective face to face meeting with the staff are carried out.
3. Deal with conflict management with subordinates	3.1 **Types of conflict** in the work place are identified. 3.2 **Main causes of conflicts** are identified and dispute are solved 3.3 Inter dependence of conflicts are demonstrated. 3.4 **Five conflict management** styles are demonstrated.
4. Apply Production Planning and Control (PPC) in the workplace	4.1 Production inputs and outputs are identified. 4.2 **Short term and long production** management decisions are demonstrated. 4.3 The **control cycle of PPC** is demonstrated. 4.4 Products estimating and costing are calculated. 4.5 **Quality dimensions and quality control** of product is carried out.

Range of Variable

Variable	Range May Include but not limited to:
1. Management function	1.1 Planning

	1.2 Organizing 1.3 Coordinating 1.4 Directing 1.5 Motivating 1.6 Controlling	
2. Motivational needs	2.1 Physiological needs 2.2 Safety needs 2.3 Social needs 2.4 Esteem needs 2.5 Self-actualization needs	
3. Production inputs	3.1 Man 3.2 Machine 3.3 Money 3.4 Material 3.5 Methods 3.6 Market	
4. Types of conflict	4.1 Inter-dependence conflict 4.2 Difference in styles 4.3 Difference in background/gender 4.4 Difference in leadership 4.5 Personalities clashes	
5. Main causes of conflicts	5.1 Lack of information 5.2 Lack of resources 5.3 Personal relationship 5.4 In competent management 5.5 Wages and benefits 5.6 Lay offs 5.7 Safety 5.8 Work hours 5.9 Unionization	
6. Five conflict management styles	6.1 Accommodating 6.2 Avoiding 6.3 Collaborating: win-lose/win-win 6.4 Competing: win-lose 6.5 Compromising: Lose-lose	
7. Short term and long production	7.1 LONG TERM 7.1.1 Product Selection (PPC) 7.1.2 Process layout 7.1.3 Proper equipment 7.1.4 Sit location selection 7.1.5 Lay out selection Control.	7.2 SHORT TERM 7.2.1 Production Planning & Control 7.2.2 Inventory/stock control/material control 7.2.3 Quality Control 7.2.4 Management program
8. Control cycle of PPC	8.1 Plan- Planning performance 8.2 Execution-Actual Performance	

	8.3 Corrective action 8.4 Re-plan and implement
9. Quality dimensions	9.1 Performance 9.2 Features 9.3 Flexibility 9.4 Durability 9.5 Conformance 9.6 Serviceability 9.7 Aesthetics 9.8 Perceived quality
10. Quality control	10.1 Product 10.2 Reactive 10.3 line function 10.4 Find the defects 10.5 Walk through 10.6 Testing 10.7 Inspection 10.8 Check point review

Curricular Evidence Guide

1. Underpinning Knowledge	1.1 Defining the management functions. 1.2 Identifying Staffs' motivational needs. 1.3 Shop management problems identification and control mechanisms 1.4 Method of selecting and gathering Production input 1.5 Encouraging, enhancing, team commitment and advancing individual performance 1.6 Participative leadership skills and techniques 1.7 Types of conflict in the work place 1.8 Dealing with conflict in the workplace 1.9 Main causes of conflicts 1.10 Production inputs and outputs
2. Underpinning Skills	2.1 Demonstrating Shop management planning, organizing, coordinating and directing functions 2.2 Demonstrating situational leadership skills model 2.3 Demonstrating the Four basic styles of leadership 2.4 Carrying out Effective face to face meeting with the staffs/subordinates 2.5 Demonstrating the Five conflict management styles 2.6 Demonstrating short and long term production management decisions 2.7 Demonstrating the control cycle of PPC 2.8 Carrying out quality dimensions and quality control of product

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 The following resources must be provided: 4.2 Workplace 4.3 Tools, equipment and facilities appropriate to processes or activity. 4.4 Materials relevant to the proposed activity. 4.5 Equipment and outfits appropriate in applying safety measures. 4.6 Relevant drawings, manuals, codes, standards and reference material.

Assessment Evidence Guide:

1. Critical Aspects of Competency	Assessment required evidence that the candidate: 1.1 Demonstrated Shop management planning, organizing, coordinating and directing functions 1.2 Demonstrated situational leadership skills model 1.3 Demonstrated the Four basic styles of leadership 1.4 Carried out Effective face to face meeting with the staffs/subordinates 1.5 Demonstrated the Five conflict management styles 1.6 Demonstrated short and long term production management decisions 1.7 Demonstrated the control cycle of PPC 1.8 Carried out quality dimensions and quality control of product
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

Master Craftsmanship

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
• Emphasis on knowledge/memorization • Teachers/Training Providers have main role • Theory & practical Tests can become outdated	• Based on competency standards • Involve industry partners in crucial role • Assessment based on demonstration of work

• High cost & central control • Relatively inflexible	skills rather than classroom knowledge • Flexible delivery • Competencies widely recognized • Guidelines & Templates used

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
Valid	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)
Reliable	Evidence presented for assessment is consistently interpreted regardless of the Assessor

Flexible	Assesses competencies held by the learner regardless of where they have been acquired; reflects the individual learner's needs
Fair	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
Safe	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
Valid	The assessor is given assurance that the learner possesses the skills, knowledge, and attitudes described in the Unit of Competency and related assessment requirements

Sufficient	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
Authentic	The assessor is assured that the evidence provided for assessment is the learner's own work
Current	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

Candidate's name:	
Assessor's name:	
Qualification:	
Project-Based Assessment Title	
Units of competency covered:	
Date of assessment:	
Time of assessment:	

Instructions for demonstration
Please see attached Instruction for Demonstration (Candidate/Assessor)

Supplies and Materials	Tools and equipment
▪ Please refer to attached specific instruction	• Please refer to attached specific instruction

	✓ to show if evidence is demonstrated		
During the demonstration of skills, did the candidate:	Yes	No	N/A
•	☐	☐	☐
•	☐	☐	☐
•	☐	☐	☐
•	☐	☐	☐
•	☐	☐	☐
•	☐	☐	☐
•	☐	☐	☐
•	☐	☐	☐
•	☐	☐	☐
•	☐	☐	☐
•	☐	☐	☐
•	☐	☐	☐
•	☐	☐	☐
•	☐	☐	☐
•	☐	☐	☐

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):			
		YES	**NO**
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Candidate's performance was:	**COMPETENT**	**NOT YET COMPETENT**	
Feedback to Candidate:			
Candidate's Signature:			Date:
Assessor's Signature:			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:

EVIDENCE PLAN: Overall Summary

QUALIFICATION:	
Project-Based Assessment Title	
Units of competency covered	

Ways in which evidence will be collected: [tick the column] The evidence must show that the candidate …….	Observation with Questioning	Demonstration with Questioning	Written Examination	Portfolio
•				
•				
•				
•				
•				
•				
•				
•				
•				
•				
•				
•				
•				
•				
•				
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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
- Review unit(s) of competency to be assessed especially evidence to be collected against performance criteria - Ensure the workplace or training center complies with all safety requirements and that high risk areas are clearly marked - Identify/request essential assessment resources: • tools and equipment • supplies and materials • personal protective equipment • print resources and rating sheets • Have trainees contacted if they have to bring any resources for the assessment, e.g. logbook	-Verify attendance through signed attendance sheet - Provide overview of what is to happen throughout day Orient the trainees to: • purpose of assessment • qualification to be assessed • assessment procedures to be followed • address needs of trainees and provide information on evidence requirements and assessment process • make all announcements just before start of assessment	Give clear instructions to trainees on what they are required to do: • time limits and expectations • all equipment and tools must be of the same quality for all trainees • written and verbal instructions translated into local dialects as needed • encourage questions • avoid providing any assistance to trainees during assessment • stop process if accident imminent • keep focused on evidence being valid, reliable, fair, flexible, and safe • Record details of evidence collected	Provide feedback on outcome of assessment process re: • give clear feedback on assessment decision • provide information on overcoming any gaps in competency assessment • provide opportunity to discuss assessment process and outcome **Prepare required assessment reports:** • all rating sheets signed by trainee as well as Assessor • maintain records of assessment procedures, evidence collected, and assessment outcome • verify assessment results/outcomes with training center **Prepare** recommendations for issuance of national certificate

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: Apply Fundamentals of Welding Metallurgy

Candidate's name:	
Assessor's name:	
Qualification:	Master Craftsmanship
Project-Based Assessment Title	
Units of competency covered:	Apply Fundamentals of Welding Metallurgy (SEIP-LIG-MAS-1-0)
Date of assessment:	
Time of assessment:	

Instructions for demonstration	
Please see attached Instruction for Demonstration (Candidate/Assessor)	
Supplies and Materials ▪ Please refer to attached specific instruction	Tools and equipment • Please refer to attached specific instruction

	✓ to show if evidence is demonstrated		
During the demonstration of skills, did the candidate:	Yes	No	N/A
1. Identify heat treatment tools and equipment	☐	☐	☐
2. Select and use appropriate PPEs when performing heat treatment processes	☐	☐	☐
3. Perform annealing process of carbon steel in accord with workplace procedures	☐	☐	☐
4. Carry out hardening of a carbon steel in accord with workplace procedures	☐	☐	☐
5. Perform tempering of a carbon steel in accord with workplace procedures	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐
	☐	☐	☐

Observation Checklist: Apply Fundamentals of Welding Metallurgy

Candidate's name:			
Assessor's name:			
Date of Assessment:			
Unit of Competency:	Apply Fundamentals of Welding Metallurgy		
Code:	SEIP-LIG-MAS-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):			
		YES	**NO**
1. Identify heat treatment tools and equipment			
2. Select and use appropriate PPEs when performing heat treatment processes			
3. Perform annealing process of carbon steel in accord with workplace procedures			
4. Carry out hardening of a carbon steel in accord with workplace procedures			
5. Perform tempering of a carbon steel in accord with workplace procedures			
Candidate's performance was:	**COMPETENT**	**NOT YET COMPETENT**	
Feedback to Candidate:			
Candidate's Signature:		Date:	
Assessor's Signature:		Date:	

Oral Questions Checklist: Apply Fundamentals of Welding Metallurgy

Candidate's name:	
Assessor's name:	
Date of Assessment:	
Assessment Venue:	
Unit of Competency:	Apply Fundamentals of Welding Metallurgy
Reference Standard:	**Master Craftsmanship**

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. What is the purpose of the annealing process?		
2. Can you identify three types of carbon steel?		
3. What are the PPEs used during the heat treatment process?		
4. What is done with waste materials after a welding operation?		
5. Can you name at least five heat treatment tools and equipment?		
6. Why is a commitment to occupational health and safety important?		
7. How important is keeping a well-maintained selection of manuals, codes, and reference materials handy?		
8. Can you give some reasons and examples why communication is important in the workplace?		

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 Welding

Candidate's name:	
Assessor's name:	
Qualification:	Master Craftsmanship
Project-Based Assessment Title	
Units of competency covered:	Perform Welding (SEIP-LIG-MAS-2-0)
Date of assessment:	
Time of assessment:	

Instructions for demonstration	
Please see attached Instruction for Demonstration (Candidate/Assessor)	
Supplies and Materials ▪ Please refer to attached specific instruction	Tools and equipment • Please refer to attached specific instruction

	✓ to show if evidence is demonstrated		
During the demonstration of skills, did the candidate:	Yes	No	N/A
1. Check welding machine performance in conformance to job requirement	☐	☐	☐
2. Perform welding in 1G, 2G, 3G, 4G positions	☐	☐	☐
3. Clean, check and identify welds for quality	☐	☐	☐
4. Rectify defects to meet job specifications/standards	☐	☐	☐
5. Mark, cut, and set welding job as per requirement	☐	☐	☐
6. Perform 6G position welding in accord with job requirement and welding joint standard	☐	☐	☐
7. Perform welding in accord to 3G and 4G positions	☐	☐	☐
8. Perform plasma cutting as per job requirement	☐	☐	☐
9. Set up and adjust welding equipment and holding devices in accord with job requirements	☐	☐	☐

Observation Checklist: Perform Welding

Candidate's name:	
Assessor's name:	
Date of Assessment:	
Unit of Competency:	Perform Welding
Code:	SEIP-LIG-MAS-2-0
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):

	YES	NO
1. Check welding machine performance in conformance to job requirement		
2. Perform welding in 1G, 2G, 3G, 4G positions		
3. Clean, check and identify welds for quality		
4. Rectify defects to meet job specifications/standards		
5. Mark, cut, and set welding job as per requirement		
6. Perform 6G position welding in accord with job requirement and welding joint standard		
7. Perform welding in accord to 3G and 4G positions		
8. Perform plasma cutting as per job requirement		
9. Set up and adjust welding equipment and holding devices in accord with job requirements		

Candidate's performance was:	**COMPETENT**	**NOT YET COMPETENT**
Feedback to Candidate:		
Candidate's Signature:		Date:
Assessor's Signature:		Date:

Oral Questions Checklist: Perform Welding

Candidate's name:	
Assessor's name:	
Date of Assessment:	
Assessment Venue:	
Unit of Competency:	Perform Welding
Reference Standard:	**Master Craftsmanship**

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. What does the designation "G" mean in a welding operation?		
2. What are six common welding defects?		
3. What is meant by "shielding gases?"		
4. What is done with rough edges after cutting?		
5. How are electrodes classified?		
6. Why is a clean workplace important?		
7. To what extent is safety an important consideration and why?		
8. Why is it important to be able to interpret welding symbol charts?		

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 Lathe Machine Operation

Candidate's name:	
Assessor's name:	
Qualification:	Master Craftsmanship
Project-Based Assessment Title	
Units of competency covered:	Perform Lathe Machine Operation (SEIP-LIG-MAS-3-0)
Date of assessment:	
Time of assessment:	

Instructions for demonstration	
Please see attached Instruction for Demonstration (Candidate/Assessor)	
Supplies and Materials ▪ Please refer to attached specific instruction	Tools and equipment • Please refer to attached specific instruction

	✓ to show if evidence is demonstrated		
During the demonstration of skills, did the candidate:	Yes	No	N/A
1. Select single point cutting tools according to requirements of the operation?	☐	☐	☐
2. Perform taper turning operation following the sequence of operation in producing the required specification of the product	☐	☐	☐
3. Check/measure the work piece for conformance to specification using appropriate techniques, measuring tools, and equipment	☐	☐	☐
4. Select acme and squire thread cutting tools in accord with work requirements	☐	☐	☐
5. Perform multi-start acme thread cutting to specifications in the drawing	☐	☐	☐
6. Select worm thread cutting tools according to requirements	☐	☐	☐
7. Perform single-start worm thread cutting to cut threads to specifications as per drawing	☐	☐	☐
8. Perform eccentric turning to produce component to specifications in the drawing and finish by lathe turning tool	☐	☐	☐
	☐	☐	☐

Observation Checklist: Perform Lathe Machine Operation

Candidate's name:			
Assessor's name:			
Date of Assessment:			
Unit of Competency:	Perform Lathe Machine Operation		
Code:	SEIP-LIG-MAS-3-0		
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):			
		YES	**NO**
1. Select single point cutting tools according to requirements of the operation?			
2. Perform taper turning operation following the sequence of operation in producing the required specification of the product			
3. Check/measure the work piece for conformance to specification using appropriate techniques, measuring tools, and equipment			
4. Select acme and squire thread cutting tools in accord with work requirements			
5. Perform multi-start acme thread cutting to specifications in the drawing			
6. Select worm thread cutting tools according to requirements			
7. Perform single-start worm thread cutting to cut threads to specifications as per drawing			
8. Perform eccentric turning to produce component to specifications in the drawing and finish by lathe turning tool			
Candidate's performance was:	**COMPETENT**	**NOT YET COMPETENT**	
Feedback to Candidate:			
Candidate's Signature:		Date:	
Assessor's Signature:		Date:	

Oral Questions Checklist: Perform Lathe Machine Operation

Candidate's name:	
Assessor's name:	
Date of Assessment:	
Assessment Venue:	
Unit of Competency:	Perform Lathe Machine Operation
Reference Standard:	**Master Craftsmanship**

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. Why is coolant applied?		
2. Can you briefly describe the eccentric turning method?		
3. What are the common PPEs used in lathe machine operations?		
4. How are cutting speed and feed determined?		
5. To what extent is communication a priority on the job?		
6. What are five common measuring tools?		
7. Why is a commitment to occupational health and safety important?		
8. How often during a work operation is machine performance checked?		

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 Operation

Candidate's name:	
Assessor's name:	
Qualification:	Master Craftsmanship
Project-Based Assessment Title	
Units of competency covered:	Perform Milling Machine Operation (SEIP-LIG-MAS-4-0)
Date of assessment:	
Time of assessment:	

Instructions for demonstration	
Please see attached Instruction for Demonstration (Candidate/Assessor)	
Supplies and Materials ▪ Please refer to attached specific instruction	Tools and equipment • Please refer to attached specific instruction

	✓ to show if evidence is demonstrated		
During the demonstration of skills, did the candidate:	Yes	No	N/A
1. Set up the horizontal/vertical machine with a vise on the table and install boring attachment/boring head using horizontal/vertical arbor	☐	☐	☐
2. Perform boring operation using boring attachment with conventional milling methods to produce a pre-determined drill hole	☐	☐	☐
3. Perform external key way cutting to produce key on shaft	☐	☐	☐
4. Set up slot milling attachment to cut internal key way using a key way fly cutter using a horizontal/vertical milling machine	☐	☐	☐
5. Perform helical and bevel gear cutting as per job requirement	☐	☐	☐
6. Perform rack and pinion gear cutting as per job requirement	☐	☐	☐
7. Check machine performance in conformance with job requirement	☐	☐	☐
8. Apply coolant to prevent over heating of work piece and cutting tool	☐	☐	☐
9. Check/measure job in conformance with drawing/specification using appropriate techniques, measuring tools and equipment	☐	☐	☐

Observation Checklist: Perform Milling Machine Operation

Candidate's name:	
Assessor's name:	
Date of Assessment:	
Unit of Competency:	Perform Milling Machine Operation
Code:	SEIP-LIG-MAS-4-0
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):

	YES	NO
1. Set up the horizontal/vertical machine with a vise on the table and install boring attachment/boring head using horizontal/vertical arbor		
2. Perform boring operation using boring attachment with conventional milling methods to produce a pre-determined drill hole		
3. Perform external key way cutting to produce key on shaft		
4. Set up slot milling attachment to cut internal key way using a key way fly cutter using a horizontal/vertical milling machine		
5. Perform helical and bevel gear cutting as per job requirement		
6. Perform rack and pinion gear cutting as per job requirement		
7. Check machine performance in conformance with job requirement		
8. Apply coolant to prevent over heating of work piece and cutting tool		
9. Check/measure job in conformance with drawing/specification using appropriate techniques, measuring tools and equipment		

Candidate's performance was:	**COMPETENT**	**NOT YET COMPETENT**
Feedback to Candidate:		
Candidate's Signature:		Date:
Assessor's Signature:		Date:

Oral Questions Checklist: Perform Milling Machine Operation

Candidate's name:	
Assessor's name:	
Date of Assessment:	
Assessment Venue:	
Unit of Competency:	Perform Milling Machine Operation
Reference Standard:	**Master Craftsmanship**

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 are milling cutters selected?		
2. What are four common materials used in welding operations?		
3. What is the standard personal protective equipment that is worn at work?		
4. Is there any special method for using cutting fluid?		
5. What is the purpose of external key way cutting?		
6. What is the purpose of rack and pinion gear cutting?		
7. To what extent is a commitment to occupational health & safety a key consideration on the job?		
8. How important is communication on the job and give examples?		

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 Grinding Machine Operation

Candidate's name:	
Assessor's name:	
Qualification:	Master Craftsmanship
Project-Based Assessment Title	
Units of competency covered:	Perform Grinding Machine Operation (SEIP-LIG-MAS-5-0)
Date of assessment:	
Time of assessment:	

Instructions for demonstration	
Please see attached Instruction for Demonstration (Candidate/Assessor)	
Supplies and Materials ▪ Please refer to attached specific instruction	Tools and equipment • Please refer to attached specific instruction

	✓ to show if evidence is demonstrated		
During the demonstration of skills, did the candidate:	Yes	No	N/A
1. Determine RPM, cutting speed, feed rate, and depth of grind	☐	☐	☐
2. Identify and set grinding machine accessories and attachment	☐	☐	☐
3. Identify, select, and balance different abrasive/grinding wheels according to abrasive wheel specifications	☐	☐	☐
4. Check machine performance conforming to job requirement	☐	☐	☐
5. Perform cylindrical grinding operation according to work place requirement	☐	☐	☐
6. Perform cylindrical grinding operation according to work place requirement	☐	☐	☐
7. Perform universal tools and cutter grinding operation according to work place requirement	☐	☐	☐
8. Apply coolant to prevent over heating of work piece and cutting tool	☐	☐	☐
9. Check/measure job for conformance to specification using appropriate techniques, measuring tools, and equipment	☐	☐	☐

Observation Checklist: Perform Grinding Machine Operation

Candidate's name:	
Assessor's name:	
Date of Assessment:	
Unit of Competency:	Perform Grinding Machine Operation
Code:	SEIP-LIG-MAS-5-0
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):

	YES	NO
1. Determine RPM, cutting speed, feed rate, and depth of grind		
2. Identify and set grinding machine accessories and attachment		
3. Identify, select, and balance different abrasive/grinding wheels according to abrasive wheel specifications		
4. Check machine performance conforming to job requirement		
5. Perform cylindrical grinding operation according to work place requirement		
6. Perform cylindrical grinding operation according to work place requirement		
7. Perform universal tools and cutter grinding operation according to work place requirement		
8. Apply coolant to prevent over heating of work piece and cutting tool		
9. Check/measure job for conformance to specification using appropriate techniques, measuring tools, and equipment		

Candidate's performance was:	**COMPETENT**	**NOT YET COMPETENT**
Feedback to Candidate:		
Candidate's Signature:		Date:
Assessor's Signature:		Date:

Oral Questions Checklist: Perform Grinding Machine Operation

Candidate's name:	
Assessor's name:	
Date of Assessment:	
Assessment Venue:	
Unit of Competency:	Perform Grinding Machine Operation
Reference Standard:	**Master Craftsmanship**

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 the different types of coolant and their functions?		
2. What is the purpose of checking machine performance?		
3. Where is the cylindrical work piece set on a cylindrical grinding machine?		
4. Can you name at least five different parts of a grinding machine?		
5. What are the two main types of abrasives?		
6. Can you name at least seven different types of grinding wheels?		
7. Can you give some reasons why a commitment to health and safety is important?		
8. How often should a grinding machine be cleaned?		

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:**