Technical and Vocational Education and Training (TVET) Council

Occupational Standards of Competence

Industrial Mechatronics – Mechanical Engineering

Level 3

Hastings House West, Balmoral Gap, Hastings, Christ Church, Barbados
Telephone: (246) 435-3096 Fax: (246) 429 2060 E-mail: office@tvetcouncil.com.bb.

Published by:
The Technical and Vocational Education and Training (TVET) Council
Hastings House West
Balmoral Gap
Hastings
Christ Church
BARBADOS, W.I.
Tel: (246) 435-3096
Fax: (246) 429-2060
Email: office@tvetcouncil.com.bb Website: www.tvetcouncil.com.bb

ACKNOWLEDGEMENTS

The Technical and Vocational Education and Training (TVET) Council thanks the following for their contribution to the development of this document:

Members of the Industrial Mechatronics – Mechanical Engineering Working Group

Mr. Christopher Brathwaite	-	Roberts Manufacturing Co. Ltd.
Mr. Trevor Headley	-	Barbados Community College
Mr. Gilli Jonteaux	-	Roberts Manufacturing Co. Ltd.
Mrs. Allison Kirton-Holder	-	Roberts Manufacturing Co. Ltd.
Mr. Mark Moore	-	Barbados Community College
Mrs. Kellyanne Jones	-	Technical and Vocational Education and Training (TVET) Council

Qualification Overview

NVQB

in

Industrial Mechatronics – Mechanical Engineering

Level 3

Qualification overview

Industrial mechatronics – mechanical engineering combines electronic, mechanical and computer skills to operate and maintain mechanical equipment. It includes dealing with installation, maintenance and repair, mechanical controls, fluid power systems and electrical and electronic equipment. Such skills once adapted, can be applied in a wide range of industrial environments outside of the metal engineering and maintenance industry.

Some units are likely to be assessed in conjunction with other mandatory units as defined by the technical definition and assessment specifications of the management activity.

Who is the qualification for?

The NVQB in Industrial Mechatronics – Mechanical Engineering Level 3 is aimed at persons who operate and maintain mechanical equipment in the metal engineering and maintenance industry. It is for those who are involved in the operations process, the maintenance of the mechanical equipment and who are in supervisory positions. A manufacturing factory can be a small or large company that produces any range of products for final use or for transition to other factories for further development. Though this standard speaks specifically to the mechanical aspect of the maintenance, some basic electrical knowledge is required. Candidates should have been working in the position for a minimum of 2 years and/or possess a minimum qualification of a Technical Certificate in Plant Maintenance, Mechanical Maintenance/Engineering, Welding & Metal fabrication or Machining.

Jobs within the occupational area

Relevant occupations include:

- Machine Operators
- Maintenance Managers
- Maintenance Technician
- Plant Managers
- Production Managers
- Plant Engineer
- Factory Engineer
- Mechanical Foreman
- Plant Foreman

This list is not exhaustive and only serves to illustrate the breadth of the qualification.

Where could it be used?

These competencies are for persons who are likely to be in roles where, for example, their duties include:

- Maintaining mechanical equipment
- Troubleshooting machinery and building system faults to rectify challenges

- Performing preventative or corrective maintenance for all machinery and plant systems
- Identifying and recommendation of spare parts or equipment to be ordered to maintain plant functionality
- Designing, fabricating and modifying structures and machinery as required
- Operating mechanical equipment within the factory
- Overseeing/supervising those who maintain mechanical equipment within the factory

A07003 - APPROVED NATIONAL VOCATIONAL QUALIFICATION STRUCTURE

INDUSTRIAL MECHATRONICS – MECHANICAL ENGINEERING - LEVEL 3

To achieve the full qualification, candidates must complete sixteen (16) units in total. All units are mandatory.

MANDATORY UNITS (All must be completed)	CODE
1. Plan and carry out work	**UA01603**
1.1 Identify work requirements	
1.2 Plan process to complete activity	
1.3 Coordinate work	
1.4 Complete work	
2. Provide basic first aid	**U61303**
2.1 Plan and prepare for initial first aid response	
2.2 Assess the situation	
2.3 Apply first aid	
2.4 Record and report the incident	
2.5 Clean up	
3. Participate in basic workplace communication	**U91402**
3.1 Communicate information	
3.2 Participate in team discussions	
3.3 Represent views of the group	
4. Perform related computations	**UA01703**
4.1 Apply rules of calculation	
4.2 Interpret and produce charts and graphs	
4.3 Perform basic calculation involving geometry	
5. Mark off/out (general engineering)	**UA01803**
5.1 Determine job requirements	
5.2 Transfer dimensions	
5.3 Make templates	
6. Use hand and power tools	**UA01903**
6.1 Select hand and power tools	
6.2 Use hand and power tools	
6.3 Maintain hand and power tools	

MANDATORY UNITS (ALL MUST BE COMPLETED)	CODE
7. Draw and interpret sketches and simple drawings	**UA02003**
7.1 Prepare freehand sketch	
7.2 Interpret details from freehand sketch	
7.3 Select technical drawings	
7.4 Identify drawing requirements	
7.5 Prepare or make changes to engineering drawings	
8. Follow principles of occupational health and safety in the workplace	**UA02103**
8.1 Follow occupational health and safety work practices	
8.2 Contribute to occupational health and safety management	
9. Perform mechanical cutting operations	**UA02203**
9.1 Determine job requirements	
9.2 Select/setup cutting tool	
9.3 Operate cutting tool	
9.4 Check material for conformance to specifications	
9.5 Clean and store machine	
10. Perform manual handling and lifting	**UA02303**
10.1 Lift materials	
10.2 Move materials manually	
11. Remove/install standard mechanical seals	**UA02403**
11.1 Determine mechanical seal requirements	
11.2 Dismantle mechanical seal installations	
11.3 Select replaceable items	
11.4 Reassemble mechanical seal installations	
12. Remove and replace basic system components	**UA02503**
12.1 Check system components	
12.2 Identify, remove/replace faulty system components	
12.3 Clean up materials and work area	
13. Maintain and repair mechanical drives and transmission assemblies	**UA02603**
13.1 Undertake maintenance checks of mechanical drives and transmission components	
13.2 Adjust mechanical drives and transmission assemblies	
13.3 Diagnose faults	
13.4 Repair mechanical drives/transmission assemblies	

13.5 Complete final adjustment and commissioning

14. Install and maintain conveyors/elevators and associated equipment UA02703

14.1 Plan and prepare for work
14.2 Remove equipment to facilitate maintenance
14.3 Maintain conveyors/elevators nd associated equipment
14.4 Replace/install conveyors/elevators and associated equipment
14.5 Complete work

15. Install and maintain mechanical valves, pumps and fluid power systems UA02803

15.1 Plan and prepare for work
15.2 Remove valves for maintenance
15.3 Perform valve maintenance
15.4 Replace/install valves
15.5 Remove pumps for maintenance
15.6 Maintain pumps
15.7 Replace/install pumps
15.8 Remove assemblies or subassemblies from plant
15.9 Maintain fluid power systems
15.10 Complete work

16. Diagnose and repair faults in mechanical equipment UA02903

16.1 Verify the fault
16.2 Locate the fault
16.3 Determine the cause of the fault
16.4 Repair or rectify the fault
16.5 Complete work

UA01603 Plan and carry out work

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to plan and carry out work effectively either individually or as a team. The work planned and carried out is specifically within the metal engineering and maintenance industry.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Identify work requirements	1.1 Obtain instructions and objectives of work requirements and clarify where necessary.
	1.2 Identify task requirements including timeframe, quality requirements and criteria for acceptable completion.
2. Plan process to complete activity	2.1 Identify and prioritize individual components of the activity based on objectives, performance requirements and specifications.
	2.2 Identify the sequence of activities to be completed.
	2.3 Check the planned sequence and objectives to ensure conformity with instructions and relevant specifications.
3. Coordinate work	3.1 Request and obtain permits ensuring that they are interpreted, clarified, signed and distributed to the **relevant persons** in accordance with company procedures and job requirements.
	3.2 Verify tasks are assigned and monitor them to ensure compliance with plans, work requirements and company procedures.
	3.3 Carry out work tasks in accordance with job specifications and instructions.
4. Complete work	4.1 Complete work and notify appropriate personnel in accordance with company procedures.

4.2 Clear waste, clean, restore and secure work area in accordance with company and environmental procedures.

4.3 Finalize work and complete required reports in accordance with company and industry requirements.

RANGE STATEMENT

All range statements must be assessed:

1. **Relevant persons:**

    - Supervisor/team leader
    - Team members
    - Clients/customers

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are the company procedures and requirements for planning and organizing work.
2. Where and how to obtain and clarify the instructions and objectives of work requirements.
3. How to identify task requirements including timeframe, quality requirements and criteria for acceptable completion.
4. How to identify and prioritize individual components of the activity based on objectives, performance requirements and specifications.
5. How to identify the sequence of activities to be completed.
6. How to check the planned sequence and objectives to ensure conformity with instructions and relevant specifications.
7. How to request and obtain permits ensuring that they are interpreted, clarified, signed and distributed to the relevant persons.
8. How to verify that tasks are assigned and how to monitor them to ensure compliance with plans, work requirements and company procedures.
9. How to carry out work tasks in accordance with job specifications and instructions.
10. How to complete work and notify appropriate personnel.
11. Who are the relevant persons to be notified on completion of work.
12. How to clear waste, clean, restore and secure the work area.
13. What are the company and environmental procedures for clearing waste.
14. How to finalize work and complete reports.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion
- Simulation tests using appropriate equipment

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the, candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

U61303 Provide basic first aid

Unit Descriptor:

This unit describes the knowledge, skills and attitudes required to provide basic first aid response, life support, management of casualty and the incident until the arrival of medical personnel.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Plan and prepare for initial first aid response	1.1 Interpret work activity and **first aid** documentation to ensure accuracy of preparation of the response according to company procedures.
	1.2 Identify potential **risks, hazards** and environmental issues and address through control measures in accordance with relevant company procedures
	1.3 Select and correctly wear personal protective equipment appropriate for the response in accordance with relevant company and occupational safety and health standards.
	1.4 Coordinate activities with others prior to, during and after the response according to standard operating procedures.
	1.5 Record, report and replenish **first aid resources** in accordance with company procedures.
2. Assess the situation	2.1 Identify **risks** and hazards in accordance with company procedures and minimize immediate **risks** and implement agreed control measures.
	2.2 Assess the casualty's vital signs and physical conditions within the scope of the individual providing the initial response.

3. Apply first aid	3.1 Provide **first aid** management within the scope of the individual according to industry and occupational safety and health requirements.
	3.2 Reassure and make the casualty comfortable in a calm, sensitive manner.
	3.3 Obtain and use **first aid resources and equipment** correctly as required to control **hazards** and **risks** in accordance with company and occupational safety and health standards.
	3.4 Monitor the casualty's condition and provide a timely, accurate response in accordance with effective **first aid** principles and company procedures.
	3.5 Seek appropriate **emergency services** in a timely manner in accordance with company procedures and finalize the management of the casualty.
4. Record and report the incident	4.1 Record accurately details of casualty's physical condition, changes in conditions, management of the situation and response to management in accordance with company procedures.
	4.2 Communicate details of the casualty's condition and management activities to relevant **emergency services,** while maintaining sensitivity to the casualty and surroundings.
	4.3 Safely secure personal effects of the casualty and pass to relevant personnel in accordance with company procedures.
	4.4 Prepare and submit relevant documentation in an appropriate and timely manner, presenting all relevant facts according to company procedures.
	4.5 Record and report use of **first aid resources** accurately in accordance with company procedures.

5. Clean up	5.1 Recover, clean, inspect/test, replace (if necessary) and correctly store **first aid equipment**, if practical.
	5.2 Dispose of medical waste correctly in accordance with occupational safety and health and company policies and procedures.
	5.3 Report **equipment** faults to the appropriate persons according to company procedures.
	5.4 Conduct appropriate debriefing or evaluation exercises as necessary.

RANGE STATEMENT

All range statements must be assessed:

1. **First aid:**

    - Cardio-pulmonary resuscitation (CPR)
    - Bleeding control
    - Basic patient management
    - Stabilizing fractures

2. **Hazards:**

    - Physical
    - Biological
    - Chemical
    - Manual handling

3. **Risks:**

    - Electrical
    - Manual
    - Substances
    - Environmental
    - Biological
    - Injury
    - Proximity
    - Vehicles

4. **Resources and equipment:**

    - Defibrillation units
    - First aid kit
    - Auto-injector
    - Ventilation chamber/inhaler
    - Resuscitation mask
    - Spacer device
    - Personal protective equipment
    - Stretcher
    - Communication equipment

5. **Emergency services:**

    - Ambulance
    - Fire
    - Police

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are the social/legal issues surrounding the provision of first aid.
2. When and how to use defibrillation units.
3. What are the basic occupational health and safety requirements.
4. What are the basic principles and concepts underlying the practice of first aid and how to carry out the associated functions.
5. How, when and which emergency services to call.
6. How to plan an appropriate first aid response.
7. How to use communication, information technology and literacy skills to function in an emergency environment.
8. How and when to prepare the appropriate documentation.
9. What is medical waste and how to dispose of it.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** the performance criteria, underpinning knowledge and range **on more than one occasion**. This evidence must come from a real working environment.

(2) Method of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Written/oral questioning
- Observation
- Written evidence (case study, projects, assignments)
- Witness testimony

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by an individual working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **may be used**.

U91402 Participate in basic workplace communication

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to participate effectively in basic workplace communication. Communication is undertaken in order to ensure information is passed on and understanding is obtained amongst all persons in the workforce.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Communicate information	1.1 Select and use an appropriate form of **communication** to meet the required purpose.
	1.2 Ask relevant questions to obtain additional information and confirm understanding.
	1.3 Identify **sources of information** relevant to the request.
	1.4 Select and sequence information according to the request.
	1.5 Respond to request appropriately following organisational protocols.
2. Participate in team discussions	2.1 Identify members of the team and verify the information required.
	2.2 Seek and provide constructive **responses** to others in the team according to the information requested.
	2.3 Confirm team members' understanding of the request and responses provided.
	2.4 Communicate and record goals of outcomes promptly to relevant persons.
3. Represent views of the group	3.1 Interpret the views and opinions of others accurately.

3.2 Provide information to relevant persons and confirm their understanding of the interpreted views and opinions.

RANGE STATEMENT

All range statements must be assessed:

1. **Communication:**

    - Verbal
    - Written
    - Sign language/hand signals
    - Electronic

2. **Sources of information:**

    - Documents
    - Organizations
    - Websites
    - Other persons

3. **Responses:**

    - Verbal
    - Written
    - Sign language
    - Electronic

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are the various and confirmed appropriate methods of communication utilized in the organization.
2. What is the best form of communication to use based on the purpose required.
3. What is effective listening and how it is demonstrated.
4. How is additional information obtained and understanding confirmed.
5. What are the various and appropriate methods of sourcing information.
6. What information is deemed relevant to the communication.
7. How is the sourced information selected and correctly sequenced.
8. What are the organizational standards regarding the completion of reports.
9. How are reports completed and to whom they should be provided.
10. How to communicate effectively with others in all settings and across all levels.
11. Who are the members of the team and how to provide them with constructive responses.
12. How to determine whether the goals and required outcomes are achieved.
13. Who are the relevant persons to whom goals and outcomes should be reported.
14. What are the views and opinions of others and how to accurately interpreted them.
15. What are the best methods to provide information to others and to confirm their understanding.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA01703 Perform related computations

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to perform related computations and effectively carry out measurements of work to required tolerance, and applies to individuals working in the metal and engineering and maintenance industry.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Apply rules of calculation	1.1 Perform simple calculations using the **basic rules of calculation.**
	1.2 Demonstrate an understanding of concepts and perform calculations involving **numbers.**
	1.3 Perform simple calculations involving percentages, algebraic expressions and proportions.
	1.4 Perform simple calculations to obtain percentages from information expressed either in fractional or decimal format.
	1.5 Perform simple calculations on algebraic expressions using the **four basic rules.**
	1.6 Perform simple calculations involving ratios and proportion using **numbers.**
2. Interpret and produce charts and graphs	2.1 Extract and interpret information from charts and graphs in accordance with company requirements.
	2.2 Utilize information extracted from the charts and graphs to make decisions in line with company requirements.
	2.3 Utilize information to produce simple charts and graphs as required.
3. Perform basic calculations involving geometry	3.1 Determine angles and linear dimensions when performing calculations.

3.2 Determine circular properties for diameters radii and circumferences when performing calculations.

3.3 Determine area and volume of various shapes when performing calculations.

RANGE STATEMENT

All range statements must be assessed:

1. **Basic rules of calculation:**

    - Addition
    - Subtraction
    - Division
    - Multiplication

2. **Numbers:**

    - Whole numbers
    - Fractions
    - Decimal fractions
    - Percentages

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are the basic rules of calculation.
2. How to perform simple calculations using the basic rules of calculation.
3. How to demonstrate an understanding of concepts and perform calculations.
4. How to perform simple calculations to obtain percentages.
5. What are the four basic rules of algebraic expression.
6. How to perform simple calculations on algebraic expressions.
7. How to perform simple calculations involving ratios and proportion.
8. What information should be extracted and used from charts and graphs.
9. How to determine angles and linear dimensions when performing calculations.
10. How to determine circular properties for diameters, radii and circumferences.
11. How to determine area and volume of various shapes.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA01803 Mark off/out (general engineering)

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to effectively transfer dimensions from engineering drawings, prints or plans. It applies to individuals working in the metal engineering and maintenance industry.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Determine job requirements	1.1 Interpret and confirm understanding of drawing, job instructions and specifications.
	1.2 Select appropriate methods and sequencing consistent with the proposed fabricating process.
2. Transfer dimensions	2.1 Complete marking off/out in accordance with specifications using the appropriate **tools and equipment.**
	2.2 Establish datum points correctly according to specifications.
	2.3 Transfer dimensions correctly and appropriately according to job instructions and specifications.
3. Make templates	3.1 Select appropriate template materials according to specifications.
	3.2 Produce templates to specifications and appropriate to desired use.
	3.3 Follow storage procedures for equipment and materials in accordance with manufacturer's and company specifications.

RANGE STATEMENT

All range statements must be assessed:

1. Marking off/out tools and equipment:

- Calipers
- Combination square
- Dies and Tooling
- Dividers
- Hammers
- Jigs and fixtures
- Marking out tables
- Measurement Tape
- Micrometer
- Punches
- Rotary tables
- Scriber
- Steel Rule
- Surface tables
- Templates
- Tremmels

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. How to determine job requirements.
2. How to interpret drawings, job instructions and specifications.
3. What are the different fabricating processes and how they are completed.
4. What is the proposed fabricating process and how to select and confirm the appropriate methods and sequencing.
5. What is marking off/out and what are the required tools and equipment.
6. How to identify the specifications for marking off/out.
7. What are datum points and how are they established.
8. How to transfer dimensions correctly and appropriately.
9. What are the different templates.
10. How to produce templates appropriate to specifications and desired use.
11. What are the manufacturer's and company procedures for storing templates and materials.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion
-

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA01903 Use hand and power tools

Unit Descriptor: This unit deals with the knowledge, skills and attitudes required to select and use appropriate hand and power tools. This unit applies to individuals working in the metal engineering and maintenance industry.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Select hand and power tools	1.1 Identify and select appropriate hand and power tools according to job specifications.
	1.2 Check tools prior to use to confirm that they are safe and operational.
	1.3 Identify and mark unsafe or faulty tools and report to the **appropriate person** according to company requirements.
2. Use hand and power tools	2.1 Identify, select and fit the appropriate **personal protective equipment.**
	2.2 Confirm and adhere to occupational safety and health requirements during work operations.
	2.3 Identify and confirm access to power sources for power tools.
	2.4 Use hand and power tools safely according to manufacturer's recommendations and company requirements.
3. Maintain hand and power tools	3.1 Clean and store hand and power tools safely and correctly according to manufacturer's and company requirements.
	3.2 Conduct **routine** maintenance of hand and power tools and mark for repair or disposal in accordance with company and manufacturer's specifications.

3.3 Document unsafe and faulty tools using relevant documentation according to company procedures.

RANGE STATEMENT

All range statements must be assessed:

1. **Appropriate person:**

    - Manager/supervisor/team leader
    - Health and safety representative
    - Maintenance personnel

2. **Personal protective equipment:**

    - Hard hat/helmet
    - Boots/shoes
    - Gloves
    - Goggles/glasses /face-shields
    - Dust mask/ respirator
    - Overalls/coveralls
    - Earplugs/Earmuffs
    - Back-brace
    - Safety Harness

3. **Routine:**

    - Daily
    - Weekly
    - Monthly
    - Other (as recommended by manufacturer)

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. How to select the appropriate hand or power tools for the required job.
2. How to check tools prior to use to ensure that they are safe and operational.
3. How to identify and mark faulty tools and to whom they should be reported.
4. How to identify, select and fit the appropriate personal protective equipment.
5. What are the occupational health and safety requirements and manufacturer's recommendations for using hand and power tools.
6. What are the sources of power supply and how to access them safely.
7. What are the manufacturer's and company requirements for cleaning and storing tools and how to do so.
8. How to conduct routine maintenance of hand and power tools.
9. What are the company requirements for documenting faulty and unsafe tools and how to do so.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA02003 Draw and interpret sketches and simple drawings

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to effectively draw and interpret sketches and simple drawings and applies to all individuals working in the metal engineering and maintenance industry.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Prepare freehand sketch	1.1 Sketch the object depicted correctly and appropriately according to specifications.
	1.2 Obtain correct dimensions and instructions and confirm that these are shown clearly.
	1.3 Indicate base line or datum point on sketch.
2. Interpret details from freehand sketch	2.1 Identify relevant components, assemblies or objects.
	2.2 Identify dimensions appropriate to the field of employment.
	2.3 Identify and follow instructions according to specifications.
	2.4 Identify the required materials according to job specifications.
	2.5 Identify and utilize symbols in the sketch.
3. Select technical drawings	3.1 Check and validate the drawing against job requirements or equipment.
	3.2 Check and validate the version of the drawing.
4. Identify drawing requirements	4.1 Determine the requirements and purpose of the drawing from the customer and/or work specifications and associated documents.
	4.2 Identify and collect the necessary data to produce the drawing.

	4.3 Confirm drawing requirements with **relevant persons** and establish timeframes for completion.
5. Prepare or make changes to engineering drawings	5.1 Select appropriate **drafting equipment**.
	5.2 Apply drafting principles to produce drawings that are consistent with standard operating procedures within the company.
	5.3 Undertake work in accordance with established procedures.
	5.4 Verify that the completed drawing is approved according to standard operating procedures.

RANGE STATEMENT

All range statements must be assessed:

1. **Relevant persons:**

    - Supervisor
    - Assigned colleagues
    - Clients/customers

2. **Drafting equipment:**

    - Drafting kit/instruments
    - Blueprints
    - Drawings/ modules/ photographs

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. How to sketch correctly and appropriately in freehand.
2. How to depict and object or part thereof in a sketch
3. How to obtain dimensions and show them clearly.
4. How to clearly depict instructions on a sketch.
5. How to indicate a base line or datum point.
6. How to identify components, assemblies and objects required for a sketch.
7. How to identify dimensions appropriate to the field of employment.
8. How to identify and follow instructions to complete the job.
9. How to identify the required materials for the job.
10. How to identify the symbols used in sketches.
11. How to check and validate drawings against job requirements or equipment.
12. What are the versions of drawings and how are they checked and validated.
13. How to determine the requirements and purpose of the drawing from the customer and/or work specifications and associated documents.
14. What are the associated required documents that support the requirements for the sketch
15. How to identify and collect necessary data to produce the drawing.
16. Who are the relevant persons with whom to confirm drawing requirements.
17. How to establish timeframes for completion.
18. What are standard operating procedures relevant to completing work and sketches.
19. What is drafting equipment and how to select the appropriate one.
20. What are the drafting principles to produce a drawing that is consistent with standard operating procedures.
21. What are the standard operating procedures for approving completed drawings.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA02103 Follow principles of occupational health and safety in the workplace

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to perform work activities to conform to occupational health and safety requirements and applies to all individuals working in the metal engineering and maintenance industry.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Follow occupational health and safety work practices	1.1 Identify and follow industrial and company policies, practices and procedures for occupational health and safety.
	1.2 Conduct work safely in accordance with company policies, procedures and industry requirements.
	1.3 Undertake housekeeping in accordance with company policies and procedures.
	1.4 Identify, confirm and demonstrate understanding of the duties and responsibilities of employees in day to day actions.
	1.5 Select and use appropriate **personal protective equipment** according to industry and company requirements.
	1.4 Utilize and store equipment and safety devices according to manufacturer's recommendations and company guidelines**.**
	1.5 Identify and follow safety signs and symbols as per instructions.
2. Contribute to occupational health and safety management	2.1 Identify workplace **hazards** during the course of work and report to the **appropriate persons** according to standard operating procedures.

2.2 Participate in the processes that govern and manage occupational health and safety in the company

2.3 Identify the correct procedures for contacting the **appropriate persons** in the event of an accident.

2.4 Identify, confirm understanding and follow company emergency and evacuation procedures when required.

RANGE STATEMENT

All range statements must be assessed:

1. **Personal protective equipment:**

    - Hard hat/helmet
    - Boots/shoes
    - Gloves
    - Goggles/glasses /face-shields
    - Dust mask/ respirator
    - Overalls/coveralls
    - Earplugs/Earmuffs
    - Back-brace
    - Safety Harness

2. **Hazards:**

    - Slippery or uneven floor surfaces
    - Chemicals or harmful substances
    - Physical movement of equipment and/or items
    - Incorrect management and disposal of waste
    - Electrical
    - Mechanical
    - Pneumatic
    - Hydraulic
    - Confined spaces
    - Dust

3. **Appropriate persons:**

    - Supervisors and team leaders
    - Occupational health and safety personnel
    - Other authorized persons
    - Colleagues

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are the industrial and company practices and procedures for occupational health and safety and how are they be obtained.
2. How to conduct work safely according to company policies, procedures and industry requirements.
3. What are the company procedures and policies for undertaking housekeeping.
4. How to identify, confirm and demonstrate understanding of the duties and responsibilities of employees in day to day actions.
5. What are the industry and company requirements for selecting and using appropriate personal protective equipment.
6. What are the manufacturer's recommendations and company guidelines for utilizing and storing equipment and safety devices.
7. What are the guidelines that govern occupational health and safety in the workplace.
8. What are the different types of safety equipment and how to utilized and store them.
9. What are the different safety signs and symbols used in the industry and how to identify and use them.
10. What constitutes workplace hazards and how to identify them during the course of work.
11. What are the standard operating procedures for reporting workplace hazards and the appropriate persons to whom they should be reported.
12. How to participate in the processes that govern and manage occupational health and safety in the company.
13. What are the correct procedures for contacting appropriate personnel in the event of an accident.
14. Who are the relevant persons to contact in the event of an accident or emergency situation.
15. How to identify, confirm understanding and follow emergency and evacuation procedures when required.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA02203 Perform mechanical cutting operations

Unit Descriptor: This unit deals with the knowledge, skills and attitudes required to effectively carry out cutting operations and applies to individuals using various materials in the metal engineering and maintenance industry.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Determine job requirements	1.1 Determine task and requirements from job sheets and **instructions**.
	1.2 Select the appropriate method or **machine/tool** to meet specifications.
	1.3 Load and adjust machine appropriately according to standard operating procedures.
2. Select/setup cutting tool	2.1 Select appropriate tool and install correctly according to standard operating procedures.
	2.2 Setup and adjust the machine using standard operating procedures.
3. Operate cutting tool	3.1 Set and adjust appropriate stops and guards as required.
	3.2 Secure material and correctly position using measuring equipment as necessary.
	3.3 Start and stop **machine/tool** safely according to standard operating procedures.
	3.4 Operate **machine/tool** to cut/hole material according to specifications.
	3.5 Lubricate areas as required according to manufacturer's and company requirements**.**
	3.6 Adhere to occupational and company health and safety procedures while operating **machinery/tools**.

4. Check material for conformance to specifications	4.1 Check material against specifications, use economically and cut and/or hole to within working tolerances.
	4.2 Adjust **machine/tool** and tooling as required.
	4.3 Observe codes and standards according to company requirements.
5. Clean and store machine	5.1 Remove all non-essential apparatus from machine when machine is not in use.
	5.2 Clean machine in accordance with manufacturer's recommendations and company policies and procedures.
	5.3 **Store** machine in accordance with safety standards and all relevant specifications.

RANGE STATEMENT

All range statements must be assessed:

1. **Instructions**:

    - Verbal
    - Written

2. **Machine/Tool:**

    - Angle grinder
    - Chop / Cold Saw
    - Croppers (bolt cutters)
    - Hammer and Chisel
    - Jig Saw
    - Lathe
    - Metal Snips
    - Milling machine
    - Oxy-Acetylene Torch
    - Pedestal /Bench Grinder
    - Reciprocating Saw

3. **Store:**

    - Cover
    - Position
    - Leave in place cleaned and powered off

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. How to determine task and requirements.
2. How to select the appropriate method or machine/tool.
3. How to operate machines/tools.
4. What are the appropriate machines/tools and how are they installed.
5. How to setup and adjust the machine/tool.
6. What are stops and guards and how are they set.
7. How to secure material.
8. What areas of machinery and material need lubricating.
9. How to follow occupational and company health and safety procedures.
10. How to remove all relevant apparatus from machine.
11. How and when to clean machine.
12. How to store machine.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA02303 Perform manual handling and lifting

Unit Descriptor: This unit deals with the knowledge, skills and attitudes required to effectively manually handle materials as applies to individuals working in the metal engineering and maintenance industry.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Lift materials	1.1 Determine material weight correctly using the most appropriate **weight estimation technique.**
	1.2 Undertake lifting techniques in accordance with outlined occupational safety and health and **standard operating procedures**.
2. Move materials manually	2.1 Select appropriate **equipment** to perform manual lifting where required.
	2.2 Place material safely and securely on moving **equipment.**
	2.3 Relocate materials ensuring safety of personnel and security of materials.
	2.4 Unload material manually from moving **equipment** and place in a safe and secure manner.

RANGE STATEMENT

All range statements must be assessed:

1. **Weight estimation technique:**

    - Weigh by scale
    - Visual estimation
    - Manufacturer's information
    - Calculation

2. **Standard operating procedures:**

    - Type of movement
    - Method of movement
    - Storage condition
    - Height and position

3. **Equipment:**

    - Hand trolleys/dolly
    - Motorized/hand pallet trucks
    - Production or process lifting equipment
    - Spreader bars
    - Rope
    - Cradles or similar attached to lifting equipment
    - Baskets

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. How to determine material weight correctly.
2. What are the most appropriate techniques to determine material weight correctly.
3. What are the standard operating procedures for lifting and the techniques that can be used.
4. How to select the appropriate equipment to perform manual handling.
5. What is moving equipment.
6. How material is placed safely on moving equipment.
7. How to relocate material ensuring safety of personnel and security of materials.
8. How to safely unload material from moving equipment and place in a safe and secure manner.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA02403 Remove/install standard mechanical seals

Unit Descriptor: This unit deals with the knowledge, skills and attitudes required to competently remove/install standard mechanical seals and applies to individuals working in the metal engineering and maintenance industry.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Determine mechanical seal requirements	1.1 Identify and demonstrate understanding of the principles and operational functions of mechanical seals.
	1.2 Interpret the specifications for new seal installation from engineering drawings.
2. Dismantle mechanical seal installations	2.1 Examine mechanical seal assembly and select the appropriate dismantling techniques, tools and equipment.
	2.2 Dismantle mechanical seal assembly using correct and appropriate engineering techniques and safe workshop procedures.
	2.3 Examine **components** and parts for wear to determine the need for repair and replacement.
	2.4 Repair serviceable items using the appropriate means where applicable.
	2.5 Remove primary sealing elements and secondary seals for replacement where required.
3. Select replaceable items	3.1 Identify and select replaceable items from **available sources.**
4. Reassemble mechanical seal installations	4.1 Fit mechanical seal **components** together according to manufacturer's requirements
	4.2 Tension and adjust mechanical seal assembly to manufacturer's specifications.

4.3 Test mechanical seal assembly using appropriate methods for compliance with specifications.

RANGE STATEMENT

All range statements must be assessed:

1. **Components:**

    - Seal head
    - Secondary seals
    - Seat assembly shaft and housing

2. **Available sources:**

    - Manufacturer's catalogues
    - Spare parts lists
    - Engineering specifications

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are mechanical seals and the principles that govern their use and function.
2. How to interpret the specifications for new seal installation from engineering drawings.
3. What is a mechanical seal assembly and how is it examined.
4. How to dismantle mechanical seals using the correct tools and equipment and techniques according to workshop procedures.
5. How to examine components and parts for wear to determine repair and replacement needs.
6. What are the processes used to repair serviceable items and how to do so.
7. What are primary and secondary seals and how to remove and replace them.
8. How to identify and select replaceable items and what are the appropriate methods for doing so.
9. How to fit mechanical seals together according to manufacturer's requirements.
10. How to tension and adjust mechanical seal assembly according to manufacturer's specifications.
11. How to test mechanical seal assembly using the appropriate methods for compliance with specifications.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion
- Simulation tests using appropriate equipment

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA02503 Remove and replace basic system components

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to remove and replace basic pneumatic and hydraulic system components and applies to individuals working in the metal engineering and maintenance industry.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Check system components	1.1 Identify **system** components correctly according to **specifications**.
	1.2 Identify the characteristics and operational function of each component.
	1.3 Confirm that the operational function of each component is inspected and tested by supervisor.
	1.4 Assess the correct operation of each component against **specifications**.
2. Identify, remove/replace faulty system components	2.1 Identify faulty **system** components and confirm the malfunction by the supervisor's report, or inspection and testing.
	2.2 Remove and replace faulty **system** components and replace according to manufacturer's/site **specifications.**
	2.3 Select replacement parts from manufacturer's catalogues according to required **specifications.**
	2.4 Reassemble and test **system** components for correct operation according to **specifications.**
	2.5 Confirm correct operation of the **system** according to designated operating procedure.
	2.6 Adopt appropriate follow up procedures in accordance with standard operating procedure.

		2.7 Complete service reports following standard operating procedures where appropriate.
3.	Clean up materials and work area	3.1 Stack and store materials and supplies for re-use or disposal according to company procedures.
		3.2 Clear work area according to company policies and procedures.
		3.3 Clean and store tools and equipment in a cool place according to manufacturer's recommendations and company procedures.
		3.4 Dispose of waste using appropriate methods in accordance with environmental regulations and company procedures.

RANGE STATEMENT

All range statements must be assessed

1. **Specifications**:

    - Standard Operating Procedures
    - Company standards
    - Industry requirements
    - Manufacturer's specifications

2. **Systems**:

    - Hydraulic components
    - Pneumatic components

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are system components and how to correctly identify them.
2. What are the characteristics and basic operational function of each component.
3. What are faulty system components and how are malfunctions confirmed.
4. How to remove and replace faulty system components.
5. How to select replacement parts from manufacturer's catalogues.
6. How to reassemble and test components for correct operation.
7. How to confirm correct operation of the system.
8. What are the appropriate follow up procedures.
9. How to complete service reports.
10. How to stack and store materials and supplies for re-use.
11. How to clear the work area.
12. How to clean and store tools and equipment.
13. What are the appropriate methods to dispose of waste.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion
- Simulation tests using appropriate equipment

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA02603 Maintain and repair mechanical drives and transmission assemblies

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to competently maintain and repair mechanical drives and mechanical transmission assemblies and applies to individuals working in the metal engineering and maintenance industry.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Undertake maintenance checks of mechanical drives and transmission components	1.1 Check mechanical drive/transmission **components** for **malfunctions**.
	1.2 Service or replace mechanical drive/transmission **components.**
	1.3 Document the identified assembly requiring further diagnosis, repair or adjustments according to company procedures.
2. Adjust mechanical drives and transmission assemblies	2.1 Determine adjustment requirements according to manufacturer's specifications and company procedures**.**
	2.2 Select **adjustments tools** and equipment in accordance with the type of assembly being serviced.
	2.3 Tension, align, balance or adjust drive or transmission **components** according to manufacturer's recommendations and company procedures.
	2.4 Check the drive/transmission assembly for correct operation according to manufacturer's specifications.
	2.5 Complete service report in accordance with company requirements.

		2.6 Carry out further diagnosis and repair requirements by appropriate means according to company requirements.
3.	Diagnose faults	3.1 Read service reports and inspect drive/transmission assembly according to company procedures.
		3.2 Test drive or transmission assembly using maintenance principles and procedures.
		3.3 Localize and analyze faults at the **component** level according to company requirements.
		3.4 Develop preventative measures to avoid reoccurrences of faults based on manufacturers' specifications.
		3.5 Document and action fault causes according to company procedures.
4.	Repair mechanical drives/transmission assemblies	4.1 Review service history and inspect the drive/transmission assembly according to company procedures.
		4.2 Check task requirements and select tools and equipment according to the type of assembly being serviced.
		4.3 Dismantle mechanical drive/transmission assembly according to manufacturer's specifications and company procedures.
		4.4 Repair serviceable items using appropriate maintenance procedures and select standard replaceable items according to company procedures.
		4.5 Refit **components** to the drive/transmission assembly according to manufacturer's recommendations.
5.	Complete final adjustment and commissioning	5.1 Tension, balance, align or adjust drive or transmission **components** according to manufacturer's specifications.

5.2 Check drive or transmission assembly after adjustment and analyze operational performance according to company procedures.

5.3 Commission assembly in conformance with specifications.

5.4 Complete service reports according to company procedures.

RANGE STATEMENT

All range statements must be assessed

1. **Components**
   - Bearings
   - Belts
   - Drive chains
   - Gears
   - Keys
   - Keyways
   - Pulleys
   - Seals
   - Taper Lock

2. **Malfunctions**:

   - Wear
   - Distortion
   - Misalignment
   - Fatigue
   - Loss of, or insufficient lubrication
   - Slackness
   - Tooth wear /breakages

3. **Adjustments tools:**

   - Dial test Indicator (DTI)
   - Precision level
   - Spirit Level
   - Engineering square
   - Inside/outside micrometers and verniers
   - Depth gauges
   - Slip gauges and feeler gauges

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. What are mechanical drive/transmission components.
2. How and when to heck mechanical drive/transmission components for malfunctions.
3. How and when to service or replace mechanical drive/transmission components.
4. How to document the identified assembly requiring further diagnosis, repair or adjustments.
5. How to determine the adjustment requirements.
6. What are adjustment tools and which one to select to service assembly.
7. How to tension, align, balance or adjust drive or transmission components.
8. How to check the drive/transmission assembly for correct operation.
9. How and when to complete a service report.
10. When and how to carry out further diagnosis and repair.
11. How to check mechanical drive/transmission components for malfunctions.
12. How and when to service or replace mechanical drive/transmission components.
13. How to document the identified assembly requiring further diagnosis, repair or adjustments.
14. What are the adjustment requirements.
15. How to select adjustments tools and equipment.
16. How to tension, align, balance or adjust drive or transmission components.
17. How and when to check the drive/transmission assembly for correct operation.
18. When to complete service report.
19. When to check drive or transmission assembly after adjustment to analyze operational performance.
20. What is the process to commission assembly in conformance.
21. When and how to complete service reports.
22. How to carry out further diagnosis and repair.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion
- Simulation tests using appropriate equipment

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA02703 Install and maintain conveyors/elevators and associated equipment

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to install and maintain conveyors/elevators and associated equipment and may involve fault finding, diagnosis and repairs. It applies to individuals working in the metal engineering and maintenance industry.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Plan and prepare for work	1.1 Identify work requirements from request/work orders and clarify/confirm with **appropriate personnel** or by site inspection.
	1.2 Identify, apply and monitor occupational health and safety standards throughout the work process.
	1.3 Identify and obtain required resources and inspect for compliance with job specifications.
	1.4 Select and interpret relevant plans, drawings and texts in accordance with the work plan.
	1.5 Determine and obtain the correct type, size and quantity of materials or components and inspect for compliance.
	1.6 Plan work in detail including sequencing and prioritizing for the maintenance of plant security and capacity.
	1.7 Resolve co-ordination requirements including requests for isolations with **appropriate personnel** where required.
	1.8 Identify potential hazards and select control or prevention measures in accordance with the work plan and site procedures.
	1.9 Prepare work area in accordance with work plan and site procedures.

2.	Remove equipment to facilitate maintenance	2.1 Identify faulty components and parts and confirm required isolations where appropriate according to site requirements.
		2.2 Disconnect associated equipment in accordance with the work plan.
		2.3 Remove associated equipment in a manner which assists replacement in accordance with the work plan.
		2.4 Inspect conveyors/elevators and associated equipment for abnormalities in accordance with the work plan.
3.	Maintain conveyors/elevators and associated equipment	3.1 Release belt tensioning equipment and secure to facilitate maintenance in accordance with the work plan.
		3.2 Make sketches, note data and mark components for identification and/or reassembly in accordance with the work plan and site requirements
		3.3 Approve specified modifications or alterations in accordance with requirements.
		3.4 Install new components and inspect for compliance with job specifications and prepare for reassembly according to manufacturer's specifications and site requirements.
		3.5 Conduct dimensional inspection using **appropriate measuring devices** to determine compliance with the job plan.
		3.6 Level, align and tension machinery/conveyors/elevators in accordance with manufacturers' specifications and site requirements.
4.	Replace/install conveyors/elevators and associated equipment	4.1 Identify faulty components and parts and where appropriate, prepare site for conveyor and associated equipment to be replaced in accordance with work plan.

	4.2 Replace conveyors/elevators and associated equipment in accordance with work plan and manufacturer's specifications.
	4.3 Level, align and couple conveyors/elevators and associated equipment in accordance with the manufacturer's specifications.
	4.4 Torque fastenings in accordance with manufacturer's specifications and company procedures.
	4.5 Test-run, monitor and adjust conveyors/elevators and associated equipment as required in accordance with manufacturer's specifications and company procedures.
5. Complete work	5.1 Complete work and notify **appropriate personnel** in accordance with site and company requirements.
	5.2 Clear work area of waste, clean, restore and secure work area in accordance with environmental and company requirements.
	5.3 Maintain and store plant, tools and equipment in accordance with site and company requirements.
	5.4 Finalize work completion details in accordance with site and company requirements.

RANGE STATEMENT

All range statements must be assessed

1. **Appropriate personnel:**

    - Supervisors
    - Colleagues
    - Clients

2. **Appropriate measuring devices:**

    - Calipers
    - Engineering Square
    - Feeler Gauge
    - Level
    - Measuring tapes
    - Verniers
    - Dial Test Indicator (DTI)

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. How to identify work requirements from request/work orders.
2. How to identify, apply and monitor occupational health and safety standards.
3. What are the required resources to be identified and obtained.
4. How to select and interpret relevant plans, drawings and texts.
5. How to obtain the correct type, size and quantity of materials.
6. How to plan work in detail.
7. How to coordinate requirements and requests for isolation.
8. How to identify potential hazards and select control or prevention measures.
9. How to prepare work area.
10. How to confirm required isolations.
11. When to remove seals in preparation for replacement.
12. How to carry out maintenance of conveyors/elevators and associated equipment.
13. How to dismantle seal assemblies.
14. How to mark component parts clearly to identify and produce sketches.
15. How to approve specified modifications or alterations.
16. How and when to install new components and inspect for compliance with job specifications to prepare for reassembly.
17. What are appropriate measuring devices and how are they used.
18. How to conduct dimensional inspection using appropriate measuring devices.
19. How to level, align, couple and tension machinery/conveyors/elevators.
20. How to identify faulty components and parts and prepare site for conveyor and associated equipment to be replaced.
21. How and when to replace conveyors/elevators and associated equipment.
22. How to torque fastenings.
23. How and when to test-run, monitor and adjust conveyors/elevators and associated equipment.

24. What are the company requirements for completing work and notifying the appropriate personnel.
25. Who are the appropriate persons to whom you should report completion of work.
26. What are the company and environmental requirements for clearing the area of waste and how to do so.
27. What are the company procedures for cleaning, restoring and securing the work area and how to do so.
28. What are the site or company procedures for maintaining and storing plant, tools and equipment.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion
- Simulation tests using appropriate equipment

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA02803 Install and maintain mechanical valves, pumps and fluid power systems

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required for fault finding, diagnosis and or overhaul of mechanical valves, pumps and fluid power systems. It applies to individuals working in the metal engineering and maintenance industry.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Plan and prepare for work	1.1 Identify work requirements from requests, work orders or specifications and confirm and clarify with **appropriate personnel** or by site visit.
	1.2 Identify, apply and monitor occupational health and safety standards throughout the work process according to company policies and procedures.
	1.3 Identify and obtain required resources and inspect for compliance with job specifications.
	1.4 Select and interpret relevant plans, drawings and texts in accordance with the work plan.
	1.5 Determine and obtain the correct type, size and quantity of materials or components and inspect for compliance with job specifications.
	1.6 Plan work in detail including sequencing and prioritizing for the maintenance of plant security and capacity.
	1.7 Resolve co-ordination requirements including requests for isolations with **appropriate personnel** where required.

		1.8 Identify potential hazards and select control or prevention measures in accordance with company policies and procedures.
2.	Remove valves for maintenance	2.1 Confirm required isolations where appropriate according to maintenance schedule and company policies and procedures.
		2.2 Disconnect the valve, remove in a manner that will assist in replacement and inspect for abnormalities in accordance with manufacturer's recommendations.
3.	Perform valve maintenance	3.1 Carry out maintenance according to manufacturer's specifications and maintenance plan.
		3.2 Dismantle the valve and clearly mark for identification and relevant sketches in accordance with the work plan.
		3.3 Correlate components in preparation for re-assembly in accordance with manufacturer's drawings or manuals.
		3.4 Inspect new components to ensure compliance with manufacturer's specifications.
		3.5 Conduct dimensional inspections using **appropriate measuring devices** to ensure compliance with manufacturer's specifications.
		3.6 Reassemble components for testing in accordance with manufacturer's specifications and company procedures.
		3.7 Undertake modifications and alterations in accordance with manufacturer's specifications and company procedures.
		3.8 Level, align couple and connect components in accordance with manufacturer's specifications and company requirements.

		3.9	Pressure test, monitor valves and adjust valves where required in accordance to manufacturer's specifications and work plan.
4.	Replace/install valves	4.1	Prepare site for valve replacement in accordance with work plan.
		4.2	Replace and connect valves in accordance with work plan, manufacturer's specifications and company procedures.
		4.3	Complete final job inspection and relinquish any permits in accordance with the work plan.
5.	Remove pumps for maintenance	5.1	Confirm required isolations where appropriate according to work plan and manufacturer's specifications.
		5.2	Disconnect pump and replace in a manner that will assist replacement and inspect for abnormalities in accordance with manufacturer's specifications and company requirements.
6.	Maintain pumps	6.1	Dismantle pumps for maintenance according to manufacturer's specifications and company procedures
		6.2	Make sketches, note data and mark components for identification and/or reassembly in accordance with job requirements and company procedures.
		6.3	Obtain and inspect new components for compliance with manufacturer's specifications.
		6.4	Conduct dimensional inspection using **appropriate measuring devices** to ensure compliance with specifications and record the results in accordance with job requirements, manufacturer's specifications and company procedures.

		6.5	Reassemble the pump applying appropriate principles and techniques in accordance with manufacturer's specifications and company procedures.
		6.6	Undertake modifications/alterations in accordance with manufacturer's recommendations and company procedures.
7.	Replace/install pumps	7.1	Identify faulty parts and prepare site for pump to be replaced in accordance with manufacturer's specifications and company procedures.
		7.2	Replace, level, align couple and connect the pump in accordance with manufacturer's specifications.
		7.3	Torque fastenings in accordance with manufacturer's specifications and company procedures.
		7.4	Test-run, monitor and adjust machinery/plant and pump as required in accordance with manufacturer's specifications and company requirements.
8.	Remove assemblies or subassemblies from plant	8.1	Confirm the required isolations where appropriate according to job requirements and company procedures.
		8.2	Disconnect fluid power systems in accordance with the work plan.
		8.3	Remove assemblies or sub-assemblies for replacement and inspect for abnormalities in accordance with the work plan.
		8.4	Align fluid power system in accordance with work plan.
		8.5	Conduct leak and pressure tests on all connections and perform a fluid power system test run.
		8.6	Monitor and adjust in accordance with manufacturer's specifications and company requirements.

		8.7 Complete alterations/corrections with approval from appropriate authority and in accordance with company procedures.
9.	Maintain fluid power systems	9.1 Identify and prepare system components, assemblies or sub-assemblies for maintenance in accordance with the maintenance plan.
		9.2 Carry out visual inspections and test hydraulic and pneumatic principles in accordance with the maintenance plan and company procedures.
		9.3 Carry out maintenance according to manufacturer's specifications, maintenance plan and company procedures.
		9.4 Dismantle, clean and examine components or sub-assemblies to verify tolerances using appropriate techniques and procedures to determine replacement, overhaul or repair in accordance with the maintenance plan.
		9.5 Conduct dimensional inspection using **appropriate measuring devices** to ensure compliance with job requirements, manufacturer's specifications and company procedures.
		9.6 Identify faulty items and ensure they are repaired/overhauled using appropriate techniques in accordance manufacturer's recommendations and company procedures.
		9.7 Complete alterations/corrections with approval from appropriate authority in accordance with company procedures.
		9.8 Refit components or sub-assemblies in accordance with manufacturer's specifications and the maintenance plan.
10.	Complete work	10.1 Complete work and notify **appropriate personnel** in accordance with site and company requirements.

10.2 Clear work area of waste, clean, restore and secure work area in accordance with environmental and company requirements.

10.3 Maintain and store plant, tools and equipment in accordance with company procedures.

10.4 Finalize work completion details in accordance with company requirements.

RANGE STATEMENT

All range statements must be assessed

1. **Appropriate persons:**

    - Supervisors
    - Maintenance personnel
    - Operational personnel

2. **Appropriate measuring devices:**

    - Calipers
    - Engineering Square
    - Feeler Gauge
    - Level
    - Measuring tapes
    - Verniers
    - Dial Test Indicator (DTI)

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. How to identify work requirements from requests, work orders and who are the appropriate personnel to be notified.
2. How to identify, apply and monitor occupational health and safety standards.
3. How to identify and obtain required resources and inspect for compliance.
4. How to select and interpret relevant plans, drawings and texts.
5. How to determine and obtain the correct type, size and quantity of materials or components required to complete the job.
6. How to plan work in detail including sequencing and prioritizing.
7. How to resolve co-ordination requirements including requests for isolations.
8. How to identify potential hazards and select control or prevention measures.
9. How to confirm required isolations.
10. When to disconnect the valve and how to remove it in a manner that will assist in replacement.
11. How to carry out maintenance.
12. How to dismantle the valve and clearly mark for identification and relevant sketches.
13. How to correlate components in preparation for re-assembly.
14. How and when to inspect new components to ensure compliance.
15. What are the appropriate measuring devices and how are they used.
16. How to conduct dimensional inspections.
17. How to reassemble components for testing.
18. How to undertake modifications and alterations.
19. How to level, align, couple and connect components.
20. How and when to pressure test, monitor valves and adjust valves.
21. How to prepare site for valve replacement.
22. How and when to replace and connect valves.
23. How to complete final job inspection and relinquish any permits obtained.
24. How to confirm required isolations.
25. How to disconnect and replace pump in a manner which will assist replacement and inspect for abnormalities.
26. How to make sketches, note data and mark components for identification and/or reassembly.

27. How to obtain and inspect new components for compliance.
28. When and how to conduct dimensional inspection using appropriate measuring devices.
29. How and when to reassemble the pump by applying appropriate principles and techniques.
30. How to undertake modifications/alterations.
31. How to identify faulty parts and prepare site for pump to be replaced.
32. How and when to replace, level, align, couple and connect the pump.
33. How to torque fastenings.
34. When to test-run, monitor and adjust machinery/plant and pump.
35. What needs to be confirmed for the required isolations.
36. When and how to disconnect fluid power systems.
37. How to remove assemblies or sub-assemblies for replacement and inspect for abnormalities.
38. How and when to align fluid power system.
39. When and how to conduct leak and pressure tests on all connections and perform a fluid power system test run.
40. When to complete alterations /corrections.
41. How to complete routine modifications/alterations.
42. How to identify and prepare system components, assemblies or sub-assemblies for maintenance.
43. When and how to carry out visual inspections and test hydraulic and pneumatic principles.
44. How to carry out maintenance.
45. How to dismantle, clean and examine components or sub-assemblies to verify tolerances.
46. How to conduct dimensional inspection using appropriate measuring devices ensuring compliance with the specifications and record the results.
47. How to identify faulty items and ensure they are repaired/overhauled.
48. How and when to complete alterations/corrections.
49. How and when to complete routine modifications and alterations.
50. How to refit components or sub-assemblies.
51. What are the company requirements for completing work and notifying the appropriate personnel.
52. What are the environmental and company requirements for clearing the work area of waste and how to do so.
53. Who are the persons to whom completion of work should be reported.

54. What are the company procedures for cleaning, restoring and securing the work area and how to do so.
55. What are the company procedures for maintaining and storing plant, tools and equipment.
56. What are the company requirements for finalizing completion of work.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion
- Simulation tests using appropriate equipment

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

UA02903 Diagnose and repair faults in mechanical equipment

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to diagnose and repair faults in a range of mechanical equipment and may entail work being conducted while the equipment is online. This unit applies to individuals working in the metal engineering and maintenance industry.

ELEMENT	PERFORMANCE CRITERIA
To be competent you must achieve the following:	
1. Verify the fault	1.1 Consult with appropriate reference sources to ascertain the normal function of the equipment in accordance with the maintenance plan.
	1.2 Verify reported symptoms and faults using fault indicators and appropriate technical information or diagnostic techniques in accordance with the company procedures.
	1.3 Reproduce and monitor symptoms if possible, while giving due regard to occupational health and safety and plant security in accordance with company procedures.
2. Locate the fault	2.1 Confirm required isolations where appropriate according to work plan and manufacturer's recommendations.
	2.2 Conduct fault finding with **appropriate personnel** in accordance with manufacturer's recommendations and company requirements.
	2.3 Inspect equipment components, pipe work, fittings and support fixings for obvious faults in accordance with maintenance plan, manufacturer's recommendations and company procedures.

		2.4 Identify, select and use appropriate fault finding or **diagnostic techniques** to determine faults in accordance with the maintenance plan, manufacturer's recommendations and company procedures.
		2.5 Utilize testing and measurement instruments according to manufacturer's instructions and company procedures.
3.	Determine the cause of the fault	3.1 Consult with **appropriate personnel** to obtain details relating to the faulty equipment in accordance with the company procedures.
		3.2 Utilize information from fault indicators and maintenance records appropriately in accordance with company procedures.
		3.3 Draw valid conclusions about the nature and cause of the fault from analysis of available evidence in accordance with company procedures.
4.	Repair or rectify the fault	4.1 Confirm required isolations appropriately according to manufacturer's recommendations and company procedures.
		4.2 Follow appropriate procedures in conjunction with **appropriate personnel** in accordance with company procedures.
		4.3 Replace, repair or secure faulty, worn, damaged or unsecured components in accordance with manufacturer's recommendations and company procedures.
		4.4 Select and replace parts and components as required according to manufacturer's specifications and maintenance plan.
		4.5 Repair or rectify faults in accordance with manufacturer's recommendations and company requirements.
		4.6 Conduct final job inspection and relinquish permits as required in accordance with the company procedures.

5. Complete work	5.1 Complete work and notify **appropriate personnel** in accordance with company procedures.
	5.2 Clear work area of waste and clean, restore and secure in accordance with environmental and company procedures.
	5.3 Maintain and store plant, tools and equipment in accordance with company procedures.
	5.4 Finalize work completion details in accordance with company procedures.

RANGE STATEMENT

All range statements must be assessed

1. **Appropriate personnel**:

    - Supervisors and team leaders
    - Occupational health and safety personnel
    - Persons authorized and/or nominated by the company
    - Colleagues

2. **Diagnostic techniques**:

    - Visual inspection
    - Auditory detection
    - Thermal imaging
    - Vibration analysis
    - Olfactory (smell) detection

UNDERPINNING KNOWLEDGE AND SKILLS

You need to know and understand:

1. Who are the appropriate personnel needed to confirm and clarify work requirements.
2. How to determine, obtain and inspect the correct size, type and quantity of materials/components for compliance.
3. How to plan work in detail including sequencing and prioritizing for the maintenance of plant security and capacity.
4. How to resolve coordination requirements with appropriate persons, including requests for isolations where appropriate.
5. How to identify hazards and select control measures in accordance with the work plan and site procedures.
6. How to ascertain the normal performance and function of equipment through consulting appropriate reference sources.
7. What are the fault indicators, appropriate technical information and diagnostic techniques that can be used to verify reported symptoms and faults and how to use them.
8. How to reproduce and monitor symptoms while focusing on personal safety and plant security.
9. How to confirm required isolations where appropriate in accordance with site requirements.
10. What is fault finding and how to conduct it with relevant persons.
11. How to inspect equipment components, pipe work and support fixings for obvious faults.
12. What are the testing and measurement instruments to be utilized and how to use them.
13. Why appropriate persons should be consulted to obtain details relating to faulty equipment and the company procedures for doing so.
14. How to appropriately use information from fault indicators and maintenance records.
15. How to reach valid conclusions about the nature and cause of the fault from analysis of available evidence.
16. How to analyze evidence.
17. How to confirm required isolations.
18. How to undertake appropriate repair procedures in conjunction with appropriate personnel in accordance with the work plan.
19. How to replace, repair or secure faulty, worn, damaged or unsecured components in accordance with the work plan.

20. How to select and replace parts and components as required in accordance with specifications and the work plan.
21. How to repair or rectify faults in accordance with the work plan.
22. How to conduct the final job inspection and relinquish permits as required in accordance with the work plan.
23. What are the company requirements for completing work and notifying the appropriate personnel.
24. What are the environmental and company requirements for clearing the work area and disposing of waste and how to do so.
25. What are the company procedures for cleaning, restoring and securing the work area and how to do so.
26. What are the site or enterprise procedures for maintaining and storing plant, tools and equipment.
27. What are the site or enterprise requirements for finalizing the completion of work.

EVIDENCE GUIDE

For assessment purposes:

(1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** of the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on more than one occasion.** This evidence must come from a real working environment.

(2) Methods of Assessment

Assessors should gather a range of evidence that is valid, sufficient, current and authentic.

Evidence may be collected in a variety of ways including:

- Observation
- Written/oral questioning
- Written evidence
- Witness testimony
- Professional discussion
- Simulation tests using appropriate equipment

Questioning techniques should not require language, literacy or numeracy skills beyond those required in this unit of competency.

(3) Context of Assessment

This unit may be assessed on the job, off the job or a combination of both. Where assessment occurs off the job, that is, the candidate is not in productive work, then an appropriate simulation must be used where the range of conditions reflects realistic workplace situations. The competencies covered by this unit would be demonstrated by a candidate working alone or as part of a team. The assessment environment should not disadvantage the candidate.

The candidate must have access to all tools, equipment, materials and documentation required. The candidate must be permitted to refer to any relevant workplace procedures, product and manufacturing specifications, codes, standards, manuals and reference materials.

Simulation **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

Level 3 Glossary of Terms

Assessment methods

The methods which can be used to determine competence in performance and underpinning knowledge.

Assessors

The Assessor guides and assesses the candidate. His/her role is to determine whether evidence presented by a candidate for assessment within the programme, meets the required standard of competence in the relevant unit or element. The Assessor needs to be competent to assess to national standards in the area under assessment.

Approved Centre

Organization/Centre approved by the TVET Council to offer full National Vocational Qualifications.

Case Studies

In situations where it is difficult for workplace assessment to take place, case studies can offer the candidate an opportunity to demonstrate potential competence.

A case study is a description of an actual or imaginary situation presented in some detail. The way the case study is presented will vary depending upon the qualification, but the most usual methods are written, taped or filmed.

The main advantage of a case study is the amount of evidence of underpinning knowledge it can generate and the specific nature of the evidence produced.

Competence

In the context of vocational qualifications, competence means: the ability to carry out prescribed activities to nationally pre-determined standards in an occupation. The definition embraces cognitive, practical and behavioural skills, underpinning knowledge and understanding and the ability to react appropriately in contingency situations.

Elements

An element is a description of an activity which a person should be able to do. It is a description of an action, behaviour or outcome which a person should be able to demonstrate.

Explanation of NVQ Levels

NVQs cover five (5) levels of competence, from entry level staff at Level 1 through to senior management at Level 5.

Level 1 - Entry Level

Recognizes competence in a range of varied work activities performed in a variety of contexts. Most work activities are simple and routine. Collaboration with others through work groups or teams may often be a requirement. Substantial supervision is required especially during the early months evolving into more autonomy with time.

Level 3 Glossary of Terms

Level 2 - Skilled Occupations

Recognizes competence in a broad range of diverse work activities performed in a variety of contexts. Some of these may be complex and non-routine and involve some responsibility and autonomy. Collaboration with others through work groups or teams and guidance of others may be required.

Level 3 - Technician and Supervisory Occupations

Recognizes competence in a broad range of complex, technical or professional work activities performed in a wide variety of contexts, with a substantial degree of personal responsibility and autonomy. Responsibility for the work of others and the allocation of resources are often a requirement. The individual is capable of self-directed application, exhibits problem solving, planning, designing and supervisory capabilities.

Level 4 - Technical Specialist and Middle Management Occupations

Recognizes competence involving the application of a range of fundamental principles and complex techniques across a wide and unpredictable variety of contexts. Requires very substantial personal autonomy and often significant responsibility for the work of others, the allocation of resources, as well as personal accountability for analysis, diagnosis, design, planning, execution and evaluation.

Level 5 - Chartered, Professional and Senior Management Occupations

Recognizes the ability to exercise personal professional responsibility for the design, development or improvement of a product, process, system or service. Recognizes technical and management competencies at the highest level and includes those who have occupied positions of the highest responsibility and made outstanding contribution to the promotion and practice of their occupation.

External Verifier

The External Verifier is trained and appointed by the TVET Council and is competent to approve and ensure an approved Centre's quality of provision.

Internal Verifier

The Internal Verifier acts in a supporting role for Assessors to ensure consistent quality of assessment and competence. He/she needs to be competent to assess to national standards in the area under assessment.

NVQ

National Vocational Qualifications (NVQs) are work-based qualifications that assess an individual's competence in a work situation and certify that the individual can perform the work role to the standards expected in employment.

NVQs are based on national occupational standards of competence drawn up by standards-setting bodies known as Industry Lead Bodies. The standards describe the level and breadth of performance that is expected of persons working in the industry or sector which the NVQ covers.

NVQ Coordinator

The NVQ Coordinator is the Centre contact within each approved Centre offering NVQs. He/she has overall responsibility for the operation and administration of the NVQ system.

Level 3 Glossary of Terms

Observation

Observation of the candidate carrying out his/her job in the workplace is the assessment method recommended in the vast majority of units and elements. Observation of staff carrying out their duties is something that most supervisors and managers do every day.

Performance Criteria

Performance criteria indicate what is required for the successful achievement of an element. They are descriptions of what is expected in competent performance.

Product of Work

This could be items produced during the normal course of work, which can be used for evidence purposes such as reports, menus, promotional literature, training plans, etc.

Questioning

Questioning is one of the most appropriate ways to collect evidence to assess a candidate's underpinning knowledge and understanding.

Questioning can also be used to assess a candidate in those areas of work listed in the range which cannot be assessed by observation. Guidance on when this assessment method can be used is given in the assessment guidance of each individual element.

As an assessment method, questioning ensures you have all of the evidence about a candidate's performance. It also allows you to clarify situations.

Range statements

The range puts the element of competence into context. A range statement is a description of the range of situations to which an element and its performance criteria is intended to apply.

Range statements are prescriptive, therefore, each category must be assessed.

Role-plays

Role-plays are simulations where the candidate is asked to act out a situation in the way he/she considers "real" people would behave. By using role-play situations to assess a candidate the Assessor is able to collect evidence and make a judgment about how the candidate is most likely to perform. This may be necessary if the range specified includes a situation in which the candidate is unlikely to find himself/herself in the normal course of their work, or where the candidate needs to develop competence, before being judged competent for example, in a disciplinary situation.

Level 3 Glossary of Terms

Simulations

Where possible, assessment should always be carried out by observing **natural performance** in the workplace. **Simulated performance,** however, can be used where specified to collect evidence about an aspect of the candidate's work which occurs infrequently or is potentially hazardous; for example, dealing with fires.

By designing the simulated situation, briefing the candidate and observing his/her performance, you will be able to elicit evidence which will help you judge how a candidate is **most likely** to perform in real life.

Supplementary evidence

Supplementary evidence can be used to confirm and support performance evidence. Types of supplementary evidence include witness testimonies, reports, journals or diaries, records of activities, personal statements, simulation (see note in glossary).

Underpinning knowledge

Underpinning knowledge indicates what knowledge is essential for a person to possess in order to successfully achieve an element and prove total competence.

Units

A unit of competence describes one or more activities which form a significant part of an individual's work. Units are accredited separately but in combination can make up a vocational qualification. There are two categories of units:

Mandatory units - are core to a qualification and must to be completed.

Optional units - candidates must choose the required number of individual units, specified in the qualification structure, to achieve the qualification.

Work-based projects

Work-based projects are a useful way for the Assessor to collect evidence to support any decision made about a candidate's performance. They are particularly appropriate in determining the level of a candidate's underpinning knowledge and understanding where it may be insufficient to rely only on questioning observation.

A project often involves the identification of a solution to a specific problem identified by the Assessor and/or the candidate (such as looking at ways to redress a recent drop in sales), or may be a structured programme of work built around a central situation or idea (such as the introduction of a new job rostering process).