



Technical and Vocational Education and Training (TVET) Council



## **Occupational Standards of Competence**

# **Photovoltaic Installation**

## **Level 1**

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**Qualification Overview**

**NVQB**

**in**

**Photovoltaic Installation**

**Level 1**

### **Qualification Overview**

Photovoltaic Installation Level 1 is an entry level competence-based qualification that covers the basic maintenance of photovoltaic (PV) arrays and systems. It is designed to introduce and educate persons about the new technology and allow them to be able to assist seasoned Photovoltaic Array Installers and Solar Array Installers on the job.

The standards of competence covers significant aspects of the work such as the introduction to the different types of tools used in the industry and how to store them safely. It also explains how to observe Occupational Health and Safety when working at heights and performing basic cleaning activities.

### **Who is this qualification for?**

The NVQB in Photovoltaic Installation Level 1 is for persons aged sixteen (16) years and above. Candidates for this qualification do not require any formal entry requirements but will require full supervisions when undertaking certain tasks.

Persons who successfully complete the training will have an access route to Level 2.

### **Where can it be used?**

Candidates pursuing this qualification can use it to provide assistance to Photovoltaic Installers and for performing basic cleaning activities or use the knowledge and skills gained as a stepping stone to advance to the level 2 qualification.

## **A07301 - APPROVED NATIONAL VOCATIONAL QUALIFICATION STRUCTURE**

### **PHOTOVOLTAIC INSTALLATION LEVEL 1**

To achieve a full award, candidates must complete all ten (10) mandatory units.

<b><u>MANDATORY UNITS (ALL MUST BE COMPLETED)</u></b>	<b><u>CODE</u></b>
<b>1. Undertake interactive workplace communication</b>	<b>U49002</b>
1.1 Communicate information	
1.2 Share information to achieve appropriate work outcomes	
1.3 Develop and maintain working relationships with colleagues	
<b>2. Use access equipment</b>	<b>UA08201</b>
2.1 Prepare to work at heights	
2.2 Conduct checks on access equipment	
2.3 Follow safety procedures	
2.4 Clean up	
2.5 Record information	
<b>3. Maintain health and safety in the photovoltaic array installation environment</b>	<b>U49202</b>
3.1 Follow safe work practices	
3.2 Adopt systems of work	
3.3 Identify and report workplace hazards and risks	
3.4 Follow accident and emergency procedures	
<b>4. Facilitate the storage and retrieval of equipment and materials</b>	<b>UA08301</b>
4.1 Identify and select equipment and materials	
4.2 Handle and transport equipment and materials	
4.3 Store equipment and materials	
<b>5. Perform basic cleaning activities</b>	<b>UA08401</b>
5.1 Follow quality and safety procedures	
5.2 Clean solar arrays	
5.3 Handle and remove waste	
5.4 Clean up	

**Mandatory Units (All must be completed)**

**CODE**

**6. Work with photovoltaic systems**

**UA08501**

- 6.1 Obtain task specifications and make plans
- 6.2 Identify components and locations
- 6.3 Clean up

**7. Use measuring devices**

**UA08601**

- 7.1 Use a range of measuring devices
- 7.2 Maintain devices

**8. Use and maintain tools**

**UA08701**

- 8.1 Identify tools
- 8.2 Select and use tools
- 8.3 Clean and store hand and power tools

**9. Identify drawing requirements**

**UA08801**

- 9.1 Prepare free-hand sketch
- 9.2 Interpret details from free-hand sketch and drawing

**10. Contribute to the protection of the environment**

**U68402**

- 10.1 Work in an environmentally conscious way
- 10.2 Contribute to continuous improvements in protecting the environment

## U49002

## Undertake interactive workplace communication

## Unit Descriptor:

This unit describes the knowledge, skills and attitudes required to effectively communicate with others in the related working environment to achieve required objectives.

It focuses on responding promptly to requests, the sharing of information and developing good working relationships with colleagues.

**ELEMENT****PERFORMANCE CRITERIA**

*To be competent you must achieve the following:*

- |   |  |
|---|--|
| 1. Communicate information                                    | 1.1 Ask questions to elicit additional <b>information</b> .                  |
|   | 1.2 Identify appropriate sources of <b>information</b> .                     |
|   | 1.3 Select and sequence <b>information</b> appropriately.                    |
|   | 1.4 <b>Communicate information</b> about tasks, processes, events or skills. |
|   | 1.5 Use verbal or written communication as required.                         |
| 2. Share information to achieve appropriate work outcomes     | 2.1 Share <b>information</b> with colleagues.                                |
|   | 2.2 Seek feedback and provide <b>information</b> to others.                  |
|   | 2.3 <b>Communicate</b> goals and aims to appropriate persons.                |
|   | 2.4 <b>Communicate</b> outcomes to appropriate persons.                      |
| 3. Develop and maintain working relationships with colleagues | 3.1 Make constructive contributions to the production process.               |
|   | 3.2 Respond to requests from colleagues and customers promptly.              |



**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Information:**

- Drawings
- Work schedules
- Job instructions
- Client instructions
- Organisational policies

**2. Communicate:**

- Face-to-face methods (including verbal and non-verbal communication)
- Using the telephone
- Using written methods (including electronic)
- Signage

**UNDERPINNING KNOWLEDGE AND SKILLS**

*You need to know and understand:*

1. How to communicate in the workplace.
2. How to convey information in simple English.
3. How to read and interpret instructions.
4. What is the basic level in writing English (writing short, routine text).
5. What information to share with colleagues in your job role and why this is important.
6. Why it is important to respond promptly to requests.
7. Why good working relationships with colleagues are important.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on at least two (2) occasions**. 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
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

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 using 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, products 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.

**UA08201****Use access equipment**

## Unit Descriptor:

This unit describes the knowledge, skills and attitudes required to effectively and safely work on elevated surfaces.

It focuses on using access equipment to work on elevated surfaces and the health and safety risks associated with working on elevated surfaces.

**ELEMENT****PERFORMANCE CRITERIA**

*To be competent you must achieve the following*

- |    |                                    |     |  |
|----|------------------------------------|-----|--|
| 1. | Prepare to work at heights         | 1.1 | Identify and adhere to the occupational health and safety requirements associated with working on elevated work surfaces.            |
|    |                                    | 1.2 | Select, correctly use and fit <b>personal protective equipment</b> appropriately according to company and manufacturer's guidelines. |
|    |                                    | 1.3 | Identify and follow workplace operation plans in accordance with job requirements, surrounding activities and environment.           |
|    |                                    | 1.4 | Identify <b>safety hazards</b> and follow correct organisational procedures to minimise risks to self and others.                    |
|    |                                    | 1.5 | Assess risks of working at heights with supervisor.  |
| 2. | Conduct checks on access equipment | 2.1 | Make the necessary checks to <b>access equipment</b> before use according to industry standards.                                     |
|    |                                    | 2.2 | Make checks to ensure that ground and floor surfaces are suitable and safe in accordance with occupational and safety requirements.  |

3. Follow safety procedures
  - 3.1 Erect barricades and signage to safely isolate working area according to occupational health and safety requirements.
  - 3.2 Identify different **types of surfaces** in relation to risks.
  - 3.3 Place tools, equipment, materials and components in, on or around the **access equipment** safely and effectively according to occupational safety and health requirements.
  - 3.4 Use access equipment when working at heights in accordance with manufacturer's and company guidelines.
  - 3.5 Conduct **work activities** safely at heights according to industry requirements.
4. Clean up
  - 4.1 Remove and dispose of waste material safely according to industry, environmental and company procedures.
  - 4.2 Store/stack unused materials appropriately according to company requirements.
  - 4.3 Remove and store tools and equipment safely according to occupational health and safety requirements and manufacturer's instructions.
5. Record information
  - 5.1 Keep records of **relevant information** pertaining to working at heights according to company requirements.
  - 5.2 Handle and store completed records in accordance with company policies.

**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Personal protective equipment:**

- Coveralls
- Safety boots
- Hard hat/cap
- Gloves
- Safety glasses/goggles
- Ear plugs/earmuffs
- Dust masks/respirator
- Harnesses/lanyards

**2. Safety hazards:**

- Limited space
- Other activities taking place within the vicinity
- Weather conditions
- Wet surfaces
- Vegetation
- Utilities
- Environmental

**3. Access equipment:**

- Scaffolding
- Ladders

**4. Types of surfaces:**

- Tile
- Shingle
- Corrugated metal
- Corrugated fibre glass
- Concrete
- Concrete
- Mud
- Gravel
- Sand

**5. Work activities:**

- Remove debris
- Clean arrays
- Clean work area

**6. Relevant information:**

- Service information
- Condition of equipment

Environmental conditions

**UNDERPINNING KNOWLEDGE AND SKILLS**

*You need to know and understand:*

1. What is meant by 'working at heights'.
2. What are the workplace and equipment safety requirements relative to working at heights.
3. How to assess the risks of working at heights and why this is important.
4. What are the different types of access equipment and working platforms for working at heights and the limitations of the use of this equipment.
5. How to inspect the prepared access equipment or working platforms before use.
6. What to do when the supplied access equipment is not suitable for the work required.
7. Why it is important to regularly inspect access equipment and working platforms.
8. What types of work surfaces are suitable and safe.
9. What types of information should be recorded when working at heights.
10. How to document information in accordance with company policies.
11. How to handle and store completed records
12. What are the risks of cleaning and removing debris around solar arrays.



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## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge, **on at least two (2) occasions**. 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 using 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 **should not be used**, except in exceptional circumstances where natural work evidence is unlikely to occur.

## U49202

**Maintain health and safety in the photovoltaic array installation environment**

## Unit Descriptor:

This unit describes the knowledge, skills and attitudes required to effectively perform work activities and conform to occupational health and safety requirements.

It focuses on knowledge of Acts, regulations and guidelines in the photovoltaic array installation environment and how these apply in practice.

Candidates will be required to identify hazards and report safety risks to their supervisor while adopting safe working practices and systems. They will also need to know what to do in the event of accidents and emergencies.

**ELEMENT****PERFORMANCE CRITERIA**

*To be competent you must achieve the following:*

- |                               |   |
|-------------------------------|---|
| 1. Follow safe work practices | 1.1 Adhere to <b>occupational health and safety requirements</b> associated with the working environment.                                     |
|                               | 1.2 Check safety equipment and devices in accordance with legislative requirements and company and manufacturer's procedures or instructions. |
|                               | 1.3 Select and use <b>personal protective equipment</b> in accordance with legislation and company procedures.                                |
|                               | 1.4 Check that <b>personal protective equipment</b> , tools and equipment are fit for the work being undertaken.                              |
|                               | 1.5 Store <b>personal protective equipment</b> not being used appropriately.  |
|                               | 1.6 Use safe <b>manual handling</b> procedures.   |
|                               | 1.7 Select and use equipment required to carry out the work safely.   |

- 2. Adopt systems of work
  - 2.1 Prioritise and carry out work tasks in accordance with **occupational health and safety requirements** and company procedures.
  - 2.2 Select and use equipment required to carry out the work safely.
  - 2.3 Select and correctly use components and materials required for the installation according to company and industry guidelines.
- 3. Identify and report workplace hazards and risks
  - 3.1 Identify **hazards and risks** in the workplace according to occupational health and safety requirements.
  - 3.2 Identify and report **hazards and risks** to the appropriate person according to company guidelines.
  - 3.3 Minimise identified **risks** according to company procedures.
- 4. Follow accident and emergency procedures
  - 4.1 Notify appropriate persons when there is an accident or emergency.
  - 4.2 Follow **emergency procedures** according to company guidelines.

**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Occupational health and safety requirements:**

- Operation of mechanical/manual equipment
- Protective clothing and equipment
- Worksite environment and safety
- Handling of materials
- Emergency procedures
- Physical/mental/emotional condition of workers

**2. Personal protective equipment:**

- Coveralls
- Safety boots
- Hard hat/cap
- Gloves
- Safety glasses/goggles
- Ear plugs/ear muffs
- Dust masks/respirator
- Harnesses

**3. Manual handling procedures:**

- Lifting and lowering of heavy loads
- Pushing and pulling objects/loads
- Carrying or moving objects/loads
- Holding or restraining

**4. Hazards or risks:**

- Limited space
- Weather conditions
- Wet surfaces
- Electrical

**5. Emergency procedures:**

- Fire
- Medical
- Evacuation

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**UNDERPINNING KNOWLEDGE AND SKILLS**

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*You need to know and understand:*

1. What are the basic principles of the Safety and Health at Work Act 2005-12 (SHAW Act).
2. What are the occupational health and safety regulations and guidelines pertaining to the photovoltaic installation environment and how these apply in practice.
3. What are the different types of personal protective equipment and how these should be used and stored.
4. What are the possible hazards and risks in the photovoltaic installation working environment.
5. How to follow safety instructions.
6. How to adopt safe working practices.
7. How to select and safely use material, equipment and tools to standards.
8. What are the different manual handling techniques.
9. How to follow procedures to respond to accidents and emergencies.
10. Who to contact in the event of an accident or emergency.

**EVIDENCE GUIDE**

*For assessment purposes:*

**(1) Critical Aspects of Evidence**

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on at least two (2) occasions**. 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
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

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 using 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, products 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.

## UA08301

**Facilitate the storage and retrieval of equipment and materials**

## Unit Descriptor:

This unit describes the knowledge, skills and attitudes required for storage and retrieval equipment and materials.

It is about selecting the correct type and quantity of equipment and materials.

Additionally, it considers the impact of incorrect handling and transportation of materials and components, as well as the importance of positioning materials and components correctly.

**ELEMENT**

*To be competent you must achieve the following:*

- |   |   |
|---|---|
| 1. Identify and select equipment and materials. | 1.1 Locate and identify equipment and materials according to company guidelines.  |
|   | 1.2 Select equipment according to job requirements.   |
|   | 1.3 Check equipment to ensure it is in good working order according to manufacturer's requirements.                         |
|   | 1.4 Select the correct types and quantity of materials for the job according to the job specifications.                     |
|   | 1.5 Check materials and their markings against the job sheet.   |
| 2. Handle and transport equipment and materials | 2.1 Handle equipment and materials safely and correctly according to manufacturer's recommendations and company guidelines. |
|   | 2.2 Transport equipment and materials safely using the correct <b>handling equipment</b> .                                  |

- 2.3 Position equipment and materials securely to avoid damage to them and surrounding objects during transportation.
- 3. Store equipment and materials
  - 3.1 Store equipment and materials in the designated location according to company policy and procedures.
  - 3.2 Position materials to allow for ease of access for other work according to company requirements.



**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Handling equipment:**

- Trolleys (i.e. hand trucks, platform trucks)
- Pallet jacks
- Pallet racks
- Strapping

**UNDERPINNING KNOWLEDGE AND SKILLS**

*You need to know and understand:*

1. How to locate and select the correct type and quantity of materials and equipment to meet the specifications.
2. How to select the appropriate handling equipment and transport materials and equipment correctly.
3. What are the consequences of handling and transporting materials and equipment incorrectly.
4. How to position equipment and materials securely to avoid damage.
5. How to store equipment and materials in the designated location.
6. Why it is important to position materials to allow for ease of access.
7. What weather conditions impede handling and transportation of materials.
8. What are the different faults that may be found when transporting materials and equipment and how these should be dealt with.
9. What recording and reporting procedures are required following the tests and why.

**EVIDENCE GUIDE**

*For assessment purposes:*

**(1) Critical Aspects of Evidence**

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on at least two (2) occasions**. 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
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

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 using 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, products 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.

**UA08401****Perform basic cleaning activities**

Unit Descriptor:

This unit describes the knowledge, skills and attitudes required to carry out basic cleaning activities on solar photovoltaic systems for effective functioning to achieve the specified energy output.

**ELEMENT****PERFORMANCE CRITERIA**

*To be competent you must achieve the following:*

- |   |  |
|---|--|
| 1. Follow quality and safety procedures | <ul style="list-style-type: none"> <li>1.1 Remove metals or jewellery to reduce the possibility of shock during maintenance activity.</li> <li>1.2 Wear appropriate gloves while cleaning aluminum frames with sharp edges to reduce the risk of accidents.</li> <li>1.3 Confirm that no material damage occurs during maintenance activities according to standard operating procedures.</li> <li>1.4 Clean and organise work area according to company procedures.</li> <li>1.5 Adhere to relevant health and safety standards.</li> </ul> |
| 2. Clean solar arrays                   | <ul style="list-style-type: none"> <li>2.1 Clean surface of solar arrays from accumulated debris according to standard operating procedures.</li> <li>2.2 Use appropriate cleaning agents to maintain the cleanliness of the aluminum framing according to manufacturer's requirements and standard operating procedures.</li> <li>2.3 Clean solar arrays and framing without causing damage to the module or yourself adhering to safety and health requirements.</li> </ul>  |

- 2.4 Clean modules periodically as per specification and maintenance schedule.
- 3. Handle and remove waste
  - 3.1 Handle and safely dispose of waste materials correctly according to occupational health and safety and environmental requirements.
  - 3.2 Identify **hazardous materials** for separate handling.
  - 3.3 Remove **hazardous materials** using correct procedures according to company and safety and health requirements.
- 4. Clean up
  - 4.1 Clean, store and maintain tools and equipment according to workplace requirements.
  - 4.2 Stack, stockpile or store unused materials safely according to workplace requirements.
  - 4.3 Clear site of debris and unwanted material.
  - 4.4 Fill in the job completion form and obtain the signature of the customer.
  - 4.5 Inform customers about maintenance of solar arrays.
  - 4.6 Follow company standards in documentation of maintenance activities performed.

**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Hazardous materials:**

- Broken glass
- Unwanted materials and debris i.e. asbestos
- Harmful substances

**UNDERPINNING KNOWLEDGE AND SKILLS**

*You need to know and understand:*

1. Why it is important to remove metals and jewellery when cleaning arrays.
2. Why it is important to ensure no material damage occurs during the maintenance of arrays.
3. Why it is important to clean and organise the work area.
4. How to clean modules and ensure that power output is not affected.
5. How to clean solar arrays and framing without causing damage to the module or yourself.
6. Why it is important to clean modules periodically.
7. How to select the appropriate personal protective equipment to clean solar arrays according to occupational health and safety.
8. How to select the appropriate cleaning agent to clean the solar arrays.
9. How to handle waste materials correctly and safely dispose of waste.
10. How to identify hazardous materials.
11. How to remove hazardous materials using the correct procedures.
12. Why it is important to clean, store and maintain tools and equipment.
13. How to stack, stockpile or store unused materials.
14. Why it is important to clear site of debris and unwanted materials.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on at least two (2) occasions**. 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
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role playing/simulation

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 using 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, products 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.



## UA08501

## Work with photovoltaic systems

## Unit Descriptor:

This unit describes the knowledge, skills and attitudes required to work with photovoltaic systems and identify major components and their purposes.

It also focuses on the necessary conditions for installing and maintaining an effective photovoltaic system and the legislation and safety precautions that must be taken.

**ELEMENT****PERFORMANCE CRITERIA**

*To be competent you must achieve the following:*

- |  |   |
|--|---|
| 1. Obtain task specifications and make plans | 1.1 Obtain relevant specifications for task outcomes.   |
|  | 1.2 Identify steps required to complete tasks.  |
| 2. Identify components and locations         | 2.1 Identify the type and <b>major components</b> of the photovoltaic system prior to installation. |
|  | 1.2 Label components with the correct information according to system requirements.                 |
|  | 1.3 Identify the different types of photovoltaic arrays used in industry.                           |
| 2. Clean up                                  | 3.1 Remove and dispose of waste material safely according to industry and company procedures.       |
|  | 3.2 Store/stack unused materials appropriately according to company procedures.                     |

**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Major components:**

- Array
- Module
- Inverter
- Charger controller
- Battery
- Balance of system's components i.e. disconnect switches, racking, mounting systems etc.

**UNDERPINNING KNOWLEDGE AND SKILLS**

*You need to know and understand:*

1. How the photovoltaic system works.
2. What types of photovoltaic technology are used in arrays.
3. What are the different materials used to construct photovoltaic arrays.
4. What is the difference between grid-connected and off-grid systems.
5. What are the common words and terms used in the photovoltaic environment.
6. How to identify non-compliant equipment.
7. Why equipment may be non-compliant.
8. What are the necessary conditions for operating an effective photovoltaic system.
9. What safety precautions to take with photovoltaic systems.
10. What are the specific installation requirements that are to be met.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on at least two (2) occasions**. 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
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

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 using 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, products and manufacturing specifications, codes, standards, manuals and reference materials.

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

**UA08601****Use measuring devices**

Unit Descriptor:

This unit describes the knowledge, skills and attitudes required to effectively measure using various devices and applies to all persons working in the photovoltaic installation industry.

**ELEMENT****PERFORMANCE CRITERIA**

*To be competent you must achieve the following:*

- |                                     |   |
|-------------------------------------|---|
| 1. Use a range of measuring devices | <ul style="list-style-type: none"> <li>1.1 Select appropriate <b>measuring devices</b> to achieve required outcome.</li> <li>1.2 Check selected <b>measuring devices</b> for serviceability according to manufacturer's specifications.</li> <li>1.3 Zero <b>measuring devices</b> to obtain greater accuracy of <b>measurements</b> according to manufacturer's specifications.</li> <li>1.4 Use <b>measuring devices</b> according to manufacturer's specifications, workplace procedures and safety requirements.</li> <li>1.5 Obtain <b>measurements</b> to the expected degree of accuracy according to requirements of the task.</li> </ul> |
| 2. Maintain devices                 | <ul style="list-style-type: none"> <li>2.1 Maintain and store <b>measuring devices</b> according to manufacturer's specifications and workplace procedures.</li> <li>2.2 Make adjustments to the <b>measuring devices</b> as expected by manufacturer's specifications.</li> <li>2.3 Tag and report faulty devices according to workplace procedures.</li> </ul>  |

---

**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Measuring devices:**

- Linear (e.g. Inclinator, Squares, Level, Measuring tape)
- Non-linear (e.g. Thermometers)
- Electrical (e.g. Multimeter)

**2. Measurements:**

- Length/width/depth
- Squareness
- Angles
- Temperature

**UNDERPINNING KNOWLEDGE AND SKILLS**

*You need to know and understand:*

1. What are electrical/electronic devices.
2. What are basic measuring devices.
3. How to interpret and understand documentation and information about measuring devices.
4. How to apply basic numeracy to using measuring devices.
5. How to follow safety instructions.
6. How to correctly use various measuring devices
7. How to adjust measurements.
8. How to measure accurately.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on at least two (2) occasions**. 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
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

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 using 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, products 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.



**UA08701****Use and maintain tools**

Unit Descriptor:

This unit describes the knowledge, skills and attitudes required to competently identify, use, maintain and store appropriate tools. It applies to all individuals working in the photovoltaic industry.

**ELEMENT****PERFORMANCE CRITERIA**

*To be competent you must achieve the following:*

- |   |   |
|---|---|
| 1. Identify tools                       | 1.1 Identify and locate <b>tools</b> used in workplace operations.<br>1.2 Identify the functions of <b>tools</b> according to manufacturer's instructions.<br>1.3 Identify sources and types of <b>power supply</b> for <b>tools</b> according to manufacturer's specifications.  |
| 2. Select and use tools                 | 2.1 Adhere to occupational health and safety requirements for using <b>tools</b> .<br>2.2 Use appropriate personal protective equipment according to the tasks to be completed.<br>2.3 Select <b>tools</b> according to job specifications.<br>2.4 Check <b>tools</b> and <b>components</b> for serviceability and safety and <b>report</b> any faults to supervisor. |
| 3. Clean and store hand and power tools | 3.1 Clean and maintain <b>tools</b> according to manufacturer's instructions and workplace procedures.<br>3.2 Clean and store power cables and hoses to <b>tools</b> according to manufacturer's instructions and workplace requirements.<br>3.3 <b>Report</b> any unserviceable <b>tools</b> to relevant personnel according to workplace procedures.                |

- 3.4 Transport **tools** in a safe and secure manner to minimise risk of injury and damage to equipment according to workplace procedures and manufacturer's specifications.
- 3.5 Store **tools** safely according to manufacturer's specifications to prevent damage to equipment.
- 3.6 Clean work area and remove waste according to industry and environmental regulations and workplace procedures.

**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Tools:**

- Hand tools
- Power tools

**2. Components:**

- Cables
- Hoses

**3. Power supply:**

- Electricity

**4. Report:**

- Verbal
- Non-verbal

**UNDERPINNING KNOWLEDGE AND SKILLS**

*You need to know and understand:*

1. How to identify, locate and select hand and power tools.
2. How to identify the functions of hand and power tools.
3. Why it is important to adhere to occupational health and safety requirements when using hand and power tools.
4. How to select, fit and use the correct personal protective equipment.
5. Why it is important to check tools and components for serviceability and safety.
6. Why it is important to report faults to the Supervisor.
7. What recording and reporting procedures are required following checks and why.
8. What weather conditions impede handling, use and transportation of materials.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on at least two (2) occasions**. 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
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

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 using 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, products 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.

## UA08801

## Identify drawing requirements

Unit Descriptor:

This unit describes the knowledge, skills and attitudes required to effectively identify drawing requirements and applies to all individuals working in the photovoltaic installation industry.

**ELEMENT****PERFORMANCE CRITERIA**

*To be competent you must achieve the following:*

- |  |   |
|--|---|
| 1. Prepare free-hand sketch                            | 1.1 Prepare a sketch using appropriate symbols according to job specifications.                       |
|  | 1.2 Identify and include dimensions and instructions correctly from job specification sheet.          |
|  | 1.3 Indicate base-line or datum points according to job specifications.                               |
| 2. Interpret details from free-hand sketch and drawing | 2.1 Identify symbols correctly from <b>drawing</b> and sketch according to task requirements.         |
|  | 2.2 Identify the components, assemblies or objects according to job specifications.                   |
|  | 2.3 Identify the dimensions from free-hand sketches and <b>drawings</b> to job specifications.        |
|  | 2.4 Identify and follow instructions from <b>drawings</b> and sketch according to job specifications. |
|  | 2.5 Identify material requirements according to <b>drawings</b> , sketch and job specifications.      |

**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Drawing:**

- Standard engineering symbols or their equivalents
- Plans i.e. single line drawings
- Elevations

**UNDERPINNING KNOWLEDGE AND SKILLS**

*You need to know and understand:*

1. How to read and interpret simple drawings.
2. How to prepare a sketch using appropriate symbols.
3. How to identify and include dimensions and instructions.
4. How symbols, dimensions, drawing terminology and their applications are used.
5. What are base line or datum points and how to indicate them on a sketch or drawing.
6. Why it is important to indicate base-line or datum point.
7. How to identify symbols correctly from drawings and sketches.
8. How to identify components, assemblies or objects from job specifications.
9. How to identify dimensions from free-hand sketches and drawings.
10. How to identify and follow instructions from drawings and sketches.
11. How to identify material requirements from drawings, sketches and job specifications.
12. How to estimate measurements.
13. How to measure accurately.



## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on at least two (2) occasions**. 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
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

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 using 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, products 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.

**U68402****Contribute to the protection of the environment**

Unit Descriptor:

This unit deals with the knowledge, skills and attitudes required to conduct work activities in a manner that protects the environment. Candidates should take steps to minimise any negative impact on the environment by completing tasks and activities in a way which causes as little damage or disturbance as possible to the environment while following organisational procedures.

**ELEMENT****PERFORMANCE CRITERIA**

*To be competent you must achieve the following:*

- |  |   |
|--|---|
| 1. Work in an environmentally conscious way                            | 1.1 Perform duties in accordance with <b>relevant policies and legislation</b> .  |
|  | 1.2 Execute duties in a <b>manner which minimises environmental damage</b> .  |
|  | 1.3 Operate and handle <b>equipment and materials</b> in a <b>manner that minimises environmental damage</b> .  |
| 2. Contribute to continuous improvements in protecting the environment | 2.1 Identify instances of likely or actual environmental damage and take appropriate action.  |
|  | 2.2 Identify improvements to procedures and practices in terms of good environmental practice and report to relevant persons.                                 |
|  | 2.3 Dispose of <b>hazardous</b> and <b>non-hazardous waste</b> safely according to approved legislative procedures and practices.                             |
|  | 2.4 Contribute to sustainable development particularly in the conservation of energy, water, use of resources and equipment to minimise environmental damage. |

**RANGE STATEMENT**

*All range statements must be assessed:*

**1. Relevant policies and legislation:**

- Company policies
- Health and safety at work
- Environmental legislation
- Solid waste management policies
- Recycling policies

**2. Manner which minimises environmental damage:**

- Using recycled/reused items and materials where appropriate
- Disposing of polluting substances safely
- Reducing the volume of waste
- Using biodegradable and eco-friendly chemicals
- Planning tasks to reduce the use of fuel and electricity

**3. Equipment and materials**

- Hand tools
- Power tools
- Personal protective equipment
- Cleaning chemicals
- Soaps and sanitisers
- Paper towels
- Garbage disposal bags
- Cloths and towels
- Containers
- Access equipment

**4. Hazardous waste:**

- Oils
- Chemicals and solutions
- Harmful materials (asbestos, fibreglass)
- Electronic equipment
- Organic hazards (pest excrement, pest carcasses)

**5. Non-hazardous waste:**

- Food
- Plant matter
- Paper

**UNDERPINNING KNOWLEDGE AND SKILLS**

*You need to know and understand:*

1. What are the relevant policies and legislation governing environmental protection.
2. How to recognise any likely or actual environmental damage.
3. What are the appropriate actions to take in the discovery of likely or actual environmental damage.
4. What are the ways in which tools and materials should be used in order to minimise environmental damage.
5. What are the different types of pollution.
6. What are the consequences of pollution.
7. How to recognise wastage of energy, water, equipment and materials.
8. What are the methods of working that will minimise pollution and wastage of resources.
9. What are the types of damage which may occur, the impact these can have on the environment and corrective actions to be taken.
10. What are the methods of waste disposal which will minimise the risk to the environment.
11. What are the company requirements to prevent wastage.

## EVIDENCE GUIDE

*For assessment purposes:*

### (1) Critical Aspects of Evidence

Candidates must prove that they can carry out **all** the elements, meeting **all** of the performance criteria, range and underpinning knowledge **on no less than three (3) occasions**. 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
- Witness testimony
- Personal statement
- Written evidence (projects or assignments)
- Case study and scenario analysis
- Role play/simulation

### (3) Context of Assessment

This unit may be assessed on the job, off the job or using 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, products and manufacturing specifications, codes, standards, manuals and reference materials.

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

**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 they 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.

**Element**

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 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. They need 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**

Within each approved Centre offering NVQs, there is a centre contact who has overall responsibility for the operation and administration of the NVQ system.

**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 you would expect to see 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 you are 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 competently, for example, in a disciplinary situation,

### 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 three 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.

**Additional units** - are units which the candidate can undertake but are not a requirement to achieve a qualification.

### Work-based projects

Work-based projects are a useful way 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 and observation.

A project often involves the identification of a solution to a specific problem identified by the you 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).