

**THE REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**SOLAR PV SYSTEMS INSTALLER**

**KNQF LEVEL 3**

**OCCUPATIONAL STANDARD ISCED CODE: 0713 254A**

# ACRONYMS

IET Institute of Electrical and electronics Engineers

PPE Personal Protective Equipment

PV Photo Voltaic

TVET Technical and Vocational Education and Training

# KEY TO UNIT CODE



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# OVERVIEW

The solar PV system installer Level 3 occupational standard describes competences required by a person to install solar PV systems. Competences in this standard include ability to perform electrical installation, install DC solar PV systems and install solar water pump systems.

The solar PV system installer at this level carries out solar work using a given design and customer’s requirements. He or she applies electrical drawings prepared by an electrical technician. The size and quantity of materials and speciﬁcations necessary to install the electrical systems are determined by the electrical technician.

**SUMMARY OF UNITS OF COMPETENCY**

|  |  |
| --- | --- |
| **CORE UNITS OF COMPETENCY** | |
| **Unit Code** | **Unit Title** |
| 0713 251 04A | Perform Electrical Installation |
| 0713 251 05A | Install DC Solar PV Systems |
| 0713 251 06A | Install Solar Water Pump System |

# CORE UNITS OF COMPETENCY

## PERFORM ELECTRICAL INSTALLATION

**UNIT CODE:** **0713 251 04A**

**UNIT DESCRIPTION**

This unit specifies competences required for performing electrical installation. The competences include identifying electrical installation components, installing electrical system and maintaining electrical installation.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |  |  |
| --- | --- | --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***(Bold and italicised terms are elaborated in the Range)*** | |
| 1. Identify electrical installation components | * 1. Electrical symbols are identified as per installation drawing.   2. Materials for electrical installation are prepared as per installation drawing.   3. Electrical route is identified as per installation drawing | |
| 1. Install electrical system | * 1. Safety Procedures are applied as per work requirement.   2. ***Tools*** and ***equipment*** are assembled as per work plan.   3. ***Materials*** are assembled as per work plan   4. ***Cable management system*** is installed as per IEC standards   5. ***Protection devices*** are installed as per IEC standards   6. Accessories are installed as per working drawing and IET regulations.   7. ***Housekeeping practice*** is performed as per work requirement. | |
| 1. Maintain electrical installation | * 1. Electrical equipment and system are inspected as per IET regulations.   2. Materialsandtools are assembled as per work requirement.   3. Maintenance is carried out as per work requirement.   4. Maintenance report is prepared as per work procedure. | |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Tools and equipment include but is not limited to: | * Fixing tools * Cutting tools * Measuring tools * Holding tools * Power tools * Multimeter * Hydrometer * Inclinometer * Compass |
| 1. Materials include but is not limited to: | * Cables * Accessories |
| 1. Cable management systems include but is not limited to: | * Cable duct * Sheath/surface * Conduits * Trunking |
| 1. Protection devices include but is not limited to: | * Circuit breakers * Fuses |
| 1. Housekeeping practiceinclude but is not limited to: | * Waste disposal * Recycle * Reuse * Reduce |

**REQUIRED KNOWLEDGE**

The individual needs to demonstrate knowledge of:

* Electrical tools and equipment
* Work safety requirements
* IEE regulations
* solar energy
* Electrical building codes

**FOUNDATION SKILLS**

* Waste disposal
* Work safety

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required knowledge and understanding and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   1. Executed group discussion strategies as per workplace policy. 2. Promoted team work as per workplace requirements 3. Promoted work ethical practices and values as per work place requirements 4. Identified Electrical symbols as per installation drawing. 5. Installed electrical system as per work plan. 6. Assembled Materialsandtools as per work requirement. 7. Carried out Maintenance as per work requirement. |
| 1. Resource implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place.   2. Access to relevant work environments.   3. Resources relevant to the proposed activities or task. |
| 1. Methods of assessment | Competency in this unit may be assessed through:   * 1. Project   2. practical   3. Portfolio of evidence   4. Third party report   5. Written assessment   6. Oral assessment |
| 1. Context of Assessment | * + 1. Competency may be assessed in a work place or a simulated work place. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## INSTALL DC SOLAR PV SYSTEMS

**UNIT CODE:** **0713 251 05A**

**UNIT DESCRIPTION**

This unit covers competences required in installing solar PV systems. The competences include constructing DC solar PV support structures, installing DC solar PV system components and maintaining DC solar PV system.

**ELEMENTS AND PERFORMANCE CRITERIA**

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| --- | --- | --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***(Bold and italicised terms are elaborated in the Range)*** | |
| 1. Construct DC Solar PV support structures | | * 1. Safety procedures are applied as per work requirements.   2. Solar PV module structure is constructed as per design requirement.   3. solar PV batteries structures is constructed as per design requirement. | |
| 1. Install DC Solar PV system components | | * 1. ***Solar PV module*** is mounted as per work layout   2. Charger controller is mounted as per work layout   3. ***Solar PV battery*** is installed as per work layout   4. Cables are joined as per work layout.   5. ***Lightening arrestor*** is installed as per work layout   6. ***Housekeeping practice*** is performed as per work requirement. | |
| 1. Maintain DC Solar PV System | | * 1. Maintenance materials are prepared as per work requirement.   2. ***Maintenance*** iscarried out as per IET regulations   3. Maintenance report is prepared as per work procedure. | |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Solar PV module may include but is not limited to: | * Mono crystalline * Poly crystalline * Amorphous * Single module up to 300 wp |
| 1. Solar PV batteries may include but is not limited to: | * Maintenance free * Flooded type * Single battery 12V |
| 1. Lightening arrestor may include but is not limited to: | * Rod gap arrester * Earth Rod * Surge arrestor (SPD) |
| 1. Housekeeping practicemay include but is not limited to: | * Waste disposal * Recycle * Reuse * Reduce |
| 1. Maintenance may include but is not limited to: | * Cleaning the modules * Cleaning battery terminals * Applying jelly/grease on battery terminals * Checking states of electrolytes |

**REQUIRED KNOWLEDGE**

The individual needs to demonstrate knowledge of:

* Electrical tools and equipment
* Work safety requirements
* IEE regulations
* solar energy
* Electrical building codes

**FOUNDATION SKILLS**

* Waste disposal
* Work safety

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Constructed DC Solar PV support structures as per work requirement.   2. Mounted Solar PV module as per work layout   3. Mounted Charger controller as per work layout   4. Installed Solar PV battery as per work layout   5. Joined Cables as per work layout.   6. Performed Housekeeping practiceas per work requirement. |
| 1. Resource implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place.   2. Access to relevant work environments.   3. Resources relevant to the proposed activities or task. |
| 1. Methods of assessment | Competency in this unit may be assessed through:   * 1. Project   2. practical   3. Portfolio of evidence   4. Third party report   5. Written assessment   6. Oral assessment |
| 1. Context of Assessment | Competency may be assessed in a work place or a simulated work place. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

## INSTALL SOLAR WATER PUMP SYSTEM

**UNIT CODE:** **0713 251 06A**

**UNIT DESCRIPTION**

This unit covers competences required in install solar water pump system. The competences include constructing solar PV module system support structures, installing solar water pump system components and maintaining solar water pump system.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |  |
| --- | --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***(Bold and italicised terms are elaborated in the Range)*** | |
| 1. Construct Solar PV module system support structures | | * 1. Safety procedures are applied as per work requirements.   2. Solar PV module mounting structures are constructed as per design requirement.   3. Solar PV water pump mounting structures are constructed as per design requirement. |
| 1. Install Solar water pump system components | | * 1. ***Solar PV module*** is mounted as per layout   2. ***Solar PV water pump*** is installed as per layout   3. Cables are jointed as per system layout.   4. Lightening arrestor is installed as per design   5. ***Housekeeping practice*** is performed as per work requirement. |
| 1. Maintain solar water pump system | | * 1. ***Materials*** for solar water pump are prepared as per system requirement.   2. Solar PV water pump system is tested as per IET regulations.   3. ***Maintenance activities*** are carried out as per IET regulations.   4. Maintenance report is prepared as per work procedure. |

**RANGE**

This section provides work environments and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

| **Variable** | **Range** |
| --- | --- |
| 1. Solar PV module may include but is not limited to: | * Mono crystalline * Poly crystalline * Amorphous * Single panel up to 300 wp |
| 1. Solar PV water pump may include but is not limited to: | * Surface/submersible Single-phase water pump |
| 1. Housekeeping practicemay include but is not limited to: | * Waste disposal * Recycle * Reuse * Reduce |
| 1. Material may include but is not limited to: | * Cables * Cable ties * Accessories * Grease |
| 1. Maintenance activity may include but is not limited to: | * Cleaning module * Removal of silt |

**REQUIRED KNOWLEDGE**

The individual needs to demonstrate knowledge of:

* Electrical tools and equipment
* Work safety requirements
* IEE regulations
* solar energy
* Electrical building codes

**FOUNDATION SKILLS**

* Communication skills
* Negotiation skills
* Work ethics
* Waste disposal
* Work safety

**EVIDENCE GUIDE**

This provides advice on assessment and must be read in conjunction with the performance criteria, required skills and understanding and range.

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Constructed Solar PV module system support structures as per layout   2. Mounted Solar PV module as per layout.   3. Installed Solar PV water pump as per layout.   4. Joined Cables as per work requirement.   5. Maintained solar water pump system as per layout. |
| 1. Resource implications | The following resources should be provided:   * 1. Appropriately simulated environment where assessment can take place.   2. Access to relevant work environments.   3. Resources relevant to the proposed activities or task. |
| 1. Methods of assessment | Competency in this unit may be assessed through:   * 1. Project   2. practical   3. Portfolio of evidence   4. Third party report   5. Written assessment   6. Oral assessment |
| 1. Context of Assessment | Competency may be assessed in a work place or a simulated work place. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |