
**REPUBLIC OF KENYA**

# NATIONAL OCCUPATIONAL STANDARDS

**FOR**

# AGRICULTURAL ENGINEERING TECHNICIAN

**LEVEL 6**

**PROGRAMME ISCED CODE: 0716 454 A**


TVET CDACC
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NAIROBI

## APPLY MATERIAL SCIENCE PRINCIPLES

**UNIT CODE:** 0716 541 20A

**TVET CDACC CODE:** ENG/OS/AGR/CC/04/6/MA

**UNIT DESCRIPTION:**

This unit specifies the competencies required by an Agricultural Engineering Technologist Level 6 to apply material science principles. It involves analysing physical and mechanical properties of engineering materials, performing engineering materials heat treatment and testing of engineering materials.

**ELEMENTS AND PERFORMANCE CRITERIA**

| **ELEMENT**<br>These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**<br>These are assessable statements which specify the required level of performance for each of the elements<br>***(Bold and italicized terms are elaborated in the Range)*** |
|---|---|
| 1. Analyse physical and mechanical properties of engineering materials | 1.1 Personal protective equipment are worn based on OSHA<br>1.2 Engineering materials are identified as per their ***physical*** and ***mechanical properties***<br>1.3 Engineering materials properties are tested as per work requirement |
| 2. Perform engineering materials heat treatment | 2.1 Personal protective equipment are worn based on OSHA<br>2.2 ***Heat treatment methods*** are described as per heat stages<br>2.3 Heat treatment on engineering materials carried out as per work requirements |
| 3. Test engineering materials | 3.1 Personal protective equipment are worn based on OSHA<br>3.2 ***Methods of testing materials*** are identified as per their properties<br>3.3 Material testing is carried out as per material testing method<br>3.4 Material testing results are analysed and interpreted |

**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 |
|---|---|
| Physical and mechanical properties may include but are not limited to: | • Density<br>• Texture<br>• Melting point<br>• Boiling point<br>• Thermo conductivity<br>• Electrical resistivity<br>• Colour |
| 1. Heat treatment methods may include but are not limited to: | • Annealing<br>• Tempering<br>• Case hardening<br>• Normalizing<br>• Hardening |
| 2. Methods of testing materials may include but are not limited to: | • Dynamic testing<br>• Static testing<br>• Destructive testing<br>• Non destructive material testing |

**REQUIRED SKILLS AND KNOWLEDGE**

This section describes knowledge and skills required for this unit of competency.

**Required knowledge**

The individual needs to demonstrate knowledge of:

- Laws of conservation of energy
- Heat transfer
- Type of forces
- Power transmission systems
- Units of measurement, conversions and abbreviations

**Required Skills**

The individual needs to demonstrate the following skills:

- Logical thinking
- Problem solving
- Communication
- Analytical

**EVIDENCE GUIDE**

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

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|---|---|
| 1. Critical Aspects of Competency | Assessment requires evidence that the learner<br>1.1 Worn personal protective equipment based on OSHA<br>1.2 Identified engineering materials as per their physical and mechanical properties<br>1.3 Tested and analysed engineering materials properties<br>1.4 Described heat treatment methods<br>1.5 Carried out heat treatment on engineering materials<br>1.6 Identified methods of testing materials depending on their properties<br>1.7 Carried out material testing as per material testing method<br>1.8 Analysed and interpreted material testing results |
| 2. Resource Implications | The following resources should be provided:<br>2.1 Appropriately simulated environment where assessment can take place<br>2.2 Access to relevant work environment<br>2.3 Resources relevant to the proposed activity or tasks |
| 3. Methods of Assessment | Competency in this unit may be assessed through:<br>3.1 Practical<br>3.2 Project<br>3.3 Portfolio of evidence<br>3.4 Third party report |

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| | 3.5 Written tests<br>3.6 Oral assessment |
| 4. Context of Assessment | Competency may be assessed:<br>4.1 Workplace<br>4.2 Simulated work environment |
| 5. Guidance information for assessment | Holistic assessment of other units relevant to the industry sector, workplace and job role is recommended. |