****

**REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**CONCRETE CONSTRUCTION** **FOREPERSON**

**LEVEL 5**

A close up of a logo

Description automatically generated

TVET CDACC

P.O. BOX 15745-00100

NAIROBI

First published 2019

Copyright © TVET CDACC

All rights reserved. No part of these occupational standards may be reproduced, distributed, or transmitted in any form or by any means, including photocopying, recording, or other electronic or mechanical methods without the prior written permission of the TVET CDACC, except in the case of brief quotations embodied in critical reviews and certain other non-commercial uses permitted by copyright law. For permission requests, write to the Council Secretary/CEO, at the address below:

**Council Secretary/CEO**

**TVET Curriculum Development, Assessment and Certification Council**

**P.O. Box 15745–00100**

**Nairobi, Kenya**

**Email: cdacc.tvet@gmail.com**

Table of Contents

[FOREWORD iv](#_Toc26797293)

[PREFACE v](#_Toc26797294)

[ACKNOWLEDGMENT vi](#_Toc26797295)

[KEY TO UNIT CODE vii](#_Toc26797296)

[COURSE OVERVIEW viii](#_Toc26797297)

[SURVERYING COMPETENCIES 1](#_Toc26797298)

[UNIT OF COMPETENCY 1: 2](#_Toc26797299)

[UNIT OF COMPETENCY 2: 7](#_Toc26797300)

[UNIT OF COMPETENCY 3: 11](#_Toc26797301)

[UNIT OF COMPETENCY 4: 15](#_Toc26797302)

[UNIT OF COMPETENCY 5: 20](#_Toc26797303)

[UNIT OF COMPETENCY 6: 24](#_Toc26797304)

[CONCRETE FIELD-TESTING COMPETENCIES 28](#_Toc26797305)

[UNIT OF COMPETENCY 7: 29](#_Toc26797306)

[UNIT OF COMPETENCY 8: 33](#_Toc26797307)

[UNIT OF COMPETENCY 9: 39](#_Toc26797308)

[UNIT OF COMPETENCY 10: 45](#_Toc26797309)

[UNIT OF COMPETENCY 11: 48](#_Toc26797310)

[UNIT OF COMPETENCY 12: 52](#_Toc26797311)

[UNIT OF COMPETENCY 13: 58](#_Toc26797312)

[CONCRETE CONSTRUCTION FOREPERSON SPECIFIC COMPETENCIES 63](#_Toc26797313)

[UNIT OF COMPETENCY 14: 64](#_Toc26797314)

[UNIT OF COMPETENCY 15: 68](#_Toc26797315)

[UNIT OF COMPETENCY 16: 72](#_Toc26797316)

[UNIT OF COMPETENCY 17: 75](#_Toc26797317)

[UNIT OF COMPETENCY 18: 78](#_Toc26797318)

[UNIT OF COMPETENCY 19: 81](#_Toc26797319)

# 

# FOREWORD

The provision of quality education and training is fundamental to the Government’s overall strategy for social economic development. Quality education and training will contribute to achievement of Kenya’s development blueprint, Vision 2030 and sustainable development goals.

Reforms in the education sector are necessary for the achievement of Kenya Vision 2030 and meeting the provisions of the Constitution of Kenya 2010. The education sector had to be aligned to the Constitution of Kenya of 2013.

These reforms demand that Industry takes a leading role in curriculum development to ensure the curriculum addresses its competence needs. It is against this background that these Occupational Standards were developed for the purpose of developing a competency-based curriculum for Concrete Construction Foreperson. These Occupational Standards will also be the bases for assessment of an individual for competence certification.

It is my conviction that these standards will play a great role towards development of competent human resource for the Construction sector’s growth and development.

**PRINCIPAL SECRETARY, VOCATIONAL AND TECHNICAL TRAINING**

**MINISTRY OF EDUCATION**

# PREFACE

Kenya Vision 2030 aims to transform the country into a newly industrializing, “middle-income country providing a high-quality life to all its citizens by the year 2030”. Kenya intends to create a globally competitive and adaptive human resource base to meet the requirements of a rapidly industrializing economy through life-long education and training. TVET has a responsibility of facilitating the process of inculcating knowledge, skills and attitudes necessary for catapulting the nation to a globally competitive country, hence the paradigm shift to embrace Competency Based Education and Training (CBET).

The Technical and Vocational Education and Training Act No. 29 of 2013, emphasized the need to reform curriculum development, assessment and certification. This called for a shift to CBET in order to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labour force.

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Construction Sector Skills Advisory Committee (SSAC have developed these occupational standards for Concrete Construction Foreperson.

I am grateful to the Council Members, Council Secretariat, Construction SSAC, expert workers and all those who participated in the development of these standards.

**Prof. CHARLES M. M. ONDIEKI, PhD, FIET (K), Con. Eng Tech.**

**CHAIRMAN, TVET CDACC**

# ACKNOWLEDGMENT

This curriculum has been designed for competency-based training and has independent units of learning that allow the trainee flexibility in entry and exit. In developing the curriculum, significant involvement and support was received from various organisations.

I appreciate the funding of the Government of Canada and its implementing partner Colleges and Institutes Canada (CICan) which enabled the development of this curriculum through the Kenya Education for Employment Program (KEFEP).

I also appreciate the Eldoret National Polytechnic and its Canadian technical partners from Algonquin College who collaborated to identify industry skills gaps and develop this curriculum.

I recognize with appreciation the role of industry partners including the National Polytechnic’s Industry Advisory Committee and the national Sector Skills Advisory Committee (SSAC) in ensuring that competencies required by the industry are addressed in the curriculum. I also thank all stakeholders in the sector for their valuable input and all those who participated in the process of developing this curriculum.

I am convinced that this curriculum will go a long way in ensuring that workers in this sector acquire competencies that will enable them to perform their work more efficiently.

**Dr. LAWRENCE GUANTAI M’ITONGA, PhD**

**COUNCIL SECRETARY/CEO**

**TVET CDACC**

**KEY TO UNIT CODE**

**ENG/CU/CON/BC/01/4/A**

Industry or sector

Occupational Standards

Occupational area

Type of competency

Competency number

Competency level

Version control

# COURSE OVERVIEW

The **Concrete Construction Foreperson Level 5 Qualification** consists of competencies that an individual must achieve to manage construction projects sites and supervise and direct surveyors, concrete workers, concrete field-testers, and other workers related to Earthworks, Surfacing, Pavement, and Concrete Works.

The Units of Competency comprising the Concrete Construction Foreperson Level 5 Qualification include six competencies associated with Surveying Level 4, seven competencies associated with Concrete Field-Testing Level 4 and six additional competencies as outlined below.

**BASIC COMPETENCIES**

1. Demonstrate communication skills
2. Demonstrate numeracy skills
3. Demonstrate digital literacy skills
4. Demonstrate entrepreneurial skills
5. Demonstrate employability skills
6. Demonstrate environmental literacy skills
7. Demonstrate occupational safety and health practices

**CORE COMPETENCIES**

**Surveying Competencies**

* 1. Conduct field surveys and operate survey instruments and computer equipment to measure distance, angles, elevations and contours.
  2. Record and assist calculation, analysis and computation in the measurements and other information obtained during field survey activities.
  3. Determine precise geographic locations using global positioning systems (GPS) equipment.
  4. Analyze latitude, longitude, and angles and compute trigonometric and other calculations to plot features, contours and areas to a specific scale.
  5. Keep records, measurements and other survey information in systematic order.
  6. Assist in the preparation of detailed drawings, charts and plans.

**Concrete Field-Testing Competencies**

* 1. Test, inspect and determine good quality materials for concrete manufacture.
  2. Prepare concrete products of various classes and standards using appropriate equipment, materials.
  3. Record, calculate, analyze and compute measurements and other information obtained during concrete work activities.
  4. Conduct unit conversions between systems of measure (metric and imperial).
  5. Interpret and edit working drawings for the construction of various formworks and determine reinforcements for concrete works.
  6. Conduct processes of concrete production including mixing, casting, jointing, testing, curing, consolidating and transporting in accordance with codes and job specifications.
  7. Perform finishing techniques.

**Additional Competencies for Concrete Construction Foreperson**

* 1. Organize construction site efficiently and effectively.
  2. Perform work plan and schedule activities.
  3. Procure, receive and engage in proper store keeping.
  4. Interpret and compute the schedule of materials from the bill of quantities.
  5. Observe the relevant/applicable statutory obligations in day to day activities.
  6. Exercise proper leadership (communication, delegation, supervision).

# SURVERYING COMPETENCIES

# UNIT OF COMPETENCY 1:

Conduct field surveys and operate survey instruments and computer equipment to measure distance, angles, elevations and contours.

**UNIT CODE:** ENG/OS/CON/CR/01/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to conduct field surveys and operate survey instruments and computer equipment competently. It involves the measurement of distance, angles, elevations and contours.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Perform calculations on curve ranging and super elevation. | * 1. Define various terms used in curve ranging   2. Explain the purpose of curve ranging.   3. Describe tools and equipment’s for curve ranging   4. Outline and calculate data for curve ranging and explain various methods of overcoming obstacles in curve ranging.   5. Calculate vertical curve elevations.   6. Calculate spiral curve delectations.   7. Calculate road way super elevation. |
| 1. Perform calculations related to traversing. | * 1. Define terms used in traversing.   2. Explain various instrumental methods of traversing.   3. Describe and demonstrate various types of traversing.   4. Execute field procedure of traversing.   5. Explain the causes and adjustments of errors. |
| 1. Operate a theodolite in tachometry surveys and operate and use a total station. | * 1. Explain principles of tachometry.   2. Describe and use tools and equipment.   3. Outline the procedure of carrying out tachometry.   4. Explain the key features and settings of the total station.   5. Set up and operate the optical and digital levels compute accurate bench mark level loops and to set grades. |
| 1. Apply surveying skills to control works. | * 1. Draw and interpret mass haul diagrams.   2. Identify and use tools and equipment in control works.   3. Calculate areas and volumes. |
| 1. Set out construction works. | * 1. Identify and operate tools and equipment required in setting out construction work.   2. Identify the appropriate surveying procedure and apply it in construction works to include verticality of building. |
| 1. Survey an assigned area as directed and produce a site plan of the area. | * 1. Use the total station to survey topographical data required.   2. Conduct a site reconnaissance of assigned compass area to identify object to be surveyed and site condition for planning the field work.   3. Draw a detail site plan of the area on AutoCAD. |

**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**  May include but are not limited to: |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Electronic Total Station Kit with Tripods   + Automatic Electronic Level   + Automatic level   + GPS Receiver   + Survey Compass   + Prismatic Compass   + Ranging Rod   + Levelling Staff   + Engineer's Multipurpose Tilting Level   + Robotic Total Stations   + Prism Pole   + Theodolite Kit/Tachometer   + Tripod   + Steel Band Tapes (10m,20m,30m, and 50m)   + Open Real Measuring Tapes   + Electronic Distance Machines (EDM)   + Telescopic Leveling Rod/Staff   + Field Notebook   + Surveying Marker Flags/Arrows   + Plotter   + Laptop   + AutoCAD/ArchiCAD or other relevant design software |
| * Permits | * + Land surveying   + Building |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Measurement
* Survey skills
* Types of surveys
* Levelling
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Demonstrated an understanding of curve ranging, definition of terms and described tools and equipment being used and performed calculations on curve ranging and super elevation. Demonstrated an understanding of terms and tools used in traversing and performed calculations related to traversing.   2. Operated a theodolite in tachometry surveys and operated and used a total station.   3. Applied surveying skills to control works.   4. Applied survey skills in setting out construction works.   5. Surveyed a section of the campus as directed and produced a site plan. |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials   4. AutoCAD software |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Field Practice/Observation   2. Oral presentations   3. Individual/group projects   4. Written tests   5. Individual/group assignments |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 2:

Record and assist calculation, analysis and computation in the measurements and other information obtained during field survey activities.

**UNIT CODE:** ENG/OS/CON/CR/02/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to record and assist calculation, analysis and computation in the measurements and other information obtained during field survey activities.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Use basic survey terminologies and fundamental skills. | * 1. Define terms used in surveying and describe various types of surveys in common use.   2. Explain the objective of surveying.   3. State the typical accuracy of engineering and explain differences between systematic and random errors.   4. Locate distances a long a baseline.   5. Apply units of measurement that are commonly used in metric and imperial systems.   6. Calculate temperature correction for survey distances.   7. Explain the procedure for applying corrections for a tape and relate the significance of random taping errors. |
| 1. Perform various surveys in common use within industry. | * 1. Explain various types of surveys in common use.   2. Describe and use tools and equipment used in survey operation.   3. Demonstrate and carry out various surveys. |
| 1. Operate a survey level for a variety of survey uses. | * 1. Define terms used in levelling.   2. Explain tools and equipment used in levelling.   3. Set up and operate a variety of survey levels as required for various uses and testing.   4. Outline the procedure of levelling and explain methods of reducing levels.   5. Describe the meaning and significance, calculate and adjust arithmetic errors in surveying.   6. Complete a set of level notes and graph results. |
| 1. Perform calculations on curve ranging and super elevation. | * 1. Define various terms used in curve ranging.   2. Explain the purpose of curve ranging.   3. Describe tools and equipment’s for curve ranging.   4. Outline and calculate data for curve ranging and explain various methods of overcoming obstacles in curve ranging.   5. Calculate vertical curve elevations.   6. Calculate spiral curve deflections.   7. Calculate road way super elevation. |
| 1. Perform calculations related to traversing. | * 1. Define terms used in traversing.   2. Explain various instrumental methods of traversing.   3. Describe and demonstrate various types of traversing.   4. Execute field procedure of traversing.   5. Explain the causes and adjustments of errors. |

**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**  May include but are not limited to: |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Electronic Distance Machine (EDM)   + Telescopic Leveling Rod/Staff   + Automatic Level   + Distance Measuring Wheel   + Hand Level   + Steel Band Measuring Tapes (10m,20m,30m,50m)   + Dumpy Level   + Ranging Rod   + Plumb Bob   + Field Notebook   + Surveying Marker Flags/Arrows |
| * Permits | * + Land surveying   + Building |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Measurement
* Survey skills
* Types of surveys
* Levelling
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Explained basic survey terminologies and fundamentals.   2. Identified surveys in common use.   3. Operated a survey level for a variety of survey exercises.   4. Demonstrated an understanding of curve ranging, definition of terms and describe tools and equipment being used and perform calculations on curve ranging and super elevation.   5. Demonstrated an understanding of terms and tools used in traversing and perform calculations related to traversing. |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Observation   2. Oral presentation   3. Individual/group projects   4. Written tests   5. Individual/group assignments   6. Field Practice |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 3:

Determine precise geographic locations using global positioning systems (GPS) equipment.

**UNIT CODE:** ENG/OS/CON/CR/03/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to determine precise geographic locations using global positioning systems (GPS) equipment.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Calculate the directions of survey control lines | * 1. Define and determine the direction of a survey line.   2. Calculate the directions of survey lines in a closed survey   3. Execute the standard check to ensure accuracy of results. |
| 1. Perform calculations on curve ranging and super elevation. | * 1. Define various terms used in curve ranging   2. Explain the purpose of curve ranging.   3. Describe tools and equipment’s for curve ranging   4. Outline and calculate data for curve ranging and explain various methods of overcoming obstacles in curve ranging.   5. Calculate vertical curve elevations   6. Calculate spiral curve delectations   7. Calculate road way super elevation |
| 1. Perform calculations related to traversing. | * 1. Define terms used in traversing   2. Explain various instrumental methods of traversing   3. Describe and demonstrate various types of traversing   4. Execute field procedure of traversing   5. Explain the causes and adjustments of errors |

**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**  May include but are not limited to: |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Electronic Total Station Kit with Tripods   + Automatic Electronic Level   + Automatic level   + GPS Receiver   + Survey Compass   + Prismatic Compass   + Ranging Rod   + Levelling Staff   + Engineer's Multipurpose Tilting Level   + Robotic Total Stations   + Prism Pole   + Theodolite Kit/Tachometer   + Tripod   + Steel Band Tapes (10m,20m,30m, and 50m)   + Open Real Measuring Tapes   + Electronic Distance Machines (EDM)   + Telescopic Leveling Rod/Staff   + Field Notebook   + Surveying Marker Flags/Arrows   + Plotter   + Laptop   + AutoCAD/ArchiCAD or other relevant design software |
| * Permits | * + Land surveying   + Building |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Measurement
* Survey skills
* Types of surveys
* Levelling
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Calculated the directions of survey control lines   2. Demonstrated an understanding of curve ranging, definition of terms and described tools and equipment being used and performed calculations on curve ranging and super elevation.   3. Demonstrated an understanding of terms and tools used in traversing and performed calculations related to traversing. |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Observation   2. Oral presentation   3. Individual/group projects   4. Written tests   5. Individual/group assignments   6. Field Practice |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 4:

Analyze latitude, longitude, and angles and compute trigonometric and other calculations to plot features, contours and areas to a specific scale.

**UNIT CODE:** ENG/OS/CON/CR/04/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to analyze latitude, longitude and angles and compute trigonometric and other calculations to plot features, contours and areas to a specific scale.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Use basic survey terminologies and fundamentals skills. | * 1. Define terms used in surveying and describe various types of surveys in common use.   2. Explain the objective of surveying.   3. State the typical accuracy of engineering and explain differences between systematic and random errors.   4. Locate distances a long a baseline.   5. Apply units of measurement that are commonly used in metric and imperial systems.   6. Calculate temperature correction for survey distances.   7. Explain the procedure for applying corrections for a tape and relate the significance of random taping errors. |
| 1. Operate survey levels for a variety of survey requirements. | * 1. Define terms used in levelling.   2. Explain tools and equipment used in levelling.   3. Set up and operate a variety of survey levels as required for various exercise and testing.   4. Outline the procedure of levelling and explain methods of reducing levels.   5. Describe the meaning and significance, calculate and adjust arithmetic errors in surveying.   6. Complete a set of level notes and graph results. |
| 1. Perform calculations on curve ranging and super elevation. | * 1. Define various terms used in curve ranging   2. Explain the purpose of curve ranging.   3. Describe tools and equipment’s for curve ranging   4. Outline and calculate data for curve ranging and explain various methods of overcoming obstacles in curve ranging.   5. Calculate vertical curve elevations   6. Calculate spiral curve delectations   7. Calculate road way super elevation |
| 1. Perform calculations related to traversing. | 4. 1 Define terms used in traversing  4. 2 Explain various instrumental methods of traversing  4. 3 Describe and demonstrate various types of traversing  4. 4 Execute field procedure of traversing  4. 5 Explain the causes and adjustments of errors |
| 1. Operate a theodolite in tachometry surveys and operate and use a total station. | * 1. Explain principles of tachometry.   2. Describe and use tools and equipment.   3. Outline the procedure of carrying out tachometry.   4. Explain the key features and settings of the total station.   5. Set up and operate the optical and digital levels compute accurate bench mark level loops and to set grades. |
| 1. Set out construction works. | * 1. Identify and operate tools and equipment required in setting out construction work.   2. Outline the procedure and apply it in construction works to include verticality of building. |
| 1. Survey an assigned area as directed and produce a site plan of the area. | * 1. Use the total station to survey topographical data required.   2. Conduct a site reconnaissance of assigned compass area to identify object to be surveyed and site condition for planning the field work.   3. Draw a detail site plan of the area on AutoCAD. |

**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**  May include but are not limited to: |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Electronic Total station Kit with tripods   + Automatic Electronic Levels   + Automatic level   + GPS receiver   + Survey compass   + Prismatic compass   + Ranging rod   + Levelling staff   + Engineer's multipurpose tilting level   + Robotic total stations   + Prism pole   + Dumpy Levels   + Theodolite Kit/Tachometer   + Tripod   + Steel Band Tapes (10m,20m,30m, and 50m)   + Open Real Measuring Tapes   + Plotter   + Laptop   + AutoCAD/ArchiCAD or other relevant design software |
| * Permits | * + Land surveying   + Building |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Measurement
* Survey skills
* Types of surveys
* Levelling
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Explained basic survey terminologies and fundamentals. Operated survey levels for a variety of survey exercises.   2. Demonstrated an understanding of curve ranging, definition of terms and describe tools and equipment being used and perform calculations on curve ranging and super elevation.   3. Demonstrated an understanding of terms and tools used in traversing and performed calculations related to traversing.   4. Operated a theodolite in tacheometry surveys and operate and use a total station.   5. Applied survey skills in setting out construction works.   6. Surveyed a section of the campus as directed and produced a site plan of the area. |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Observation   2. Oral presentation   3. Individual/group projects   4. Written tests   5. Individual/group assignments   6. Field Practice |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 5:

Keep records, measurements and other survey information in systematic order.

**UNIT CODE:** ENG/OS/CON/CR/05/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to keep records, measurements and other survey information in systematic order.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Operate survey levels for a variety of survey requirements. | * 1. Define terms used in levelling.   2. Explain tools and equipment used in levelling.   3. Set up and operate a variety of survey levels as required for various exercise and testing.   4. Outline the procedure of levelling and explain methods of reducing levels.   5. Describe the meaning and significance, calculate and adjust arithmetic errors in surveying.   6. Complete a set of level notes and graph results. |
| 1. Calculate the directions of survey control lines. | * 1. Define and determine the direction of a survey line.   2. Calculate the directions of survey lines in a closed survey.   3. Execute the standard check to ensure accuracy of results. |
| 1. Perform calculations related to traversing. | * 1. Define terms used in traversing.   2. Explain various instrumental methods of traversing.   3. Describe and demonstrate various types of traversing.   4. Execute field procedure of traversing.   5. Explain the causes and adjustments of errors. |

**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**  May include but are not limited to: |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Electronic Total station kit with tripods   + Automatic electronic levels   + Automatic level   + GPS receiver   + Survey compass   + Prismatic compass   + Ranging rod   + Levelling staff   + Engineer's multipurpose tilting level   + Robotic total stations   + Prism pole   + Dumpy Levels   + Theodolite Kit/Tachometer   + Tripod   + Steel Band Tapes (10m,20m,30m, and 50m)   + Open Real Measuring Tapes   + Field Notebook |
| * Permits | * + Land surveying   + Building |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Measurement
* Survey skills
* Types of surveys
* Levelling
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Operated a survey levels for a variety of survey exercises.   2. Calculated the directions of survey control lines.   3. Demonstrated an understanding of terms and tools used in traversing and performed calculations related to traversing. |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Observation   2. Oral presentation   3. Individual/group projects   4. Written tests   5. Individual/group assignments   6. Field Practice |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 6:

Assist in the preparation of detailed drawings, charts and plans.

**UNIT CODE:** ENG/OS/CON/CR/06/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to assist in the preparation of detailed drawings, charts and plans.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Operate survey levels for a variety of survey requirements. | * 1. Define terms used in levelling   2. Explain tools and equipment used in levelling.   3. Set up and operate a variety of survey levels as required for various exercise and testing.   4. Outline the procedure of levelling and explain methods of reducing levels.   5. Describe the meaning and significance, calculate and adjust arithmetic errors in surveying.   6. Complete a set of level notes and graph results. |
| 1. Perform calculations on curve ranging and super elevation. | * 1. Define various terms used in curve ranging.   2. Explain the purpose of curve ranging.   3. Describe tools and equipment’s for curve ranging.   4. Outline and calculate data for curve ranging and explain various methods of overcoming obstacles in curve ranging.   5. Calculate vertical curve elevations   6. Calculate spiral curve deflections.   7. Calculate road way super elevation. |
| 1. Apply surveying skills to control works. | * 1. Draw and interpret mass haul diagrams.   2. Identify and use tools and equipment in control works.   3. Calculate areas and volumes. |
| 1. Operate GPS receiver and use AutoCAD to draw maps. | 4. 1 Explain properties of maps.  4. 2 State types of maps.  4. 3 Analyse interrelationships between scales.  4. 4 Use GPS receiver to determine horizontal coordinates of point. |
| 1. Survey an assigned area as directed and produce a site plan of the area. | * 1. Use the total station to survey topographical data required   2. Conduct a site reconnaissance of assigned compass area to identify object to be surveyed and site condition for planning the field work.   3. Draw a detail site plan of the area on AutoCAD. |

**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**  May include but are not limited to: |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Electronic Total Station kit with tripods   + Automatic Electronic Levels   + Automatic Level   + GPS Receiver   + Survey Compass   + Prismatic Compass   + Ranging Rod   + Levelling Staff   + Engineer's multipurpose tilting level   + Robotic Total Stations   + Prism Pole   + Theodolite Kit/Tachometer   + Tripod   + Steel Band Tapes (10m,20m,30m, and 50m)   + Open Real Measuring Tapes   + Field Notebook   + Laptop   + AutoCAD/ArchiCAD or other relevant software |
| * Permits | * + Land surveying   + Building |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Measurement
* Survey skills
* Types of surveys
* Levelling
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Operated survey levels for a variety of survey exercises.   2. Demonstrated an understanding of curve ranging, definition of terms and described tools and equipment being used and performed calculations on curve ranging and super elevation.   3. Applied surveying skills to control works.   4. Operated a GPS receiver and used AutoCAD to draw maps.   5. Surveyed a section of the campus as directed and produced a site plan of the area. |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Observation   2. Oral presentation   3. Individual/group projects   4. Written tests   5. Individual/group assignments   6. Field Practice |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# CONCRETE FIELD-TESTING COMPETENCIES

# UNIT OF COMPETENCY 7:

Test, inspect and determine good quality materials for concrete manufacture.

**UNIT CODE:** ENG/OS/CFT/CR/07/5/A

**UNIT DESCRIPTION**

This unit describes the competencies required to competently understand test, inspect and determine good quality materials for concrete manufacture.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Explain the origins of rock and the formation of soil deposits. | * 1. Identify and distinguish the characteristics of igneous, sedimentary and metamorphic rocks and to explain the weathering of rock and the formation of soil deposits.   2. Distinguish and explain the differences among finer, cohesive and coarser, non-cohesive soils |
| 1. Convey (numerically) the physical state of a soil through its index properties. | 2.1 Determine the weight/volume of air, water and solid constituents of a given soil with the aid of a phase diagram and to subsequently express (numerically) the index properties of a soil. |
| 1. Classify soil according to grain size. | * 1. Determine the particle size distribution of a soil by sieve testing and express the results graphically in the form of a grain size distribution curve.   2. Express variation in particle size concisely in the form of the Uniformity Coefficient and the Coefficient of Curvature, and to compute the Fineness Modulus of an aggregate.   3. Classify a soil according to grain size and soil mixtures using the textural classification chart of the American Concrete Institute (ACI) |
| 1. Determine and express   (numerically) the properties of soils. | 4.1 Perform the standard laboratory permeability tests on  soil and express the results in the form of the Coefficient of Permeability.   * 1. Perform a standard pumping test on soil and express the results in the form of the Coefficient of Permeability and Shear.   2. Perform Field Compaction factor test   3. Determine Plasticity Index |

**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**  May include but are not limited to: |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Set of Sieves   + Sieve Shaker   + Sieve Moulds   + Compression Testing Machine   + Slump Test Apparatus   + Mechanical Sieve Shaker   + Drying Oven Concrete Mixer   + Poker Vibrator   + Coarse Aggregate Density Test Set   + Dunagan Test Set   + Organic Impurities Test Set   + Riffle Boxes (sample spliters)   + Vibrating Table   + Los Angeles Abrasion Machine   + Impact Testing Machine   + Iso 200mm Test Set   + Soil Hydrometers   + Consolidation Apparatus   + Soil Volume Change Meter   + Plate Bearing Test Machine   + Core Cutter   + Gauge Rods   + Chapman Flask % Voids in Aggregates   + Coarse Aggregate Density Test Set   + Length Gauge   + Automatic Mechanical Soil Compactor   + Soil Permeable Apparatus   + Motorized CBR Machine |
| * Permits | * Building |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Identify appropriate additives and admixtures in concrete
* Measurement
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy
* Testing procedures

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing
* Testing concrete members procedures
* Construction Health and Safety

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Identify and distinguish the characteristics of igneous, sedimentary and metamorphic rocks and to explain the weathering of rock and the formation of soil deposits.   2. Distinguish and explain the differences among finer, cohesive and coarser, non-cohesive soils. |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Field Practice/Observation   2. Oral presentations   3. Individual/group projects   4. Written tests   5. Individual/group assignments   6. Lab Testing |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated  workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 8:

Prepare concrete products of various classes and standards using appropriate equipment, materials.

**UNIT CODE:** ENG/OS/CFT/CR/08/5/A

**UNIT DESCRIPTION**

This unit describes the competencies required to competently understand and prepare concrete products of various classes and standards using appropriate equipment, materials.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Explain the origins of rock and the formation of soil deposits. | * 1. Identify and distinguish the characteristics of igneous, sedimentary and metamorphic rocks and to explain the weathering of rock and the formation of soil deposits.   2. Distinguish and explain the differences among finer, cohesive and coarser, non-cohesive soils |
| 1. Design and prepare a concrete mix | * 1. Design a concrete mix to calculate the quantities in kg. for water, cement, coarse aggregate and fine aggregate to produce one cubic meter of concrete.   2. The mix design quantities are to be based on the proposed concrete use, and the material specifications which are provided. |
| 1. Classify a soil according to grain size. | * 1. Determine the particle size distribution of a soil by sieve testing and express the results graphically in the form of a grain size distribution curve.   2. Express variation in particle size concisely in the form of the Uniformity Coefficient and the Coefficient of Curvature, and to compute the Fineness Modulus of an aggregate.   3. Classify a soil according to grain size and soil mixtures using the textural classification chart of the American Concrete Institute (ACI) |
| 1. Determine and express (numerically) the properties of soils. | * 1. Perform the standard laboratory permeability tests on soil and express the results in the form of the Coefficient of Permeability.   2. Perform a standard pumping test on soil and express the results in the form of the Coefficient of Permeability and Shear.   3. Perform Field Compaction factor test   4. Determine Plasticity Index |
| 1. Use basic concrete fundamentals and terminology | * 1. Outline the basic materials used to produce concrete, and their approximate percentages. Outline the advantages and limitations of concrete as a building material.   2. State the types of Portland cement commonly used and describe a typical application for each.   3. Describe the properties of finished concrete which are affected by the water to cement ratio. |
| 1. Carry out basic laboratory tests and related calculations for concrete aggregates | * 1. Complete a sieve analysis of the fine and coarse concrete aggregate. Plot the test results and the aggregate grading limits and determine graphically if the aggregates meet specifications.   2. Calculate the dry rodded unit weight of the concrete coarse aggregate and the fineness modulus of the fine aggregate. Determine whether the dry rodded unit weight and the fineness modulus of the aggregates meet specifications for concrete production.   3. Calculate the % of voids present in the lab aggregate samples and calculate the amount of cement paste required to produce concrete.   4. Calculate the moisture content of the concrete fine and coarse aggregates and make appropriate adjustments to reduce the concrete mix water requirements.   5. Calculate the maximum allowable size of aggregate in a concrete mix to cast a structural element such as a concrete beam, based on the beam dimensions and the number and size of steel reinforcing bars.   6. Cast a concrete beam based on the specifications provided. Test the beam for tensile strength by loading at mid-span until failure.   7. Mix concrete based on the mix design provided, cast test cylinders and place in a water bath to be moist cured. Perform standard concrete tests during the casting such as slump test and concrete unit weight.   8. Cap the concrete test cubes when hardened. Test the cubes for compressive strength in MPa at standard curing times of 7, 14, and 28 days.   9. Outline the conclusions which can be drawn from the compressive strength testing data with respect to strength vs. water to cement ratio, and strength vs. time of moist curing. Use the available data from all groups and graph the results in order to draw conclusions. Use a spreadsheet to carry out calculations and graphing. |
| 1. Design and prepare concrete mixes for specific uses. | * 1. Design a concrete mix to calculate the quantities in kg. for water, cement, coarse aggregate and fine aggregate to produce one cubic meter of concrete.   2. The mix design quantities are to be based on the proposed concrete use, and the material specifications which are provided. |

**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**  May include but are not limited to: |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Set of Sieves   + Sieve Shaker   + Compression Testing Machine   + Molds   + Slump Test Apparatus   + Mechanical Sieve Shaker   + Drying Oven   + Concrete Mixer   + Poker Vibrator   + Coarse Aggregate Density Test Set   + Dunagan Test Set   + Organic Impurities Test Set   + Riffle Boxes (sample spliters)   + Vibrating Table   + Los Angeles Abrasion Machine   + Impact Testing Machine   + Iso 200mm Test Set   + Soil Hydrometers   + Consolidation Apparatus   + Soil Volume Change Meter   + Plate Bearing Test Machine   + Core Cutter   + Gauge Rods   + Chapman flask % voids in aggregates   + Coarse aggregate density test set   + Length gauge   + Automatic mechanical soil compactor   + Soil permeable apparatus   + Motorized CBR machine   + Field CBR equipment   + CBR Test Machine (hand operated)   + Le-Chatelier Apparatus   + Aggregate Crushing Value Apparatus   + BR Moulds   + Compaction Rammers 2.5 kg and 4.5 kg   + Moulds for Compaction   + Concrete Standards BS 812   + Soil Standards BS |
| * Permits | * Building |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Identify appropriate additives and admixtures in concrete
* Measurement
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing
* Testing procedures
* Construction Health and Safety

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Identify and distinguish the characteristics of igneous, sedimentary and metamorphic rocks and to explain the weathering of rock and the formation of soil deposits.   2. Distinguish and explain the differences among finer, cohesive and coarser, non-cohesive soils |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials   4. AutoCAD software |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Field Practice/Observation   2. Oral presentations   3. Individual/group projects   4. Written tests   5. Individual/group assignments   6. Lab testing/assignments |
| 1. Context of   Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 9:

Record, calculate, analysis and compute measurements and other information obtained during concrete work activities.

**UNIT CODE:** ENG/OS/CFT/CR/09/5/A

**UNIT DESCRIPTION**

This unit describes the competencies required to competently understand record, calculate, analysis and compute measurements and other information obtained during concrete work activities.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Perform computations and unit conversions within and between the imperial and metric systems of measure. | * 1. Express the fundamental units associated with the Imperial and Metric Systems along with the standard prefixes used to denote order of magnitude.   2. Perform unit conversion within and between systems of measure using first principles.   3. Measure volume, weight, and density of various materials, and to express them in Imperial and Metric units through formal unit conversion. |
| 1. Explain the origins of rock and the formation of soil deposits. | * 1. Identify and distinguish the characteristics of igneous, sedimentary and metamorphic rocks and to explain the weathering of rock and the formation of soil deposits.   2. Distinguish and explain the differences among finer, cohesive and coarser, non-cohesive soils |
| 1. Convey (numerically) the physical state of a soil through its index properties. | 3.1 Determine the weight/volume of air, water and solid constituents of a given soil with the aid of a phase diagram and to subsequently express (numerically) the  index properties of a soil. |
| 1. Classify a soil according to grain size. | * 1. Determine the particle size distribution of a soil by sieve testing and express the results graphically in the form of a grain size distribution curve.   2. Express variation in particle size concisely in the form of the Uniformity Coefficient and the Coefficient of Curvature, and to compute the Fineness Modulus of an aggregate.   3. Classify a soil according to grain size and soil mixtures using the textural classification chart of the American Concrete Institute (ACI) |
| 1. Determine and express (numerically) the properties of soils. | * 1. Perform the standard laboratory permeability tests on soil and express the results in the form of the Coefficient of Permeability.   2. Perform a standard pumping test on soil and express the results in the form of the Coefficient of Permeability and Shear.   3. Perform Field Compaction factor test   4. Determine Plasticity Index |
| 1. Use basic concrete fundamentals and terminology | * 1. Outline the basic materials used to produce concrete, and their approximate percentages. Outline the advantages and limitations of concrete as a building material.   2. State the types of Portland cement commonly used and describe a typical application for each.   3. Describe the properties of finished concrete which are affected by the water to cement ratio. |
| 1. Carry out basic laboratory tests and related calculations for concrete aggregates | * 1. Complete a sieve analysis of the fine and coarse concrete aggregate. Plot the test results and the aggregate grading limits and determine graphically if the aggregates meet specifications.   2. Calculate the dry rodded unit weight of the concrete coarse aggregate and the fineness modulus of the fine aggregate. Determine whether the dry rodded unit weight and the fineness modulus of the aggregates meet specifications for concrete production.   3. Calculate the % of voids present in the lab aggregate samples and calculate the amount of cement paste required to produce concrete.   4. Calculate the moisture content of the concrete fine and coarse aggregates and make appropriate adjustments to reduce the concrete mix water requirements.   5. Calculate the maximum allowable size of aggregate in a concrete mix to cast a structural element such as a concrete beam, based on the beam dimensions and the number and size of steel reinforcing bars.   6. Cast a concrete beam based on the specifications provided. Test the beam for tensile strength by loading at mid-span until failure.   7. Mix concrete based on the mix design provided, cast test cylinders and place in a water bath to be moist cured. Perform standard concrete tests during the casting such as slump test and concrete unit weight.   8. Cap the concrete test cubes when hardened. Test the cubes for compressive strength in MPa at standard curing times of 7, 14, and 28 days.   9. Outline the conclusions which can be drawn from the compressive strength testing data with respect to strength vs. water to cement ratio, and strength vs. time of moist curing. Use the available data from all groups and graph the results in order to draw conclusions. Use a spreadsheet to carry out calculations and graphing. |

**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** |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Set of Sieves   + Sieve Shaker   + Compression Testing Machine   + Moulds   + Slump Test Apparatus   + Mechanical Sieve Shaker   + Drying Oven   + Concrete Mixer   + Poker Vibrator   + Coarse Aggregate Density Test Set   + Dunagan Test Set   + Organic Impurities Test Set   + Riffle Boxes (sample spliters)   + Vibrating Table   + Los Angeles Abrasion Machine   + Impact Testing Machine   + Iso 200mm Test Set   + Soil Hydrometers   + Consolidation Apparatus   + Soil Volume Change Meter   + Plate Bearing Test Machine   + Core Cutter   + Gauge Rods   + Chapman flask % voids in aggregates   + Coarse aggregate density test set   + Length gauge   + Automatic Mechanical Soil compactor   + Soil Permeable Apparatus   + Aggregate Crushing Value Apparatus |
| * Permits | * Building |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Identify appropriate additives and admixtures in concrete
* Measurement
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:  1.1 Determine the weight/volume of air, water and solid constituents of a given soil with the aid of a phase diagram and to subsequently express (numerically) the index properties of a soil. |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials   4. AutoCAD software |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Field Practice/Observation   2. Oral presentations   3. Individual/group projects   4. Written tests   5. Individual/group assignments |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 10:

Conduct unit conversions between systems of measure (metric and imperial).

**UNIT CODE:** ENG/OS/CFT/CR/10/5/A

**UNIT DESCRIPTION**

This unit describes the competency required to conduct unit conversions between systems of measure (metric and imperial).

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Perform computations and unit conversions within and between the imperial and metric systems of measure. | * 1. Express the fundamental units associated with the Imperial and Metric Systems along with the standard prefixes used to denote order of magnitude.   2. Perform unit conversion within and between systems of measure using first principles.   3. Measure volume, weight, and density of various materials, and to express them in Imperial and Metric units through formal unit conversion. |
| 1. Convey (numerically) the physical state of a soil through its index properties. | 2.1 Determine the weight/volume of air, water and solid constituents of a given soil with the aid of a phase  diagram and to subsequently express (numerically) the index properties of a soil. |

**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** |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Set of Sieves   + Sieve Shaker   + Compression Testing Machine   + Moulds   + Slump Test Apparatus   + Mechanical Sieve Shaker   + Drying Oven   + Concrete Mixer   + Poker Vibrator |
| * Permits | * Building |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Identify appropriate additives and admixtures in concrete
* Measurement
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Be able to express the fundamental units associated with the Imperial and Metric Systems along with the standard prefixes used to denote order of magnitude.   2. Be able to perform unit conversion within and between systems of measure using first principles.   3. Be able to measure volume, weight, and density of various materials, and to express them in Imperial and Metric units through formal unit conversion. |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials   4. AutoCAD software |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Field Practice/Observation   2. Oral presentations   3. Individual/group projects   4. Written tests   5. Individual/group assignments |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 11:

Interpret and edit working drawings for the construction of various formworks and determine reinforcements for concrete works.

**UNIT CODE:** ENG/OS/CFT/CR/11/5/A

**UNIT DESCRIPTION**

This unit describes the competencies required to competently understand interpret and edit working drawings for the construction of various formworks and determine required reinforcements for concrete works.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Perform computations and unit conversions within and between the imperial and metric systems of measure. | * 1. Express the fundamental units associated with the Imperial and Metric Systems along with the standard prefixes used to denote order of magnitude.   2. Perform unit conversion within and between systems of measure using first principles.   3. Measure volume, weight, and density of various materials, and to express them in Imperial and Metric units through formal unit conversion. |
| 1. Use basic wood fundamentals and terminology | * 1. Outline the advantages and limitations of wood as a building material.   2. Outline measures which can be taken to lessen the environmental impact of harvesting wood for use as a building material.   3. Outline the species of wood most often used for building materials, and the most common grades of lumber available.   4. Describe three ways in which the strength of wood is typically measured and describe how the strength is affected by the grain.   5. Describe the advantages of engineered wood products and compare the strength of conventional lumber to engineered wood. |
| 1. Erect and strike formwork construction | * 1. Outline procedures of erecting formwork   2. Determine sizes of formwork   3. Select sizes of formwork materials   4. Construction of formwork   5. Striking formwork |
| 1. Analyze compressive load and design the composite section required to carry/distribute load. | 4. 1 Describe the concept of relative stiffness between steel and concrete expressed in terms of the modular ratio.  4. 2 Determine and work with the equivalent, transformed cross section of a composite section subjected to uniform compression.  4. 3 Analyse and design a composite section subjected to ultimate compressive load. |
| 1. Analyze and determine required ultimate capacity/load requirement for concrete columns and identify appropriate column type. | 5.1 Elaborate on the more common types of columns in use (i.e. tied versus spiral columns) and the use of load- moment interaction diagrams in their analysis and design. |

**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**  May include but are not limited to: |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + AutoCAD/ArchiCAD or relative design software   + Laptop   + Plotter |
| * Permits | * Building |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Identify appropriate additives and admixtures in concrete
* Measurement
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Plan reading, formwork installation and removal,   2. Reinforcements, embedment’s,   3. Sampling and testing freshly mixed concrete, conveying, placing, consolidation,   4. Finishing, jointing, curing, and protection. |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials   4. AutoCAD software |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Field Practice/Observation   2. Oral presentations   3. Individual/group projects   4. Written tests   5. Individual/group assignments |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 12:

Conduct processes of concrete production including mixing, casting, jointing, testing, curing, consolidating and transporting in accordance with codes and job specifications.

**UNIT CODE:** ENG/OS/CFT/CR/12/5/A

**UNIT DESCRIPTION**

This unit describes the competencies required to competently understand and conduct processes of concrete production including mixing, casting, jointing, testing, curing, consolidating and transporting in accordance with codes and job specifications.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Perform computations and unit conversions within and between the imperial and metric systems of measure. | * 1. Express the fundamental units associated with the Imperial and Metric Systems along with the standard prefixes used to denote order of magnitude.   2. Perform unit conversion within and between systems of measure using first principles.   3. Measure volume, weight, and density of various materials, and to express them in Imperial and Metric units through formal unit conversion. |
| 1. Explain the origins of rock and the formation of soil deposits. | * 1. Identify and distinguish the characteristics of igneous, sedimentary and metamorphic rocks and to explain the weathering of rock and the formation of soil deposits.   2. Distinguish and explain the differences among finer, cohesive and coarser, non-cohesive soils |
| 1. Convey (numerically) the physical state of a soil through its index properties. | 3.1 Determine the weight/volume of air, water and solid constituents of a given soil with the aid of a phase  diagram and to subsequently express (numerically) the index properties of a soil. |
| 1. Classify a soil according to grain size. | * 1. Determine the particle size distribution of a soil by sieve testing and express the results graphically in the form of a grain size distribution curve.   2. Express variation in particle size concisely in the form of the Uniformity Coefficient and the Coefficient of Curvature, and to compute the Fineness Modulus of an aggregate.   3. Classify a soil according to grain size and soil mixtures using the textural classification chart of the American Concrete Institute (ACI) |
| 1. Determine and express (numerically) the properties of soils. | * 1. Perform the standard laboratory permeability tests on soil and express the results in the form of the Coefficient of Permeability.   2. Perform a standard pumping test on soil and express the results in the form of the Coefficient of Permeability and Shear.   3. Perform Field Compaction factor test   4. Determine Plasticity Index |
| 1. Use basic concrete fundamentals and terminology | * 1. Outline the basic materials used to produce concrete, and their approximate percentages. Outline the advantages and limitations of concrete as a building material.   2. State the types of Portland cement commonly used and describe a typical application for each.   3. Describe the properties of finished concrete which are affected by the water to cement ratio. |
| 1. Design and prepare concrete mixes for specific uses. | * 1. Design a concrete mix to calculate the quantities in kg. for water, cement, coarse aggregate and fine aggregate to produce one cubic meter of concrete.   2. Accurately base mix design quantities on the proposed concrete use, and the material specifications which are provided. |
| 1. Construct joints in concrete works | * 1. Demonstrate the construction of joints used in concrete work   2. Outline the processes of forming various types of joints   3. Identify appropriate positions for a construction joint |
| 1. Identify and use appropriate methods of adverse weather conditions | * 1. Perform concreting tasks in adverse weather conditions   2. Apply hot weather curing techniques in concrete works |
| 1. Evaluate the strength and stiffness of plain concrete in accordance with CSA and identify appropriate type, grade and any necessary steel reinforcement. | * 1. Know the individual and composite, mechanical properties of concrete and steel reinforcement.   2. Describe the types, grades and method of identification of steel reinforcement |

**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**  May include but are not limited to: |
| * PPEs | * Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Set of Sieves   + Sieve Shaker   + Compression testing Machine   + Moulds   + Slump Test Apparatus   + Mechanical Sieve Shaker   + Drying Oven   + Concrete Mixer   + Poker Vibrator   + In-situ water permeable test kit   + Concrete cover meter   + Bulk density kit   + Coarse aggregate density test set   + Dunagan test set   + Organic Impurities Test Set   + Riffle Boxes (sample spliters)   + Sieve shaker   + Vibrating Table   + Los Angeles Abrasion Machine   + Digital point load tester   + Impact Testing Machine   + Field CBR equipment   + CBR test machine (hand operated)   + Hand Operated Casagrande Equipment   + Motorized Casagrande Equipment   + Iso 200mm Test Set   + Soil Hydrometers   + Consolidation Apparatus   + Soil Volume Change Meter   + Plate Bearing Test Machine   + Core Cutter   + Rammers   + Block making machine (manually operated)   + Concrete poker vibrator   + Gauge Rods   + Chapman flask % voids in aggregates   + Coarse aggregate density test set   + Length gauge   + Automatic mechanical soil compactor   + Soil permeable apparatus   + Motorized CBR machine   + Cone penetrometer   + Plastic Limit Roller   + Le-Chatelier Apparatus   + Aggregate Crushing Value Apparatus   + CBR Moulds   + Compaction Rammers 2.5 kg and 4.5 kg   + Moulds for Compaction   + Concrete Standards BS 812   + Soil Standards BS |
| * Permits | * Building |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Identify appropriate additives and admixtures in concrete
* Measurement
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing
* AutoCAD

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Outline the basic materials used to produce concrete, and their approximate percentages. Outline the advantages and limitations of concrete as a building material.   2. State the types of Portland cement commonly used and describe a typical application for each.   3. Describe the properties of finished concrete which are affected by the water to cement ratio. |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials   4. AutoCAD software |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Field Practice/Observation   2. Oral presentations   3. Individual/group projects   4. Written tests   5. Individual/group assignments |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 13:

Perform finishing techniques.

**UNIT CODE:** ENG/OS/CFT/CR/13/5/A

**UNIT DESCRIPTION**

This unit describes the competencies required to competently understand and perform finishing techniques.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Work with, and to undertake, computations in both the imperial and metric systems of measure and to perform unit conversions within and between the two systems | * 1. Express the fundamental units associated with the Imperial and Metric Systems along with the standard prefixes used to denote order of magnitude.   2. Perform unit conversion within and between systems of measure using first principles.   3. Measure volume, weight, and density of various materials, and to express them in Imperial and Metric units through formal unit conversion. |
| 1. Convey (numerically) the physical state of a soil through its index properties. | 2.1 Determine the weight/volume of air, water and solid constituents of a given soil with the aid of a phase  diagram and to subsequently express (numerically) the index properties of a soil. |
| 1. Classify a soil according to grain size. | * 1. Determine the particle size distribution of a soil by sieve testing and express the results graphically in the form of a grain size distribution curve.   2. Express variation in particle size concisely in the form of the Uniformity Coefficient and the Coefficient of Curvature, and to compute the Fineness Modulus of an aggregate.   3. Classify a soil according to grain size and soil mixtures using the textural classification chart of the American Concrete Institute (ACI) |
| 1. Determine and express (numerically) the properties of soils. | 4.1 Perform the standard laboratory permeability tests on soil and express the results in the form of the Coefficient of  Permeability.   * 1. Perform a standard pumping test on soil and express the results in the form of the Coefficient of Permeability and Shear.   2. Perform Field Compaction factor test   Determine Plasticity Index |
| 1. Describe basic concrete fundamentals and terminology | * 1. Outline the basic materials used to produce concrete, and their approximate percentages. Outline the advantages and limitations of concrete as a building material.   2. State the types of Portland cement commonly used and describe a typical application for each.   3. Describe the properties of finished concrete which are affected by the water to cement ratio. |
| 1. Design and prepare concrete mixes for specific uses. | * 1. Design a concrete mix to calculate the quantities in kg. for water, cement, coarse aggregate and fine aggregate to produce one cubic meter of concrete.   2. The mix design quantities are to be based on the proposed concrete use, and the material specifications which are provided. |
| 1. Determine methods of concreting in adverse weather conditions | * 1. Perform concreting tasks in adverse weather conditions   2. Apply hot weather curing techniques in concrete works |
| 1. Evaluate the strength and stiffness of plain concrete in accordance with CSA and identify appropriate type, grade and any necessary steel reinforcement. | * 1. Demonstrated knowledge of the individual and composite, mechanical properties of concrete and steel reinforcement.   2. Describe the types, grades and method of identification of steel reinforcement |

**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** |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Set of Sieves   + Sieve Shaker   + Compression testing Machine   + Molds   + Slump Test Apparatus   + Mechanical Sieve Shaker   + Drying Oven   + Concrete Mixer   + Poker Vibrator   + In-situ water permeable test kit   + Concrete cover meter   + Bulk density kit   + Coarse aggregate density test set   + Dunagan test set   + Organic Impurities Test Set   + Riffle Boxes (sample splitters)   + Vibrating Table   + Los Angeles Abrasion Machine   + Digital point load tester   + Impact Testing Machine   + Field CBR equipment   + CBR test machine (hand operated)   + Hand Operated Casagrande Equipment   + Motorized Casagrande Equipment   + Iso 200mm Test Set   + Soil Hydrometers   + Consolidation Apparatus   + Soil Volume Change Meter   + Plate Bearing Test Machine   + Core Cutter   + Rammers   + Block making machine (manually operated)   + Concrete poker vibrator   + Gauge Rods   + Chapman flask % voids in aggregates   + Coarse aggregate density test set   + Length gauge   + Automatic mechanical soil compactor   + Soil permeable apparatus   + Motorized CBR machine   + Cone penetrometer   + Plastic limit roller   + Le-Chatelier Apparatus   + Aggregate Crushing Value Apparatus   + CBR Moulds   + Compaction Rammers 2.5 kg and 4.5 kg   + Moulds for Compaction   + Concrete Standards BS 812   + Soil Standards BS |
| * Permits | * Building |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Identify appropriate additives and admixtures in concrete
* Measurement
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy
* Testing of concrete members

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Outline the basic materials used to produce concrete, and their approximate percentages. Outline the advantages and limitations of concrete as a building material.   2. State the types of Portland cement commonly used and describe a typical application for each.   3. Describe the properties of finished concrete which are affected by the water to cement ratio. |
| 1. Resource Implications | The following resources must be provided:  2.1 PPEs   * 1. Tools and equipment   2. Writing materials   3. AutoCAD software |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Field Practice/Observation   2. Oral presentations   3. Individual/group projects   4. Written tests   5. Individual/group assignments |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# CONCRETE CONSTRUCTION FOREPERSON SPECIFIC COMPETENCIES

# UNIT OF COMPETENCY 14:

Organize construction site efficiently and effectively.

**UNIT CODE:** ENG/OS/CON/CR/01/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to organize construction site efficiently and effectively.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Identify required site construction office procedures and organizational structure and roles of contractors, sub-contractors, and stakeholders. | * 1. Explain and apply the scope of construction works   2. Explain and apply the meaning and principles of organization.   3. Describe the different types of construction   4. Illustrate various types of organization structure.   5. Define types of contractors and roles of various stakeholders   6. Use appropriate site construction office procedures. |
| 1. Review and interpret construction plan, existing services and specifications, and complete initial project site plan layout. | * 1. Plan construction site layout   2. Implement construction site layout plans   3. Read and interpret existing services and specifications |
| 1. Execute and plan site organization and layout | * 1. Plan and execute site layout plan   2. Define access routes   3. Implement security hoarding and fencing   4. Define existing services |
| 1. Read and interpret contracts | * 1. Explain the role of parties involved in building contracts   2. Outline types of contracts   3. Describe various methods of tendering   4. Apply contract laws |

**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**  May include but are not limited to: |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Design software (AutoCAD, ArchiCAD etc.)   + Project scheduling software such as MS Project (most current version)   + Laptop   + Occupational Health and Safety Standards   + Standard operating and/or other workplace procedures manuals   + Machine/equipment manufacturer’s specifications and instructions   + Plans table   + Kenyan British Standard Building Book |
| * Permits | * + Land surveying   + Building   + Electrical   + HVAC   + Plumbing   + Soils reports   + Foundation |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Measurement
* Survey skills
* Types of surveys
* Levelling
* Drawing and sketching
* Communication skills
* Site works
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy
* Use of tools and equipment
* Identify appropriate additives and admixtures in concrete
* Concrete testing procedures
* Construction site management

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing
* Project management software

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Explain and apply the meaning, principles and functions of management.   2. Explain and apply the meaning and principles of organization.   3. Illustrate various types of organization structure.   4. Use appropriate office procedures. |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials   4. AutoCAD software   5. Project management software |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Field Practice/Observation   2. Oral presentations   3. Individual/group projects   4. Written tests   5. Individual/group assignments |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 15:

Perform work plan and schedule activities.

**UNIT CODE:** ENG/OS/CON/CR/02/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to perform work plan and schedule activities.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Identify and establish required resources | * 1. Establishing people, equipment, material, cost, and pay resources   2. Adjusting work times and adding resource notes |
| 1. Define Resource and Task Assignments | 2.1 Assigning work resources to tasks, adding more work resource assignments to tasks, assigning material resources to tasks, and cost resources |
| 1. Refine Project Schedule | 3.1 Apply a task calendar to an individual’s task, changing tasks types, splitting a task, establishing recurring tasks, applying task constraints, reviewing the project’s  critical path, viewing resource allocations overtime |
| 1. Review and finalize tasks, task scheduling, and required resources | * 1. Managing task constraints and relationships   2. Apply deadline dates, task priorities, establishing manually scheduled tasks   3. Entering material resource consumption, assigning multiple pay rates for resources,   4. Applying different cost rates to assignments, specifying resource availability, resolving resource over allocations, leveling |
| 1. Identify required project information and scheduling details. | * 1. Sort resource data, group data, filtering data,   2. Gantt chart formatting |
| 1. Implement Project information and schedule tracking. | * 1. Establishing a project baseline   2. Track a project as scheduled   3. Apply the completion percentage for a task   4. Identifying over budget tasks and resources and resolve   5. Identifying and resolving time and schedule problems |

**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**  May include but are not limited to: |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Design software (AutoCAD, ArchiCAD etc.)   + Project scheduling software such as MS Project (most current version)   + Laptop   + Occupational Health and Safety Standards   + Standard operating and/or other workplace procedures manuals   + Machine/equipment manufacturer’s specifications and instructions   + Plans table   + Kenyan British Standard Building Book |
| * Permits | * + Land surveying   + Building   + Electrical   + HVAC   + Plumbing   + Soils reports   + Foundation |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Measurement
* Survey skills
* Types of surveys
* Levelling
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing
* Project management software

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Explain basic accounting concepts   2. Identify and resolve scheduling complications   3. Demonstrate an understanding of effective work breakdown structure   4. Demonstrate an understanding of terms used in project management |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials |
| 1. Methods of Assessment | Competency in this unit may be assessed through:  3.1 Observation   * 1. Oral presentation   2. Individual/group projects   3. Written tests   4. Individual/group assignments   5. Field Practice |
| 1. Context of   Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 16:

Procure, receive and engage in proper store keeping.

**UNIT CODE:** ENG/OS/CON/CR/03/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to procure, receive and engage in proper store keeping.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Procure materials using appropriate procedures and documentation. | * 1. Define materials procurement procedures   2. Calculate materials procurement   3. Outline procedures ordering materials   4. Record and document inventory lists |
| 1. Define and implement required sourcing/outsourcing strategies. | * 1. Define various terms for sourcing materials and equipment   2. Explain the purpose of outsourcing   3. Describe the organizational process of assets   4. Implement the sourcing strategy |
| 1. Effectively negotiate with suppliers and select the supplier. | * 1. Define terms used in a make or buy analysis   2. Explain various contract types   3. Describe and demonstrate project management plan   4. Execute field procedures for request for changes   5. Collect supplier information |

**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** |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Project scheduling software such as MS Project (most current version)   + Laptop |
| * Permits | * + Land surveying   + Building   + Electrical   + HVAC   + Plumbing   + Soils reports   + Foundation |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Measurement
* Survey skills
* Types of surveys
* Levelling
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Calculate book of accounts   2. Demonstrated an understanding of terms used in accounting concepts and perform calculations related to procurement.   3. Explain various accounting concepts   4. Compute final bill of accounts |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Observation   2. Oral presentation   3. Individual/group projects   4. Written tests   5. Individual/group assignments   6. Field Practice |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 17:

Interpret and compute the schedule of materials from the bill of quantities.

**UNIT CODE:** ENG/OS/CON/CR/04/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to Interpret and compute the bill of materials from the bill of quantities.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Establish, implement, and maintain project budget tracking tools and procedures and prepare and maintain financial statements and accounts | * 1. Compute proper accounting records   2. Calculate annual accounts   3. Outline procedures project cost tracking   4. Prepare financial accounts |
| 1. Quantify costs and verify/validate claimed work and/or invoices. | * 1. Define various tools and techniques to quantify the claimed work   2. Explain the importance of activity cost tracking   3. Describe the organization of cost estimating   4. Execute documents that present quantification |
| 1. Compute cost and schedule analysis and update project budget reporting. | * 1. Document proper data to support quantity calculations   2. Explain various contract types   3. Assess schedule effect of changes and claims to compare the as-planned schedule   4. Execute procedures for project actual activity |

**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 |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Project scheduling software, such as MS Project (most recent version)   + Laptop |
| * Permits | * + Land surveying   + Building   + Electrical   + HVAC   + Plumbing   + Soils reports   + Foundation |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Measurement
* Survey skills
* Types of surveys
* Levelling
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Explained basic terminologies and fundamentals.   2. Develop calculation sheets   3. Demonstrated an understanding of bill of quantities   4. Demonstrated an understanding of terms project control   5. Operated project tracking software   6. Applied management skills in setting out construction works. |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Observation   2. Oral presentation   3. Individual/group projects   4. Written tests   5. Individual/group assignments   6. Field Practice |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 18:

Observe the relevant/applicable statutory obligations in day to day activities.

**UNIT CODE:** ENG/OS/CON/CR/05/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to observe the relevant/applicable statutory obligations in day to day activities.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Manage daily operations and activities for project. | * 1. Outline and explain the management concept   2. Apply the work study concept in construction   3. Perform contract planning and programming   4. Carry out material procurement |
| 1. Interpret and apply relevant construction Laws | * 1. Outline and identify basic principles of laws of Kenya   2. Outline and state landownership, mortgages and charge |
| 1. Manage daily required human resources for project | * 1. Explain personnel management concept   2. Handle labour relations |
| 1. Prepare and keep proper accounting records and financial accounts | * 1. Explain various accounting concepts   2. Understand various books of account   3. Compute financial accounts |

**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**  **May include but are not limited to:** |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Project scheduling software, such as MS Project (most recent version)   + Laptop   + Occupational Health and Safety Standards   + Standard operating and/or other workplace procedures manuals   + Site specific job procedures manual   + Kenyan British Standard Building Code |
| * Permits | * + Land surveying   + Building   + Electrical   + HVAC   + Plumbing   + Soils reports   + Foundation |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Measurement
* Survey skills
* Types of surveys
* Levelling
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Explain and outline the structure of jurisdiction of law courts in Kenya   2. Identify the sources of law   3. Explain the various implications of trespassing   4. Distinguish types of nuisance   5. Outline the law governing land ownership in Kenya   6. Outline the types of mortgages and charge   7. Describe arbitration procedure |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Observation   2. Oral presentation   3. Individual/group projects   4. Written tests   5. Individual/group assignments   6. Field Practice |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 19:

Exercise proper leadership (communication, delegation, supervision).

**UNIT CODE:** ENG/OS/CON/CR/06/5/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to exercise proper leadership (communication, delegation, supervision).

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function (to be stated in active voice) | **PERFORMANCE CRITERIA**  These are **assessable statements** which specify the required level of performance for each of the elements (to be stated in passive voice)  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Supervise and lead concrete construction personnel | * 1. Demonstrated leadership   2. Selected qualified personnel   3. Demonstrated leadership   4. Handled labour relationship effectively |
| 1. Select, hire, and manage, in accordance with labour laws and requirements, construction personnel and ensure that employee training and qualifications meet and remain current with industry and government regulatory requirements. | * 1. Recruit qualified team members   2. Provide site specific training   3. Evaluate staff efficiency   4. Identify and discipline and termination procedures   5. Demonstrate leadership   6. Network with industry professionals   7. Assist with industrial training   8. Describe regulations governing employment in the construction industry   9. Define factory and labour act |

**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**  **May include but are not limited to:** |
| * PPEs | * + Work boots   + Hard hat   + Safety glasses   + Safety vest   + Gloves |
| * Tools, equipment | * + Design software (AutoCAD, ArchiCAD etc.)   + Project scheduling software such as MS Project (most current version)   + Laptop   + Occupational Health and Safety Standards   + Standard operating and/or other workplace procedures manuals   + Machine/equipment manufacturer’s specifications and instructions   + Plans table   + Kenyan British Standard Building Book   + Site specific job procedures manuals |
| * Permits | * + Land surveying   + Building   + Electrical   + HVAC   + Plumbing   + Soils reports   + Foundation |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills:**

The individual needs to demonstrate the following skills:

* Use of tools and equipment
* Measurement
* Survey skills
* Types of surveys
* Levelling
* Drawing and sketching
* Communication skills
* Numeracy skills
* Digital literacy skills
* Safety and Health practices
* Environmental literacy

**Required Knowledge:**

The individual needs to demonstrate knowledge of:

* National legislations and regulations
* Types of tools, equipment and PPEs
* Design and drawing

**EVIDENCE GUIDE**

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

|  |  |
| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:   * 1. Demonstrated leadership   2. Selected qualified personnel   3. Demonstrated leadership   4. Handled labour relationship effectively |
| 1. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   * 1. Observation   2. Oral presentation   3. Individual/group projects   4. Written tests   5. Individual/group assignments   6. Field Practice |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these. Off the job assessment must be undertaken in a closely simulated workplace environment. |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |