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**REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**CONCRETE FIELD TESTING**

**LEVEL 4**



TVET CDACC

P.O. BOX 15745-00100

NAIROBI

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**Council Secretary/CEO**

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

**P.O. Box 15745–00100**

**Nairobi, Kenya**

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

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# 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 2010.

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 Field-Testing. These Occupational Standards will also be the bases for assessment of an individual for competence certification.

It is my conviction that these occupational 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 standards for Concrete Field Testing.

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

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

**CHAIRMAN, TVET CDACC**

# ACKNOWLEDGMENT

These occupational standards have been designed for competency-based training and has independent units of learning that allow the trainee flexibility in entry and exit. In developing these standards, 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 these standards 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 these standards.

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 these standards. I also thank all stakeholders in the sector for their valuable input and all those who participated in the process of developing these occupational standards.

I am convinced that these standards 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/OS/CFT/BC/01/4/A**

Industry or sector

Occupational Standards

Occupational area

Type of competency

Competency number

Competency level

Version control

# COURSE OVERVIEW

The **Concrete Field-Testing Level 4 Qualification** consists of competencies that an individual must achieve to properly perform various testing, observation, and inspection on construction materials such as soil, aggregates, concrete, masonry, reinforcing steel and asphalt. Complete, document and record the results of field tests.

The Units of Competency comprising Concrete Field Testing Level 4 Qualification includes the following:

**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**

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.

# BASIC UNITS OF COMPETENCY

**DEMONSTRATE COMMUNICATION SKILLS**

**UNIT CODE:** ENG/OS/CFT/BC/01/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to gather, interpret and convey information in response to workplace requirements and to lead in the dissemination and discussion of ideas, information and issues in the workplace.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Obtain and convey workplace information | * 1. Specific and relevant information is accessed from ***appropriate sources***   2. Effective questioning, active listening and speaking skills are used to gather and convey information   3. Appropriate ***medium*** is used to transfer information and ideas   4. Appropriate non- verbal communication is used   5. Appropriate lines of communication with supervisors and colleagues are identified and followed   6. Defined workplace procedures for the location and ***storage*** of information are used   7. Personal interaction is carried out clearly and concisely |
| 1. Complete relevant work related documents | * 1. Range of forms relating to conditions of employment are completed accurately and legibly   2. Workplace data is recorded on standard workplace forms and documents   3. Basic mathematical processes are used for routine calculations   4. Errors in recording information on forms/ documents are identified and properly acted upon   5. Reporting requirements to supervisor are completed according to organizational guidelines |
| 1. Communicate information about workplace processes | * 1. Appropriate method of communication is selected   2. Multiple operations involving several topics areas are communicated accordingly   3. Questions are used to gain extra information   4. Correct sources of information are identified   5. Information is selected and organized correctly   6. Verbal and written reporting is undertaken when required   7. Communication skills are maintained in all situations |
| 1. Lead workplace discussion | * 1. Response to workplace issues are sought   2. Response to workplace issues are provided immediately   3. Constructive contributions are made to workplace discussions on such issues as production, quality and safety   4. Goals/objectives and action plan undertaken in the workplace are communicated accordingly |
| 1. Identify and communicate issues arising in the workplace | * 1. Issues and problems are identified as they arise   2. Information regarding problems and issues are organized coherently to ensure clear and effective communication   3. Dialogue is initiated with appropriate personnel   4. Communication problems and issues are raised as they arise |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. 1.***Methods of communication*** include but not limited to: | 1.1. Non-verbal gestures  1.2. Verbal  1.3. Face to face  1.4. Two-way radio  1.5. Speaking to groups  1.6. Using telephone  1.7. Written  1.8. Internet |
| 1. 2.***Workplace discussion*** include but not limited to: | 2.1. Coordination meetings  2.2. Toolbox discussion  2.3. Peer-to-peer discussion |

**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:

* Organize information
* Understand and convey intended meaning
* Participate in variety of workplace discussions
* Comply with organization requirements for the use of written and electronic communication methods
* Effective report writing
* Effective clarifying and probing skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Organization requirements for written and electronic communication methods
* Effective verbal communication methods
* Report writing
* Effective questioning techniques (clarifying and probing)
* Workplace etiquette

**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 Dealt with a range of communication/information at one time  1.2 Made constructive contributions in workplace issues  1.3 Sought workplace issues effectively  1.4 Responded to workplace issues promptly  1.5 Presented information clearly and effectively in written form  1.6 Used appropriate sources of information  1.7 Asked appropriate questions  1.8 Provided accurate information |
| 1. Resource Implications | The following resources should be provided:  2.1 Variety of Information  2.2 Communication tools  2.3 Simulated workplace |
| 1. Methods of Assessment | 3.1 Case Study  3.2 Third-party reports  3.3 Portfolio  3.4 Interview  3.5 Role Play |
| 1. Context of Assessment | Competency may be assessed individually in the actual workplace or through accredited institution |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE NUMERACY SKILLS**

**UNIT CODE:** ENG/OS/CFT/BC/02/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to perform numerical functions.The person who is competent in this unit shall be able to: Identify and use whole numbers and simple fractions, decimals and percentages; Identify, measure and estimate familiar quantities for work, Read and use familiar maps, plans and diagrams for work, Identify and describe common 2D and some 3D shapes for work, Construct simple tables and graphs for work using familiar data, Identify and interpret information in familiar tables, graphs and charts for work.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |  |
| --- | --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range.*** |
| 1. Identify and use whole numbers and simple fractions, decimals and percentages for work | | 1. Simple fractions, decimals and percentages identified and interpreted 2. understanding of place value by organising numbers from smallest to largest demonstrated 3. Required numerical information located and decision made on appropriate method to solve a problem 4. Limited range of calculations performed using the 4 operations 5. Links between operations described 6. Estimations made to check reasonableness of results of problem solving process 7. Numerical information recorded and the result of the task communicated using informal and some formal language and symbolism |
| 2. Identify, measure and estimate familiar quantities for work | 1. Measurement information in workplace tasks and texts identified and interpreted 2. Familiar units of measurement needed for tasks is identified 3. Familiar and simple amounts estimated 4. Appropriate measuring equipment selected 5. Simple measuring equipment graduated in familiar units to measure relevant quantities is used 6. Calculation done using familiar units of measurement 7. measurements and results checked against estimates 8. Results are recorded or reported 9. Results relevant to the workplace task are communicated using informal and some formal mathematical and general language |
| 3. Read and use familiar maps, plans and diagrams for work | 1. Items and places are located in familiar maps, plans and diagrams 2. Common symbols and keys recognised in familiar maps, plans and diagrams 3. Understanding of direction and location demonstrated by describing the location of objects, or route to familiar places 4. Instructions to locate familiar objects or places are given and followed 5. Informal and some formal oral mathematical language and symbols are used |
| 4. Identify and describe common 2D and some 3D shapes for work | 1. Common 2D shapes and some common 3D shapes in familiar situations are identified and named 2. Common 2D shapes and designs are compared and classified 3. Informal and some formal language used to describe common two dimensional shapes and some common three dimensional shapes 4. Simple items used to draw or construct common 2D shapes 5. Common 3D shapes matched to their 2D sketches or nets |
| 5.Construct simple tables and graphs for work using familiar data | 1. Common types of graphs are identified and named 2. Familiar data to be collected is determined 3. A method to collect data is selected 4. A small amount of simple familiar data is collected 5. One or two variables determined from the data collected 6. Data ordered and collated 7. A table constructed and data enter 8. Graphs are constructed using data from table 9. Results are promptly checked 10. Graph information related to work is reported or discussed using informal and some formal mathematical and general language |
| 6. Identify and interpret information in familiar tables, graphs and charts for work | 1. Simple tables are identified in familiar texts and contexts 2. Title, headings, rows and columns located in familiar tables 3. Information and data in simple tables identified and interpreted 4. Information is related to relevant workplace tasks 5. Familiar graphs and charts are identified in familiar texts and contexts 6. Title, labels, axes, scale and key from familiar graphs and charts are located 7. Information and data in familiar graphs and charts is identified and interpreted 8. Information related to relevant workplace tasks |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| 1. Simple measuring equipment | May include but not limited to:  1.1 Rulers  1.2 Watches/clocks  1.3 Scales  1.4 Thermometers  1.5 AVO meter |
| 1. Common 2D shapes and common 3D shapes | May include but not limited to:  2.1 Round  2.2 Square  2.3 Rectangular  2.4 Triangle  2.5 Sphere  2.6 Cylinder  2.7 Cube  2.8 Polygons  2.9 Cuboids |
| 3. Diagrammatical representation | May include but not limited to:   1. Charts 2. Maps 3. Graphs |

**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:

Applying Fundamental operations (addition, subtraction, division, multiplication)

Using calculator

Using different measuring tools

**Required knowledge**

The individual needs to demonstrate knowledge of:

* Types of common shapes
* Differentiation between two dimensional shapes / objects
* Formulae for calculating area and volume
* Types and purpose of measuring instruments
* Units of measurement and abbreviations
* Fundamental operations (addition, subtraction, division, multiplication)
* Rounding techniques
* Types of fractions
* Different types of tables and graphs
* Meaning of graphs, such as increasing, decreasing, and constant value
* Preparation of basic data, tables & graphs

**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. Simple fractions, decimals and percentages are correctly identified and interpreted   2. Performed a limited range of calculations using the 4 operations   3. Performed calculations using familiar units of measurement   4. Recognised common symbols and keys in familiar maps, plans and diagrams   5. Constructed simple tables and graphs using familiar data   6. Identified and interpret information in familiar tables, graphs and charts |
| 2. Resource Implications | 2.1 Calculator   * 1. Basic measuring instruments |
| 1. Methods of Assessment | Competency may be assessed through:  3.1 Written Test  3.2 Interview/Oral Questioning   * 1. Demonstration |
| 1. Context of Assessment | Competency may be assessed in an off the job setting |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE DIGITAL LITERACY**

**UNIT CODE:** ENG/OS/CFT/BC/03/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required to effectively demonstrate digital literacy in a working environment. It entails identifying and using digital devices such as smartphones, tablets, laptops and desktop PCs for purposes of communication and performing work related tasks at the work place.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Identify computer software and hardware | * 1. ***Appropriate computer software*** is identified according to manufacturer’s specification   2. ***Appropriate computer hardware*** is identified according to manufacturer’s specification |
| 1. Apply security measures to data, hardware, software | * 1. ***Data security and privacy are classified*** in accordance with the technological situation   2. ***Security and control measures*** are applied in accordance with laws governing protection of ICT   3. Computer threats and crimes are detected.   4. Protection against computer crimes is undertaken in accordance with laws governing protection of ICT |
| 1. Apply computer software in solving tasks | * 1. Basic ***word processing concepts*** are applied in resolving workplace tasks   2. ***Word processing utilities*** are applied in accordance with workplace procedures   3. Data is manipulated on worksheet in accordance with office procedures |
| 1. Apply internet and email in communication at workplace | * 1. Electronic mail is applied in workplace communication in accordance with office procedures   2. Office internet functions are defined and executed in accordance with office procedures   3. ***Network configuration*** and uses are determined in accordance with office operations procedures |

**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.

|  |  |
| --- | --- |
| **Range** | **Variable** |
| ***Appropriate computer software*** may include but not limited to: | * A collection of instructions that enable the user to interact with a computer, its hardware, or perform tasks. * Computer tools that will help computer users interact with the hardware in a computer*.* |
| ***Appropriate computer hardware*** may include but not limited to: | Collection of physical parts of a computer system. This includes the computer case, monitor, keyboard, and mouse and all the parts inside the computer case, such as the hard disk drive, motherboard, video card, |
| ***Data security and privacy*** may include but not limited to: | * Confidentiality * Cloud computing * Confidentiality * Cyber terrorism * Integrity -but-curious data serving |
| ***Security and control measures*** may include but not limited to: | * Countermeasures and risk reduction * Cyber threat issues * Risk management |
| ***Word processing concepts*** may include but not limited to: | Using a special program to create, edit, and print documents |
| ***Network configuration*** may include but not limited to: | Organizing and maintaining information on the components of a computer network |

**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:

* Analytical skills
* Interpretation
* Typing
* Communication
* Computing (applying fundamental operations such as addition, subtraction, division and multiplication)
* Using calculator
* Basic ICT skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Input and output devices
* Central processing Unit (CPU)
* Peripherals
* Storage Media
* Software concept
* Types of concept
* Function of computer software
* Data security and privacy
* Security threats and control measures
* Computer crimes
* Detection and protection of computer crimes
* Laws governing protection of ICT
* Word processing;
* Functions and concepts of word processing.
* Documents and tables creation and manipulations
* Mail merging
* Word processing utilities
* Spread sheet;
* Meaning, formulae, function and charts, uses, layout, data manipulation and application to cell
* Networking and Internet;
* Meaning, functions and uses of networking and internet.
* Electronic mail and world wide web
* Emerging trends and issues in ICT;
* Identify and apply emerging trends and issues in ICT
* Challenges posed by emerging trends and issues

**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. Identified input, output, CPU and storage media devices of computers in accordance to computer specification   2. Identified concepts, types and functions of computer software according to operation manual   3. Identified and controlled security threats   4. Detected and protected computer crimes   5. Applied word processing in office tasks   6. Prepared work sheet and applied data to the cells in accordance to workplace procedures   7. Used Electronic Mail for office communication as per workplace procedure   8. Applied internet and World Wide Web for office tasks in accordance with office procedures   9. Applied laws governing protection of ICT |
| 1. Resource Implications | * 1. Smartphones   2. Tablets   3. Laptops   4. Desktop computers   5. Calculators   6. Internet   7. Operation Manuals |
| 1. Methods of Assessment | Competency may be assessed through:   * 1. Written Test   2. Demonstration   3. Practical assignment   4. Interview/Oral Questioning   5. Demonstration |
| 1. Context of Assessment | Competency may be assessed in an off and on the job setting |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE ENTREPRENEURIAL SKILLS**

**UNIT CODE :** ENG/OS/CFT/BC/04/4/A

**UNIT DESCRIPTION**

This unit covers the competencies required for creating and maintaining small scale business, establishing small business customer base, managing and growing a micro/small-scale business.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the **key outcomes** which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Create and maintain small-scale business | 1.1 Generation and evaluation of business ideas is undertaken in accordance with the existing procedure  1.2 Competencies are matched with business opportunities in accordance with business practices.  1.3 Procedure for starting a small business is identified as per the legal requirements  1.4 SWOT/ PESTEL analysis and or industrial survey is carried out according to office procedures  1.5**Business operations** are monitored and controlled following established procedures.  1.6Quality assurance measures are implemented consistently.  1.7 Good relations are maintained with staff/workers.  1.8Policies and procedures on occupational safety and health and environmental concerns are constantly observed. |
| 2. Establish small business customer base | 2.1 Good customer relations are maintained in accordance with office procedures  2.2 New customers and markets are identified, explored and reached out to according to the marketing plan  2.3 Promotions/Incentives are offered to loyal customers in accordance with office procedures  2.4 Additional products and services are evaluated and tried in accordance with marketing strategy  2.5 Customer record is maintained in accordance with office procedures |
| 3. Manage small scale business | 3.1 Enterprise is built up and sustained through judicious control of cash flows.  3.2 **Profitability of enterprise** is ensured though appropriate internal controls.  3.3 Unnecessary or lower-priority expenses and purchases are avoided to ensure profitability  3.4 Basic cost-benefit analysis are undertaken in accordance with office procedures  3.5 Basic financial management are undertaken in accordance with office procedures  3.6 Basic financial accounting in undertaken in accordance with office procedures  3.7 Business **internal controls** are implemented in accordance with office procedure  3.8 Setting business priorities and strategies is carried out according to office procedures  3.9 Preparation and interpretation of basic financial statements is undertaken in accordance with set procedures  3.10Preparation of business plans for small business is undertaken in accordance with business strategy  3.11 Business Social Responsibility is maintained in accordance with Standard Operations Procedures (SOP) |
| 4.Grow/ expand small scale business | 4.1 Prepared business growth strategy for small sale business in accordance with office procedures  4.2 Incorporated technology in small scale business growth in accordance with technological trends  4.3 Emerging issues and trends are considered in accordance with business growth strategy  4.4 Built audience interest in product/service according to growth strategy  4.5 Boosted cooperate communication according to business **communication strategy** |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| **Business Strategy** include but not limited to: | Manage wastages, environmental conservation |
| **Business Operations** include but not limited to: | * Purchasing * Accounting/administrative * Work production/operations/sales * Marketing |
| **Internal control** include but not limited to: | * Accounting systems * Financial statements/reports * Cash management * Human resource management |
| **Profitability of enterprise** include but not limited to: | Operating expenses lower than income |
| **Communication strategy** include but not limited to: | * Blue print of exchange of information * Technology and exchange of information |

**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:

* Individual marketing skills
* Using basic advertising (posters/ tarpaulins, flyers, social media,
* Basic bookkeeping/ accounting skills
* Communication skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Generation and evaluation of business ideas
* Legal requirements for starting a small business
* SWOT/ PESTEL analysis
* Occupational Safety and Health
* Public relations concepts
* Business plan
* Business financing
* Marketing strategies
* Business management and control
* Production/ operation process
* Product promotion strategies
* Market and feasibility studies
* Business ethics
* Building customer relations
* Business models and strategies
* Types and categories of businesses
* Business internal controls
* Relevant national and local legislation and regulations
* Basic quality control and assurance concepts
* Building relations with customer and employees
* Building competitive advantage of the enterprise
* Business growth strategies

**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 Demonstrated entrepreneurial skills  1.2 Demonstrate competencies to create a small-scale business  1.2 Demonstrated ability to conceptualize and plan a micro/small business  1.3 Grew customer base for the small-scale business  1.3 Demonstrated ability to manage/operate a micro/small-scale business  1.4 Demonstrated competencies to grow a micro/small-scale business |
| 1. Resource Implications | |  | | --- | | The following resources should be provided: |   2.1 Case studies on micro/small-scale enterprises  2.2 Materials and location relevant to the proposed activity and tasks |
| 1. Methods of Assessment | Competency in this unit may be assessed through:   |  |  | | --- | --- | | 3.1 Case studies  3.2 Oral Questioning  3.3 Portfolio  3.4 Projects |  | |
| 1. Context of Assessment | 4.1 Competency may be assessed in workplace or in a simulated workplace setting  4.2 Assessment shall be observed while tasks are being undertaken whether individually or in-group |
| 1. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE EMPLOYABILITY SKILLS**

**UNIT CODE:** ENG/OS/CFT/BC/05/4/A

**UNIT DESCRIPTON**

This unit covers the competencies required to demonstrate employability skills. It involves competencies for exuding self-awareness and dealing with everyday life challenges; applying critical safe work habits and working harmoniously in a team; participating in planning and organizing work activities; applying learning, creativity and innovativeness in workplace functions; pursuing professional growth and managing time effectively in the workplace.

**ELEMENTS AND PERFORMANCE CRITERIA**

|  |  |
| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Develop self-awareness and ability to deal with life challenges | 1. Personal goals and objectives are written based on potential and in relation to organization objectives. 2. Emotions are handled as per workplace requirement. 3. Thoughts, feelings and beliefs are shared with superiors in direct and honest ways in line with organization policy. 4. Assertiveness is developed and maintained based on the requirements of the job. 5. Individual performance is recorded and monitored according to the agreed targets. 6. Ideas that generate excitement, interest and commitment are shared with immediate supervisors in line with workplace policy. 7. Accountability for assigned duties is demonstrated. 8. Self-esteem and a positive self-image are developed and demonstrated based on job requirements. |
| 1. Demonstrate critical safe work habits for employees | 1. Stress is handled at the workplace in accordance with standard procedures. 2. Punctuality and time consciousness is demonstrated in line with organization policy. 3. ***Personal objectives*** are integrated with organization objectives in accordance with organization’s policy. 4. Resources are effectively and efficiently utilized in accordance with workplace policy. 5. Work activities are prioritized based on standard operating procedures. 6. Task objectives are met in according to workplace procedures. 7. Individual performance targets are set in line with organization objectives. 8. Performance targets are met based on targets agreed as per workplace policy. 9. Assertiveness is demonstrated based on the requirements of the job. 10. Leisure time is used positively and productively in line with workplace policy. 11. Abstinence from ***drug and substance abuse*** is demonstrated as per workplace policy. 12. Awareness of HIV and AIDS is demonstrated in line with workplace policy and requirements of the job. 13. ***Emerging issues*** are dealt with in accordance with organization policy. |
| 1. Demonstrate workplace teamwork | 1. Roles and objectives of the team are identified in accordance organization policy. 2. Team parameters and relationships are identified according to workplace policy. 3. Individual activities are identified and followed through in line with job requirements. 4. Effective and appropriate forms of communication in a team are used according to workplace policy. 5. Resolution of conflicts between team members is sought promptly in line with organization. 6. Ability to work in a team with gender diversityis demonstrated in accordance with workplace policy. 7. Basic human rights are identified, sought after and adhered to in line with workplace policy. 8. Respect for team members’ human rights is demonstrated in accordance with existing protocol. 9. Healthy ***relationships*** are established and maintained for harmonious co-existence in line with workplace policy. |
| 1. Plan and organize work | 1. Work schedules for given tasks are adhered to within the set time lines and based on workplace policy. 2. Punctuality and time consciousness are demonstrated based on workplace policy. 3. Assignment goals/objectives and deliverables are identified and achieved based on instructions from superiors and organizations’ policy. 4. Resources are identified and utilized to meet assignment goals and deliverables as per workplace policy. 5. Work records are kept and maintained in line with workplace policy. 6. Situations that require consultation with superiors are identified and consultations made in accordance with workplace policy. 7. Operational decisions are made and applied based on the requirements of the job. 8. Problems arising in the course of working are identified and solved or reported according the workplace policies and procedures. 9. Situations that require negotiation are identified and negotiations done to create win-win situations. 10. Negotiation techniques are demonstrated to meet ***client’s*** satisfaction and organizations’ objectives. |
| 1. Maintain professional growth and development in the workplace | * 1. Personal training needs are assessed and outlined based on requirements of the job.   2. Career progression opportunities are identified and pursued based on job requirements.   3. Sponsorship for training for career progression is sought based on organization policy.   4. Licensees and certifications relevant to job and career are obtained and renewed based on standard operating procedures.   5. Personal growth is pursued towards improving the qualifications set for the profession in line with organization policy.   6. Available training opportunities are embraced and completed within allowed time limits.   7. Recognitions for prior learning are sought as proof of career advancement.   8. Mentorship and coaching programs are attended regularly based on availability and workplace policy. |
| 1. Demonstrate learning, creativity and innovativeness in the workplace | * 1. Time and effort is invested in learning new skills based on job requirements and workplace policy.   2. Willingness to learn under different context is demonstrated based on available learning opportunities arising in the workplace.   3. Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job.   4. Ability to apply a range of basic Information Technology skills is demonstrated based on requirements of the job.   5. Application of Occupational Health and Safety procedures in use of technology is demonstrated in the workplace.   6. Initiative is taken to use more effective and efficient processes and procedures in line with job requirements.   7. Ability to adapt to new systems is demonstrated in accordance with the requirements of the job.   8. Recognition and support of innovative and creative ideas is demonstrated in the workplace.   9. Opportunities to carryout functions better are identified and exploited in line with organization objectives.   10. Ability to discuss new ideas and get consensus is demonstrated in line with job requirements.   11. Awareness of personal role in workplace innovation is demonstrated. |

**RANGE**

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

|  |  |
| --- | --- |
| **Variable** | **Range** |
| ***Drug and substance abuse*** includes but not limited to: | Commonly abused;   * Alcohol * Tobacco * Miraa * Over-the-counter drugs * Cocaine * Bhang * Glue |
| ***Feedback*** includes but not limited to: | * Verbal * Written * Informal * Formal |
| ***Clients*** includes but not limited to: | * New clients * Existing clients * Internal clients * External clients |
| ***Relationships*** includes but not limited to: | * Man/Woman * Trainer/trainee * Employee/employer * Client/service provider * Husband/wife * Boy/girl * Parent/child * Sibling relationships |
| ***Communication methods*** includes but not limited to: | * Written * Talk/presentation * Video * Audio * Graphical * Modeling |
| ***Team*** includes but not limited to: | * Small work group * Staff in a section/department * Inter-agency group |
| ***Personal growth*** includes but not limited to: | |  | | --- | | * Growth in the job * Career mobility * Gains and exposure the job gives * Net workings * Benefits that accrue to the individual as a result of noteworthy performance | |
| ***Personal objectives*** includes but not limited to: | * Long term * Short term * Broad * Specific |
| ***Trainings and career opportunities*** includes but not limited to | * Participation in training programs * Technical * Supervisory * Managerial * Continuing Education * Serving as Resource Persons in conferences and workshops |
| ***Resource*** include but not limited to: | * Human * Financial * Technology * Hardware * Software |
| ***Innovation*** include but not limited to: | * New ideas * Original ideas * Different ideas * Methods/procedures * Processes * New tools |
| ***Emerging issues*** include but not limited to: | * Terrorism * Social media * National cohesion * Open offices |

**REQUIRED SKILLS AND KNOWLEDGE**

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

**Required Skills**

This section describes the required skills which supports performance. These skills will need to be considered in the learning and assessment process.

* Appropriate practice of personal hygiene
* Intra and Interpersonal skills
* Communication skills
* Knowledge management
* Interpersonal skills
* Critical thinking skills
* Observation skills
* Organizing skills
* Record keeping skills
* Negotiation skills
* Problem solving skills
* Decision Making skills
* Resource utilization skills

**Required Knowledge**

This section describes the required knowledge which supports performance. This knowledge will need to be considered in the learning and assessment process.

The individual needs to demonstrate knowledge of:

* Work values and ethics
* Company policies
* Occupational Safety and Health
* Company operations, procedures and standards
* Fundamental rights at work
* Personal hygiene practices
* Workplace communication
* Concept of time
* Building relationships
* Training needs assessment
* Time management
* Decision making
* Types of resources
* Work planning
* Record keeping
* Resources and allocating resources
* Organizing work
* Workplace problems areas and how to deal with them
* Negotiation
* Assertiveness
* Team work
* Gender
* HIV and AIDS
* Drug and substance abuse
* Leadership
* Safe work habits
* Professional growth and development
* Technology in the workplace
* Learning
* Creativity
* Innovation
* Emerging issues
  + - Social media
    - Terrorism
    - National cohesion

**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. Attained job targets within key result areas.   2. Maintained punctuality and time consciousness.   3. Maintained intra- and inter-personal relationship in the course of managing oneself.   4. Completed trainings and career progression opportunities within time limits.   5. Acquired and maintained licenses and/or certifications required for the job.   6. Planned and organized resources to achieve assigned goals and objectives.   7. Identified and solved a problem in a particular problem situation.   8. Displayed critical safe work habits in carrying out work functions.   9. Innovatively made work processes and procedures more effective and efficient.   10. Worked harmoniously with people of diverse gender in the workplace.   11. Participated effectively in team activities.   12. Demonstrated awareness of HIV and AIDS.   13. Abstained from drug and substance abuse.   14. Participated in mentorship and coaching programs.   15. Demonstrated safety consciousness.   16. Maintained work records.   17. Demonstrated ability to cope with emerging issues. |
| 1. Resource Implications | The following resources should be provided:   * 1. Workplace or assessment location   2. Case studies/scenarios |
| 1. Methods of Assessment | Competency in this unit may be assessed through:  3.1 Oral Interviews  3.2 Observation  3.3 Third Party Reports  3.4 Written tests |
| 1. Context of Assessment | * 1. Competency may be assessed in workplace or in a simulated workplace setting.   2. Assessment shall be observed while tasks are being undertaken whether individually or in-group. |
| 1. Guidance information for assessment | | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

**DEMONSTRATE ENVIRONMENTAL LITERACY**

**UNIT CODE :** ENG/OS/CFT/BC/06/4/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to follow procedures for environmental hazard control, follow procedures for environmental pollution control, comply with workplace sustainable resource use and evaluate current practices in relation to resource usage.

**ELEMENTS AND PERFORMANCE CRITERIA**

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| --- | --- |
| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Control environmental hazard | * 1. ***Storage methods*** for environmentally hazardous materials are strictly followed according to environmental regulations and OSHS.   2. ***Disposal methods*** of hazardous wastes are followed at all times according to environmental regulations and OSHS.   3. ***PPE*** is used according to OSHS. |
| 1. Control environmental Pollution control | * 1. Environmental pollution ***control measures*** are compiled following standard protocol.   2. Procedures for solid waste management are observed according Environmental Management and Coordination Act 1999   3. Methods for minimizing ***noise pollution*** complied following environmental regulations. |
| 1. Demonstrate sustainable resource use | * 1. Methods for minimizing wastage are complied with.   2. Waste management procedures are employed following principles of 3Rs (Reduce, Reuse, Recycle)   3. Methods for economizing or reducing resource consumption are practiced. |
| 1. Evaluate current practices in relation to resource usage | * 1. Information on resource efficiency ***systems and procedures*** are collected and provided to the work group where appropriate.   2. Current resource usage is measured and recorded by members of the work group.   3. Current purchasing strategies are analyzed and recorded according to industry procedures.   4. Current work processes to access information and data is analyzed following enterprise protocol. |

**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.

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| --- | --- |
| **Variable** | **Range** |
| 1. PPE may include but are not limited to: | 1.1 Masks  1.2 Gloves  1.3 Goggles  1.4 Safety hat  1.5 Overall   * 1. Hearing protector   2. Safety boots |
| 1. Environmental pollution control measures may include but are not limited to: | * 1. Methods for minimizing or stopping spread and ingestion of airborne particles   2. Methods for minimizing or stopping spread and inhaling gases and fumes   3. Methods for minimizing or stopping spread and ingestion of liquid wastes |
| 1. Waste management Procedures may include but are not limited to: | 3.1 Sorting  3.2 Storing of items  3.2 Recycling of items  3.3 Disposal of items  3.4 Handling  3.5 Transport |
| 1. Resources may include but are not limited to: | 4.1 Electric  4.2 Water  4.3 Fuel  4.3 Telecommunications   * 1. Supplies   2. Materials |
| 1. Workplace environmental hazards may include but are not limited to: | 5.1Biological hazards  5.2 Chemical and dust hazards  5.3 Physical hazards |
| 1. Organizational systems and procedures may include but are not limited to: | 7.1 Supply chain, procurement and purchasing  7.2 Quality assurance  7.3 Making recommendations and seeking approvals |

**EVIDENCE GUIDE**

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

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| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:  1.1 Controlled environmental hazard  1.2 Controlled environmental pollution  1.3 Demonstrated sustainable resource use  1.4 Evaluated current practices in relation to resource usage |
| 1. Resource Implications | The following resources should be provided:   * 1. Workplace with storage facilities   2. Tools, materials and equipment relevant to the tasks (ex. Cleaning tools, cleaning materials, trash bags, etc.)   3. PPE   4. Manuals and references   5. Legislation, policies, procedures, protocols and local ordinances relating to environmental protection   6. Case studies/scenarios relating to environmental Protection |
| 1. Methods of Assessment | Competency in this unit may be assessed through:  3.1 Demonstration  3.2 Oral questioning  3.3 Written examination  3.4 Third Party Reports  3.5 Portfolio (citations/awards from GOs and NGOs, certificate of training – local and abroad)  3.6 Simulations and role-plays |
| 1. Context of Assessment | Competency may be assessed on the job, off the job or a combination of these as well as in work placement (internship). 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. |

**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:

* Following storage methods of environmentally hazardous materials
* Following disposal methods of hazardous wastes
* Using PPE
* Practicing OSHS
* Complying environmental pollution control
* Observing solid waste management
* Complying methods of minimizing noise Pollution
* Complying methods of minimizing wastage
* Employing waste management procedures
* Economizing resource consumption
* Listing of resources used
* Measuring current usage of resources
* Identifying and reporting workplace environmental hazards
* Conveying all environmental issues
* Following environmental regulations
* Identifying environmental regulations
* Assessing procedures for assessing compliance
* Collecting information on environmental and resource efficiency systems and procedures, and Providing information to the work group
* Measuring and recording current resource usage
* Analysing and recording current purchasing strategies.
* Analysing current work processes to access information and data and Assisting identifying areas for improvement

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* Storage methods of environmentally hazardous materials
* Disposal methods of hazardous wastes
* Usage of PPE Environmental regulations
* OSHS
* Types of pollution
* Environmental pollution control measures
* Different solid wastes
* Solid waste management
* Different noise pollution
* Methods of minimizing noise pollution
* Solid Waste Act
* Methods of minimizing wastage
* Waste management procedures
* Economizing of resource consumption
* Principle of 3Rs
* Types of resources
* Techniques in measuring current usage of resources
* Calculating current usage of resources
* Types of workplace environmental hazards
* Environmental regulations
* Environmental regulations applying to the enterprise.
* Procedures for assessing compliance with environmental regulations.
* Collection of information on environmental and resource efficiency systems and procedures,
* Measurement and recording of current resource usage
* Analysis and recording of current purchasing strategies.
* Analysis current work processes to access information and data Analysis of data and information
* Identification of areas for improvement

**DEMONSTRATE OCUPATIONAL SAFETY AND HEALTH PRACTICES**

**UNIT CODE:** ENG/OS/CFT/BC/07/4/A

**UNIT DESCRIPTION**

This unit specifies the competencies required to practice safety and health and comply with OSH requirements relevant to work.

**ELEMENTS AND PERFORMANCE CRITERIA**

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| **ELEMENT**  These describe the key outcomes which make up workplace function. | **PERFORMANCE CRITERIA**  These are assessable statements which specify the required level of performance for each of the elements.  ***Bold and italicized terms are elaborated in the Range*** |
| 1. Observe workplace procedures for hazards and risk prevention | 1.1 Arrangement of work area and items in accordance with  Company housekeeping procedures is followed  1.2 Work standards and procedures are followed  1.3 ***Prevention and control measures***, including use of ***safety***  ***gears/PPE*** are applied  1.4 Standards and procedures for ***incidents and emergencies*** are studied and applied, as needed |
| 1. Participate in arrangements for workplace safety and health maintenance | 2.1 Orientations on ***OSH requirements/regulations*** of tasks is  participated  2.2 Feedback on health, safety, and security concerns are provided to appropriate personnel as required in a sufficiently detailed manner.  2.3 Workplace procedures for reporting hazards, incidents, injuries and sickness are practiced  2.4 OSH requirements/ regulations and workplace safety and hazard control procedures are reviewed and compliance reported to appropriate personnel, as needed  2.5 Needed ***OSH-related trainings*** are identified and proposed to appropriate personnel |

**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.

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| **Variable** | **Range** |
| 1. ***Prevention and control measures*** may include but are not limited to: | 1.1 Eliminate the hazard (i.e., get rid of the dangerous machine  1.2 Isolate the hazard (i.e. keep the machine in a closed room and operate it remotely; barricade an unsafe area off)  1.3 Substitute the hazard with a safer alternative (i.e., replace the machine with a safer one)  1.4 Use administrative controls to reduce the risk (i.e. give  trainings on how to use equipment safely; OSH-related  topics, issue warning signages, rotation/shifting work  schedule)  1.5 Use engineering controls to reduce the risk (i.e. use safety guards to machine)  1.6 Use personal protective equipment  1.7 Safety, Health and Work Environment Evaluation   * 1. Periodic and/or special medical examinations of workers |
| 1. ***Safety gears /PPE*** (Personal Protective Equipment) may include but are not limited to: | 2.1 Arm/Hand guard, gloves  2.2 Eye protection (goggles, shield)  2.3 Hearing protection (ear muffs, ear plugs)  2.4 Hair Net/cap/bonnet  2.5 Hard hat  2.6 Face protection (mask, shield)  2.7 Apron/Gown/coverall/jump suit  2.8 Anti-static suits  2.9 High-visibility reflective vest |
| 1. ***Incidents and emergencies*** may include but are not limited to: | 3.1 Chemical spills  3.2 Equipment/vehicle accidents  3.3 Explosion  3.4 Fire  3.5 Gas leak  3.6 Injury to personnel  3.7 Structural collapse   * 1. Toxic and/or flammable vapours emission. |
| 1. ***OSH requirements / regulations*** may include but are not limited to: | 4.2 Building code  4.5 Permit to Operate |
| 1. ***OSH-related trainings*** may include but are not limited to: | 5.1 Safety Orientations relevant to tasks  5.2 Safe and Correct Operation of Tools and Equipment  5.3 Health Orientations/trainings (Healthy Lifestyle, Prevention of drug/alcohol dependence, violence in the workplace, work-stress)  5.4 Prevention and Control of OSH Hazards in the workplace  5.5 Chemical Handling  5.6 Safety Trainings (Fire Safety, Construction Safety, Confined Space)  5.7 Prevention and Control of Work-related Injuries and Illness  5.8 Basic First-aid Trainings  5.9 Emergency Response Trainings  5.10 Trainings on use of fire-extinguisher |

**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:

* Communication Skills
* Knowledge management
* Collaborating skills
* Interpersonal Skills
* Troubleshooting skills
* Critical thinking Skills
* Observation Skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

* General OSH principles and legislations
* Principles of good housekeeping(5S)
* Company/work place policies/guidelines
* Standards and safety requirements of work process and procedures
* Standard Workplace emergency plan and procedures
* Safety and health requirements of tasks
* Workplace guidelines on providing feedback on OSH and security concerns
* OSH regulations
* Hazard control procedures
* OSH trainings relevant to work

**EVIDENCE GUIDE**

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

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| --- | --- |
| 1. Critical Aspects of Competency | Assessment requires evidence that the candidate:  1.1 Follows work and housekeeping procedures, and complies with its requirements  1.2 Follows work standards and procedures  1.3 Applies OSH preventive and control measures, including emergency plan, standards and procedures  1.4 Participates in orientations on OSH requirements of tasks  1.5 Provides feedback on health, safety, and security concerns in a sufficiently detailed manner.  1.6 Practices workplace procedures for reporting hazards, incidents, injuries and sickness  1.7 Reviews and reports compliance to workplace OSH regulations and hazard control procedures  1.8 Identifies and proposes OSH trainings relevant to work |
| 1. Resource Implications | The following resources should be provided:  2.1 Facilities, materials tools and equipment necessary for the activity |
| 1. Methods of Assessment | Competency in this unit may be assessed through:  3.1 Observation/Demonstration with oral questioning  3.2 Third party report  3.3 Written exam |
| 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. |

# CORE UNITS OF COMPETENCY

# UNIT OF COMPETENCY 1

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

**UNIT CODE:** ENG/OS/CFT/CR/01/4/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**

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| **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 |
| 2. 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. |
| 3. 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) |
| 4. 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. |

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|  | * 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** |
| 1. PPEs | May include but are not limited to:   * 1. Work boots   2. Hard hat   3. Safety glasses   4. Safety vest   5. Gloves |
| 2. Tools, equipment | May include but are not limited to:   * 1. Set of Sieves   2. Sieve Shaker   3. Sieve Moulds   4. Compression Testing Machine   5. Slump Test Apparatus   6. Mechanical Sieve Shaker   7. Drying Oven Concrete Mixer   8. Poker Vibrator   9. Coarse Aggregate Density Test Set   10. Dunagan Test Set   11. Organic Impurities Test Set   12. Riffle Boxes (sample spliters)   13. Vibrating Table   14. Los Angeles Abrasion Machine   15. Impact Testing Machine   16. Iso 200mm Test Set   17. Soil Hydrometers   18. Consolidation Apparatus   19. Soil Volume Change Meter   20. Plate Bearing Test Machine   21. Core Cutter   22. Gauge Rods   23. Chapman Flask % Voids in Aggregates |

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| --- | --- |
|  | * 1. Coarse Aggregate Density Test Set   2. Length Gauge   3. Automatic Mechanical Soil Compactor   4. Soil Permeable Apparatus   5. Motorized CBR Machine |
| 3.Permits | May include but are not limited to:  3.1 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. |
| 2. 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 |
| 3. 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. |
| 4. Guidance  information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 2

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

**UNIT CODE:** ENG/OS/CFT/CR/02/4/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**

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| --- | --- |
| **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 |
| 2. 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. |
| 3. 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) |

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| 4. 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 |
| 5. 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. |
| 6. 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. |
| 7. 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** |
| 1. PPEs | May include but are not limited to:   * 1. Work boots   2. Hard hat   3. Safety glasses   4. Safety vest   5. Gloves |
| 1. Tools, equipment | * 1. Set of Sieves   2. Sieve Shaker   3. Compression Testing Machine   4. Molds   5. Slump Test Apparatus   6. Mechanical Sieve Shaker   7. Drying Oven   8. Concrete Mixer   9. Poker Vibrator   10. Coarse Aggregate Density Test Set   11. Dunagan Test Set   12. Organic Impurities Test Set   13. Riffle Boxes (sample spliters)   14. Vibrating Table   15. Los Angeles Abrasion Machine   16. Impact Testing Machine   17. Iso 200mm Test Set   18. Soil Hydrometers   19. Consolidation Apparatus   20. Soil Volume Change Meter   21. Plate Bearing Test Machine   22. Core Cutter   23. Gauge Rods   24. Chapman flask % voids in aggregates   25. Coarse aggregate density test set   26. Length gauge   27. Automatic mechanical soil compactor   28. Soil permeable apparatus   29. Motorized CBR machine   30. Field CBR equipment   31. CBR Test Machine (hand operated)   32. Le-Chatelier Apparatus 2.31Aggregate Crushing Value Apparatus   33. BR Moulds   34. Compaction Rammers 2.5 kg and 4.5 kg   35. Moulds for Compaction   36. Concrete Standards BS 812   37. Soil Standards BS |
| 1. Permits | May include but are not limited to:  3.1 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 |
| 2. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials   4. AutoCAD software |
| 3. 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 |
| 4. 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. |
| 5. Guidance  information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 3

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

**UNIT CODE:** ENG/OS/CFT/CR/03/4/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. |
| 2. 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 |
| 3. 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. |
| 4. 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) |
| 5. 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 |
| 6.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. |
| 7. 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** |
| 1. PPEs | May include but are not limited to:   * 1. Work boots   2. Hard hat   3. Safety glasses   4. Safety vest   5. Gloves |
| 2. Tools, equipment | May include but are not limited to:   * 1. Set of Sieves   2. Sieve Shaker   3. Compression Testing Machine   4. Moulds   5. Slump Test Apparatus   6. Mechanical Sieve Shaker   7. Drying Oven   8. Concrete Mixer   9. Poker Vibrator   10. Coarse Aggregate Density Test Set   11. Dunagan Test Set   12. Organic Impurities Test Set   13. Riffle Boxes (sample spliters)   14. Vibrating Table   15. Los Angeles Abrasion Machine   16. Impact Testing Machine   17. Iso 200mm Test Set   18. Soil Hydrometers   19. Consolidation Apparatus   20. Soil Volume Change Meter   21. Plate Bearing Test Machine   22. Core Cutter   23. Gauge Rods   24. Chapman flask % voids in aggregates   25. Coarse aggregate density test set   26. Length gauge   27. Automatic Mechanical Soil compactor   28. Soil Permeable Apparatus   29. Aggregate Crushing Value Apparatus |
| 3.Permits | May include but are not limited to:   * 1. 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. |
| 2. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials   4. AutoCAD software |
| 3. 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 |
| 4. 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. |
| 5. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 4

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

**UNIT CODE:** ENG/OS/CFT/CR/04/4/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. |
| 2. 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** |
| 1. PPEs | May include but are not limited to:   * 1. Work boots   2. Hard hat   3. Safety glasses   4. Safety vest   5. Gloves |
| 2. Tools, equipment | May include but are not limited to:   * 1. Set of Sieves   2. Sieve Shaker   3. Compression Testing Machine   4. Moulds   5. Slump Test Apparatus   6. Mechanical Sieve Shaker   7. Drying Oven   8. Concrete Mixer   9. Poker Vibrator |
| 3.Permits | May include but are not limited to:  3.1 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. |
| 2. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials   4. AutoCAD software |
| 3. 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 |
| 4. 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. |
| 5. Guidance information for  assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 5

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

**UNIT CODE:** ENG/OS/CFT/CR/05/4/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. |
| 2. 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. |
| 3. 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 |
| 4. Analyze compressive load and design the composite section required to carry/distribute load. | * 1. Describe the concept of relative stiffness between steel and concrete expressed in terms of the modular ratio.   2. Determine and work with the equivalent, transformed cross section of a composite section subjected to uniform compression.   3. Analyse and design a composite section subjected to ultimate compressive load. |
| 5. 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** |
| 1. PPEs | May include but are not limited to:   * 1. Work boots   2. Hard hat   3. Safety glasses   4. Safety vest   5. Gloves |
| 2. Tools, equipment | May include but are not limited to:   * 1. AutoCAD/ArchiCAD or relative design software   2. Laptop   3. Plotter |
| 3.Permits | May include but are not limited to:  3.1 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. |
| 2. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials   4. AutoCAD software |
| 3. 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 |
| 4. 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. |
| 5. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 6

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/06/4/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. |
| 2. 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 |
| 3. 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. |
| 4. 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) |
| 5. 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   Determine Plasticity Index |
| 6. 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. |
| 7. 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. |
| 8. 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 |
| 9. Identify and use appropriate methods of concreting in adverse weather conditions | * 1. Perform concreting tasks in adverse weather conditions   2. Apply hot weather curing techniques in concrete works |
| 10. 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** |
| 1. PPEs | May include but are not limited to:  1.1 Work boots   * 1. Hard hat   2. Safety glasses   3. Safety vest   4. Gloves |
| 1. Tools, equipment | May include but are not limited to:   * 1. Set of Sieves   2. Sieve Shaker   3. Compression testing Machine   4. Moulds   5. Slump Test Apparatus   6. Mechanical Sieve Shaker   7. Drying Oven   8. Concrete Mixer   9. Poker Vibrator   10. In-situ water permeable test kit   11. Concrete cover meter   12. Bulk density kit   13. Coarse aggregate density test set   14. Dunagan test set   15. Organic Impurities Test Set   16. Riffle Boxes (sample spliters)   17. Sieve shaker   18. Vibrating Table   19. Los Angeles Abrasion Machine   20. Digital point load tester   21. Impact Testing Machine   22. Field CBR equipment   23. CBR test machine (hand operated)   24. Hand Operated Casagrande Equipment   25. Motorized Casagrande Equipment   26. Iso 200mm Test Set   27. Soil Hydrometers   28. Consolidation Apparatus   29. Soil Volume Change Meter   30. Plate Bearing Test Machine   31. Core Cutter   32. Rammers   33. Block making machine (manually operated)   34. Concrete poker vibrator   35. Gauge Rods   36. Chapman flask % voids in aggregates   37. Coarse aggregate density test set   38. Length gauge   39. Automatic mechanical soil compactor   40. Soil permeable apparatus   41. Motorized CBR machine   42. Cone penetrometer   43. Plastic Limit Roller   44. Le-Chatelier Apparatus   45. Aggregate Crushing Value Apparatus   46. CBR Moulds   47. Compaction Rammers 2.5 kg and 4.5 kg   48. Moulds for Compaction   49. Concrete Standards BS 812   50. Soil Standards BS |
| 1. Permits | May include but are not limited to:  3.1 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. |
| 2. Resource Implications | The following resources must be provided:   * 1. PPEs   2. Tools and equipment   3. Writing materials   4. AutoCAD software |
| 3. 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 |
| 4. 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. |
| 5. Guidance information for assessment | Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended. |

# UNIT OF COMPETENCY 7

Perform finishing techniques.

**UNIT CODE:** ENG/OS/CFT/CR/07/4/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   3. 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.

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| **VARIABLE** | **RANGE** |
| 1. PPEs | May include but are not limited to:   * 1. Work boots   2. Hard hat   3. Safety glasses   4. Safety vest   5. Gloves |
| 2. Tools, equipment | May include but are not limited to:   * 1. Set of Sieves   2. Sieve Shaker   3. Compression testing Machine   4. Molds   5. Slump Test Apparatus   6. Mechanical Sieve Shaker   7. Drying Oven   8. Concrete Mixer   9. Poker Vibrator   10. In-situ water permeable test kit   11. Concrete cover meter   12. Bulk density kit   13. Coarse aggregate density test set   14. Dunagan test set   15. Organic Impurities Test Set   16. Riffle Boxes (sample splitters)   17. Vibrating Table   18. Los Angeles Abrasion Machine   19. Digital point load tester   20. Impact Testing Machine   21. Field CBR equipment   22. CBR test machine (hand operated)   23. Hand Operated Casagrande Equipment   24. Motorized Casagrande Equipment   25. Iso 200mm Test Set   26. Soil Hydrometers   27. Consolidation Apparatus   28. Soil Volume Change Meter   29. Plate Bearing Test Machine   30. Core Cutter   31. Rammers   32. Block making machine (manually operated)   33. Concrete poker vibrator   34. Gauge Rods   35. Chapman flask % voids in aggregates   36. Coarse aggregate density test set   37. Length gauge   38. Automatic mechanical soil compactor   39. Soil permeable apparatus   40. Motorized CBR machine   41. Cone penetrometer   42. Plastic limit roller   43. Le-Chatelier Apparatus   44. Aggregate Crushing Value Apparatus   45. CBR Moulds   46. Compaction Rammers 2.5 kg and 4.5 kg   47. Moulds for Compaction   48. Concrete Standards BS 812   49. Soil Standards BS |
| 3.Permits | May include but are not limited to:  3.1 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.

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| 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   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. |