



**REPUBLIC OF KENYA**

**NATIONAL OCCUPATIONAL STANDARDS**

**FOR**

**PLUMBER**

**LEVEL 3**



TVET CDACC

P.O. BOX 14744-00100

NAIROBI

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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 Kenya's development blue print 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 and this resulted in the formulation of the Policy Framework for Reforming Education and Training. A key feature of this policy is the radical change in the design and delivery of the TVET training. The policy document requires that training in TVET shall be competency based, curriculum development shall be industry led, certification shall be based on demonstration of competence and mode of delivery shall allow for multiple entry and exit in TVET programs.

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 Plumbing Level 3.

These Occupational Standards will also be the basis 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 sustainable 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 on Reforming Education and Training in Kenya, emphasized the need to reform curriculum development, assessment and certification. This called for shift to CBET to address the mismatch between skills acquired through training and skills needed by industry as well as increase the global competitiveness of Kenyan labor force

The TVET Curriculum Development, Assessment and Certification Council (TVET CDACC), in conjunction with Construction Sector Skills Advisory Committee (SSAC) have developed these Occupational Standards for Plumber Level 3. These Occupational Standards will be the basis for development of competency-based curriculum for Plumbers. These Standards will also be the basis for assessment of an individual for competence certification.

The Occupational Standards are designed and organized with clear performance criteria for each element of a unit of competency. These standards also outline the required knowledge and skills as well as evidence guide.

I am grateful to Council Secretariat, Council Technical Committee, Construction SSAC and expert workers and all those who participated in the development of these Occupational Standards.

**CHAIRPERSON, TVET CDACC**

## **ACKNOWLEDGMENT**

These Occupational Standards were developed through combined effort of various stakeholders from private and public organizations. I am sincerely thankful to the management of these organizations for allowing their staff to participate in this course. I wish to acknowledge the invaluable contribution of industry players who provided inputs towards the development of these Standards.

I thank TVET Curriculum Development, Assessment and Certification Council (TVET CDACC) for providing guidance on the development of these Standards. My gratitude goes to the Construction Sector Skills Advisory Committee (SSAC) members for their contribution to the development of these Standards. I also thank all the individuals and organizations who participated in the validation of these Standards.

My gratitude also goes to CAP Youth Empowerment Institute and Kenya Youth Employment and Skills who cooperated with TVET CDACC in financing the development of these Standards.

I acknowledge any other institution which in one way or another contributed to the success of development of these Standards but has not been mentioned.

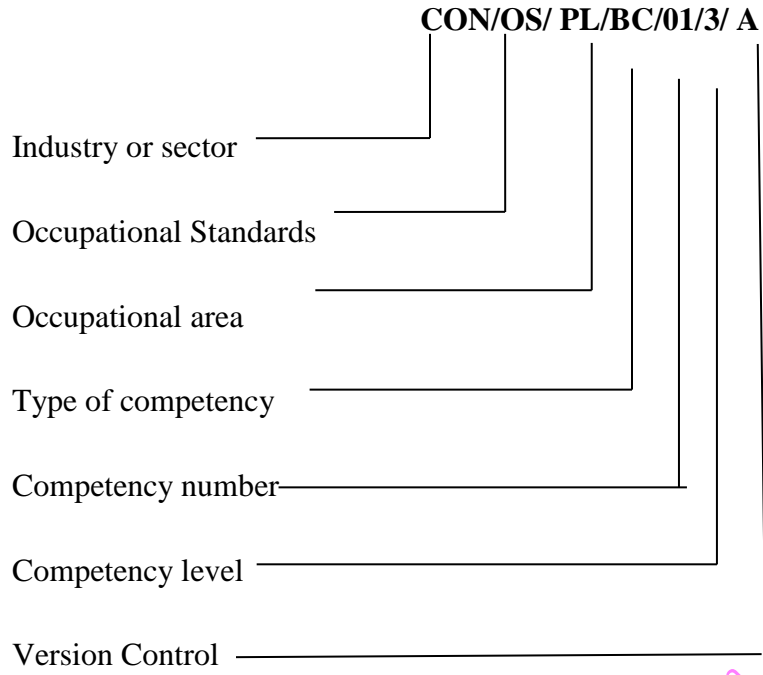
### **CHAIRPERSON**

### **CONSTRUCTION SECTOR SKILLS ADVISORY COMMITTEE**

## ABBREVIATIONS AND ACRONYMS

BC	Basic Competency
CDACC	Curriculum Development, Assessment and Certification Council
CPU	Central Processing Unit
CR`	Core Competency
CC	Common Competency
CON	Construction Sector
PL	Plumbing
ICT	Information Communication Technology
OS	Occupational Standard
PPE	Personal Protective equipment
SOP	Standard Operating Procedure
SSAC	Sector Skills Advisory Committee
TVET	Technical and Vocational Education and Training

## KEY TO UNIT CODE



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## COURSE OVERVIEW

Plumbing Level 3 Qualification consists of competencies that an individual must achieve to enable him/her offer plumbing services comprising of installing pipes, sanitary appliances and storage and pumping systems in buildings. It also entails maintaining plumbing systems.

The units of competency comprising Plumbing Level 3 Qualification include the following:

### Basic Units of Competency

Unit Code	Unit Title
CON/OS/PL/BC/01/3/A	Demonstrate Communication Skills
CON/OS/PL/BC/02/3/A	Demonstrate numeracy skills
CON/OS/PL/BC/03/3/A	Demonstrate Digital Literacy
CON/OS/PL/BC/04/3/A	Demonstrate Entrepreneurial Skills
CON/OS/PL/BC/05/3/A	Demonstrate Employability Skills
CON/OS/PL/BC/06/3/A	Demonstrate Environmental Literacy
CON/OS/PL/BC/07/3/A	Demonstrate Occupational Safety and Health Practices

### Common Units of Competency

Unit Code	Unit Title
CON/OS/PL/CC/01/3/A	Measure and Calculate Object Parameters
CON/OS/PL/CC/02/3/A	Interpret architectural and engineering drawings

### Core Units of Competency

Unit code	Unit Title
CON/OS/PL/CR/01/3/A	Install pipes in buildings
CON/OS/PL/CR/02/3/A	Install sanitary appliances
CON/OS/PL/CR/03/3/A	Install storage and pumping systems
CON/OS/PL/CR/04/3/A	Maintain plumbing systems

## **BASIC UNITS OF COMPETENCY**

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## DEMONSTRATE COMMUNICATION SKILLS

**UNIT CODE: CON/OS/PL/BC/01/3/A**

### UNIT DESCRIPTION

This unit specifies the competencies required to demonstrate communication skills. It involves obtaining and conveying workplace information, speaking English at a basic operational level, participating in workplace meetings and discussions, and completing relevant work-related documents.

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
<p>These describe the key outcomes which make up workplace function</p>	<p>These are assessable statements which specify the required level of performance for each of the elements.</p> <p><i><b>Bold and italicized terms are elaborated in the Range</b></i></p>
<p>1. Obtain and convey workplace information</p>	<p>1.1 Specific and relevant information is accessed from <i><b>appropriate sources</b></i> based on standard procedures</p> <p>1.2 Effective questioning, active listening and speaking skills are used to gather and convey information based on communication needs</p> <p>1.3 Appropriate <i><b>medium</b></i> is used to transfer information and ideas in accordance with workplace guidelines</p> <p>1.4 Appropriate non- verbal communication is used as per the communication needs</p> <p>1.5 Appropriate lines of communication with supervisors and colleagues are identified and followed based on workplace requirements</p> <p>1.6 Location and storage of information is undertaken according to workplace procedures</p> <p>1.7 Personal interaction is carried out clearly and concisely according to workplace requirements</p>
<p>2. Speak English at a basic operational level</p>	<p>2.1 Participation in simple conversations with work colleagues is undertaken based on familiar topics</p> <p>2.2 Simple verbal instructions and requests are responded to according to workplace guidelines</p> <p>2.3 <i><b>Routine procedures</b></i> are provided in accordance with workplace policy</p>

	<p>2.4 Likes, dislikes and preferences are expressed based on individual preference</p> <p>2.5 Different forms of expression in English are identified in line with workplace requirements</p>
3. Participate in workplace meetings and discussions	<p>3.1 Team meetings are attended on time according to schedules</p> <p>3.2 Own opinions are clearly expressed and those of others are listened to in accordance with workplace guidelines</p> <p>3.3 Meeting inputs are provided based on the meeting purpose and established <i>protocols</i></p> <p>3.4 <b>Workplace interactions</b> are conducted as per organizations' code of conduct</p> <p>3.5 Work-related questions are asked and responded based on set protocols</p> <p>3.6 Meetings outcomes are interpreted and implemented as per organizations' objectives</p>
4. Complete relevant work-related documents	<p>4.1 Range of forms relating to conditions of employment are completed according to workplace procedures</p> <p>4.2 Workplace data is recorded based on workplace requirements</p> <p>4.3 Errors in recording information are identified and acted upon in accordance with workplace policies</p> <p>4.4 Reporting requirements are completed according to organizational guidelines</p>

## 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. Appropriate Sources may include but not limited to:	<ul style="list-style-type: none"> <li>• Various department heads,</li> <li>• organization documents</li> </ul>
2. Medium may include but not limited to:	<ul style="list-style-type: none"> <li>• Method of communication</li> <li>• Physical media</li> <li>• Mechanical media</li> </ul>

3. Routine procedures may include but not limited to:	<ul style="list-style-type: none"> <li>• Day to day activities</li> </ul>
4. Protocols may include but not limited to:	<ul style="list-style-type: none"> <li>• Procedures for doing a task</li> </ul>
5. Workplace interactions may include but not limited to:	<ul style="list-style-type: none"> <li>• Official inter relations</li> </ul>

## 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
- Active Listening
- Communication
- writing
- Interpretation
- Basic Information Technology (IT)

### Required Knowledge

The individual needs to demonstrate knowledge of:

- Minutes writing
- Report writing

## 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	<p>Assessment requires evidence that the candidate:</p> <p>1.1 Prepared written communication following standard format of the organization</p> <p>1.2 Accessed information using communication equipment</p> <p>1.3 Spoken English at a basic operational level</p> <p>1.4 Made use of relevant terms as an aid to transfer information effectively</p>
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	1.5 Conveyed information effectively adopting the formal or informal communication
2. Resource Implications	The following resources should be provided: <ul style="list-style-type: none"> <li>2. 1 Access to relevant workplace where assessment can take place</li> <li>2. 2 Appropriately simulated environment where assessment can take place</li> <li>2. 3 Materials relevant to the proposed activity or tasks</li> </ul>
3. Methods of Assessment	Competency may be assessed through: <ul style="list-style-type: none"> <li>3.1 Direct Observation</li> <li>3.2 Interview</li> <li>3.3 Written test</li> </ul>
4. Context of Assessment	Competency may be assessed: <ul style="list-style-type: none"> <li>4.1 On the job</li> <li>4.2 Off the job</li> <li>4.3 During industrial attachment</li> </ul>
5. 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: CON/OS/PL/BC/02/3/A**

**UNIT DESCRIPTION:**

This unit covers the competencies required to demonstrate numeracy skills. It involves using whole numbers and money up to one hundred thousand for work, Locating, comparing and using highly familiar measurement for work, using highly familiar maps and diagrams for work, identifying and using some common 2D shapes for work and locating specific information in highly familiar tables, graphs and charts for work

**Elements and Performance Criteria**

<b>Element</b>	<b>Performance Criteria</b>
Elements describe the essential outcomes.	Performance criteria describe the performance needed to demonstrate achievement of the element. <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Use whole numbers for work	1.1 Whole numbers and money amount up to 100,000 in highly familiar workplace documents and tasks are named and read according to workplace procedures. 1.2 Understanding of place value and the role of zero is demonstrate according to standard operating procedures. 1.3 Halves are recognised and understood in workplace as per Standard operating procedures. 1.4 Whole numbers and money amounting up to 100,000 are organised in size order and are compared as per workplace procedures. 1.5 Counting is done in numbers as per standard operating procedures. 1.6 Addition and subtraction of whole numbers and money up to 100,000 done in accordance with workplace requirement 1.7 Links between operations of addition and subtraction are clearly described as per job requirement. 1.8 Reasonableness of outcome with prompting and support is checked as per work requirement. 1.9 Numerical information is recorded, and the result of the task is communicated using informal language and symbolism as per workplace procedures.

Element	Performance Criteria
<p>2. Locate, compare and use highly familiar measurement for work</p>	<p>2.1 Measurements in highly familiar workplace documents and tasks are located as per standard operating procedures</p> <p>2.2 Different units of measurements and their uses are identified in accordance with job specifications</p> <p>2.3 The comparative relationship between the units of measurement identified as per standard operating procedures.</p> <p>2.4 Understanding of conversion of amounts is demonstrated in accordance with requirements.</p> <p>2.5 Informal language is used to compare measurements as per workplace procedures.</p> <p>2.6 Digital time is well read and am and pm used in reference to time</p> <p>2.7 Calendar used appropriately to record information in accordance with organizational events.</p> <p>2.8 Basic measurement information is well read and recorded as per the manuals</p> <p>2.9 Additions and subtraction of simple quantities done in workplace as per SOPs.</p>
<p>3. Use highly familiar maps and diagrams for work</p>	<p>3.1 Familiar items or places are in highly familiar maps and diagrams in accordance with SOPs</p> <p>3.2 Simple symbols and pictorial representations are identified in accordance with familiar maps and diagrams</p> <p>3.3 Simple oral directions are given to locate objects as per SOPs</p> <p>3.4 Simple oral directions followed to locate objects as per job specifications</p> <p>3.5 Understanding of informal directional language is demonstrated as per work procedures.</p>
<p>4. Identify and use some common 2D shapes for work</p>	<p>4.1 <b>Common two-dimensional shapes</b> are identified and named as per SOPs</p> <p>4.2 Common objects are described in terms of size and shape as per SOPs</p> <p>4.3 Common, every day, informal language is used to compare objects in accordance SOPs</p> <p>4.4 Common objects are grouped based on shape, size, colour and features as per job requirements</p>



Element	Performance Criteria
5. Locate specific Information in highly familiar tables, graphs and charts for work	5.1 Features of simple tables identified as per work place procedures 5.2 Specific numerical information located in highly familiar tables using grid movement (up and down columns and across rows) and key as graph and chart manuals 5.3 Numerical information and data in highly familiar tables compared using appropriate informal language as per workplace procedures. 5.4 Information related to relevant workplace tasks as per workplace procedures 5.5 Features of simple graphs and charts identified as per SOPs 5.6 Specific numerical information located in highly familiar graphs and charts as per workplace procedures. 5.7 Numerical information and data compared using appropriate informal language as per SOPs.

### 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. Common two - dimensional shapes: may include but not limited to:	<ul style="list-style-type: none"> <li>• Round/circle</li> <li>• Square</li> <li>• Rectangular</li> <li>• Triangle</li> </ul>

### 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:

- Measuring
- Logical thinking
- Computing
- Drawing of graphs
- Applying mathematical formulas
- Analytical

## 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: 1.1 Measured objects or materials as per job requirements 1.2 Used calculator to perform the four fundamental operations 1.3 Performed calculations involving money up to one hundred thousand 1.4 Performed conversions between hours, minutes and seconds 1.5 Calculated area and volume of regular shapes 1.6 Created tables and graphs to represent and interpret information
2. Resource Implications for competence assessment	The following resources should be provided: 2. 1 Access to relevant workplace where assessment can take place 2. 2 Appropriately simulated environment where assessment can take place 2. 3 Materials relevant to the proposed activity or tasks

3. Methods of Assessment	Competency may be assessed through: 3.1 Written Test 3.2 Interview 3.3 Oral Questioning 3.4 Demonstration
4. Context of Assessment	Competency may be assessed: 4.1 On the job 4.2 Off the job 4.3 During industrial attachment
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.

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## DEMONSTRATE DIGITAL LITERACY

**UNIT CODE: CON/OS/PL/BC/03/3/A**

### UNIT DESCRIPTION

This unit covers the competencies required to demonstrate digital literacy in a working environment. It entails identifying computer software and hardware, applying security measures to data, hardware, software, applying computer software in solving tasks and applying internet and email in communication at workplace.

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
These describe the key outcomes which make up workplace function	These are assessable statements which specify the required level of performance for each of the elements.  <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Identify computer software and hardware	1.1 <i><b>Computer software</b></i> are identified according to manufacturer's specification 1.2 <i><b>Appropriate computer hardware</b></i> is identified according to manufacturer's specification
2. Apply security measures to data, hardware, software	2.1 <i><b>Data security and privacy are classified</b></i> in accordance with the technological situation 2.2 <i><b>Security and control measures</b></i> are applied in accordance with laws governing protection of ICT 2.3 Computer threats and crimes are detected in accordance with information management guidelines. 2.4 Protection against computer crimes is undertaken in accordance with laws governing protection of ICT
3. Apply computer software in solving tasks	3.1 Basic <i><b>word processing concepts</b></i> are applied in resolving workplace tasks as per job requirement. 3.2 <i><b>Word processing utilities</b></i> are applied in accordance with workplace procedures 3.3 Data is manipulated on worksheet in accordance with office procedures
4. Apply internet and email in	4.1 Electronic mail is applied in workplace communication in accordance with office procedures 4.2 Office internet functions are defined and executed in accordance with office procedures

communication at workplace	4.3 <i>Network configuration</i> and uses are determined in accordance with office operations procedures
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## 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. Computer software may include but not limited to:	<ul style="list-style-type: none"> <li>• Operating system</li> <li>• MS office</li> <li>• Web browser</li> <li>• Media players</li> </ul>
2. Computer hardware may include but not limited to:	<ul style="list-style-type: none"> <li>• Computer Case</li> <li>• Monitor</li> <li>• Keyboard</li> <li>• Mouse</li> <li>• Hard Disk Drive</li> <li>• Motherboard</li> <li>• Video Card</li> </ul>
3. Data security and privacy may include but not limited to:	<ul style="list-style-type: none"> <li>• Confidentiality</li> <li>• Cloud computing</li> <li>• Confidentiality</li> <li>• Cyber terrorism</li> <li>• Integrity -but-curious data serving</li> </ul>
4. Security and control measures may include but not limited to:	<ul style="list-style-type: none"> <li>• Countermeasures and risk reduction</li> <li>• Cyber threat issues</li> <li>• Risk management</li> </ul>
5. Word processing concepts may include but not limited to:	<ul style="list-style-type: none"> <li>• Create</li> <li>• Edit</li> <li>• Print</li> <li>• Documents</li> </ul>

## 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 skills
- 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.

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Identified input, output, CPU and storage media devices of computers in accordance to computer specification</li> <li>1.2 Identified concepts, types and functions of computer software according to operation manual</li> <li>1.3 Identified and controlled security threats</li> <li>1.4 Detected and protected computer crimes</li> <li>1.5 Applied word processing in office tasks</li> <li>1.6 Prepared work sheet and applied data to the cells in accordance to workplace procedures</li> <li>1.7 Used Electronic Mail for office communication as per workplace procedure</li> <li>1.8 Applied internet and World Wide Web for office tasks in accordance with office procedures</li> <li>1.9 Applied laws governing protection of ICT</li> </ul>
<p>2. Resource Implications for competence assessment</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> <li>2.1 Access to relevant workplace where assessment can take place</li> <li>2.2 Appropriately simulated environment where assessment can take place</li> <li>2.3 Materials relevant to the proposed activity or tasks</li> </ul>
<p>3. Methods of Assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>3.1 Written Test</li> <li>3.2 Observation</li> <li>3.3 Practical assignment</li> <li>3.4 Interview</li> <li>3.5 Oral Questioning</li> </ul>
<p>4. Context of Assessment</p>	<p>Competency may be assessed:</p> <ul style="list-style-type: none"> <li>4.1 On the job</li> <li>4.2 Off the job</li> <li>4.3 During industrial attachment</li> </ul>

5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.
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## DEMONSTRATE ENTREPRENEURIAL SKILLS

**UNIT CODE : CON/OS/PL/BC/04/3/A**

### UNIT DESCRIPTION

This unit specifies the competencies required to demonstrate Entrepreneurial skills. It involves developing entrepreneurial culture, identifying entrepreneurial opportunities, starting, operating and growing a small business.

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
These describe the key outcomes which make up workplace function.	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 entrepreneurial culture	1.1 <i>Entrepreneurship terminologies</i> are defined following established procedures. 1.2 Contribution of entrepreneurship towards national development is identified in accordance to national development goals 1.3 Self-employment benefit are identified and emphasized to help create a positive attitude 1.4 Cultural factors that promote or inhibit entrepreneurial development are identified and emphasis made on entrepreneurial promotion 1.5 Ways of managing factors that inhibit development of entrepreneurial culture are identified in accordance with cultural background and national social economic situation
2. Identify entrepreneurial opportunities	2.1 Myths associated with entrepreneurship, types of entrepreneurs and characteristics of entrepreneurship are determined in accordance with the set procedures 2.2 Identification of <i>sources of business ideas</i> , generation of business ideas is undertaken in accordance with the existing procedure 2.3 Evaluation of business opportunities is undertaken according to prevailing office procedures

	2.4 Competencies are matched with business opportunities in accordance with business practices.
3. Start a small business	<p>Factors to consider when starting a small business are identified according to business sector.</p> <p>3.1 <b>Forms of business ownership</b> are identified and procedure of starting a small business stipulated according to relevant legal requirements</p> <p>3.2 Procedure of starting a small business is identified as per the legal requirements</p> <p>3.3 Challenges faced when starting a small business are identified and mitigating factors provided for in accordance prevailing legal and regulatory requirement</p> <p>3.4 Resource requirement for a small business are specified according to nature of business</p> <p>3.5 Business life cycle is projected as per the nature of business and national social economic situation</p>
4. Operate a small business	<p>4.1 Relevant terms are defined in accordance with the set rules</p> <p>4.2 Small business record is maintained in accordance with office procedures</p> <p>4.3 Business support services are set up in accordance with the nature and size of business</p> <p>4.4 Marketing activities are effected according to the nature and size of business</p> <p>4.5 Small enterprise business plan is prepared depending on the size and nature of business and the client specification</p> <p>4.6 Small business resources are run for efficiency and profitability</p> <p>4.7 Small business records are kept for decision making purposes</p> <p>4.8 Word processing concepts are applied in the management of small business according to office procedures</p> <p>4.9 Basic computer application software and emerging trends and concerns are applied in small business management in accordance with office procedures</p>

<p>5. Grow a small business</p>	<p>5.1 Methods of growing/expanding a small business are identified and implemented in accordance with growth schedule</p> <p>5.2 Resources for growing small business are identified and implementing</p> <p>5.3 Small business growth plans are prepared according to growth schedule</p> <p>5.4 ICT and small business growth schedule is prepared in accordance with office procedures</p> <p>5.5 Use of computers and technology is incorporated in small scale business growth schedule in accordance with technological trends</p> <p>5.6 Social media is used for business growth and profitability</p> <p>5.7 Emerging issues and trends are considered in accordance with business growth schedule and activities</p> <p>5.8 Community interest is built in product/service according to growth plan</p> <p>5.9 Business communication is enhanced according to business communication plan and profitability</p> <p>5.10 Basic business growth strategies are identified and implemented for increased profitability</p> <p>5.11 Word processing concepts are applied in growing of small business according to office procedures</p> <p>5.12 Basic computer application software, programming and emerging trends and concerns are applied in small business growth in accordance with office procedures for growth and profitability</p>
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## 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
<p>1. Entrepreneurship terminologies include but not limited to:</p>	<ul style="list-style-type: none"> <li>• Intrapreneurship</li> <li>• Enterprise</li> <li>• Business vision. Mission, core values, objectives</li> </ul>

<p>2. Sources of business ideas may include but not limited to:</p>	<ul style="list-style-type: none"> <li>• Brainstorming</li> <li>• Personal hobbies</li> <li>• Newspapers, magazines,</li> <li>• Friends and relatives</li> <li>• Accounting/Administrative work</li> <li>• Modern trends and concerns</li> </ul>
<p>3. Forms of business ownership may include but not limited to:</p>	<ul style="list-style-type: none"> <li>• Sole proprietorship</li> <li>• Partnership</li> <li>• Limited Company</li> <li>• Unlimited Company</li> </ul>

## REQUIRED SKILLS AND KNOWLEDGE

### Required Skills

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

The individual needs to demonstrate the following skills:

- Marketing skills
- Advertising
- Basic book-keeping
- accounting skills
- Communication skills

### Required Knowledge

The individual needs to demonstrate knowledge of:

- Public relations concepts
- Basic product promotion strategies
- Basic market and feasibility studies
- Basic 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

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## EVIDENCE GUIDE

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

1. Critical aspects of Competency	Assessment requires evidence that the candidate: 1.1 Demonstrated basic entrepreneurial skills 1.2 Demonstrated ability to conceptualize and plan a micro/small enterprise 1.3 Demonstrated ability to manage/operate a micro/small-scale business 1.4 Demonstrated basic marketing skills
2. Resource Implications for assessment	The following resources should be provided: 2.1 Access to relevant workplace where assessment can take place 2.2 Appropriately simulated environment where assessment can take place 2.3 Materials relevant to the proposed activity or tasks
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Written tests 3.2 Oral Questioning 3.3 Observation 3.4 Third Party Report
4. Context of Assessment	Competency may be assessed: 4.1 On the job 4.2 Off the job 4.3 During industrial attachment
5. 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: CON/OS/PL/BC/05/3/A**

### UNIT DESCRIPTION

This unit covers competencies required to demonstrate employability skills. It involves conducting self-management, demonstrating critical safe work habits, demonstrating workplace learning and workplace ethics.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
<p>These describe the key outcomes which make up workplace function.</p>	<p>These are assessable statements which specify the required level of performance for each of the elements.</p> <p><i><b>Bold and italicized terms are elaborated in the Range</b></i></p>
<p>1. Conduct self-management</p>	<p>1.1 Personal vision, mission and goals are formulated based on potential and in relation to organization objectives</p> <p>1.2 Emotional intelligence is demonstrated as per workplace requirements.</p> <p>1.3 Individual performance is evaluated <del>and monitored</del> according to the agreed targets.</p> <p>1.4 Assertiveness is developed and maintained based on the requirements of the job.</p> <p>1.5 Accountability and responsibility for own actions are demonstrated based on workplace instructions.</p> <p>1.6 Self-esteem and a positive self-image are developed and maintained based on values.</p> <p>1.7 Time management, attendance and punctuality are observed as per the organization policy.</p> <p>1.8 Goals are managed as per the organization's objectives</p> <p>1.9 Self-strengths and weaknesses are identified based on personal objectives</p>
<p>2. Demonstrate critical safe work habits</p>	<p>2.1. Stress is managed in accordance with workplace policy.</p> <p>2.2. Punctuality and time consciousness is demonstrated in line with workplace policy.</p> <p>2.3. Personal objectives are integrated with organization goals based on organization's strategic plan.</p>

	<p>2.4. <b>Resources</b> are utilized in accordance with workplace policy.</p> <p>2.5. Work priorities are set in accordance to workplace goals and objectives.</p> <p>2.6. Leisure time is recognized and utilized in line with personal objectives.</p> <p>2.7. <b>Drugs and substances of abuse</b> are identified and avoided based on workplace policy.</p> <p>2.8. HIV and AIDS prevention awareness is demonstrated in line with workplace policy.</p> <p>2.9. Safety consciousness is demonstrated in the workplace based on organization safety policy.</p> <p>2.10. <b>Emerging issues</b> are identified and dealt with in accordance with organization policy.</p>
<p>3. Demonstrate workplace learning</p>	<p>3.1 Learning opportunities are sought and managed based on job requirement and organization policy.</p> <p>3.2 Improvement in performance is demonstrated based on courses attended.</p> <p>3.3 Application of learning is demonstrated in both technical and non-technical aspects based on requirements of the job</p> <p>3.4 Time and effort is invested in learning new skills based on job requirements</p> <p>3.5 Initiative is taken to create more effective and efficient processes and procedures in line with workplace policy.</p> <p>3.6 New systems are developed and maintained in accordance with the requirements of the job.</p> <p>3.7 Awareness of personal role in workplace <b>innovation</b> is demonstrated based on requirements of the job.</p>
<p>4. Demonstrate workplace ethics</p>	<p>4.1 Policies and guidelines are observed as per the workplace requirements</p> <p>4.2 Self-worth and professionalism is exercised in line with personal goals and organizational policies</p> <p>4.3 Code of conduct is observed as per the workplace requirements</p> <p>4.4 Integrity is demonstrated as per legal requirement</p>

## 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.



Range	Variable
1. Drug and substance abuse may include but not limited to:	Commonly abused <ul style="list-style-type: none"> <li>• Alcohol</li> <li>• Tobacco</li> <li>• Miraa</li> <li>• Over-the-counter drugs</li> <li>• Cocaine</li> <li>• Bhang</li> <li>• Glue</li> </ul>
2. Feedback may include but not limited to:	<ul style="list-style-type: none"> <li>• Verbal</li> <li>• Written</li> <li>• Informal</li> <li>• Formal</li> </ul>
3. Team may include but not limited to:	<ul style="list-style-type: none"> <li>• Small work group</li> <li>• Staff in a section/department</li> <li>• Inter-agency group</li> </ul>
4. Innovation may include but not limited to:	<ul style="list-style-type: none"> <li>• New ideas</li> <li>• Original ideas</li> <li>• Different ideas</li> <li>• Methods/procedures</li> <li>• Processes</li> <li>• New tools</li> </ul>
5. Emerging issues may include but not limited to:	<ul style="list-style-type: none"> <li>• Terrorism</li> <li>• Social media</li> <li>• National cohesion</li> <li>• Open offices</li> </ul>

## 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
- Critical thinking
- Observation
- Organizing
- Record keeping

- Problem solving
- Decision Making
- Resource utilization

### **Required Knowledge**

The individual needs to demonstrate knowledge of:

- Work values and ethics
- Company policies
- Company operations, procedures and standards
- Occupational Health and safety procedures
- Fundamental rights at work
- Personal hygiene practices
- Workplace communication
- Concept of time
- Time management
- Decision making
- Types of resources
- Work planning
- Organizing work
- Record keeping
- Workplace problems and how to deal with them
- Assertiveness
- Team work
- HIV and AIDS
- Drug and substance abuse
- Safe work habits
- Professional growth and development
- Technology in the workplace
- 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: 1.1 Conducted self-management 1.2 Demonstrated critical safe work habits 1.3 Demonstrated workplace learning 1.4 Demonstrated workplace ethics
2. Resource Implications	The following resources should be provided: 2.1 Access to relevant workplace where assessment can take place 2.2 Appropriately simulated environment where assessment can take place
3. Methods of Assessment	Competency in this unit may be assessed through: 3.1 Oral questioning 3.2 Portfolio of evidence 3.3 Third Party Reports 3.4 Written tests
4. Context of Assessment	Competency may be assessed: 4.1 On-the-job 4.2 Off-the-job 4.3 During Industrial attachment
5. 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 : CON/OS/PL/BC/06/3/A

### UNIT DESCRIPTION

This unit specifies the competencies required to demonstrate environmental literacy. It involves controlling environmental hazard, controlling environmental pollution and demonstrating sustainable resource use.

### ELEMENTS AND PERFORMANCE CRITERIA

ELEMENT	PERFORMANCE CRITERIA
These describe the key outcomes which make up workplace function.	These are assessable statements which specify the required level of performance for each of the elements. <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Control environmental hazard	1.1 Storage and handling methods for environmentally hazardous materials are strictly followed according to environmental regulations and OSHS. 1.2 Disposal methods of hazardous wastes are followed at all times according to environmental regulations and OSHS. 1.3 <i><b>PPE</b></i> is used according to OSHS.
2. Control environmental Pollution	2.1 <i><b>Environmental pollution control measures</b></i> are complied with following standard protocol. 2.2 Procedures for solid waste management are observed according Environmental Management and Coordination Act 1999 2.3 Methods for minimizing noise pollution complied following environmental regulations.
3. Demonstrate sustainable use of resource	3.1 Methods for minimizing wastage are complied with. 3.2 <i><b>Waste management procedures</b></i> are employed following principles of 3Rs (Reduce, Reuse, Recycle) 3.3 Methods for economizing or reducing <i><b>resource</b></i> consumption are practiced.

### 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
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1. PPE may include but not limited to:	<ul style="list-style-type: none"> <li>• Mask</li> <li>• Gloves</li> <li>• Goggles</li> <li>• Safety hat</li> <li>• Overall</li> <li>• Hearing protector</li> </ul>
2. Environmental pollution control measures may include but not limited to:	<ul style="list-style-type: none"> <li>• Methods for minimizing or stopping spread and ingestion of airborne particles</li> <li>• Methods for minimizing or stopping spread and ingestion of gases and fumes</li> <li>• Methods for minimizing or stopping spread and ingestion of liquid wastes</li> </ul>
3. Waste management procedures may include but not limited to:	<ul style="list-style-type: none"> <li>• Sorting</li> <li>• Storing of items</li> <li>• Recycling of items</li> <li>• Disposal of items</li> </ul>
4. Resources may include but not limited to:	<ul style="list-style-type: none"> <li>• Electric</li> <li>• Water</li> <li>• Fuel</li> <li>• Telecommunications</li> <li>• Supplies</li> <li>• Materials</li> </ul>
5. Workplace environmental hazards may include but not limited to:	<ul style="list-style-type: none"> <li>• Biological hazards</li> <li>• Chemical and dust hazards</li> <li>• Physical hazards</li> </ul>

## 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
- Observation
- Writing
- Analytical

## 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

## 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 Controlled environmental hazard 1.2 Controlled environmental pollution 1.3 Demonstrated sustainable resource use
2. Resource Implications for assessment	The following resources should be provided: 2.1 Workplace with storage facilities 2.2 Tools, materials and equipment relevant to the tasks (ex. Cleaning tools, cleaning materials, trash bags, etc.) 2.3 PPE 2.4 Manuals and references
3 Methods of Assessment	Competency in this unit may be assessed through: 3.1 Observation

	<p>3.2 Oral questioning</p> <p>3.3 Written examination</p>
4 Context of Assessment	<p>Competency may be assessed</p> <p>4.1 On the job</p> <p>4.2 Off the job</p> <p>4.3 During industrial attachment</p>
5 Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

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## DEMONSTRATE OCCUPATIONAL SAFETY AND HEALTH PRACTICES

**UNIT CODE: CON/OS/PL/BC/07/3/A**

### UNIT DESCRIPTION

This unit specifies the competencies required to practice and promote safety and health at work. This entails preparing to practice safety and health at work and complying and promoting compliance of workers to organization's occupational safety and health instructions and requirements

### ELEMENTS AND PERFORMANCE CRITERIA

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
<p>These describe the key outcomes which make up workplace function.</p>	<p>These are assessable statements which specify the required level of performance for each of the elements.</p> <p><b><i>Bold and italicized terms are elaborated in the Range</i></b></p>
<p>1. Prepare to practice safety and health at work</p>	<p>1.1 Awareness of legislation that outlines the minimum standards for occupational safety and health requirements/ regulations are emphasized</p> <p>1.2 Benefits of implementing an occupational safety and health program are identified</p> <p>1.3 <b><i>Safety requirements/ regulations</i></b> of own work and of other workers are familiarized</p> <p>1.4 Workplace standards and procedures <b><i>for incidents and Emergencies</i></b> are determined</p> <p>1.5 <b><i>Prevention and control measures</i></b>, including use of <b><i>safety gears/PPE</i></b> (Personal Protective Equipment) to avoid accident, injuries and sickness are identified</p>
<p>2. Comply and promote compliance of workers to organization's occupational safety and health instructions and requirements</p>	<p>2.1 Safety instructions and safety signs are followed and disseminated to co-workers</p> <p>2.2 Safe handling of tools, equipment and materials is learned and shared with co-workers</p> <p>2.3 Execution of own work and of co-workers is monitored in according to safe work procedures</p>



	<p>2.4 Use of safe guards and safety devices is monitored</p> <p>2.5 Hazards, incidents, injuries and sickness in the workplace are reported properly following standards and procedures</p>
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## 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. <i>Safety requirements / regulations</i> may include but are not limited to:	<ul style="list-style-type: none"> <li>• Building code</li> <li>• Permit to Operate</li> <li>• Occupational Safety and Health Standards</li> </ul>
2. <i>Incidents and emergencies</i> may include but are not limited to:	<ul style="list-style-type: none"> <li>• Chemical spills</li> <li>• Equipment/vehicle accidents</li> <li>• Explosion</li> <li>• Fire</li> <li>• Gas leak</li> <li>• Injury to personnel</li> <li>• Structural collapse</li> <li>• Toxic and/or flammable vapors emission.</li> </ul>
3. <i>Prevention and control measures</i> may include but are not limited to:	<ul style="list-style-type: none"> <li>• Eliminate the hazard</li> <li>• Isolate the hazard</li> <li>• Substitute the hazard with a safer alternative</li> <li>• Use administrative controls to reduce the risk</li> <li>• Use engineering controls to reduce the risk</li> <li>• Use personal protective equipment</li> <li>• Safety, Health and Work Environment Evaluation</li> <li>• Periodic and/or special medical examinations of workers</li> </ul>

<p>4. <b>Safety devices/ PPEs</b> (personal protective equipment) May include but are not limited to:</p>	<ul style="list-style-type: none"> <li>• Arm/Hand guard, gloves</li> <li>• Eye protection (goggles, shield)</li> <li>• Hearing protection (ear muffs, ear plugs)</li> <li>• Hair Net/cap/bonnet</li> <li>• Hard hat</li> <li>• Face protection (mask, shield)</li> <li>• Apron/Gown/coverall/jump suit</li> <li>• Anti-static suits</li> <li>• High-visibility reflective vest</li> </ul>
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## 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
- Observation
- Reporting
- Organizing

### Required Knowledge

The individual needs to demonstrate knowledge of:

- Elements of an effective occupational safety and health program
- Benefits of implementing an occupational safety and health program
- Safety requirements of own work and of other workers
- Standard emergency plan and procedures in the workplace
- Different OSH control measures
- General OSH principles
- Work standards and procedures
- Safe handling procedures of tools, equipment's and materials
- Standard emergency plan and procedures in the workplace
- Different OSH control measures
- Standard accident and illness reporting procedures in the workplace
- Monitoring system on compliance to work safety and health

## EVIDENCE GUIDE

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

<p>1. Critical Aspects of Competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1. Arranged work area and items in accordance with workplace procedures requirements</li> <li>1.2. Followed work standards and procedures based on instructions</li> <li>1.3. Applied <b><i>Prevention and control measures</i></b> based on instructions</li> <li>1.4. Undertook orientations on <b><i>OSH requirements and regulations</i></b> in line with policy.</li> <li>1.5. Provided feedback on occupational health and safety as per workplace instructions.</li> <li>1.6. Adhered to workplace procedures for reporting hazards, incidents, injuries and sickness to as per workplace policy.</li> <li>1.7. Identified and proposed <b><i>OSH-related training needs</i></b> as per workplace policy.</li> </ul>
<p>2. Resource Implications for assessment</p>	<p>The following resources should be provided:</p> <ul style="list-style-type: none"> <li>2.1 Access to relevant workplace where assessment can take place</li> <li>2.2 Appropriately simulated environment where assessment can take place</li> </ul>
<p>3. Methods of Assessment</p>	<p>Competency in this unit may be assessed through:</p> <ul style="list-style-type: none"> <li>3.1 Oral questioning</li> <li>3.2 Portfolio of evidence</li> <li>3.3 Third Party Reports</li> <li>3.4 Written tests</li> </ul>
<p>4. Context of Assessment</p>	<p>Competency may be assessed:</p> <ul style="list-style-type: none"> <li>4.1 On-the-job</li> <li>4.2 Off-the-job</li> <li>4.3 During Industrial attachment</li> </ul>
<p>5. Guidance information for assessment</p>	<p>Holistic assessment with other units relevant to the industry sector, workplace and job role is recommended.</p>

## COMMON UNITS OF COMPETENCY

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## MEASURE AND CALCULATE OBJECTS PARAMETERS

**UNIT CODE: CON/OS/PL/CC/01/3/A**

### Unit Description

This unit of competency covers the competencies required to measure and calculate various parameters of an object. It entails distinguishing objects to be measured and calculated, use and care for measuring and calculation instruments and calculating parameters of a given object. It applies in the construction sector.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>Element</b> These describe the key outcomes which make up workplace function	<b>Performance Criteria</b> These are assessable statements which specify the required level of performance for each of the elements <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Distinguish objects to be measured and calculated	1.1 selected and gathered as per object to be measured or job requirements. 1.2 Specifications for <i><b>measurement and calculations</b></i> are obtained from relevant sources
2. Use and care for measuring and calculation instruments	2.1 Measurements are obtained according to job requirements 2.2 <i><b>Measuring and calculation instruments</b></i> are checked to the limit of accuracy of the tool. 2.3 Measuring and calculation instruments are maintained as per manufacturer's instructions. 2.4 Personal Protective Equipment is used in line with occupational safety and health regulations
3. Calculate parameters of a given object	3.1 Object is measured and readings recorded based of specification of the job. 3.2 Systems of measurement are identified and converted according to job requirements/ISO. 3.3 Calculations needed to complete work tasks are performed based on job specifications. 3.4 Numerical computation is self-checked and corrected for accuracy as per workplace policy. 3.5 Measurements and calculations are documented as per workplace policy.

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## 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.

Variables	Range
1. Measuring and calculation instruments may include but not limited to	<ul style="list-style-type: none"><li>• Micrometer gauge (In-out, depth)</li><li>• Vernier calipers (out, inside)</li><li>• Straight edge</li><li>• Try-square</li><li>• Protractor</li><li>• Steel rule</li><li>• Gauges</li><li>• Tape measure</li><li>• Pair of compasses</li><li>• Pair of dividers</li><li>• Calculator</li><li>• T-Square</li></ul>
2. Measurement calculations may include and not limited to:	<ul style="list-style-type: none"><li>• linear</li><li>• Volume</li><li>• Area</li><li>• Displacement</li><li>• Inside diameter</li><li>• Circumference</li><li>• Length</li><li>• Thickness</li><li>• Outside diameter</li><li>• Taper</li><li>• Out of roundness</li></ul>

## 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:

- Addition
- Subtraction
- Multiplication
- Division
- Algebraic equations
- Visualizing
- Interpreting
- Tool handling
- Communication
- Inter personal
- Reading
- Analytical

### Required Knowledge

- The individual needs to demonstrate knowledge of:
  - Four fundamental operations
  - Linear measurements
  - Dimensions
  - Unit conversion
  - Ratio and proportion
  - Algebraic equations
  - Use and maintenance of masonry tools and equipment
  - Geometrical shapes.

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### EVIDENCE GUIDE

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

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Selected and prepared measuring and calculation instruments correctly.</li> <li>1.2 Performed measurements and calculations accurately</li> <li>1.3 Obtained measurement and calculations specifications from relevant sources.</li> </ul>
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	<p>1.4 Checked measuring and calculation instruments accuracy to the limit of the tool.</p> <p>1.5 Measured and recorded objects' readings based of specification of the job.</p> <p>1.6 Identified and converted systems of measurement to job requirements.</p> <p>1.7 Performed calculations needed to complete work tasks accurately.</p> <p>1.8 Self-checked and corrected numerical computations for accuracy</p>
2. Resource Implications	<p>The following resources must be provided:</p> <p>2.1 Workplace location</p> <p>2.2 A problem to solve</p> <p>2.3 Measuring instrument appropriate to carry out tasks</p> <p>2.4 Instructional materials relevant to the proposed activity</p>
3. Methods of Assessment	<p>Competency may be assessed through:</p> <p>3.1 Observation.</p> <p>3.2 Written test</p> <p>3.3 Interview</p> <p>3.4 Oral questioning</p> <p>3.5 Project</p>
4. Context of Assessment	<p>Assessment may be done:</p> <p>4.1 On-the –job</p> <p>4.2 Off-the –job</p> <p>4.3 During work placement</p>
5. Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector workplace and job role is recommended</p>

## INTERPRET ARCHITECTURAL AND ENGINEERING DRAWINGS

**UNIT CODE: CON/OS/PL/CC/02/3/A**

### Unit Description

This unit deals with competencies required to interpret architectural and engineering drawings. It entails using drawing instruments, supplies and materials, differentiating parts of a drawing, applying isometric drawings and different types of scales.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>Element</b> These describe the key outcomes which make up workplace function	<b>Performance Criteria</b> These are assessable statements which specify the required level of performance for each of the elements  <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Use drawing instruments, supplies and materials	1.1 Drawing instruments are identified and gathered based on job requirements. 1.2 Drawing supplies and materials are identified and gathered based on the job specifications. 1.3 Drawing instruments are used and maintained as per manufacturer's instructions 1.4 Supplies and materials are used as per workplace policy 1.5 Waste supplies and materials are disposed in due regard to environmental protection and conservation 1.6 Personal Protective Equipment is used in line with occupational safety and health regulations
2. Differentiate parts of a drawing	2.1 Different parts of architectural and engineering drawings are identified based on international standards. 2.2 Symbols in construction drawings are identified based on international standards. 2.3 Types of drawings in a construction site are identified based on international standards
3. Apply isometric drawings	3.1 Types of isometric drawings are identified based on international standards. 3.2 Various objects are drawn 3.3 Principles of isometric drawing are applied in construction working drawings.

4. Apply different types of scales	<p>4.1 Scaled measurements are interpreted in accordance with international standards.</p> <p>4.2 Scales are used in sketching details of drawings.</p> <p>4.3 Measurements are transferred to the ground according to the drawings.</p>

## 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.

Variables	Range
1. Types of drawings may include but not limited to:	<ul style="list-style-type: none"> <li>• Architectural drawings</li> <li>• Structural drawings</li> <li>• Mechanical drawings</li> <li>• Scaffolding and shoring plans</li> <li>• Formwork drawings and details</li> <li>• Stone dressing details drawings</li> <li>• Finishing detail drawings</li> <li>• Electrical drawings</li> </ul>
2. Symbols may include but not limited to:	<ul style="list-style-type: none"> <li>• Architectural symbols</li> <li>• Piping / plumbing symbols</li> <li>• Electrical symbols</li> <li>• Mechanical symbols</li> <li>• Steelworks details symbols</li> <li>• Scaled measurements symbols</li> <li>• Site development symbols</li> </ul>
3. Measurements may include but not limited to:	<ul style="list-style-type: none"> <li>• Linear</li> <li>• Square-ness</li> <li>• Slope</li> <li>• Depth</li> <li>• Width</li> </ul>
4. Scaled measurements may include but not limited to:	<ul style="list-style-type: none"> <li>• Reducing scales</li> <li>• Extending scales</li> </ul>

5. Types of isometric drawings may include but not limited to:	<ul style="list-style-type: none"> <li>• Square</li> <li>• Oval</li> <li>• Cylindrical</li> <li>• Rectangular</li> <li>• Conical</li> </ul>
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## 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:

- Addition
- Subtraction
- Multiplication
- Division
- Visualizing
- Critical thinking
- Interpreting
- Tool handling
- Communication
- Inter personal
- Reading
- Analytical
- Measuring

### Required Knowledge

The individual needs to demonstrate knowledge of:

- Construction working drawings
- Terms and symbols used in working drawings
- Common lines used in working drawings.
- Common units of measurements,
- Taking measurements
- Conversion of units of measurement
- Tools and materials for making a working drawing
- Developing a working drawing
- Interpretation of working drawings

## EVIDENCE GUIDE

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

<p>1. Critical aspects of competency</p>	<p>Assessment requires evidence that the candidate:</p> <ul style="list-style-type: none"> <li>1.1 Demonstrated correct interpretation of the construction working drawings</li> <li>1.2 Identified symbols correctly in construction working drawing</li> <li>1.3 Identified different parts of a construction drawing correctly</li> <li>1.4 Identified symbols in construction drawings correctly.</li> <li>1.5 Identified types of working drawings in a construction site appropriately.</li> <li>1.6 Identified types of isometric drawings correctly</li> <li>1.7 Drew various objects in isometric.</li> <li>1.8 Applied principles of isometric drawing</li> <li>1.9 Interpreted scaled measurements correctly</li> <li>1.10 Sketched details of a working drawing to scales</li> <li>1.11 Transferred measurements on the working drawings to the ground correctly.</li> </ul>
<p>2. Resource Implications</p>	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>2.1 Workplace location</li> <li>2.2 Tools, and equipment for interpretation of working drawings</li> <li>2.3 Materials relevant to interpretation of working drawings</li> <li>2.4 A complete set of construction working drawings</li> </ul>
<p>3. Methods of Assessment</p>	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>3.1 Observation.</li> <li>3.2 Written test</li> <li>3.3 Interview</li> <li>3.4 Oral questioning</li> <li>3.5 Project</li> </ul>
<p>4. Context of Assessment</p>	<p>Assessment may be done:</p> <ul style="list-style-type: none"> <li>4.1 On-the –job</li> <li>4.2 Off-the –job</li> </ul>

	4.3 During work placement
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector workplace and job role is recommended

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## CORE UNITS OF COMPETENCY

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## INSTALL PIPES IN BUILDINGS

**UNIT CODE: CON/OS/PL/CR/01/3/A**

### Unit Description

This unit specifies the competencies required to install pipes in buildings. It involves interpreting drawings, using tools and equipment, quantifying materials requirement, fitting-up domestic pipework as well as testing functionality of pipework. It applies in the construction industry.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>Element</b> These describe the key outcomes which make up workplace function	<b>Performance Criteria</b> These are assessable statements which specify the required level of performance for each of the elements  <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Interpret working drawing	1.1 Drawings are differentiated based on <i><b>type of drawing</b></i> . 1.2 The scale of the drawing is read based on the provided key. 1.3 Imperial measurements are converted into metric measurements based on conversion table. 1.4 Symbols are identified based on internationally accepted codes. 1.5 Isometric piping drawings are drawn based on internationally accepted codes.
2. Use piping tools and equipment	2. 1 <i><b>Piping tools and equipment</b></i> are identified based on the requirements of the job. 2. 2Piping tools and equipment are cared for and maintained based on manufacturer's manual and workplace place policy. 2. 3Piping tools and equipment are used based on manufacturer's instructions. 2. 4Piping tools and equipment are stored based on manufacturer's instructions. 2. 5 <i><b>Personal Protective Equipment</b></i> is used in line with SOP 2. 6Materials required for piping are identified based on the drawings. 2. 7Supplies are identified based on <i><b>specifications</b></i> .



	2. 8A schedule of materials is created based on the drawing.
3. Quantify piping materials	3.1 Materials required for piping are identified based on the drawings. 3.2 Supplies are identified based on <i>specifications</i> . 3.3 A schedule of materials is created based on the drawing.
4. Fit-up domestic pipe work	4.1 Galvanized Iron pipes are threaded based on international codes. 4.2 Thermoplastic pipes are joined in accordance with international piping code. 4.3 Poly Vinyl Chloride pipes are joined as per manufacturer's instructions. 4.4 Pipes are fitted based on drawing specifications. 4.5 Pipe bending is done based on type, drawing specifications and requirements of the job. 4.6 Solar water heater system is installed based manufacturer's instructions.
5. Test functionality of pipe work	5.1 Hydro static test is conducted based on international pipe testing codes. 5.2 Air test is conducted based on international pipe testing codes 5.3 Faults in pipe work functionality and leakage are corrected based on workplace policy

## 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.

Variables	Range
1. Personal Protective may include but not limited to:	<ul style="list-style-type: none"> <li>• Hardhat</li> <li>• Gloves</li> <li>• Dustcoat / overall</li> <li>• Safety shoes / boots</li> </ul>
2. Piping tools and may include but not limited to:	<ul style="list-style-type: none"> <li>• Pipe wrench</li> <li>• Pipe cutter</li> </ul>

	<ul style="list-style-type: none"> <li>• Hacksaw</li> <li>• Pipe Threading Equipment</li> <li>• Vise - Bench</li> <li>• Tap and Punch</li> <li>• Files</li> <li>• Screwdrivers</li> <li>• Drill with various sizes of bits</li> <li>• Mallet</li> <li>• Ball hammer</li> <li>• Masonry chisel</li> <li>• PPR machine / Heat Fusion equipment</li> <li>• Pipe bender</li> </ul>
3. Materials may include but not limited to:	<ul style="list-style-type: none"> <li>• Various types of pipes</li> <li>• Various types and sizes of fittings</li> <li>• Caulking supplies</li> <li>• Various types of pipe support</li> <li>• Sandpapers</li> <li>• Threading oil</li> <li>• Thread tape</li> <li>• Solar water heater (passive and active)</li> <li>• Various types of valves</li> </ul>
4. Specifications may include but not limited to:	<ul style="list-style-type: none"> <li>• Gradient</li> <li>• Level</li> <li>• Plumpness</li> </ul>
5. Solar water but not limited to:	<ul style="list-style-type: none"> <li>• Active system</li> <li>• Passive system (vacuum tubes,etc.)</li> </ul>
6. Test may include but not limited to	<ul style="list-style-type: none"> <li>• Smoke test</li> <li>• Water test</li> <li>• Air test</li> </ul>
7. Type of drawing may include but not limited to	<ul style="list-style-type: none"> <li>• Architectural Engineering Details and sections</li> <li>• Isometric drawings</li> </ul>
8. Thermoplastic may include but not limited to:	<ul style="list-style-type: none"> <li>• PPR-Poly propylene random pipes</li> <li>• HDPE-High density poly</li> <li>• ethylene pipes</li> </ul>

9. Bending methods may include but not limited to	<ul style="list-style-type: none"> <li>• Bending machines for GI pipes</li> <li>• Burning for PVC pipes</li> <li>• Sanding for PVC pipes</li> </ul>
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## 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

- Interpersonal skills
- Communication skills
- Drawing and interpretation skills
- Problem-solving skills
- Critical thinking skills
- Organizing skills
- Measuring skills
- Numeracy skills
- Cutting skills
- Threading skills
- Fusion skills
- Bending skills
- Interpersonal Relationship skills

### Required Knowledge

The individual needs to demonstrate knowledge of:

- Measurement
- Fusion
- Bending
- Mensuration
- Plumping systems
- Solar water heating systems
- Rain water harvesting system
- Firefighting systems
- Drainage Waste and Vent (DWV) Systems

## EVIDENCE GUIDE

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

<p>1. Critical aspects of competency</p>	<p>1.1 Interpreted the working drawing correctly.            1.2 Used piping tools and equipment appropriately.            1.3 Quantified required supplies and materials accurately.            1.4 Fitted pipes are based on drawing specifications.            1.5 Produced functional pipe work.</p>
<p>2. Resource Implications</p>	<p>The following resources must be provided:            2.1 A functional workshop with basic plumbing tools,            2.2 equipment, materials and supplies.            2.3 References and manuals including construction working drawings            2.4 Personal protective equipment</p>
<p>3. Methods of Assessment</p>	<p>Competency may be assessed through:            3.1 Observation.            3.2 Written test            3.3 Interview            3.4 Oral questioning            3.5 Project</p>
<p>4. Context of Assessment</p>	<p>Assessment may be done:            4.1 On-the –job            4.2 Off-the –job            4.3 During work placement</p>
<p>5. Guidance information for assessment</p>	<p>Holistic assessment with other units relevant to the industry sector workplace and job role is recommended</p>

## INSTALL SANITARY APPLIANCES

**UNIT CODE: CON/OS/PL/CR/02/3/A**

### Unit Description

This unit specifies the competencies required to install sanitary appliances. It involves interpreting drawings, quantifying appliances and supplies, fixing sanitary appliances as well as testing working sanitary appliances. It applies in the construction industry.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>Element</b> These describe the key outcomes which make up workplace function	<b>Performance Criteria</b> These are assessable statements which specify the required level of performance for each of the elements  <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Interpret working drawing	Assessment requires evidence that the candidate: <ul style="list-style-type: none"> <li>1.1 Drawings are differentiated based on <i>type of drawing</i>.</li> <li>1.2 The scale of the drawing is read based on the provided key.</li> <li>1.3 Imperial measurements are converted in to metric measurements based on conversion table.</li> <li>1.4 Symbols are identified based on internationally accepted codes</li> <li>1.5 Isometric piping drawings are drawn based on internationally accepted codes.</li> </ul>
2. Interpret manufacturers drawings	<ul style="list-style-type: none"> <li>2.1 Manufacturers drawing of sanitary appliances are interpreted as presented.</li> <li>2.2 Assembling of sanitary appliances is done as per manufacturers' Instructions</li> <li>2.3 Supply pipes are connected as per manufacturers' instructions</li> </ul>
3. Quantify sanitary appliances	3.1 <i>Materials</i> required for fixing are identified based on requirements of the job.

	<p>3.2 Supplies required for fixing are identified based on manufacturers' instructions.</p> <p>3.3 <b>Schedule</b> of sanitary appliances is prepared based on the drawing.</p> <p>3.4 <b>Tools and equipment</b> needed for fixing appliances are selected based on the type of sanitary appliance instructions.</p>
4. Fix sanitary appliances	<p>4.1 Tools and equipment are used based manufacturer's instructions.</p> <p>4.2 Appliance <b>positioning</b> is determined based on working drawings.</p> <p>4.3 <b>Support</b> for sanitary appliances is put in place based on manufacturers' specifications</p> <p>4.4 Sanitary appliances are mounted based on manufacturer's installation manual.</p> <p>4.5 <b>Quality checks</b> and parameters are done in accordance to industry standards.</p> <p>4.6 <b>Personal Protective Equipment</b> is used in line with occupational safety and health regulations</p>
5. Test and commission working of sanitary appliances	<p>5.1 Functionality of the appliance is tested based on manufacturer's manual and requirements.</p> <p>5.2 Faults in appliance functionality and leakage are corrected based on manufacturers' procedures.</p> <p>5.3 The works are commissioned in accordance to job requirements</p>

## 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.

Variables	Range
1. Materials may include but not limited to	<ul style="list-style-type: none"> <li>• Screws</li> <li>• Adhesives</li> <li>• Cement</li> <li>• Sand</li> </ul>

	<ul style="list-style-type: none"> <li>• Pipes</li> <li>• Traps</li> <li>• Gutters</li> <li>• Electric cables</li> <li>• Caulking material</li> </ul>
2. Tools and equipment may include but not limited to:	<ul style="list-style-type: none"> <li>• Pipe wrench</li> <li>• Pipe cutter</li> <li>• Hacksaw</li> <li>• Pipe Threading Equipment</li> <li>• Vise - Bench</li> <li>• Tap and Punch</li> <li>• Files</li> <li>• Screwdrivers</li> <li>• Drill with various sizes of bits</li> <li>• Mallet</li> <li>• Ball hammer</li> <li>• Masonry chisel</li> <li>• PPR machine / Heat Fusion equipment</li> <li>• Pipe bender</li> <li>• Trowel</li> </ul>
3. Personal Protective Equipment (PPE) include but not limited to:	<ul style="list-style-type: none"> <li>• Hardhat</li> <li>• Gloves</li> <li>• Dustcover / overall</li> <li>• Safety shoes / boots</li> </ul>
4. Types of appliances include but not limited to:	<ul style="list-style-type: none"> <li>• Wash hand basin</li> <li>• Water closet</li> <li>• Bath tub</li> <li>• Urinal</li> <li>• Bidet</li> <li>• Kitchen sink</li> <li>• Jacuzzi</li> <li>• Shower head</li> </ul>
5. Positioning include but not limited to:	<ul style="list-style-type: none"> <li>• Standard positioning</li> <li>• Special positioning</li> </ul>

6. Specifications include but not limited to:	<ul style="list-style-type: none"> <li>• Manufacturer’s specifications</li> <li>• Engineer’s specifications</li> <li>• Client’s specifications</li> </ul>
7. Faults include but not limited to:	<ul style="list-style-type: none"> <li>• Installation faults</li> <li>• Manufacturer’s faults</li> </ul>
8. Quality checks and parameters may include but not limited to:	<ul style="list-style-type: none"> <li>• Levelness</li> <li>• Plumpness</li> <li>• Accuracy</li> </ul>
9. Support may include but not limited to:	<ul style="list-style-type: none"> <li>• Self-support</li> <li>• Provided support</li> </ul>

## 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:

- Drawing and interpretation skills
- Problem-solving skills
- Critical-thinking skills
- Organizing skills
- Measuring skills
- Numeracy skills
- Cutting skills
- Threading skills
- Fusion skills
- Bending skills
- Quality of materials identification skills

### Required knowledge

The individual needs to demonstrate knowledge of:

- Conversion of units
- Measurement



- Fusion
- Bending
- Mensuration
- Types of cloaking materials
- Types of valves
- Types of appliances
- Types of traps
- Testing
- Special appliances and
- New technologies

## EVIDENCE GUIDE

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

1. 1. Critical aspects of competency	Assessment requires evidence that the Candidate: <ul style="list-style-type: none"> <li>1.1 Interpreted working drawings correctly.</li> <li>1.2 Positioned appliances based on specifications.</li> <li>1.3 Installed functional appliances correctly.</li> <li>1.4 Quantify materials, supplies and appliances accurately.</li> </ul>
2. Resource Implications	The following resources must be provided: <ul style="list-style-type: none"> <li>2.1 A functional workshop with basic tools, equipment and sanitary appliances.</li> <li>2.2 Reference and appliance</li> <li>2.3 manuals</li> <li>2.4 Personal protective equipment</li> </ul>
3. Methods of Assessment	Competency may be assessed through: <ul style="list-style-type: none"> <li>3.1 Observation.</li> <li>3.2 Written test</li> <li>3.3 Interview</li> <li>3.4 Oral questioning</li> <li>3.5 Project</li> </ul>

4. Context of Assessment	Assessment may be done: 4.1 On-the –job 4.2 Off-the –job 4.3 During work placement
5. Guidance information for assessment	Holistic assessment with other units relevant to the industry sector workplace and job role is recommended

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## INSTALL STORAGE AND PUMPING SYSTEMS

**UNIT CODE: CON/OS/PL/CR/03/3/A**

### Unit Description

This unit specifies the competencies required to install storage and pumping systems. It involves interpretation of drawings quantifying storage and ancillary appliance, and testing and commissioning storage and ancillary appliances, it applies in the construction industry

### ELEMENTS AND PERFORMANCE CRITERIA

<b>Element</b> These describe the key outcomes which make up workplace function	<b>Performance Criteria</b> These are assessable statements which specify the required level of performance for each of the elements <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Interpret working drawing	1.1 Working drawings are differentiated based on international technical drawings (ISO 128). 1.2 Imperial measurements are converted into metric measurements based on conversion table. 1.3 Symbols are identified and interpreted based on international technical drawings (ISO 128). 1.4 Storage and ancillary appliance position is identified based on working drawings.
2. Interpret water storage appliances manufacturers drawings	2.1 Water storage appliances manufacturers' drawing is interpreted as presented. 2.2 Pipe work installation to water storage appliances are done as per manufacturers 'instructions.
3. Interpret pumps manufacturers drawing	3.1 Water pump manufacturers' drawing is interpreted as presented. 3.2 Pipe work installation to pump is done as per manufacturer's instructions.
4. Quantify storage and ancillary appliances supplies and materials required	4.1 <b>Materials</b> required for installing storage and <b>ancillary appliances</b> are identified based on requirements of the job. 4.2 <b>Supplies</b> required for installation of storage and ancillary

	<p>4.3 appliances are identified based on requirements of the job.</p> <p>4.4 Quantity and <i>types of storage</i> and <i>types of pumps</i> required are enumerated based on the drawing.</p>
5. Install storage systems and ancillary appliances	<p>5.1 <b>Tools and equipment</b> needed for fixing storage and ancillary appliances are selected based on the job requirements.</p> <p>5.2 Tools and equipment are used based manufacturer's instructions</p> <p>5.3 Storage and ancillary appliances positioning are determined based on drawings.</p> <p>5.4 Support for Storage and ancillary appliances are put in place-based manufacturers' instructions</p> <p>5.5 Storage and ancillary appliances are mounted based on job requirements and manufacturer's installation manual.</p> <p>5.6 Personal Protective Equipment is used in line with occupational safety and health regulations</p>
6. Test and commission storage and Ancillary appliances	<p>6.1 Functionality of the Storage and ancillary appliances are tested based on manufacturer's manual and requirements.</p> <p>6.2 Faults in Storage and ancillary appliances functionality and leakage is corrected based on workplace policy.</p> <p>6.3 Commission the storage and pumping system as per the clients/ contract requirements.</p>

## 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.

Variables	Range
1. Materials may include but not limited to:	<ul style="list-style-type: none"> <li>• Pipes</li> <li>• Various type of Valves</li> <li>• Fittings</li> <li>• Various types of tanks</li> </ul>

	<ul style="list-style-type: none"> <li>• Various types of pumps</li> </ul>
2. Tools and Equipment may include but not limited to:	<ul style="list-style-type: none"> <li>• Pipe wrench</li> <li>• Pipe cutter</li> <li>• Hacksaw</li> <li>• Pipe threading equipment</li> <li>• Vise - Bench</li> <li>• Tap and Punch</li> <li>• Files</li> <li>• Screwdrivers</li> <li>• Drill with various sizes of bits</li> <li>• Mallet</li> <li>• Ball hammer</li> <li>• Masonry chisel</li> <li>• PPR machine / Heat Fusion equipment</li> <li>• Pipe bender</li> <li>• Sealant gun</li> </ul>
3. Ancillary Appliances may include but not limited to:	<ul style="list-style-type: none"> <li>• Float valves</li> <li>• Control valves</li> <li>• Pressure relief valves</li> <li>• Non-return valves</li> <li>• Foot valves</li> <li>• Strainers</li> <li>• Various pumps and controllers</li> <li>• Solar storage / tanks and collectors</li> <li>• Flanges</li> </ul>
4. Supplies may include but not limited to:	<ul style="list-style-type: none"> <li>• Fittings</li> <li>• Gaskets and O-rings</li> <li>• Caulking agents</li> <li>• Sealant and glue</li> <li>• Water proofing agents</li> </ul>
5. Storage type may include but not limited to	<ul style="list-style-type: none"> <li>• Plastic tanks (PE)</li> <li>• Steel tanks</li> <li>• Concrete tanks</li> <li>• Masonry tanks</li> <li>• Rubber tanks</li> </ul>

	<ul style="list-style-type: none"> <li>• Aluminum Alloy</li> <li>• Fiber Reinforced Plastics (FRP)</li> <li>• Insulated tanks</li> <li>• Septic tank systems</li> </ul>
6. Pumps types may include but not limited:	<ul style="list-style-type: none"> <li>• Sump pumps</li> <li>• Submersible pumps</li> <li>• Centrifugal pumps</li> <li>• Booster pumps</li> <li>• Various types of controllers</li> </ul>
7. Ancillary appliances may include but not limited to:	<ul style="list-style-type: none"> <li>• Solar water heaters</li> <li>• Pumps and controllers</li> <li>• Safety valves</li> <li>• Sump tanks</li> <li>• Instant water heaters</li> <li>• Washing machines</li> <li>• connections)</li> <li>• Water purifiers</li> </ul>
8. Positioning may include but not limited to	<ul style="list-style-type: none"> <li>• Underground</li> <li>• On-ground</li> <li>• Above ground (elevated)</li> </ul>
9. Support may include but not limited to:	<ul style="list-style-type: none"> <li>• Steel</li> <li>• Steel Pipes</li> <li>• Concrete</li> <li>• Timber</li> <li>• Masonry</li> <li>• Compact earth</li> </ul>
10. Faults may include but not limited to:	<ul style="list-style-type: none"> <li>• Low and high pressure</li> <li>• Air locks</li> <li>• Leaks</li> <li>• Clogged system</li> <li>• Control valve problems</li> <li>• Pump faults</li> </ul>

## 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:

- Drawing and interpretation skills
- Problem-solving skills
- Critical thinking skills
- Communication skills
- Interpersonal relationship skills
- Organizing skills
- Measuring skills
- Numeracy skills
- Cutting skills
- Threading skills
- Fusion skills
- Bending skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

- Drawing and drawing interpretation
- Mensuration
- Basic fluid mechanics
- Storage systems
- Pumping systems
- Support system for elevated storage
- Plumbing ancillary systems
- Solar water heating systems
- Septic storage systems

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**EVIDENCE GUIDE**

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

<p>1. 1. Critical aspects of competency</p>	<p>Assessment requires evidence that the Candidate:</p> <ul style="list-style-type: none"> <li>1.1 Interpreted working drawing correctly.</li> <li>1.2 Quantified storage and ancillary appliances supplies and materials required accurately.</li> <li>1.3 Installed storage systems and ancillary appliances according to work requirements properly.</li> <li>1.4 Tested storage and ancillary appliances to functionality according to manuals</li> </ul>
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2. Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>2.1 A functional workshop with basic tools, equipment and sanitary appliances.</li> <li>2.2 Reference and appliance manuals</li> <li>2.3 Personal protective equipment</li> </ul>
3. Methods of Assessment	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>3.1 Observation.</li> <li>3.2 Written test</li> <li>3.3 Interview</li> <li>3.4 Oral questioning</li> <li>3.5 Project</li> </ul>
4. Context of Assessment	<p>Assessment may be done:</p> <ul style="list-style-type: none"> <li>4.1 On-the –job</li> <li>4.2 Off-the –job</li> <li>4.3 During work placement</li> </ul>
5. Guidance information for assessment	<p>Holistic assessment with other units relevant to the industry sector workplace and job role is recommended</p>



## MAINTAIN PLUMBING SYSTEMS

**UNIT CODE:** CON/OS/PL/CR/04/3/A

### Unit Description

This unit specifies the competencies required to maintain plumbing systems. It involves trouble shooting plumbing systems faults, quantifying requirements for repair, fixing plumbing system faults, and testing functionality of plumbing systems. It applies in the construction industry.

### ELEMENTS AND PERFORMANCE CRITERIA

<b>Element</b> These describe the key outcomes which make up workplace function	<b>Performance Criteria</b> These are assessable statements which specify the required level of performance for each of the elements <i><b>Bold and italicized terms are elaborated in the Range</b></i>
1. Troubleshoot plumbing systems faults	1.1 History of the plumbing faults in taken as per workplace policy. 1.2 Possible causes of the plumbing faults are listed. 1.3 Most likely cause of the plumbing fault is identified by elimination. 1.4 Solution for the fault is identified based on best practice.
2. Quantify requirements for repair	2. 1 <b>Materials</b> required for plumbing fault repair are identified based on requirements of the job. 2. 2 <b>Supplies</b> required for plumbing fault repair are identified based on requirements of the job. 2. 3 <b>Appliances</b> that need replacement are identified based on the requirements of the job. 2. 4 <b>Tools and equipment</b> are identified based on job requirements.
3. Fix plumbing system faults	3.1 Notice for <b>maintenance</b> operation are issued as per standard Operating procedure. 3.2 Fluid flow is stopped as per standard operating procedure. 3.3 <b>Tools and equipment</b> are used as per manufacturer's instructions.

	<p>3.4 Faulty area is dis-assembled as per standard operating procedure.</p> <p>3.5 Fault is repaired based on building's pre-existing standards</p> <p>3.6 Work area is cleared as per standard operating procedure or best practice.</p> <p>3.7 <b>Personal Protective Equipment</b> is used in line with occupational safety and health regulations.</p>
4. Test functionality of Plumbing system	<p>4.1 <b>Fluid</b> flow is reinstated as per the design.</p> <p>4.2 Functionality of the plumbing system is tested based on expected outcome.</p> <p>4.3 Repair work area is returned to initial condition as per workplace policy.</p>

## 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.

Variables	Range
Materials may include but not limited to:	<ul style="list-style-type: none"> <li>• Screws</li> <li>• Adhesives</li> <li>• Cement</li> <li>• Sand</li> <li>• Pipes</li> <li>• Traps</li> <li>• Electric cables</li> <li>• Cloaking material</li> <li>• fittings</li> </ul>
Appliances may include but not limited to:	<ul style="list-style-type: none"> <li>• Wash hand basin</li> <li>• Water closet</li> <li>• Bath tub</li> <li>• Urinal</li> <li>• Bidet</li> <li>• Kitchen sink</li> <li>• Jacuzzi</li> <li>• Shower head</li> </ul>

	<ul style="list-style-type: none"> <li>• Solar water heaters</li> <li>• Rain water harvester</li> <li>• Strainers</li> <li>• Storage systems</li> <li>• Pumping systems</li> <li>• Instant Showers</li> <li>• Water Filters</li> <li>•</li> </ul>
Personal Protective Equipment (PPE) may include but not limited to:	<ul style="list-style-type: none"> <li>• Hardhat</li> <li>• Gloves</li> <li>• Dustcoat/overall</li> <li>• Dust mask</li> <li>• Safety shoes/boots</li> <li>•</li> </ul>
Tools and equipment may include but not limited to:	<ul style="list-style-type: none"> <li>• Pipe wrench</li> <li>• Pipe cutter</li> <li>• Hacksaw</li> <li>• Pipe threading equipment</li> <li>• Tap and Punch</li> <li>• Files</li> <li>• Screwdrivers</li> <li>• Drill with various sizes of bits</li> <li>• Mallet</li> <li>• Ball hammer</li> <li>• Masonry chisel</li> <li>• PPR machine/heat fusion equipment</li> <li>• Pipe bender</li> <li>• Trowel</li> <li>• De-clogging wire/de-clogging machine</li> <li>• Toilet pump</li> <li>•</li> </ul>
Fluid may include but not limited to:	<ul style="list-style-type: none"> <li>• Liquids</li> <li>• Gases</li> <li>•</li> </ul>

## 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
- Drawing skills
- Problem-solving skills
- Critical thinking skills
- Organizing skills
- Measuring skills
- Numeracy skills
- Cutting skills
- Threading skills
- Fusion skills
- Bending skills

**Required Knowledge**

The individual needs to demonstrate knowledge of:

- Trouble shooting process
- Preventive maintenance of all systems
- Corrective maintenance of all systems
- Plumbing systems
- Types of fitting and appliances
- Maintenance of each type of fitting and appliance

**EVIDENCE GUIDE**

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

<p>1. 1. Critical aspects of competency</p>	<p>Assessment requires evidence that the Candidate:</p> <ul style="list-style-type: none"> <li>1.1 Troubleshoot plumbing systems faults correctly.</li> <li>1.2 Quantified requirements for repair accurately</li> <li>1.3 Fixed plumbing faults correctly</li> <li>1.4 Tested functionality of plumbing systems according to standards.</li> </ul>
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<p>2. Resource Implications</p>	<p>The following resources must be provided:</p> <p>2.1 A functional workshop with basic tools, equipment and sanitary appliances.</p> <p>2.2 Reference and maintenance manuals</p> <p>2.3 Personal protective equipment</p>
<p>3. Methods of Assessment</p>	<p>Competency may be assessed through:</p> <p>3.1 Observation.</p> <p>3.2 Written test</p> <p>3.3 Interview</p> <p>3.4 Oral questioning</p> <p>3.5 Project</p>
<p>4. Context of Assessment</p>	<p>Assessment may be done:</p> <p>4.1 On-the –job</p> <p>4.2 Off-the –job</p> <p>4.3 During work placement</p>
<p>5. Guidance information for assessment</p>	<p>Holistic assessment with other units relevant to the industry sector workplace and job role is recommended</p>