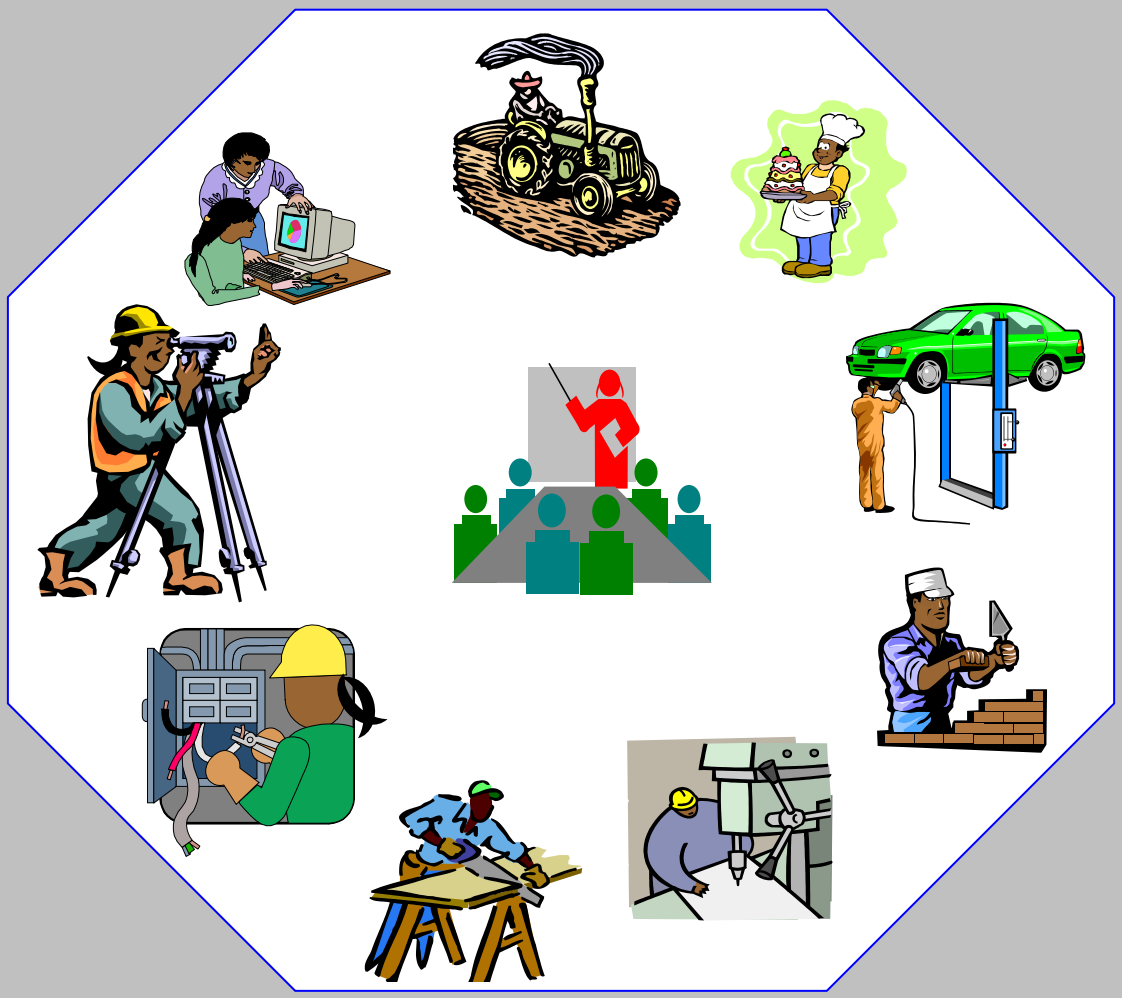
Federal Democratic Republic of Ethiopia

OCCUPATIONAL STANDARD

CEMENT PRODUCTION TECHNOLOGY MANAGEMENT

NTQF Level V



Ministry of Education

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Introduction

Ethiopia has embarked on a process of reforming its TVET-System. Within the policies and strategies of the Ethiopian Government, technology transformation – by using international standards and international best practices as the basis, and, adopting, adapting and verifying them in the Ethiopian context – is a pivotal element. TVET is given an important role with regard to technology transfer. The new paradigm in the outcome-based TVET system is the orientation at the current and anticipated future demand of the economy and the labor market.

The Ethiopia Occupational Standard (EOS) is the core element of the Ethiopian National TVET-Strategy and an important factor within the context of the National TVET-Qualification Framework (NTQF).They are national Ethiopian standards, which define the occupational requirements and expected outcome related to a specific occupation without taking TVET delivery into account.

This document details the mandatory format, sequencing, wording and layout for the Ethiopia Occupational Standard which comprised of Units of Competence.

A Unit of Competence describes a distinct work activity. It is documented in a standard format that comprises:

- Occupational title, NTQF level
- Unit code
- Unit title
- Unit descriptor
- Elements and Performance criteria
- Variables and Range statement
- Evidence guide

Together all the parts of a Unit of Competence guide the assessor in determining whether the candidate is competent.

The ensuing sections of this EOS document comprise a description of the respective occupation with all the key components of a Unit of Competence:

- the chart with an overview of all Units of Competence for the respective occupation including the Unit Codes and the Unit Titles
- the contents of each Unit of Competence (competence standard)
- occupational map providing the technical and vocational education and training (TVET) providers with information and important requirements to consider when designing training programs for this standards, and for the individual, a career path

UNIT OF COMPETENCE CHART

Occupational Standard: Cement Production Technology Management

Occupational Code: IND CPM

NTQF V

IND CPM5 01 0111 Optimize Production Systems	IND CPM5 02 0111 Control Process in Abnormal Situations	IND CPM5 03 0111 Determine Energy Transfer Loads
IND CPM5 04 0111 Determine Mass Transfer Loads	IND CPM5 05 0111 Manage Utilities	IND CPM5 06 0111 Analyze Production Trials
IND CPM5 07 0111 Analyze Equipment Performance	IND CPM5 08 0111 Prepare Basic Engineering Drawing	IND CPM5 09 0111 Manage People Relationships
IND CPM5 10 0111 Manage Workplace Learning	IND CPM5 11 0111 Determine and Improve Process Capability	IND CPM5 12 0111 Implement Continuous Improvement System
IND CPM5 13 0111 Review Procedures to Minimize Environmental Impact of Process	IND CPM5 14 0111 Facilitate Development of New Product	IND CPM5 15 0111 Establish and Conduct Business Relationship
IND CPM5 16 1012 Develop and Refine Systems for Continuous Improvement in Operations		

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Optimize Production Systems**
Unit Code	**IND CPM5 01 0111**
Unit Descriptor	This unit covers the application of in depth knowledge of process and plant to the optimization of complex operating production systems

Elements	Performance Criteria
1. Identify process or system for review	1.1 Review process or plant performance to determine likely areas of improvement. 1.2 Gather data on the process or system design 1.3 Design the data collection system for the required data.
2. Collect and analyze data	2.1 Collect or review available data from the process or plant 2.2 Analyze the data for trends or dependencies 2.3 Postulate possible cause and effect scenarios
3. Develop tests or trials	3.1 Propose controlled tests or trials to review the plant or process patterns 3.2 Discuss possible solutions to cause with relevant people 3.3 Arrange for required tests or controls to be undertaken in appropriate time frame 3.4 Collect further data from tests or trials 3.5 Review plant or process data and compare with original data. 3.6 Prepare further tests or trials as required, or until possible solutions are developed.
4. Develop improvement solution	4.1 Agree required improvement solution with appropriate people 4.2 Arrange for required improvement solution to be undertaken in appropriate time frame 4.3 Follow items initiated through until final resolution has occurred 4.4 Check effectiveness of solution and take appropriate action 4.5 Complete reports to procedure

Variable	Range
Codes of practice/ standards	• Where reference is made to industry codes of practice, and/or Australian/international standards, the latest version must be used
Context	• This unit of competence includes reviews of the plant, plant equipment or process which may make itself evident through desire for improved quality, higher yields, less waste or better control.
Health, safety and environment (HSE)	• All operations to which this unit applies are subject to stringent health, safety and environment requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between performance criteria and HSE requirements, the HSE requirements take precedence

Evidence Guide	
Critical aspects of Competence	Assessment requires evidence that the candidate: • analyzed and resolved different types of processes or plant units • satisfied different types of stakeholders • identified and analyzed the range of possible causes and the most likely cause determined • took appropriate action
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • plant equipment, its characteristics and limitations • impact of variations in plant/process and the distinctive signs of each variation • process chemistry, physics as relevant (eg to the extent of writing chemical equations and identifying factors controlling reaction rate and yield or equivalent, or determining mass or heat transfer rates for a process) • problem isolation techniques • problem analysis techniques • organization approval processes
Underpinning Skills	Demonstrates skills to: • data collection and analysis • problem solving for multi-variable processes • negotiation • communication • mathematics

Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Assessment Methods	Competence may be assessed through: • Interview / Written Test / Oral Questioning • Observation / Demonstration
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Control Process in Abnormal Situations**
Unit Code	**IND CPM5 02 0111**
Unit Descriptor	This unit covers the responses required by a senior operation technician to make decisions and control a process during abnormal or declared incident situations to prevent or avoid an emergency

Elements	Performance Criteria
1. Identify the abnormal situation	1.1 Identify the state of the plant/process 1.2 Gather available information on the plant/process with particular focus on trends and rates of change 1.3 Verify and confirm situation with other technicians in the area and any upstream or downstream units
2. Respond appropriately	2.1 Apply immediate actions to respond to the abnormal situation to bring the plant/process to a safer state 2.2 Decide whether to continue operations, shutdown or abandon 2.3 Keep in contact with other operation technicians in the area
3. Review and respond to changes	3.1 Review the situation, gather data on the state of the plant / process and the trends and rates of change 3.2 Make appropriate changes to the state of the plant/ process to keep parameters within limits 3.3 Rectify or initiate procedures to rectify any faults or adjustments to secure the safe operation of the plant/process 3.4 Review the state of the recovery, making adjustments as required 3.5 Keep all other stakeholders informed of progress 3.6 When plant is restored to stable conditions, continue to monitor the situation
4. Document abnormal situation and response	4.1 Complete all logs and workplace documentation relating to the abnormal situation, ensuring all details, actions and responses are accurately recorded 4.2 Record any further ongoing production problems and report to appropriate persons or authority

Variable	Range
Codes of practice/standards	• Where reference is made to industry codes of practice, and/or National/international standards, the latest version must be used
Context	• This unit of competence includes abnormal situations, declared situations or emergency conditions in the plant or process, where recovery of the situation is possible.
Health, safety and environment (HSE)	• All operations to which this unit applies are subject to stringent health, safety and environment requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between Performance Criteria and HSE requirements, the HSE requirements take precedence

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • analyzed and resolved different types of abnormal situations • satisfied different types of stakeholders • identified and analyzed the range of possible causes and the most likely cause determined • took appropriate action
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • plant equipment, its characteristics and limitations • impact of variations in plant/process and the distinctive signs of each variation • process chemistry and physics as relevant • problem isolation techniques • problem analysis techniques • organization approval processes
Underpinning Skills	Demonstrates skills to: • analysis of rapidly changing and possibly confusing data • problem solving • communication under stress • leadership of the operational team
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Assessment Methods	Competence may be assessed through: • Interview / Written Test / Oral Questioning • Observation / Demonstration
Context of Assessment	Competence may be assessed in the workplace or in a simulated workplace setting

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Determine Energy Transfer Loads**
Unit Code	**IND CPM5 03 0111**
Unit Descriptor	This competence covers the application of a knowledge of energy transfer and energy balance principles to the design and use of processing equipment

Elements	Performance Criteria
1. Prepare for work	1.1 Identify work requirements 1.2 Identify and control hazards 1.3 Coordinate with appropriate personnel
2. Calculate heat transferred from/to items	2.1 Calculate conductive heat transfer to/from an object 2.2 Calculate convective heat transfer to/from an object 2.3 Calculate radiative heat transfer to/from an object 2.4 Calculate combined heat transfer to/from an object, including resistances in series and parallel.
3. Calculate temperature change	3.1 Calculate temperature change caused by heating/cooling of process materials in typical examples of processing equipment 3.2 Calculate change in heat content caused by chemical reaction 3.3 Calculate temperature rise caused by chemical reaction.
4. Select appropriate heating/cooling mechanism for an application	4.1 Compare rates of heat transfer/overall heat transfer coefficients for major methods of heating and cooling 4.2 Determine appropriate methods of varying/controlling rates of heat transfer 4.3 Calculate heat transfer rates under a range of conditions
5. Conduct energy balance over process components	5.1 Determine desired boundaries for energy balance calculation 5.2 Determine possible sources of data required from the plant 5.3 Match and adjust sources of data to desired boundary for energy balance 5.4 Determine overall heating load 5.5 Determine overall cooling load 5.6 Determine the adequacy (or otherwise) of the process/ plant heating/cooling system to cope with this load

Variable	Range
Codes of practice/ standards	Where reference is made to industry codes of practice, and/or National/international standards, the latest version must be used
Context	This competence unit includes the heating/cooling loads of all processing equipment and requires the quantitative determination of loads. This competence applies to all sectors within the chemical, hydrocarbons and oil refining industry. Heat transfer modes include: • conduction • convection (forced and natural) • radiation • combined conduction/convection • Sources of heating/cooling include: • chemical reaction • water cooling • air cooling • steam heating (calculations for saturated steam only) • hot fluid (e g oil) heating
Health, safety and environment (HSE)	All operations to which this unit applies are subject to stringent health, safety and environment requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between Performance Criteria and HSE requirements, the HSE requirements take precedence

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • drawn realistic boundaries for the energy balance which align with practical sources of data from the plant • collected data from the plant with minimum disruption to production • consistent theoretical and practical requirements for the energy balance • used the energy balance data to identify and contribute to solutions for plant problems
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • heat transfer principles and calculations sufficient to determine the heating/cooling loads of an existing or a new process

Underpinning Skills	Demonstrates skills to: • determine the boundaries of the system to be studied • collect the required plant data from measurements, readings or calculated quantities • calculate the energy transfer loads • report the results • Competence also includes the ability, for the practical completion of the job, to apply and/or explain: • conduction • convection • radiation • combined conduction/convection • specific heat capacity • exothermic and endothermic reaction calculations • energy balances
Resources Implication	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Assessment Methods	Competence may be assessed through: • Interview / Written Test / Oral Questioning • Observation / Demonstration
Context of Assessment	Competence may be assessed in the workplace or in a simulated workplace setting

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Determine Mass Transfer Loads**
Unit Code	**IND CPM5 04 0111**
Unit Descriptor	This competence covers the application of a knowledge of mass transfer and mass balance principles to the design and use of processing equipment

Elements	Performance Criteria
1. Prepare for work	1.1 Identify work requirements 1.2 Identify and control hazards 1.3 Coordinate with appropriate personnel
2. Calculate mass flow rates of streams	2.1 Calculate mass flow rate of plant streams from volumetric data, correcting for changes in density 2.2 Calculate mass flow rate of individual components of plant streams from their concentrations 2.3 Calculate mass accumulation (+ or -) within a plant item.
3. Calculate mass change due to a chemical reaction	3.1 Determine yield from reaction of all significant products 3.2 Determine mass output of all significant products arising from the reaction for specified reactant inputs
4. Conduct mass balance over process components	4.1 Determine desired boundaries for mass balance calculation 4.2 Determine possible sources of data required from the plant 4.3 Match and adjust sources of data to desired boundary for mass balance 4.4 Determine overall mass balance 4.5 Determine mass balance for each significant component/reactant and product 4.6 Determine the adequacy (or otherwise) of the process/plant heating/cooling system to meet production requirements

Variable	Range
Context	This competence unit includes the mass transfer into and out of all processing equipment and requires the quantitative determination of mass transfer loads. This competence applies to all sectors within the cement industry. Mass transfer modes include:

	• simple (physical) mixing • simple (physical) separation • changes in component mass flow rates due to chemical reaction (including mixing and separation using chemical reaction)
Health, safety and environment (HSE)	All operations to which this unit applies are subject to stringent health, safety and environment requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between Performance Criteria and HSE requirements, the HSE requirements take precedence

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • drawn realistic boundaries for the mass balance which align with practical sources of data from the plant • collected data from the plant with minimum disruption to production • consistent theoretical and practical requirements for the mass balance • used the mass balance data to identify and contribute to solutions for plant problems
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • mass transfer principles and calculations sufficient to determine the mass transfer loads of an existing or a new process
Underpinning Skills	Demonstrates skills to: • determine the boundaries of the system to be studied • collect the required plant data from measurements, readings or calculated quantities • calculate the mass transfer loads • report the results • changes in density with temperature (and pressure where appropriate) • stoichiometry of chemical reactions • mass balances
Resource Implications	The following resources should be provided: • access to relevant workplace or appropriately simulated environment where assessment can take place • materials relevant to the proposed activity or task
Methods of Assessment	Competence may be assessed through: • Interview / Written Test / Oral Questioning • Observation/demonstration
Context of Assessment	Competence may be assessed in the work place or in a simulated work place setting.

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Manage Utilities**
Unit Code	**IND CPM5 05 0111**
Unit Descriptor	This competence covers management of utilities used by a whole site or group of plants with a view to improving the efficiency of usage

Elements	Performance Criteria
1. Identify source and use of all utilities on plant.	1.1 Obtain current services diagram or schematic for plant 1.2 Identify all items of equipment using utilities 1.3 Identify source of each utility 1.4 Identify utility properties (eg pressure,flow rate, voltage, current) as supplied 1.5 Determine required utility properties(eg from engineering specification) for each item of equipment using each utility
2. Determine actual consumption of utilities	2.1 Get information showing consumption of utilities by the plant and plant equipment 2.2 Get information showing actual utility properties as used by each plant item 2.3 Physically check each item of equipment for signs of inefficient utility use, eg faulty steam traps, leaks 2.4 Compile report/database showing actual usage of utilities and observed problems
3. Determine efficiency of use	3.1 Determine theoretical consumption of utilities for equipment items from engineering specifications, by calculation or other methods 3.2 Compare actual consumption of utilities with theoretical consumption 3.3 Determine inefficient users of utilities 3.4 Compile report/database showing efficiency of use of Utilities
4. Take required action to improve utility efficiency	4.1 Rank inefficient users in priority order for remediation based on costs and business requirements 4.2 Investigate and determine cause(s) of inefficiency in the higher ranked users 4.3 Develop plans to remove the causes of inefficiency 4.4 Identify any safety, health and environmental (HSE) implications of planned actions and address prior to any

	implementation of changes 4.5 Consult with relevant stakeholders regarding HSE implications and the implementation of these plans 4.6 Initiate appropriate action for items within scope of authority 4.7 Follow through on items to facilitate a timely completion 4.8 Report/make recommendations on required improvements which are beyond scope of authority to action

Variable	**Range**
Context	• This unit of competence includes all such items of equipment and unit operations which use utilities
Health, safety and environment (HSE)	• All operations to which this unit applies are subject to stringent health, safety and environment requirements, which may be imposed through State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between Performance Criteria and HSE requirements, the HSE requirements take precedence

Evidence Guide	
Critical aspects of competence	Assessment requires evidence that the candidate: • obtained plant data in a manner which does not interfere with production • interpreted plant drawings (e g P&IDs) and engineering specifications correctly • identified and addressed health, safety and environmental implications of any changes, by applying the hierarchy of control, prior to any changes being implemented • considered all relevant factors such as plant key performance indicators, health, safety and environmental implications, simple, quick solutions versus those requiring a capital project, and other relevant business factors
Underpinning knowledge	Demonstrates knowledge of: • schematics and flow diagrams for the utilities distribution system • usage of utilities by plants and equipment • sources of utilities • utility properties • requirements for utilities, properties, usage patterns, supply • efficiencies and usage at the plant or equipment

Underpinning skills	Demonstrates skills to: • identify all utility consuming items on a schematic of the plant, describe the function of each and the purpose of the utility supplied • describe the nature/condition of the utility entering and leaving each stage of the process, the changes which have occurred in that stage and why they have occurred • describe the causes and remedies of common problems in the use of each utility used • isolate the causes of problems and to be able to distinguish between causes of problems/alarm/fault indications such as: ➢ poor/inappropriate quality supply of utility ➢ equipment failure, e g faulty steam trap, fouled heat exchanger ➢ operational problem (inappropriate usage pattern of utility)
Resource implications	The following resources should be provided: • access to relevant workplace or appropriately simulated environment where assessment can take place • materials relevant to the proposed activity or task
Methods of assessment	Competence may be assessed through: • Interview / Written Test / Oral Questioning • Observation/demonstration
Context for assessment	Competence may be assessed in the workplace or in a simulated workplace setting.

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Analyze Production Trials**
Unit Code	**IND CPM5 06 0111**
Unit Descriptor	This competence covers the reviewing of trial results, analyzing and correcting trial outcomes, and specifying and carrying out retrial procedures. This is typically performed by operation technologists in all sectors of the industry.

Elements	Performance Criteria
1. Review trial results	1.1 Confirm trial objectives as a basis for comparison prior to review of results. 1.2 Review trial product quality results and compare with trial objectives to identify variations. 1.3 1.3 Review trial production results and compare with trial objectives to identify variations.
2. Analyze and correct trial outcome	2.1 Analyze trial results to establish priorities for the correction of parameters which are outside specifications. 2.2 Recommend changes to achieve product quality and production requirements. 2.3 Make changes in to ***procedures*** to achieve the required product quality and production requirements.
3. Specify and carry out retrial procedures	3.1 Specify retrial objectives and priorities to procedures. 3.2 Carry out retrial variations to achieve the trial objectives to procedures. 3.3 Record trial results to procedures

Variable	Range
Context	• This competence applies to all work environments and sectors within the cement industry, but does require both a theoretical/ mathematical and a practical analysis of the trial data • It assumes an understanding of the operation of all relevant equipment and processes but does not necessarily require them to be used personally
Procedures	• All operations are performed in accordance with procedures. • Procedures include all relevant workplace procedures, work instructions, temporary instructions and relevant industry and government codes and standards.

Tools and equipment	This competence includes use of equipment and tools such as: • procedures • product specifications • trial results and data • data analyzing and reporting tools (e g computer spreadsheets)
Hazards	Typical hazards include operating equipment.
Problems	Anticipate and solve problems' means resolve a wide range of routine and non-routine problems, using product and process knowledge to develop solutions to problems which do not have a known solution/a solution recorded in the procedures. Typical process and product problems may include: • new products or processes • modified equipment or components • modified or new materials
Variables	Key variables to be monitored include production data

Evidence Guide	
Critical aspects of competence	Assessment requires evidence that the candidate: • applied an understanding of raw materials and cement production processing to the interpretation of trial results and making judgments about the trials in terms of the trial objectives • analyzed correctly one type of product or process trial on a typical machine and set up, run and completed other types of analyses satisfactorily
Underpinning knowledge	Knowledge as a basis for solving processing and material problems, including: • a thorough understanding of raw materials and processing • calculate results from trial data • interpret trial results in terms of trial objectives • determine variations to trial procedures to overcome limitations found • interpret results in terms of product end use requirements • make recommendations for changes to materials, process and product based on trial results • trial objectives • preliminary product specifications (physical properties, size, weight, appearance, moisture content, chemical composition, strength, proportion) • production requirements (output, rejects, yield, practical operating window) • trial results • product quality results • production results • changes

	• product design and specifications • material grade • machine configuration or specification • production specifications • processing parameters • retrial objectives • product quality • production requirements • variations • sample size • machine parameters • material grade changes • machine configurations
Underpinning skills	Demonstrates skills to: • high levels of numeracy and literacy with the ability to interpret technical specifications and reports • Advanced numeracy allowing the calculation and interpretation of statistics, product formulae and process conditions is also required
Resource implications	The following resources should be provided: • access to relevant workplace or appropriately simulated environment where assessment can take place • materials relevant to the proposed activity or task
Methods of assessment	Competence may be assessed through: • Interview / Written Test / Oral Questioning • Observation/demonstration
Context for assessment	Competence may be assessed in the workplace or in a simulated workplace setting

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Analyze equipment performance**
Unit Code	**IND CPM5 07 0111**
Unit Descriptor	This unit of competence covers the analysis of the performance, and performance verification of existing equipment. It involves calculating the theoretical performance components, gathering data, calculating performance and making recommendations based on verification results.

Elements	Performance Criteria
1. Determine theoretical performance	1.1 Identify item of plant and plant components to be analyzed 1.2 Locate and interpret design specification 1.3 Identify process materials being processed/to be processed during verification trial 1.4 Determine process material properties under process conditions 1.5 Calculate theoretical performance of components with that material under those conditions
2. Conduct trial	2.1 Design verification trial to be compatible with theoretical analysis 2.2 Check trial design to ensure occupational health and safety (OHS) issues are identified and addressed 2.3 Determine measurements needed from trial to yield required data 2.4 Select ***equipment*** suitable to give required measurements 2.5 Consult with relevant stakeholders 2.6 Arrange for verification trial with relevant process personnel 2.7 Set up required measurement equipment 2.8 Supervise trial and ensure trial conditions are appropriate 2.9 Collect trial data for analysis
3. Verify performance of components	3.1 Calculate actual performance from trial data 3.2 Compare theoretical with actual performance 3.3 Determine significance of variation between theoretical and actual performance 3.4 Investigate suspicious results and take appropriate action

4. Recommend required action	4.1 Determine appropriate action to bring performance to desired level 4.2 Check that recommended action addresses any OHS issues 4.3 Consult with relevant stakeholders 4.4 Initiate the corrective action in accordance with company ***procedures*** 4.5 Determine measures to increase equipment productivity 4.6 Recheck performance after corrective action is implemented

Variable	**Range**
Procedures	• All operations are performed in accordance with standard procedures and work instructions
Equipment components	This competence unit includes the analysis of equipment • components such as: • Crushers, grinding mills, kilns, packing equipments and other items of equipment or processes
Typical problems	Typical problems include: • worn components • validation of new components to design specification • component performance analysis in order to upgrade process performance

Evidence Guide	
Critical aspects of competence	Assessment requires evidence that the candidate: • understood process materials, their additives, heat and other effects of processing to the design of equipment and components are applied to predict practical performance results • understood material and process interactions and able to be applied to interpreting data and making judgments about the state of the equipment/component
Underpinning knowledge	Demonstrates knowledge of: • enterprise requirements • calculation of equipment and component performance from the design specification • determine equipment and design performance from practical trials • determine the 'limiting component' in the performance of an item of equipment or a process • determine possible performance of an item of equipment/ process if practical improvements were made to the 'limiting

	item'
Underpinning skills	Demonstrates skills to: • predicting the interactions of the materials, equipment and process and their impacts on performance • implementing the enterprise's procedures and policies within appropriate time constraints and in a manner relevant to the job • high levels of numeracy and literacy to interpret technical specifications and reports • advanced numeracy allowing the calculation and interpretation of statistics, product formulae and process conditions • identifying hazards associated with the trial and implementing controls by applying the hierarchy of control
Resource implications	The following resources should be provided: • access to relevant workplace or appropriately simulated environment where assessment can take place • materials relevant to the proposed activity or task
Methods of assessment	Competence may be assessed through: • Interview / Written Test / Oral Questioning • Observation/demonstration
Context for assessment	Competence may be assessed in the workplace or in a simulated workplace setting

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Prepare Basic Engineering Drawing**
Unit Code	**IND CPM5 08 0111**
Unit Descriptor	This unit covers identifying the drawing requirements, preparing or making changes to engineering drawings, preparing an engineering parts list and issuing the drawings

Elements	**Performance Criteria**
1. Identify drawing requirements	1.1 Requirements and purpose of drawing are determined from customer and/or work specification and associated documents. 1.2 All data necessary to produce the drawing is identified and collected. 1.3 Drawing requirements are confirmed with **relevant personnel** and timeframes for completion are established.
2. Prepare or make changes to engineering drawing	2.1 ***Drafting equipment*** is selected appropriate to the drawing method chosen. 2.2 ***Drafting principles*** are applied to produce a drawing that is consistent with standard operating procedures within the enterprise. 2.3 All work is undertaken safely and to prescribed procedure. 2.4 Completed drawing is approved in accordance with standard operating procedures
3. Prepare engineering parts list	3.1 Components parts are identified and organized by component type and/or in accordance with organization/customer requirements
4. Issue drawing	4.1 Drawings and or parts lists ***records*** are completed in accordance with standard operating procedures. 4.2 Approved drawings and or parts lists are copied and *issued* to relevant personnel in accordance with standard operating procedures. 4.3 Approved drawings and or parts lists are stored and catalogued in accordance with standard operating procedures

Variable	Range
Relevant personnel	• Operation personnel, technical personnel, supervisors, manufacturers, suppliers, contractors, customers
Drafting equipment	• Drafting and drawing equipment includes the use of Computer • Aided Drafting systems
Drafting principles	• Drawings are prepared in accordance with Ethiopian standard , or equivalent, as required • Interpretation of Ethiopian standard or other problems are resolved in consultation with a supervisor
Records	• Drawing records may include cataloguing, issuing security • classifications, filing, preparing distribution lists • Issued In hard copy, photographic, slide or transparency form • including presentation as a single drawing and/or with other • drawings, support documentation as a package

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • identified drawing requirements • prepared or made changes to engineering drawing • prepared engineering parts list • issued drawing
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • requirements and purpose of the drawing to be produced • requirements and purpose of the engineering parts list • sources of relevant data/ information • timeframe for completion of the drawing(s) • person(s) who can confirm drawing requirements • method of drawing preparation • the reasons for selecting the chosen drawing method • procedures for producing an initial drawing • procedures for changing an existing drawing • drafting principles to be applied to the production/changing of a drawing • standards to which the drawing is to be produced • procedures for checking drawings • the persons responsible for checking and approving drawings • consequences of inappropriate/incomplete components parts lists • procedures and reasons for recording completed drawings and or parts lists • procedures for copying approved drawings and or parts lists

	• procedures for issuing approved drawings and or parts lists • the personnel to whom copies of approved drawings and/or parts lists can be issued • procedures for filing approved drawings and or parts lists • procedures for safe handling and storage of drawings and/or parts lists and consequences of inappropriate handling and storage • safe work practices and procedures
Underpinning Skills	Demonstrates skills to: • obtaining all relevant job requirements, data/information and specifications necessary to produce the drawing in accordance with workplace procedures • using drafting equipment appropriate to the drawing method chosen • producing/changing the drawing to conform with the relevant standard • undertaking all work safely and in accordance with workplace procedures • checking the completed drawing in accordance with standard operating procedures • producing the component parts list with part name, description of part, material specification or part number, quantities and all other details specified by the customer and/or organizational procedures • recording completed drawings and or parts lists in accordance with standard operating procedures • where appropriate, copying and issuing approved drawings and or parts lists in accordance with standard operating procedures • handling and storing the approved drawings and or parts lists in accordance with standard operating procedures • reading, interpreting and following information on written job instructions, specifications, standard operating procedures, charts, lists, drawings and other applicable reference documents • planning and sequencing operations • checking and clarifying task related information • undertaking numerical operations, geometry and calculations/ formulae within the scope of this unit
Resource Implications	The following resources should be provided: • access to relevant workplace or appropriately simulated environment where assessment can take place • materials relevant to the proposed activity or task
Methods of Assessment	Competence may be assessed through: • Interview / written test • Observation/demonstration
Context of Assessment	Competence may be assessed in the workplace or in a simulated workplace setting

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Manage People Relationships**
Unit Code	**IND CPM5 09 0111**
Unit Descriptor	This unit covers the knowledge and skills needed to manage the human relationship aspects of implementing and operating competitive production systems.

Elements	Performance Criteria
1. Develop an open environment	1.1 Establish and maintain regular dialogue between all levels and all relevant processes of the organization 1.2 Encourage a flow of communications in both directions 1.3 Identify ***key personnel*** for communications 1.4 Develop and maintain a ***formal mechanism*** for the flow of issues, concerns and suggestions in both directions 1.5 Develop and maintain regular and frequent verbal communication with all key stakeholders
2. Identify significant issues	2.1 In liaison with relevant team members/ ***stakeholders***, identify current and potential issues 2.2 Assist team members/stakeholders to formulate issues 2.3 Identify and define boundary and ' non-negotiable' issues for all team members/stakeholders 2.4 Negotiate with relevant team members/stakeholders over actual and potential issues
3. Proactively resolve issues	3.1 Liaise with team members/stakeholders to develop agreed, and where possible win-win, solutions 3.2 Negotiate acceptable solutions as required in accordance with company practices/procedures 3.3 Obtain any required official authorizations 3.4 Consult with relevant stakeholders to develop implementation plan 3.5 Implement solution
4. Monitor ongoing situation	4.1 Determine relevant Key Performance Indicators (KPIs) for plan 4.2 Check that implementation is proceeding to plan 4.3 Check for unforeseen consequences 4.4 Take appropriate action to resolve any arising issues

Variable	Range
Competitive production	Competitive production is used to describe the range of systemic production practice concepts and approaches. It covers but is not limited to: • lean production • agile production • preventative and predictive maintenance approaches • monitoring and data gathering systems such as Systems • Control and Data Acquisition (SCADA) software, Enterprise Resource Planning (ERP) systems, Manufacturing Resource Planning (MRP), and proprietary systems such as SAP • statistical process control systems, including six sigma and three sigma • Just in Time (JIT), kanban and other pull related manufacturing control systems • supply, value, and demand chain monitoring and analysis • other continuous improvement systems • Competitive production should be interpreted so as to take • into account the stage of implementation of competitive • production approaches, the enterprise's size and work • organization, culture, regulatory environment and production sector
Key personnel	• Key personnel for communication include formally identified managers, supervisors and workforce delegates as well as key opinion shapers (such as employees with specialist technical knowledge) on the issue being communicated.
Formal mechanisms	• Formal mechanisms for communication will vary according to the enterprise but may include notice boards, employee circulars, consultative committees, staff associations, union representatives, team leaders
Stakeholders	• Stakeholders include team members, personnel officers, industrial officers, union delegates, production management, human relations management, financial management, engineering/technical personnel

Evidence Guide	
Critical aspects of competence	Assessment requires evidence that the candidate: • managed people relationships and dealing with issues
Underpinning knowledge	Demonstrates knowledge of: • industrial relations structures • relevant awards and agreements • types of workforce structures and reward systems
Underpinning skills	Demonstrates skills to: • negotiating • communication

	• teamwork • problem solving
Resource implications	The following resources should be provided: • access to relevant workplace or appropriately simulated environment where assessment can take place • materials relevant to the proposed activity or task
Methods of assessment	Competence may be assessed through: • Interview / Written test • Observation/demonstration
Context for assessment	Competence may be assessed in the workplace or in a simulated workplace setting

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Manage Workplace Learning**
Unit Code	**IND CPM5 10 0111**
Unit Descriptor	This unit covers the knowledge and skills required to manage the learning and skill development for a operation workforce

Elements	Performance Criteria
1. Identify current skill requirements for the work team	1.1 Ensure records/data base of skill mix currently required by the work team are maintained in accordance with ***procedures*** 1.2 Re-assess and monitor the skills required by the team as enterprise requirements change 1.3 Consult with relevant stakeholders to predict any new/different skill requirements arising from changes to products, processes, equipment or work organization
2. Determine current skill mix of work team	2.1 Ensure current records/data base of skill profile of individuals within the team are maintained 2.2 Consult with relevant stakeholders and monitor the application of these skills in the workplace to ensure they remain current and valid 2.3 Review the actual skill mix of the team compared to the required skill mix of the team
3. Make arrangements for skill development	3.1 Consult with team and identify any mismatch of skills possessed and used and skills required 3.2 Identify any new skills required due to anticipated changes 3.3 Consult with relevant stakeholders to determine the best way to refresh existing skills/develop new skills 3.4 Develop individual skill development program 3.5 Ensure skill development programs are implemented in accordance with procedures
4. Forecast possible future skill needs	4.1 Examine strategic directions of organization 4.2 Discuss possible future directions with relevant stakeholders 4.3 Determine possible long term future skill requirements in consultation with relevant stakeholders 5. Develop plan to ensure skills are developed in advance of when they are required

Variable	Range
Workplace learning	• This unit covers the development and maintenance of skill of the team operating in a Just in Time (JIT) environment. It covers both formally recognized and unrecognized training as well as other skill development programs. It may include job rotation, internal training, external training and self directed training
Procedures	• Procedures include all work instructions, standard operating procedures, formulas/recipes, batch sheets, temporary instructions and similar instructions provided for the smooth running of the plant. They may be written, verbal, computer based or in some other form. • For the purposes of this Training Package, 'procedures' also includes good operating practice as may be defined by industry codes of practice Procedures may also include industrial relations requirements and any classification changes that result from the acquisition of higher level skills

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • evidence of the work team always having the required skills for the job
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • knowledge of skill analysis methods or how to access skill analysis from relevant experts • knowledge of skill development methods, or how to access skill development programs from relevant experts • relevant formal qualifications/skill standards available to the team members, and their relevance to the job and the organization
Underpinning Skills	Demonstrates skills to: • communication • planning • assessing and analyzing • negotiation • problem solving • teamwork
Resource Implications	The following resources should be provided: • access to relevant workplace or appropriately simulated environment where assessment can take place • materials relevant to the proposed activity or task
Methods of Assessment	Competence may be assessed through: • Interview / Written Test • Observation/demonstration
Context of Assessment	Competence may be assessed in the workplace or in a simulated workplace setting

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Determine and Improve Process Capability**
Unit Code	**IND CPM5 11 0111**
Unit Descriptor	This unit covers the knowledge and skills needed to determine the actual (as distinct from design) capability of a process and then to analyze that process to remove assignable causes and reduce random causes. This would typically be done by a manager or technical expert support person either working in a team, or in close liaison with key stakeholders. Process capability is typically calculated using standard deviations.

Elements	Performance Criteria
1. Obtain necessary data	1.1 Identify the process requiring capability analysis 1.2 Obtain process capability data 1.3 Organize obtained data for process capability study
2. Analyze data	2.1 Identify assignable causes of variation in liaison with relevant personnel 2.2 Develop solutions to eliminate variation due to assignable causes in liaison with relevant people 2.3 Analyze random variations for possible causes in liaison with relevant people 2.4 Confirm cause/s of random variation 2.5 Develop solutions to reduce random variations in liaison with relevant people
3. Take action to improve process capability	3.1 Develop plans to implement solutions 3.2 Liaise with relevant people to implement solutions 3.3 Gain necessary approvals as required 3.4 Monitor implementation and make adjustments as required 3.5 Determine new/revised process capability 3.6 Implement revised process capability regime

Variable	Range
Six sigma	• Six sigma is a statistical tool for recording defects and determining capability which equates to only 3.4 defects per million opportunities for each product or service transaction • Six sigma is also used as a general term covering a competitive production approach.

Three sigma	• Traditional statistical process control uses three sigma limits which equates to 3 defects per thousand opportunities for each product or service transaction
Procedures	• Procedures includes all work instructions, standard operating procedures, formulas/recipes, batch sheets, temporary instructions and similar instructions provided for the smooth running of the plant. They may be written, verbal, computer based or in some other form. • For the purposes of this Training Package, 'procedures' also includes good operating practice as may be defined by industry codes of practice and government regulations

Evidence Guide	
Critical aspects of competence	Assessment requires evidence that the candidate: • identified and obtained process capability data, developed and analyzed variations and gained approvals for implementing revised process capability regime.
Underpinning knowledge	Demonstrates knowledge of: • data collection methods and processing techniques • variability and normal distribution • three sigma or six sigma processes as relevant • random and non-random results - recognition of assignable causes • causes of different types of non-random results • causes of random variation • process understanding sufficient to translate the data into variations in the process and determine methods of controlling them
Underpinning skills	Demonstrates skills to: • mathematics and statistical methods • communication • negotiation • planning • analysis • problem solving • teamwork • computer operation
Resource implications	The following resources should be provided: • access to relevant workplace or appropriately simulated environment where assessment can take place • materials relevant to the proposed activity or task
Methods of assessment	Competence may be accessed through: • Interview / Written Test • Observation/demonstration
Context for assessment	Competence may be assessed in the workplace or in a simulated work place setting

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Implement Continuous Improvement System**
Unit Code	**IND CPM5 12 0111**
Unit Descriptor	This unit covers the knowledge and skills required to introduce and institutionalize continuous improvement (kaizen) to the organization.

Elements	Performance Criteria
1. Prepare for continuous improvement (kaizen) event	1.1 Select process/area for kaizen event 1.2 Select kaizen team for event 1.3 Develop ***scope*** and direction for event 1.4 Validate scope with stakeholders 1.5 Determine ***whether to proceed*** with kaizen event 1.6 Negotiate problem issues with undertaking identified improvement, or choose a different process or area for improvement activity 1.7 Make infra structure and support arrangements for improvement event
2. Undertake kaizen event	2.1 Arrange for initial training in continuous improvement (kaizen) and related skills for employees involved in improvement event 2.2 Facilitate the development of operating protocols for the team 2.3 Build a ***description of the target work process*** 2.4 Clarify points of disagreement/uncertainty through consultation and where required by reference to ***procedures*** or other relevant ***authority*** 2.5 Analyze the process to quantify ***waste*** volumes and sources 2.6 Consult individual operators in process or area asking for improvement ideas 2.7 **Solve performance issues** 2.8 Negotiate any differences between problems and proposed solutions and initial objectives of improvement event 2.9 Develop plan(s) and obtain agreements to implement improvements 2.10 Implement improvements

	2.11 Measure changes and calculate benefits 2.12 Complete all relevant documentation 2.13 Communicate achievements to stakeholders
3. Institutionalize continuous improvement	3.1 Arrange for additional continuous improvement (kaizen) events using different team members 3.2 Arrange for ongoing continuous improvement (kaizen) events with previous kaizen team members 3.3 Build a culture for ongoing continuous improvement (kaizen)

Variable	**Range**
Scope	Scope of event may include: • description of the process • the target work process • what the key stakeholders seek from the kaizen event • a mission for the event • a set of goals • a statement of the do's and don'ts for the kaizen team
Procedures	Whether to proceed The decision to proceed (or otherwise) will be based on: • the focus of the kaizen event makes sense • the process case for doing the event is reasonable • the degree of support from management and employees • the setting and resources available to the event are adequate • the timing of the event will not interfere with process • specifics about the work process such as its overall operating cost and factor costs (e g labour, machine, raw materials) are available
Description of the target work process	The description of the work target process may include: • an overview that captures the purpose of the work process • essentials about the process (e g inputs, outputs, departments with which it coordinates) • a work process map that shows the sequence of operations that execute it
Procedures	• Procedures includes all work instructions, standard operating procedures, formulas/ recipes, batch sheets, temporary instructions and similar instructions provided for the smooth running of the plant. They may be written, verbal, computer based or in some other form. • For the purposes of this Training Package, 'procedures' also includes good operating practice as may be defined by industry codes of practice and government regulations. • Procedures also include required procedures under

	legislation or regulation. awards and enterprise agreements
Authority	The authority will vary according to the problem encountered and may include: • internal or external technical specialist • designated manager • equipment supplier • regulatory authority • safety specialist • reference manuals
Waste	Waste is any activity which does not contribute to customer benefit/features in the product. Within cement production , categories of waste include: • excess production and early production • delays • movement and transport • poor process design • inventory • inefficient performance of a process • making defective product • Waste for this unit may include activities which do not yield any benefit to the organization or any benefit to the organizations customers
Solve performance issues	Solving performance issues includes: • generating improvement ideas (brainstorming/ask expert) • selecting most appropriate improvement ideas to proceed with • conducting experiments where required to test idea • making final selection of improvement ideas

Evidence Guide	
Critical aspects of competence	Assessment requires evidence that the candidate: • generally one significant kaizen event or a number of routine events, plus ongoing kaizen would be needed to generate sufficient evidence
Underpinning knowledge	Demonstrates knowledge of: • continuous improvement (kaizen) philosophy and process
Underpinning skills	Demonstrates skills to: • analyze • problem solving • teamwork • planning and organizing • communication • documenting
Resource implications	The following resources should be provided: • access to relevant workplace or appropriately simulated environment where assessment can take place

	• materials relevant to the proposed activity or task
Methods of assessment	Competence may be assessed through: • Interview • Observation/demonstration
Context for assessment	Competence may be assessed in the work place or in a simulated work place setting

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Review Procedures to Minimize Environmental Impact of Process**
Unit Code	**IND CPM5 13 0111**
Unit Descriptor	This competence covers the minimization of waste and environmental threat by a plant and/or a process. It covers all resources used and products made

Elements	Performance Criteria
1. Establish procedures for environmental management	1.1 Establish workplace procedures of ***proactive environmental management*** which include resource conservation, pollution and waste minimization 1.2 Determine primary source of respective aspects 1.3 Describe the negative impact of these aspects on the environment and the society if they are mismanaged 1.4 Prioritize management options according to the greatest benefit to environment and the society 1.5 Develop management procedures 1.6 Complete required documentation of implement change
2. Review procedures for environmental management	2.1 Review the procedures on a regular basis by consulting various ***work group***s for feedback. 2.2 Incorporate relevant feedback into the revised procedures in consultation with the relevant personnel 2.3 Inform relevant work groups of any changes and implement changes in the procedures
3. Implement and review an environmental management training program	3.1 Understand the workplace environmental management training program 3.2 Review the program on a regular basis by consulting various work groups for feedback 3.3 Incorporate relevant feedback into the revised program in consultation with the relevant personnel 3.4 Inform relevant work groups of any changes and implement changes in the training program
4. Implement and review environmental management recording system	4.1 Understand the workplace environmental management recording system. 4.2 Review the system on a regular basis by consulting various work groups for feedback. 4.3 Incorporate relevant feedback into the revised system in consultation with the relevant personnel

	4.4 Inform relevant work groups of any changes and implement changes in the management of environmental records

Variable	Range
Context	This competence covers process in cement processing plants which may involve workplace hazards such as: • chemicals and hazardous materials • gases and liquids under pressure • materials handling This competence includes: • legislation, codes and national standards relevant to the workplace which may include: • award and enterprise agreements and relevant industrial instruments • relevant legislation from all levels of government that effects business operation, especially in regard to OHS, environmental issues and industrial relations • relevant industry codes of practice • awareness of the environment and the effects on the environment of the organization's: • liquid waste • solid waste • gas/fume/vapor/smoke emissions, including fugitive emissions • hazardous materials • excessive energy and water use • excessive noise and the workplace practices that can be used to minimize or prevent these effects
Information	Information may include: • organizational policies and procedures • relevant environmental legislation/regulation requirements • license conditions • environmental treaties, conventions and national policies and strategies • National Pollutant Inventory • State of the Environment reports • voluntary environmental agreements entered into with external organizations/authorities • continuous improvement policies and processes for the organization
Work group	Work group may include: • formal or unstructured groups • two or more people
Proactive environmental	Proactive environmental management may include: • resource conservation and efficiency

management	• minimization of waste • recycling • reduction in use of non-renewable resources • maximization of product yield from raw materials • reduction in volume of pollutants made • reduction in concentration/intensity of pollutants made • reduction in emissions
Approaches to proactive environmental management	Some approaches to proactive environmental management may include: • preventing and minimizing the production of pollution, e g discharges to air, land and water, hazardous waste • improving housekeeping, e g using a broom instead of a • hose, using old rags for cleaning instead of toxic cleaners or water • substituting materials, e g replacing toxic solvent based coatings with water based ones • changing processes, e g mechanical cleaning, re-design of products/ procedures so that materials are used more efficiently
Environmental management policies	Environmental management policies must be appropriate to the scope and scale of the enterprise and may include: • environmental load reduction and waste minimization • tenders for the provision of goods and services that specify environmentally preferred selection criteria • protection of land and habitat • environmentally sustainable work practices
Typical functions	Typical functions may include: • examining plant records • examining operating procedures and practices • liaising with a range of internal people
Health, safety and environment (HSE)	All operations to which this unit applies are subject to stringent health, safety and environment requirements, which may be imposed through Regional State or Federal legislation, and these must not be compromised at any time. Where there is an apparent conflict between Performance Criteria and HSE requirements, the HSE requirements take precedence

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • taken a holistic 'clean production' approach to waste minimization • understood potential effects on the environment • occurred terms initiated are followed through until final resolution • understood the process/plant and capable proposals implementation

	• addressed training needs • kept records
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • nature and severity of potential environmental hazards caused by the plant/process • sensitivity of local environment to these environmental threats • pathways of entry to the environment from the plant • regulatory requirements such as: • environment protection regulations • OHS • HAZCHEM • duty of care • dangerous goods • external licensing requirements such as: • EPA • water authorities • local councils • enterprise procedures and practices
Underpinning Skills	Demonstrates skills to: • completing plant records • communication • problem solving
Resource Implications	• Fax machine • Telephone • Writing materials • Internet
Methods of Assessment	• Direct Observation • Oral interview and written test
Context of Assessment	Competence may be assessed individually in the actual workplace or through accredited institution

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Facilitate Development of New Product**
Unit Code	**IND CPM5 14 0111**
Unit Descriptor	This unit the covers knowledge, attitudes and skills required to develop a new/evolutionary product within an existing range of products and encompass design for production and the facilitation of its initial production.

Elements	Performance Criteria
1. Confirm design brief of new product in consultation with relevant people	1.1 Communicate with customer and other key stakeholders and agree on technical specification, aesthetic requirements, timelines, cost and other market requirements 1.2 Determine regulatory/industry code/intellectual property requirements for product 1.3 Identify possible ***tooling/process/equipment*** needs 1.4 Develop design brief, including relevant drawings, to meet needs 1.5 Obtain 'sign off' on total design brief from all relevant persons
2. Determine material requirements for product	2.1 Select appropriate materials/combination of materials/ components in liaison with key stakeholders 2.2 Determine material/component testing and evaluation regime required to meet product end use requirements, including ***regulatory***/industry code requirements 2.3 Arrange for, testing and evaluation of trial materials/ components 2.4 Guide material trial process and interpret material trial results 2.5 Determine final materials/components specifications and details of value chain
3. Determine process requirements for product	3.1 Select appropriate process to make product in liaison with key stakeholders and based on ***relevant factors*** 3.2 Determine any special process/equipment requirements for this product 3.3 Communicate with production personnel to determine their concerns and/or training or other needs 3.4 Adjust the design as required to satisfy customer and production needs

4. Ensure process needs for new product have been met	4.1 Liaise with equipment design/procurement personnel 4.2 Interpret hardware specifications and ensure they are appropriate for the job required 4.3 Liaise with process personnel to ensure appropriate draft procedures for new product have been developed 4.4 Validate product cost and design meets objectives
5. Trial new product through the process	5.1 Design trialing procedure to deliver required information 5.2 Liaise with relevant stakeholders 5.3 Ensure health safety and environment (HSE) requirements are stringently observed 5.4 Coordinate the trialing of the new product 5.5 Interpret product trial results and guide product trial process 5.6 Tune process to optimize production of new product
6. Determine process capability	6.1 Plot appropriate statistical process control charts 6.2 Determine confidence limits 6.3 Compare confidence limits with product specification
7. Coordinate product trials	7.1 Determine product testing and evaluation regime required to meet end use requirements, including regulatory/industry code requirements 7.2 Arrange for testing and evaluation of trial product/prototype 7.3 Interpret product trial results and guide product trial process 7.4 Determine final product specification in liaison with key stakeholders 7.5 Make required changes to materials, process and Equipment
8. Implement standard procedures for new product	8.1 Monitor initial production and, in liaison with appropriate team members, adjust process, conditions and materials to ensure the product and process outcomes conform to requirements 8.2 Ensure process specifications are updated and reflect the optimized operation developed 8.3 Ensure standard operating procedures are correct for the new product 8.4 Ensure equipment and other hardware records are updated to reflect additions/changes 8.5 Ensure project records are complete and all required

	reports have been completed and submitted 8.6 Archive records according to company procedure

Variable	Range
Processes and policies	• This competence unit is for the design of a new product 'from scratch'. It assumes an understanding of the operation of all relevant equipment and processes but does not necessarily require them to be used personally. • The competence assumes a working knowledge of all main processes and materials so that an informed choice can be made between them. • All operations are performed in accordance with standard procedures and policies
Tools and equipment	• understanding of use of all standard processing equipment • relevant personal protective equipment
Typical regulatory requirements include	• Occupational Health and Safety (OHS) • environmental regulations • structural codes • product/industry specific requirements
Typical problems include	• defining product end use requirements in terms meaningful to the product design and manufacture • matching suitable materials and processes to the product needs and company expertise and facilities • matching (and improving) process capability to product tolerances
Relevant factors may include	• type of material • proportional precision of product • length of run/number of products • size and complexity of product • available capital funding • process equipment available • HSE

Evidence Guide	
Critical Aspects of Competence	Assessment requires evidence that the candidate: • understood materials and components, their grades and properties and the effects of processing to a new situation and use this understanding to predict likely solutions to the new product design specification challenge • understood material/component and process interactions and should also be able to be applied in interpreting data and making adjustments to materials and process to ach eve the desired outcomes

Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • materials, equipment and process • sufficient to choose an appropriate combination of materials and process to achieve the end use function of the product • enterprise's procedures and relevant regulatory requirements along with the ability to implement them within appropriate time constraints and work standards
Underpinning Skills	Demonstrates skills to: select and justify the selection of: • type of material/material specification • appropriate process for a range of product/market applications • material and product testing procedures • apply theoretical principles to predict: ➢ properties of product based on materials selected ➢ effects of processes and processing on the final properties of the product ➢ mathematically determine: ➢ product cost estimates ➢ interpret and make recommendations based on: ➢ field test results ➢ market analysis data ➢ trailing data
Resource Implications	• Fax machine • Telephone • Writing materials • Internet
Methods of Assessment	• Direct Observation • Oral interview and written test
Context of Assessment	Competence may be assessed individually in the actual workplace or through accredited institution

TOP

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Establish and Conduct Business Relationships**
Unit Code	**IND CPM5 15 0111**
Unit Descriptor	This unit covers the skills, attitudes and knowledge required to manage business relationship with customers.

Elements	Performance Criteria
1. Establish contact with customer	1.1 Welcoming customer environment is maintained 1.2 Customer is greeted warmly according to enterprise policies and procedures 1.3 Effective service environment is created through verbal and non-verbal presentation according to enterprise policies and procedures 1.4 Customer data is maintained to ensure database relevance and currency 1.5 Information on customers and service history is gathered for analysis 1.6 ***Opportunities*** to maintain regular contact with customers are identified and taken up
2. Clarify needs of customer	2.1 Customer needs are determined through questioning and active listening 2.2 Customer needs are accurately assessed against the products/services of the enterprise 2.3 Customer details are documented clearly and accurately in required format 2.4 Conduct negotiations in a business-like and professional manner 2.5 Maximize benefits for all parties in the negotiation through use of established ***techniques*** and in the context of establishing long term relationships 2.6 Communicate the results of negotiations to appropriate colleagues and stakeholders within appropriate timeframes
3. Provide information and advice	3.1 Features and benefits of products/services provided by the enterprise are described/recommended to meet customer needs 3.2 Information to satisfy customer needs is provided 3.3 Alternative sources of information/advice are discussed with the customer

4. Foster and maintain business relationships	4.1 Pro-actively seek, review and act upon information needed to maintain sound business relationships. 4.2 Honor agreements within the scope of individual responsibility. 4.3 Make adjustments to agreements in consultation with the customer and share information with appropriate colleagues. 4.4 Nurture relationships through regular contact and use of effective interpersonal and communication styles.

Variables	**Range**
Opportunities to maintain regular contact with customers may include:	• informal social occasions • industry functions • association membership • co-operative promotions • program of regular telephone contact
Negotiation techniques	• identification of goals, limits • clarification of needs of all parties • identifying points of agreement and points of difference • preparatory research of facts • active listening and questioning • non-verbal communication techniques • appropriate language • bargaining • developing options • confirming agreements • appropriate cultural behavior

Evidence Guide	
Critical Aspects of Competence	It is essential that competence is fully observed and there is ability to transfer competence to changing circumstances and to respond to unusual situations in the critical aspects of: • consistently applying enterprise policies and procedures and industry codes of practice in regard to customer service • providing a quality service environment by treating customers in a courteous and professional manner through all stages of the procedure • using effective questioning/active listening and observation skills to identify customer needs • communicating effectively with others involved in or affected by the work • maintaining relevant and current customer databases in accordance with enterprise policies and procedures

	• ability to build and maintain relationships to achieve successful business outcomes
Required knowledge	• Operational knowledge of enterprise policies and procedures in regard to: ▪ customer service ▪ dealing with difficult customers ▪ maintenance of customer databases ▪ allocated duties/responsibilities ▪ General knowledge of the range of enterprise merchandise and services, location of telephone extensions and departments/sections • Basic operational knowledge of legislation and statutory requirements, including consumer law, trade practices and fair trading legislation • Basic operational knowledge of industry/workplace codes of practice in relation to customer service • negotiation and communication techniques appropriate to negotiations that may be of significant commercial value
Underpinning Skills	• Use workplace technology related to use of customer database • Collect, organize and understand information related to collating and analyzing customer information to identify needs • Communicate ideas and information • Plan and organize activities concerning information for database entries • Use mathematical ideas and techniques to plan database cells and size • Establish diagnostic processes which identify and recommend improvements to customer service
Resources Implication	The following should be made available: • a workplace or simulated workplace • documentation, such as enterprise policy and procedure manuals relating to customer service
Assessment Methods	Competence may be assessed through: • Interview / Written Test • Observation/Demonstration with Oral Questioning
Context of Assessment	Elements of competence contain both knowledge and practical components. Knowledge components may be assessed off the job. Practical components should be assessed on the job or in a simulated work environment.

Occupational Standard: Cement Production Technology Management Level V	
Unit Title	**Develop and Refine Systems for Continuous Improvement in Operations**
Unit Code	**IND CPM5 16 1012**
Unit Descriptor	This unit of competency covers the skills, knowledge and processes required to ensure that continuous improvement systems do not stultify and continue to improve along with other operational systems in an organization. This unit is about improving the process yield/unit of effort or cost, reducing process variation and increasing process reliability, upgrading, enhancing or refining process outputs, and includes developing a culture of reviewing and sustaining change ensuring improvements are maintained and built on.

Elements	Performance Criteria
1. Establish parameters of current internal improvement systems	1.1 Describe ***organization systems*** that impact on continuous improvement 1.2 Identify current ***relevant metrics*** and their values 1.3 Check that metrics are collected for all improvements 1.4 Determine ***yield of current improvement processes*** 1.5 Review results of improvements
2. Distinguish breakthrough improvement processes	2.1 Identify all ***improvements*** which have occurred over an agreed period of time 2.2 Distinguish between ***breakthrough improvements*** and continuous improvements 2.3 Determine the timing of breakthrough improvement processes 2.4 Analyze factors controlling the ***timing*** and selection of breakthrough improvements 2.5 Analyze ***continuous improvements*** to identify cases where breakthrough improvements were required 2.6 Validate findings with process/system owners and obtain required approvals 2.7 Improve timing/selection of breakthrough improvements 2.8 Improve other factors limiting the gains from breakthrough improvements
3. Develop continuous improvement practice	3.1 Check that levels of delegated authority and responsibility are appropriate for continuous improvement from the shop floor 3.2 Ensure all personnel have appropriate capabilities for

	continuous improvement processes 3.3 Ensure personnel and systems recognize potential breakthrough improvement projects 3.4 Ensure sufficient resources are available for the operation of continuous and breakthrough improvement processes 3.5 Check that relevant information flows from improvement changes to all required areas and stakeholders 3.6 Check data collection and metrics analysis capture changes which result from improvement actions 3.7 Check that improvement changes are standardized and sustained 3.8 Check review processes for routine continuous improvements 3.9 Remove or change factors limiting gains from improvements 3.10 Modify systems to ensure appropriate possible changes are referred to other improvement processes 3.11 Institutionalize breakthrough
4. Establish parameters of current external improvement system	4.1 Review ***value stream*** systems that impact on improvement 4.2 Review procedures for deciding improvement methodologies Identify current relevant metrics and their values, as appropriate 4.3 Determine yield of current improvement processes 4.4 Review results of improvements
5. Explore opportunities for further development of value stream improvement processes	5.1 Review mechanisms for consultation with value stream members 5.2 Develop mechanisms for further improving joint problem solving 5.3 Develop mechanisms for increased sharing of organizational knowledge 5.4 Obtain support and necessary authorizations from process/system owners 5.5 Capture and standardize improvements 5.6 Improve factors limiting gains from continuous improvements
6. Review systems for compatibility with improvement strategy	6.1 Review all systems which impact or are ***impacted on improvements*** and the improvement system 6.2 Analyze relationships between improvement systems and other relevant systems

	6.3 Analyze practices caused by and results from the systems 6.4 Negotiate changes to the systems to improve the outcomes from improvement systems 6.5 Obtain necessary approvals to implement changes 6.6 Monitor the implementation of the changes

Variable	**Range**
Competitive systems and practices	Competitive systems and practices may include, but are not limited to: • lean operations • agile operations • preventative and predictive maintenance approaches • monitoring and data gathering systems, such as Systems Control and Data Acquisition (SCADA) software, Enterprise Resource Planning (ERP) systems, Materials Resource Planning (MRP) and proprietary systems • statistical process control systems, including six sigma and three sigma • JIT, kanban and other pull-related operations control systems • supply, value, and demand chain monitoring and analysis • 5S • continuous improvement (kaizen) • breakthrough improvement (kaizen blitz) • cause/effect diagrams • overall equipment effectiveness (OEE) • takt time • process mapping • problem solving • run charts • standard procedures • current reality tree • Competitive systems and practices should be interpreted so as to take into account: – stage of implementation of competitive systems and practices – the size of the enterprise – the work organization, culture, regulatory environment and the industry sector
Code of practice and standards	Where reference is made to industry codes of practice, and/or Ethiopian/international standards, the latest version must be used
Organization systems	Organization systems may include: • problem recognition and solving

	• operational/process improvement • improvement projects • product/process design and development • processes for making incremental improvements
Relevant metrics	Relevant metrics include all those measures which might be used to determine the performance of the improvement system and may include: • hurdle rates for new investments • KPIs for existing processes • quality statistics • delivery timing and quantity statistics • process/equipment reliability (‘uptime’) • incident and non-conformance reports • complaints, returns and rejects
Process improvement yield	Improvement process yield may be regarded as: • the benefit achieved for the effort invested
Breakthrough improvements	Breakthrough improvements include: • those which result from a kaizen blitz or other improvement project or event and are a subset of all improvements
Timing of breakthrough improvements	Timing of breakthrough improvements includes: • frequency (which should be maximized) and duration (which should be minimized) of events/projects
Continuous improvement	Continuous improvement is part of normal work and does not require a special event to occur (although may still require authorizations) and contrasts with breakthrough improvement/kaizen blitz which occurs by way of an event or project
Resources for improvement	Resources for improvements include: • improvement budget • guidelines for trialing of possible improvements • mechanism for approvals for possible improvements • business case guidelines for proposed improvements • indicators of success of proposed improvement • mechanisms for tracking and evaluation of changes • forum for the open discussion of the results of the implementation • mechanisms for the examination of the improvement for additional improvements • organization systems to sustain beneficial changes
Capturing value stream improvements	Capturing value stream improvements includes: • revised contractual arrangements • revised specifications • signed agreements • other documented arrangements which formalize the raised base line
Systems impacting improvements	Systems which impact/are impacted on improvements and the improvement system include:

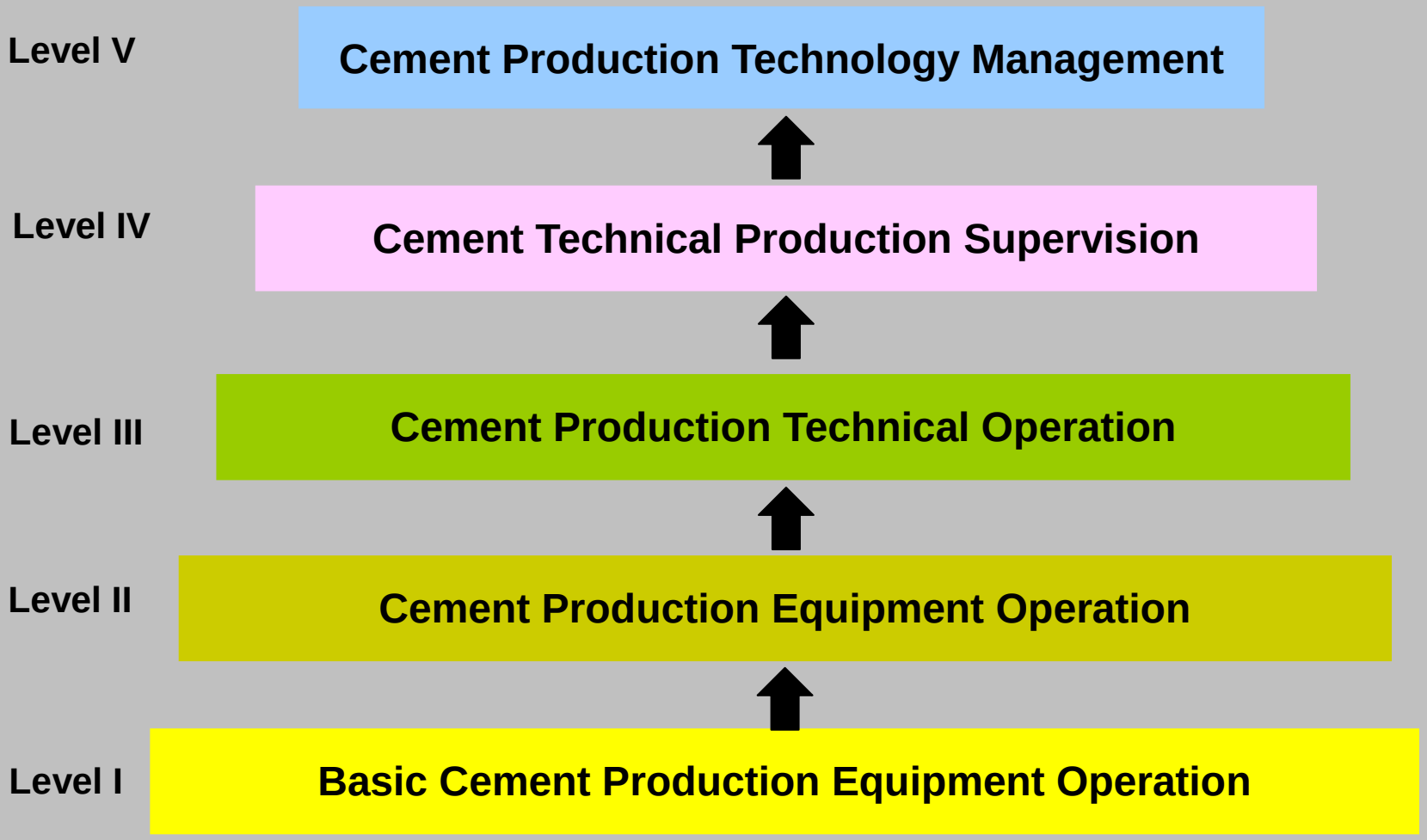
	• office • purchasing • rewards (individual or team at all levels) • sales • marketing • maintenance • process/product • transport and logistics
Organizational knowledge	Organizational knowledge should: • be able to be quantified or otherwise modified to make its outcomes measurable or observable • be able to be expressed in an accessible and distributable form appropriate to the organization operations and stakeholders
Improvements	Improvements may: • be to process, plant, procedures or practice • include changes to ensure positive benefits to stakeholders are maintained
Manager	Manager may include: • any person who may have either a permanent or an ad hoc role in facilitating the function of multiple teams in a workplace, departments or entire organizations

Evidence Guide	
Critical Aspects of Competence	A person who demonstrates competency in this unit must be able to provide evidence of the ability to: • critically review current continuous improvement processes • establish ongoing review of continuous improvement processes • implement improvements in the practice of continuous improvement • better align internal and external systems • gather data through interviews with stakeholders • review existing data • obtain additional data through a variety of techniques • communicate and negotiate at all levels within the organization
Underpinning Knowledge and Attitudes	Demonstrates knowledge of: • competitive systems and practices tools, including: • value stream mapping • 5S • Just in Time (JIT) • mistake proofing • process mapping • establishing customer pull

	• kaizen and kaizen blitz • setting of KPIs/metrics • identification and elimination of waste (muda) • continuous improvement processes including implementation, monitoring and evaluation strategies for a whole organization and its value stream • difference between breakthrough improvement and continuous improvement • organizational goals, processes and structure • approval processes within organization • cost/benefit analysis methods • methods of determining the impact of a change • advantages and disadvantages of communication media, methods and formats for different messages and audiences • customer perception of value • define, measure, analyze, improve, and control and sustain (DMAIC) process
Underpinning Skills	Demonstrates skills to: • undertaking self-directed problem solving and decision-making on issues of a broad and/or highly specialized nature and in highly varied and/or highly specialized contexts • communicating at all levels in the organization and value stream and to audiences of different levels of literacy and numeracy • analyzing current state/situation of the organization and value stream • determining and implementing the most appropriate method for capturing value stream improvements • collecting and interpreting data and qualitative information from a variety of sources • analyzing individually and collectively the implementation of competitive systems and practices tools in the organization and determining strategies for improved implementation • relating implementation and use of competitive systems and practices and continuous improvement to customer benefit • solving highly varied and highly specialized problems related to competitive systems and practices implementation and continuous improvement to root cause • negotiating with stakeholders, where required, to obtain information required for implementation and refinement of continuous improvements, including management, unions, value stream members, employees and members of the community • reviewing relevant metrics, including all those measures which might be used to determine the performance of the improvement system, including: – key performance indicators (KPIs) for existing processes

	– quality statistics – delivery timing and quantity statistics – process/equipment reliability (‘uptime’) – incident and non-conformance reports – implementing continuous improvement to support systems and areas, including maintenance, office, training and human resources
Resources Implication	Access may be required to: • workplace procedures and plans relevant to work area • specifications and documentation relating to planned, currently being implemented, or implemented changes to work processes and procedures relevant to the assessee • documentation and information in relation to production, waste, overheads and hazard control/management • reports from supervisors/managers • case studies and scenarios to assess responses to contingencies
Methods of Assessment	Competence in this unit may be assessed by using a combination of the following to generate evidence: • demonstration in the workplace • suitable simulation • oral or written questioning to assess knowledge of principles and techniques associated with change management In all cases it is expected that practical assessment will be combined with targeted questioning to assess underpinning knowledge
Context of Assessment	Assessment of performance must be undertaken in a workplace using or implementing one or more competitive systems and practices.

Sector: Industry Development
Sub-Sector: Cement Production



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