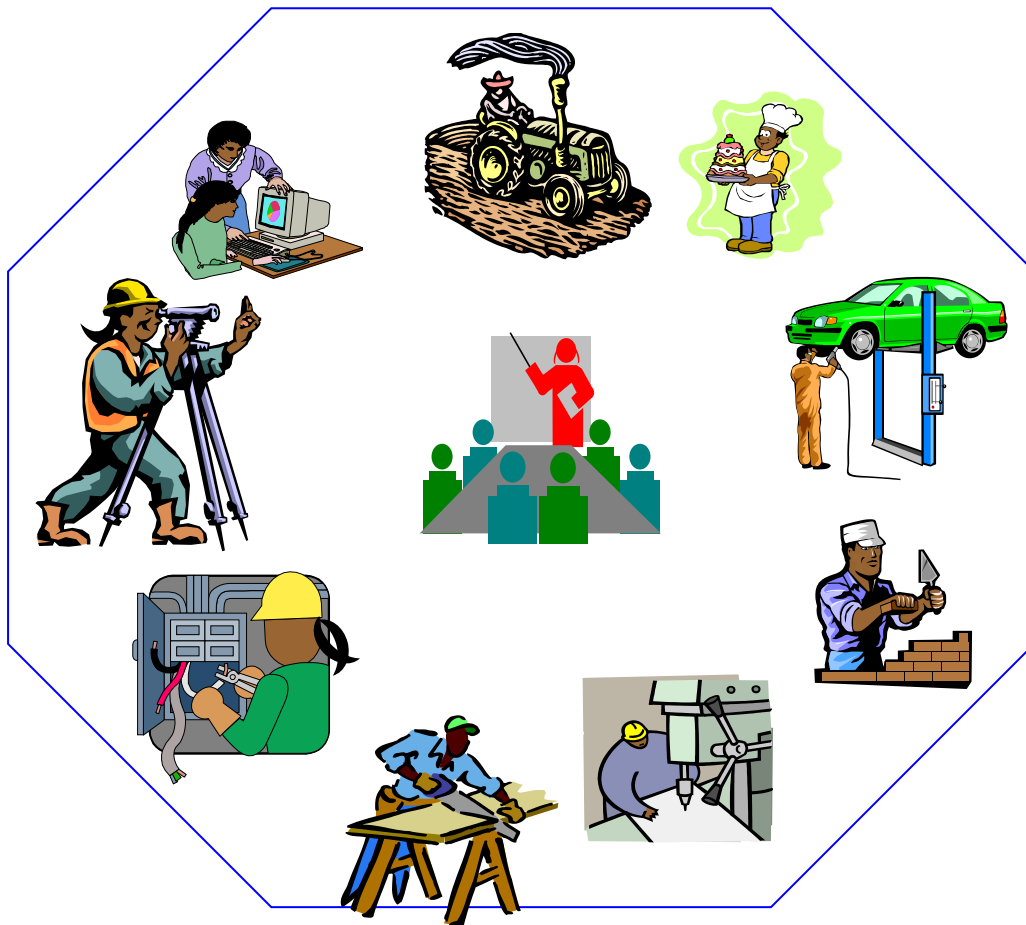




**Federal Democratic Republic of Ethiopia**  
**OCCUPATIONAL STANDARD**  
**ROAD CONSTRUCTION AND MAINTENANCE**  
**NTQF Level III**



*Ministry of Labor and Skills*  
*March 2022*

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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 Ethiopia 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 and 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 level of the occupation (Unit of Competence Chart) with all the key components of a Unit of Competence:

- chart with an overview of all Units of Competence for the respective level including the Unit Codes and the Unit titles
- 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

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## UNIT OF COMPETENCE CHART

Occupational Title: Road Construction and Maintenance Level III		
Occupational Code: <b>EIS RCM</b>		
<i>NTQF Level III</i>		
<a href="#">EIS RCM3 01 0322</a> Establish Control Points and Boundaries	<a href="#">EIS RCM3 02 0322</a> Use CAD Systems to Produce Basic Engineering Drawings	<a href="#">EIS RCM3 03 0322</a> Prepare Quantity Work for Estimation
<a href="#">EIS RCM3 04 0322</a> Conduct Road Construction Material Sampling & Testing	<a href="#">EIS RCM3 05 0322</a> Monitor Installation of Water Main, Storm and Sewer Pipelines	<a href="#">EIS RCM3 06 0322</a> Construct and Maintain Minor Drainage Structures & Retaining Walls
<a href="#">EIS RCM3 07 0322</a> Conduct and Monitor Stabilizer Operations	<a href="#">EIS RCM3 08 0322</a> Conduct and Monitor Asphalt Concrete Production	<a href="#">EIS RCM3 09 0322</a> Conduct and Monitor Construction of Ridged Pavement
<a href="#">EIS RCM3 10 0322</a> Conduct and Monitor Construction of Flexible Pavement	<a href="#">EIS RCM3 11 0322</a> Monitor Installation of Concrete Kerb, Channel and Road Side Fixtures	<a href="#">EIS RCM3 12 0322</a> Conduct and Monitor Pavement Recycling Operations
<a href="#">EIS RCM3 13 0322</a> Conduct Pile Construction Operations	<a href="#">EIS RCM3 14 0322</a> Perform Road Maintenance Operation and Surface Treatment	

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Occupational Standard: Road Construction and Maintenance Level III	
<b>Unit Title</b>	<b>Establish Control Points and Boundaries</b>
<b>Unit Code</b>	<a href="#"><u>EIS RCM3 01 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, skills and attitudes required to specify the competence to carry out the establishment of horizontal, vertical and cross section set out of the road alignment and transfer center line heights with offset pegs to the control points. It includes the minimum criteria for competence assessment. The unit also covers planning and preparation for work, establishment of alignment, set up and use of labor-based surveying devices, methods and recording of outcomes.

Elements	Performance Criteria
1. Plan and prepare	<p>1.1. Work instructions, including plans, specifications, <b>quality requirements</b> and operational detail are obtained, confirmed and applied to the allotted task.</p> <p>1.2. <b>Safety</b> requirements are obtained from the site safety plan and organizational policies and procedures, confirmed and applied to the allotted task.</p> <p>1.3. Signage requirements are identified and obtained from the project traffic management plan and observed.</p> <p>1.4. <b>Tools and equipment</b> selected to carry out tasks are consistent</p>

	<p>with the requirements of the job, checked for serviceability and any faults are rectified or reported.</p> <p>1.5. Leveling equipment is checked for serviceability, within specified tolerances and any faults are reported.</p> <p>1.6. Environmental protection requirements are identified from the project environmental management plan, confirmed and applied to the allotted task.</p>
2. Perform traversing	<p>2.1 Types of traverses are identified</p> <p>2.2 Azimuth and bearing of line is determined</p> <p>2.3 The specifics (azimuth of lines and coordinate) of unknown stations on the ground by traversing, are determined</p> <p>2.4 Area enclosed within the polygon by coordinate and double meridian distance methods</p> <p>2.5 Traversing fieldwork is carried out.</p>
3. Compute Triangulation	<p>3.1 Selection of simple triangulation station is applied</p> <p>3.2 Construction and placement of monuments are applied</p> <p>3.3 Measurement of the required angles is considered</p> <p>3.4 Measuring of the base line is cross checked accordingly</p> <p>3.5 Calculation of the lengths of triangle sides and coordinates of stations are checked</p>
4. Set out Horizontal alignment	<p>4.1 The straight section between the points of intersection (PIs) are established as per the given or agreed design requirement or selected route alignment.</p> <p>4.2 The established points are joined to make a smooth curve as per the given or agreed design requirement.</p>
5. Set out Vertical alignment	<p>5.1 The straight grades are established as per the given or agreed design &amp; specification requirement.</p> <p>5.2 The <i>sags</i> or dips are established as per the given or agreed design &amp; specification requirement.</p> <p>5.3 <i>The crests</i> or humps are established as per the given or agreed design &amp; specification requirement.</p> <p>5.4 labor based leveling instruments/profile board are set-up and correctly used in accordance with standard operating procedures and/or manufacturers' guidelines</p> <p>5.5 Results of leveling procedure are documented and closed out to organizational requirements</p>
6. Establish intersection	<p>6.1 Use of intersection is performed with reference to establishment points</p> <p>6.2 Measurement of intersection by angles is checked</p> <p>6.3 Intersection by distances is exactly applied</p>
7. Establish Resection	<p>7.1 Introduction to resection is made with reference to the location</p> <p>7.2 Angles from the new point is measured to three points of known coordinates and checked correctly</p>

	7.3 Calculation of coordinates of stations are applied
8. Write the description for Stations	8.1 The descriptions of <i>stations</i> are written on the field book sheet 8.2 The position of stations is located with reference to the true directions.

Variable	Range
Quality requirements	May include but not limited to: <ul style="list-style-type: none"> <li>• Dimensions,</li> <li>• Tolerances,</li> <li>• Standards of work and material standards as detailed in the project drawings, specifications and project documentation to meet client satisfaction</li> </ul>
Safety	May include but not limited to <ul style="list-style-type: none"> <li>• Recognizing and preventing hazards associated with underground and overhead services, other machines, personnel, restricted access barriers, traffic control, working in proximity to others, worksite visitors and the public</li> </ul>
Tools & Equipment	May include but not limited to: <ul style="list-style-type: none"> <li>• Leveling</li> <li>• Theodolite</li> <li>• Hand Held GPS</li> <li>• Compass</li> <li>• Hammer</li> <li>• Ranging Pole</li> <li>• String</li> <li>• Meter</li> </ul>
Sag	May include but not limited to: <ul style="list-style-type: none"> <li>• A vertical curve joining two sections of a straight grade to form a valley.</li> </ul>
Crest	May include but not limited to: <ul style="list-style-type: none"> <li>• A vertical curve joining two sections of a straight grade to form a crest or hump.</li> </ul>
station	May include but not limited to: <ul style="list-style-type: none"> <li>• Datum/survey mark</li> <li>• Selected Points</li> </ul>

### Evidence Guide

<p>Critical aspects of Competence</p>	<p>Must demonstrate knowledge skill and attitude of:</p> <ul style="list-style-type: none"> <li>• Location, interpretation and application of relevant information, standards and specifications</li> <li>• Compliance with site safety plan, OH &amp;S regulations and State/Territory legislation applicable to workplace operations</li> <li>• Compliance with organizational policies and procedures including quality requirements</li> <li>• The conduct of a minimum of three different leveling tasks, at least one utilizing an automatic level. One of the tasks must include closed traverse utilizing either the height of instrument or rise and fall method of reduction</li> <li>• The conduct of a two-peg test with an automatic level, to confirm instrument meets manufacturers' tolerances</li> <li>• Setting out of vertical and horizontal curves using labor-based survey methods.</li> <li>• Determining Grade/slope.</li> <li>• The accurate recording of the results of each leveling procedure to organizational requirements</li> <li>• Communication and working effectively and safely with others</li> </ul>
<p>Required Knowledge and Attitudes</p>	<p>Must demonstrate knowledge and attitudes of:</p> <ul style="list-style-type: none"> <li>• Basic surveying processes</li> <li>• Surveying terminology</li> <li>• Surveying device types, characteristics, technical capabilities and limitations</li> <li>• Surveying techniques related to essential tasks</li> <li>• Basic mathematical techniques associated with control surveying</li> <li>• Basic road construction processes</li> <li>• Basic technical drawing</li> <li>• Construction plan, symbols and construction terminology</li> <li>• Leveling device types, characteristics, technical capabilities and limitations.</li> <li>• Site and equipment safety requirements</li> <li>• Processes for interpreting engineering drawings and sketches</li> <li>• Site and equipment safety requirements</li> <li>• Site isolation and traffic control responsibilities and</li> </ul>

	<p>authorities</p> <ul style="list-style-type: none"> <li>• Project quality requirements</li> </ul>
Required Skills	<p>Must demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Plan and prepare</li> <li>• Perform Traversing</li> <li>• Compute Triangulation</li> <li>• Set out horizontal alignment</li> <li>• Set out vertical alignment</li> <li>• Set out cross sections</li> <li>• Establish offset pegs</li> <li>• Establish Intersection</li> <li>• Establish Re section</li> <li>• Write the description for Stations</li> </ul>
Resource Implications	<p>Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.</p>
Assessment Methods	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview / Written Test</li> <li>• Observation / Demonstration and Oral Questioning</li> </ul>
Context of Assessment	<p>Competency may be assessed in the work place or in a simulated work place setting</p>



Occupational Standard: Road Construction & Maintenance Level III	
Unit Title	Use CAD Systems to Produce Basic Engineering Drawings
Unit Code	<a href="#">EIS RCM3 02 0322</a>
Unit Descriptor	This unit covers producing basic engineering drawings using a CAD system, under the direction of a supervisor.

Elements	Performance criteria
1. Prepare the CAD environment	<p>1.1 All relevant manuals, instructions and operating procedures for the <b>CAD software</b> are obtained in accordance with workplace procedures.</p> <p>1.2 The CAD package is booted up in accordance with workplace procedures.</p> <p>1.3 Screen display areas and <b>basic parameters</b> are set in accordance with instructions.</p>
2. Produce drawings & Modify existing CAD drawings	<p>2.1 <b>Basic CAD drawings</b> are created and guidance is sought as required.</p> <p>2.2 Drawings are prepared in accordance with standard operating procedures.</p> <p>2.3 As required, CAD drawings are reviewed with supervisor and/or other designated staff in accordance with company procedures.</p> <p>2.4 Existing CAD drawings are located and modified by adding, deleting or changing drawing elements within that drawing.</p>
3. Produce output & Shot down	<p>3.1 Drawing files are saved in the appropriate format in accordance with standard operating procedures.</p> <p>3.2 Drawing files are printed out using plotter or <b>equivalent devices</b>.</p> <p>3.3 Programs and computer are shut down in accordance with workplace procedures.</p>

Variable	Range
CAD Software	My include Computer Aided Drafting/Drawing Softwer With Diffrent version Minimum of 2007 CAD
Basic parameters	My Include layer or level, line type, line width, colour and text format etc.
Basic CAD drawings	My Include the following characteristics: <ul style="list-style-type: none"> <li>lines, arcs, circles, polygons, ellipses, hatching or filling of areas, text, dimensions and tangents</li> </ul>
Equivalent devices	May include ink jet printers or the like

<b>Evidence Guide</b>	
Critical aspects of Competence	<p>Must demonstrate knowledge skill and attitude to:</p> <ul style="list-style-type: none"> <li>• use computer aided drafting systems to produce basic engineering drawings..</li> </ul>
Required Knowledge and Attitudes	<p>Must demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• CAD program capabilities and processing</li> <li>• Computer operation</li> <li>• Drawing principles</li> </ul>
Required Skills	<p>Demonstrates skills to:</p> <ul style="list-style-type: none"> <li>• read and interpret engineering specifications</li> <li>• organise information</li> <li>• use computer and peripherals</li> <li>• use `CAD program</li> <li>• prepare simple drawings in plane orthogonal, isometric projection or equivalent</li> </ul>
Resource Implications	<p>Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.</p>
Assessment Methods	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview / Written Test / Oral Questioning</li> <li>• Observation / Demonstration</li> </ul>
Context of Assessment	<p>Competency may be assessed in the work place or in a simulated work place setting</p>

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<b>Unit Title</b>	<b>Prepare Quantity Work for Estimation</b>
<b>Unit Code</b>	<a href="#"><u>EIS RCM3 03 0322</u></a>
<b>Unit Descriptor</b>	This unit specifies the competency required to calculate Volume of materials, requirements and establish Specification for services or products. It includes gathering information, estimate material, determine take off sheet ,quantify and preparing specification,

<b>Elements</b>	<b>Performance Criteria</b>
1. Gather information	1.1 Details of customer requirements are obtained through discussion with customer or from information supplied 1.2 <b>Plans/specifications</b> are accessed and site inspected 1.3 Details of products and/or services to be provided are developed delivery point and methods of transportation are determined where necessary
2. Take off work quantity	2.1. Work, including preparatory tasks, is planned and sequenced 2.2. Prepare take off & bill of <b>quantity</b> format for preparing details 2.3. Prepare item detail description/specification of materials 2.4. Measure & book each work item based on design details 2.5. Quantify take off result and put in summarized quantity in BOQ Format
3. Document and verify details	3.1 Work & other details are verified in accordance with workplace procedures 3.2 Customer quotation/tender is prepared 3.3 Details are documented for future reference in accordance with workplace procedures 3.4 Details are recorded in accordance with workplace procedures

<b>Variable</b>	<b>Range</b>
Tools and Equipment	May include: <ul style="list-style-type: none"> <li>• Calculators and stationery,</li> <li>• Measuring equipment appropriate to work</li> <li>• Levelling equipment,</li> <li>• Calculating necessary details Information</li> </ul>
Plans/specifications	May include: <ul style="list-style-type: none"> <li>• Floor plan</li> <li>• Sections</li> <li>• Elevation plans</li> <li>• Details and</li> <li>• Underground Service plans</li> </ul>
Quantity	Quantity My Include <ul style="list-style-type: none"> <li>• Unit Measurement</li> </ul>

	<ul style="list-style-type: none"> <li>• Volume of Material</li> <li>• Parameters</li> </ul>
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<b>Evidence Guide</b>	
Critical aspects of competence	<p>Must demonstrate knowledge, skills and attitude to:</p> <ul style="list-style-type: none"> <li>• Locate, interpret and apply relevant information, standards and specifications</li> <li>• Prepare specifications For Work Item</li> <li>• Apply a written quotation/tender for each of the work requirements</li> <li>• Communicate and work effectively and safely with others</li> </ul>
Required Knowledge and Attitudes	<p>Must demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• SI system of measurements</li> <li>• workplace and equipment safety requirements</li> <li>• the relevant statutory and authority requirements related to estimating and costing work</li> <li>• The standards applicable to the work to be undertaken</li> <li>• Gathering sources of information and the processes for the calculation of material requirements</li> <li>• Process of estimating and costing work</li> <li>• Performing tendering and contracting processes</li> </ul>
Required Skills	<p>Must demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Perform SI systems of measurements</li> <li>• Properly use measuring instruments and tools</li> </ul>
Resource Implications	<p>The following resources should be provided:</p> <p>Access to relevant workplace or appropriately simulated environment where assessment can take place</p> <p>Materials relevant to the proposed activity or task</p>
Methods of Assessment	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview / Written Test</li> <li>• Observation / Demonstration with Oral Questioning</li> </ul>
Context for Assessment	<p>Competency may be assessed in the work place or in a simulated work place setting</p>

Occupational Standard: Road Construction and Maintenance Level III	
Unit Title	Conduct Road Construction Material Sampling and Testing
Unit Code	<a href="#">EIS RCM3 04 0322</a>
Unit Descriptor	<p>This unit specifies the competence required to collect samples of construction materials used in the road construction for testing suitability to intended purpose and it specifies the competence required to conduct construction material sampling, specimen preparation and testing and it covers the ability to log samples, check sample documentation, schedule and prepare a range of samples for testing. All operations are performed in accordance with standard operating procedures (SOPs).</p> <p>Finally, it includes the planning and preparation for work, the conduct of pre-operational checks, the operation of testing equipment and the conduct of appropriate testing procedures.</p>

Elements	Performance Criteria
1. Plan and prepare for work	<p>1.1 Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied to the allotted task</p> <p>1.2 Safety requirements are obtained from the site safety plan and organizational policies and procedures, confirmed and applied to the allotted task</p> <p>1.3 <i>Construction materials</i> to be used and handling procedures to be employed are determined according to specifications</p> <p>1.4 Tools and equipment selected to carry out tasks are consistent with the requirements of the job, checked for serviceability and any faults are rectified or reported</p> <p>1.5 Environmental protection requirements are identified from the project environmental management plan, confirmed and applied to the allotted task</p>
2. Prepare and take samples for test	<p>2.1 Suitable clean <i>containers</i> and sampling <i>tools</i> are obtained</p> <p>2.2 Sample is taken in accordance with approved procedure/job instructions/standards/ sampling methods</p> <p>2.3 Sample is handled, labeled and stored in accordance with approved procedure/job instructions/standards/ sampling methods</p> <p>2.4 OHS procedures for obtaining and handling samples are adhered to throughout the process including handling hazards and risks</p> <p>2.5 Necessary reports and documentation are accomplished in accordance with organization standards and format.</p>

	<p>2.6 Perform physical separation of the samples</p> <p>2.7 Prepare the required number of sub-samples</p> <p>2.8 Perform chemical separation of the samples as required</p> <p>2.9 Place samples in appropriate transport media, if appropriate</p> <p>2.10 Monitor and control sample conditions before, during and after processing</p>
3. Log samples	<p>3.1 Record date (and time of arrival if required) of samples at enterprise</p> <p>3.2 Check and match samples with request forms before they are accepted</p> <p>3.3 Enter samples into the laboratory information management system (LIMS)</p> <p>3.4 Apply required document tracking mechanisms</p> <p>3.5 Process ‘urgent’ test requests according to enterprise requirements</p> <p>3.6 Ensure security and traceability of all information, laboratory data and records</p>
4. Address customer service issues	<p>4.1 Report to referring client when samples and request forms do not comply with enterprise requirements</p> <p>4.2 Refer to supervisor for instruction where ‘return to source’ is inappropriate or not possible</p> <p>4.3 Maintain confidentiality of all client/enterprise data and information</p> <p>4.4 Ensure that information provided to customers is accurate, relevant and authorized for release</p> <p>4.5 Deal with customers politely and efficiently and in accordance with enterprise procedures</p>
5. Distribute samples	<p>5.1 Group samples requiring similar testing requirements</p> <p>5.2 Distribute samples to work stations maintaining sample integrity</p> <p>5.3 Distribute request forms for data entry or filing in accordance with enterprise procedures</p> <p>5.4 Check that samples and relevant request forms have been received by laboratory personnel</p>
6. Maintain a safe work area and environment	<p>6.1 Apply safe work practices to ensure personal safety and that of other laboratory personnel</p> <p>6.2 Use appropriate protective equipment to ensure personal safety when sampling, processing, transferring or disposing of samples</p> <p>6.3 Report all accidents and spillages to supervisor</p> <p>6.4 Clean up splashes and spillages immediately using appropriate techniques and precautions</p> <p>6.5 Minimize the generation of wastes and environmental impacts</p> <p>6.6 Ensure the safe disposal of hazardous materials and other</p>

	laboratory wastes.
7. Conduct preparation of stabilized construction materials & testing	<p>7.1 Hazards associated with testing operations are identified and safe operating techniques are used to minimize risk</p> <p>7.2 Specimen is prepared in accordance to the test to be conducted and following standard procedures and safety measures</p> <p>7.3 Operating techniques in the use of <b>testing equipment</b> are identified and applied to achieve optimum output in accordance with manufacturers' design specifications while achieving specified tolerances</p> <p>7.4 Operations of field and laboratory tests are carried out in accordance with the work specific requirements.</p> <p>7.5 Proper handling of construction materials and <b>additives (stabilizers)</b> used for the preparation of the mix.</p> <p>7.6 Site hazards associated with the preparation of stabilized construction materials are identified and safe operational techniques are used to minimize risk.</p> <p>7.7 Preparation techniques for stabilized construction materials are identified and applied to achieve optimum output in accordance with technical specification.</p>
8. Identify & Control hazards and risks	<p>8.1 <b>Safety regulations</b> and workplace safety and hazard control practices and procedures are clarified based on organization procedures</p> <p>8.2 <b>Hazards/risks</b> in the workplace and their corresponding indicators are identified to minimize or eliminate risk to co-workers, workplace and environment in accordance with organization procedures</p> <p>8.3 <b>Contingency measures</b> during workplace accidents, fire and other emergencies are recognized and established in accordance with organization procedures</p> <p>8.4 Occupational Health and Safety (OHS) procedures for controlling hazards/risks in workplace are consistently followed</p> <p>8.5 Procedures for dealing with workplace accidents, fire and emergencies are followed in accordance with organization OHS policies</p> <p>8.6 <b>Personal protective equipment (PPE)</b> is correctly used in accordance with organization OHS procedures and practices</p> <p>8.7 Appropriate assistance is provided in the event of a workplace emergency in accordance with established organization protocol</p>

9. Clean up	<p>9.1 Work area is cleared and materials disposed of or replaced in accordance with project environmental management plan.</p> <p>9.2 Samples are transported and store in accordance with the required techniques.</p> <p>9.3 Tools are cleaned, checked, maintained and stored in accordance with standard work practices and safety regulations</p>
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Variable	Range
Construction Materials	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Selected material</li> <li>• Borrow material</li> <li>• Natural gravel</li> <li>• Crushed aggregate</li> <li>• Bitumen</li> <li>• Rock</li> <li>• Sand</li> <li>• Cement</li> <li>• Reinforcement bar</li> <li>• Water</li> </ul>
Containers	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Sample bag</li> <li>• Shelby tube</li> <li>• Plastic jar</li> <li>• Sample box</li> </ul>
Tools	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Spade</li> <li>• Pick</li> <li>• Chisel</li> <li>• Auger</li> </ul>
Testing equipment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• CBR testing device</li> <li>• Concrete compressive test machine</li> <li>• Tensile Strength Machine</li> <li>• Liquid Limit apparatuses</li> <li>• Compaction Test Apparatuses</li> </ul>
additives Stabilizers	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Lime</li> <li>• Cement</li> <li>• Mechanical stabilization</li> </ul>
Safety regulations and Safe work	<p>Safety regulation may include but are not limited to:</p> <ul style="list-style-type: none"> <li>• Clean Air Act</li> </ul>



practices	<ul style="list-style-type: none"> <li>• Building code</li> <li>• National Electrical and Fire Safety Codes</li> <li>• Waste management statutes and rules</li> <li>• Occupational Safety and Health Standards</li> </ul> <p>Safe work practices may include: -</p> <ul style="list-style-type: none"> <li>• Use of personal protective equipment, such as hard hats, hearing protection, gloves, safety glasses, goggles, face guards, coveralls, gown, body suits, respirators, safety boots</li> <li>• Use of biohazard containers and laminar flow cabinets</li> <li>• Correct labelling of reagents and hazardous materials</li> <li>• Handling, and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer’s instructions, enterprise procedures and regulations</li> <li>• Regular cleaning and/or decontamination of equipment and work areas</li> </ul>
Hazards/Risks	<p>May include but are not limited to:</p> <ul style="list-style-type: none"> <li>• Physical hazards – impact, illumination, pressure, noise, vibration, temperature, radiation</li> <li>• Biological hazards- bacteria, viruses, plants, parasites, mites, molds, fungi, insects</li> <li>• Chemical hazards – dusts, fibers, mists, fumes, smoke, gasses, vapors</li> <li>• Ergonomics</li> <li>• Psychological factors – over exertion/ excessive force, awkward/static positions, fatigue, direct pressure, varying metabolic cycles</li> <li>• Physiological factors – monotony, personal relationship, work out cycle</li> </ul>
Contingency measures	<p>May include but are not limited to:</p> <ul style="list-style-type: none"> <li>• Evacuation</li> <li>• Isolation</li> <li>• Decontamination</li> <li>• (Calling designed) emergency personnel</li> </ul>
PPE	<p>May include but are not limited to:</p> <ul style="list-style-type: none"> <li>• Mask</li> <li>• Gloves</li> <li>• Goggles</li> <li>• Hair Net/cap/bonnet</li> <li>• Face mask/shield</li> </ul>

	<ul style="list-style-type: none"> <li>• Ear muffs</li> <li>• Apron/Gown/coverall/jump suit</li> <li>• Anti-static suits</li> </ul>
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<b>Evidence Guide</b>	
Critical aspects of competence	<p>must demonstrate Knowledge, skill and attitude on</p> <ul style="list-style-type: none"> <li>• Interpretation and application of relevant information, standards and specifications</li> <li>• Compliance with site safety plan, OHS regulations and state/territory legislation applicable to workplace operations</li> <li>• Compliance with organizational policies and procedures including quality requirements</li> <li>• Sample of construction materials to be taken from each of a container, site and stock pile</li> <li>• Safe and effective operational use of tools</li> <li>• Communication and working effectively and safely with other</li> <li>• receives and logs samples in accordance with enterprise procedures</li> <li>• checks samples for history and acceptable transport conditions</li> <li>• applies standard precautions when dealing with hazardous materials</li> <li>• applies knowledge of relationship(s) between specific sample preparation and associated tests</li> <li>• promptly clarifies specific client requirements with appropriate personnel, as necessary</li> <li>• performs sample preparation and sub-sampling in accordance with enterprise procedures</li> <li>• labels and stores samples following enterprise procedures and maintains sample integrity, and traceability</li> <li>• follows required sample disposal procedures</li> <li>• maintains all equipment and workspace in accordance with enterprise procedures</li> </ul>
Required Knowledge and Attitudes	<p>Must demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• Site and equipment safety requirements</li> <li>• Construction materials</li> <li>• Sampling techniques</li> <li>• Materials Safety Data Sheets and materials</li> <li>• handling methods</li> <li>• Project quality requirements</li> <li>• Civil construction terminology</li> <li>• Safe work method statements</li> </ul>

	<ul style="list-style-type: none"> <li>• Study/select appropriate technology</li> <li>• Relevant technology</li> <li>• enterprise procedures for the receipt, documentation, distribution and storage of samples</li> <li>• Potentially hazardous and unstable nature of samples</li> <li>• Requirement of specified sample types for specific tests</li> <li>• Importance of accurate and complete labelling of samples</li> <li>• Importance of maintaining effective customer relations</li> <li>• Sample storage and transport requirements.</li> <li>• Relevant health, safety and environment requirements.</li> </ul>
Required Skills	<p>Must demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Apply site and equipment safety rules</li> <li>• Apply sampling techniques</li> <li>• Apply handling methods</li> <li>• Apply mathematical procedure/solution</li> </ul>
Resource Implications	<p>Access to the following:</p> <ul style="list-style-type: none"> <li>• Workplace or simulated workplace</li> <li>• All materials which can be sampled in bituminous surfacing operations</li> <li>• Tools and equipment appropriate to sampling materials</li> <li>• Specifications and work instructions</li> </ul>
Assessment Methods	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview / Written Test</li> <li>• Demonstration / Observation with Oral questioning</li> </ul>
Context of Assessment	<p>Competency may be assessed in the work place or in a simulated work place setting</p>

**Occupational Standard: Road Construction and Maintenance Level III**

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<b>Unit Title</b>	<b>Monitor Installation of Water Main, Storm and Sewer Pipelines</b>
<b>Unit Code</b>	<a href="#"><u>EIS RCM3 05 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the installation of water main pipelines, storm and sewer pipelines in the civil construction industry. It includes planning and preparing, setting out and excavating, installing main pipeline, testing main pipe system, and cleaning up.

<b>Elements</b>	<b>Performance Criteria</b>
1. Prepare plan	1.1 Access, interpret and apply <b>compliance documentation</b> relevant to the work activity. 1.2 Obtain <b>safety requirements</b> from the site safety plan 1.3 Identify, obtain and implement <b>signage</b> requirements from the project <b>traffic</b> management plan 1.4 Select plant, <b>tools and equipment</b> to carry out tasks consistent with the requirements of the job, check for serviceability and rectify or report any faults 1.5 Identify, confirm and apply <b>environmental protection requirements</b> from the project environmental management plan
2. Set out and excavate site	2.1 Ensure to prepare work area and <b>materials</b> to support the efficient <b>installation</b> of the pipe work 2.2 Determine and apply de-watering requirements 2.3 Determine location, alignment direction, level and grade of <b>main pipe system</b> from job drawings/specifications 2.4 Set out works to specification 2.5 Advise plant operator of excavation requirements and monitor levels 2.6 Install main pipe system <b>support mechanism</b> in accordance with plans, specifications and standards
3. Install, Test main & sewer pipelines	3.1 Lower and place pipes in position to design specifications 3.2 <b>Join</b> pipes in accordance with manufacturer's specifications 3.3 Place pipes and fit <b>valves, fittings and flow control devices</b> in accordance with drawings and specifications 3.4 Check alignment level and grade continuously for conformance with design plans and specifications 3.5 Check continuously alignment level and grade for conformance with design plans and specifications 3.6 Position side support and/or overlay beside the pipes 3.7 Check main pipe and sewer pipeline system support structure 3.8 Monitor backfill procedure to ensure work is completed to specification

	<p>3.9 Construct valve chambers, minor structures and thrust blocks</p> <p>3.10 Construct manholes, inspection and valve chambers, minor structures and thrust blocks</p> <p>3.11 Perform test to relevant authority requirements as determined by the specifications</p> <p>3.12 Perform <i>sewer</i> &amp; main pipe system <i>test procedures</i> establishing functionality and serviceability</p> <p>3.13 Record and report test results</p>
4. Install storm water system	<p>4.1 Lower pipes and place in position to design specifications</p> <p>4.2 Join pipes in accordance with manufacturer's specifications</p> <p>4.3 Check alignment level and grade continuously for conformance with design plans and specifications</p> <p>4.4 Position side support and/or overlay beside the pipes</p> <p>4.5 Fit inspection openings in accordance with job specifications</p> <p>4.6 Monitor backfill procedure to ensure work is completed to specification, where specified</p>
5. Test storm water system	<p>5.1 Perform test to relevant authority requirements as determined by the specifications</p> <p>5.2 Perform <i>storm water system</i> test procedures establishing functionality and serviceability</p> <p>5.3 Record and report test results</p>
6. Clean up work area	<p>6.1 Clear work area and dispose of or recycle materials in accordance with project environmental management plan</p> <p>6.2 Clean, check, maintain and store plant, tools and equipment</p>

Variable	Range
Compliance documentation	<p>may include:</p> <ul style="list-style-type: none"> <li>• Legislative</li> <li>• Organizational and site requirements and procedures</li> <li>• Manufacturer's guidelines and specifications</li> <li>• Ethiopian standards</li> <li>• Employment and workplace relations legislation</li> <li>• Equal Employment Opportunity and Disability discrimination program</li> <li>• Work instructions, including plans, specifications, quality requirements and operational details</li> </ul>
Safety requirements	<p>may include the following:</p> <ul style="list-style-type: none"> <li>• OHS requirements in accordance with Federal legislation and regulations</li> <li>• Organizational safety policies and procedures</li> <li>• Project safety plan including: <ul style="list-style-type: none"> <li>➤ protective clothing and equipment</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>➤ use of tools and equipment</li> <li>➤ workplace environment and safety</li> <li>➤ handling of materials</li> <li>➤ use of fire fighting equipment</li> <li>➤ use of First Aid equipment</li> <li>➤ hazard control, and hazardous materials and substances</li> <li>➤ safe operating procedures including recognizing and preventing hazards associated with underground services</li> <li>➤ other machines, personnel, restricted access barriers</li> <li>➤ traffic control, working in proximity to others, worksite visitors and the public</li> <li>➤ recognizing hazards and risks including uneven/unstable terrain, trees</li> <li>➤ underground services, buildings</li> <li>➤ excavations, traffic, embankments, cuttings, structures and hazardous materials</li> <li>➤ safe parking practices including ensuring access ways are clear, equipment/machinery is away from overhangs and re-fuelling sites</li> <li>➤ safe distance from excavations, and secured from unauthorized access or movement</li> <li>➤ emergency procedures including emergency shutdown and stopping</li> <li>➤ extinguishing equipment fires</li> <li>➤ organizational First Aid requirements and evacuation</li> </ul>
Signage	<p>may include:</p> <ul style="list-style-type: none"> <li>• Escort vehicles</li> <li>• Highway traffic signs</li> <li>• Site Safety signage</li> <li>• Temporary signage for the benefit of motorists and pedestrians</li> <li>• Barricades</li> <li>• Traffic conditions signage</li> </ul>
Traffic	<p>may include:</p> <ul style="list-style-type: none"> <li>• Congested urban environments</li> <li>• Low traffic rural areas</li> <li>• Off-road un-trafficked areas</li> <li>• Buildings</li> <li>• Parking sites</li> <li>• Pedestrian areas</li> </ul>
Tools and equipment	<p>may include:</p> <ul style="list-style-type: none"> <li>• Leveling equipment</li> <li>• Shovels</li> </ul>

	<ul style="list-style-type: none"> <li>• Lifting equipment</li> <li>• Crow bars</li> <li>• Hammers</li> <li>• Grinders</li> <li>• Jointing equipment</li> <li>• Oxy-acetylene equipment</li> <li>• Scaffolding</li> <li>• Saws</li> </ul>
Environmental protection requirements	<p>may include:</p> <ul style="list-style-type: none"> <li>• Organizational/project environmental management plan</li> <li>• Waste management</li> <li>• Water quality protection</li> <li>• Noise</li> <li>• Vibration</li> <li>• Dust And clean-up management</li> </ul>
Materials	<p>may include:</p> <ul style="list-style-type: none"> <li>• Picks</li> <li>• Pipes</li> <li>• Concrete</li> <li>• Backfill</li> <li>• Bedding materials</li> <li>• Backfill</li> </ul>
Installation procedures	<p>may include:</p> <ul style="list-style-type: none"> <li>• Selecting size, type and materials of pipe</li> <li>• Bedding down pipes</li> <li>• Positioning pipes</li> <li>• Checking alignment, level and grade</li> <li>• Repair work</li> </ul>
Main pipe system	<p>may include:</p> <ul style="list-style-type: none"> <li>• Pressurized main water pipelines</li> <li>• In-ground and above ground systems</li> <li>• Pipes constructed from PVC, UPVC, poly, DICL, steel and copper</li> </ul>
Support mechanism	<p>may include:</p> <ul style="list-style-type: none"> <li>• Bedding for in-ground trenches which may include: <ul style="list-style-type: none"> <li>➤ aggregate</li> <li>➤ sand</li> </ul> </li> <li>• Concrete shoulders for above ground pipes</li> </ul>
Valves	<p>may include:</p> <ul style="list-style-type: none"> <li>• Stop valves</li> <li>• Flow control valves</li> </ul>

	<ul style="list-style-type: none"> <li>• Non return valves</li> <li>• Pressure control valves</li> <li>• Energy dissipaters and air release valves</li> </ul>
Test	<p>may include:</p> <ul style="list-style-type: none"> <li>• Pressure</li> <li>• Visual straightness</li> <li>• Quality</li> <li>• Tolerance</li> <li>• Air</li> <li>• Water</li> </ul>
Pipe	<p>may include:</p> <ul style="list-style-type: none"> <li>• Storm water pipes constructed from • reinforced concrete (RCP) • PVC • Steel</li> <li>• Fibre reinforced concrete (FRC) • DICL • UPVC • clay</li> </ul>
Join	<p>may include:</p> <ul style="list-style-type: none"> <li>• Rubber ring</li> <li>• Solvent welded</li> <li>• Arc welded</li> <li>• Mechanical jointed</li> </ul>
Valves, fittings and flow control devices	<p>may include:</p> <ul style="list-style-type: none"> <li>• Stop valves</li> <li>• Non return valves</li> <li>• Flow control valves</li> <li>• Air release valves</li> <li>• Waste and leak detection meters</li> </ul>
Sewer pipeline	includes only in-ground
Test procedures	<p>may include:</p> <ul style="list-style-type: none"> <li>• Visual straightness</li> <li>• Quality</li> <li>• Tolerance</li> <li>• Air</li> <li>• Water</li> </ul>
Storm water systems	<p>include:</p> <ul style="list-style-type: none"> <li>• Only in-ground</li> </ul>

<b>Evidence Guide</b>			
Critical Aspects of Competence	<p>Must demonstrate knowledge, skill and attitude on:</p> <ul style="list-style-type: none"> <li>• Prepared plan</li> <li>• Prepared work area and materials to support the installation of pipe work</li> <li>• Installed pipe lines</li> </ul>		
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	<ul style="list-style-type: none"> <li>• Tested main pipe system</li> <li>• Installed storm water system</li> <li>• Tested storm water system</li> <li>• Installed sewer pipeline</li> <li>• Tested sewer pipeline</li> <li>• Cleaned –up work area</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrates knowledge of:</p> <ul style="list-style-type: none"> <li>• Environmental protection requirements</li> <li>• Specifications of materials, tools and equipment</li> <li>• Safety requirements</li> <li>• Compliance documentation</li> <li>• Design specifications and standards</li> <li>• Design plans</li> <li>• Testing procedures</li> <li>• Site safety signage for traffic control</li> </ul>
Required Skills	<p>Demonstrates skills to:</p> <ul style="list-style-type: none"> <li>• Read and interpretation of design plans</li> <li>• Apply Pipe lines installation</li> <li>• Test pipeline system</li> <li>• Record and report</li> <li>• Implement safety precautions</li> </ul>
Resource Implications	Access is required to real working areas or appropriately simulated environments including working site, materials & equipment and to information on workplace and OHS practices.
Methods of Assessment	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview / Written Test</li> <li>• Observation / Demonstration and Oral Questioning</li> </ul>
Context for Assessment	Competency may be assessed in the work place or in a simulated work place setting

<b>Occupational Standard: Road Construction and Maintenance Level III</b>			
<b>Unit Title</b>	<b>Construct and Maintain Minor Drainage structures and Retaining Walls</b>		
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<b>Unit Code</b>	<a href="#"><u>EIS RCM3 06 0322</u></a>
<b>Unit Descriptor</b>	<p>This unit covers the knowledge, attitude and skills required to carry out concrete and masonry work in constructing and maintaining minor concrete drainage and retaining wall structures.</p> <p>This unit includes setting out, carrying out excavation, placing reinforcement, erecting and dismantling formwork, placing, finishing, curing of concrete, maintenance of minor drainage structures and retaining wall structure.</p>

<b>Elements</b>	<b>Performance Criteria</b>
1. Plan and prepare constructing and maintaining minor concrete bridges	<p>1.1. <b>Work instructions</b> and operational details relevant to the tasks are obtained, confirmed and applied to the allotted tasks.</p> <p>1.2. Safety requirements are obtained from the site safety plan and organizational policies and procedures, confirmed and applied to the allotted task</p> <p>1.3. Signage requirements are identified and obtained from the project traffic management plan and implemented</p> <p>1.4. Plant, <b>tools and equipment</b> selected to carry out tasks are consistent with the requirements of the job, checked for serviceability and any faults are rectified or reported</p> <p>1.5. Temporary storm water diversion requirement determined in accordance with existing drainage outlets, site requirements and planned schedule of construction</p> <p>1.6. <b>Construction materials</b> appropriate to the work application are identified, safely handled and located ready for use</p> <p>1.7. Environmental protection requirements are identified from the project environmental management plan, confirmed and applied to the allotted task</p>
2. Conduct masonry work abutment and Wing wall	<p>2.1 Set and laid out minor bridge structures as per the work order from design standards and specifications.</p> <p>2.2 Location and structural details of masonry structures are determined from the work order.</p> <p>2.3 Clearing and excavation to level and bridge foundation excavation are carried out according to the work order.</p> <p>2.4 Work platform is erected in accordance with regulatory and workplace requirements.</p> <p>2.5 Setout area is correctly relocated and footing dimensions and locations are checked for conformity as per the work order.</p> <p>2.6 Masonry structure is set out as per the work order.</p> <p>2.7 Mortar materials are prepared and mixed in accordance with work order.</p> <p>2.8 Masonry wall structure is laid to set out for base and specified</p>

	<p>bond in accordance with the work order.</p> <p>2.9 Masonry wall is constructed maintaining bond, and completed to work order.</p> <p>2.10 Walls are to be straight, plumb and level within standard tolerances.</p> <p>2.11 Tie down and lateral support system structures are installed to walls in accordance with plans, specifications, codes and standards</p> <p>2.12 Type of articulation method is identified and applied in accordance with the work order</p> <p>2.13 Joints to laid face brickwork are raked or ruled to correct profile and depth in accordance with job specifications.</p> <p>2.14 Masonry stone work is brushed down prior to drying.</p> <p>2.15 Back fill and compaction are carried out according to the work order.</p>
<p>3. Conduct concreting work</p>	<p>3.1 Location of spread footing and formwork is determined from drawings and reinforcement schedule.</p> <p>3.2 Formwork components/materials are selected consistent with job.</p> <p>3.3 Fixing/fasteners are selected and used consistent with requirements of the job.</p> <p>3.4 String lines are set accurately from existing pegs.</p> <p>3.5 Grades are provided to ensure correct fall.</p> <p>3.6 Services are identified and protected to prevent damage.</p> <p>3.7 Work area is cleared and surface prepared for safe erection of formwork.</p> <p>3.8 Formwork is set out to requirements of work order.</p> <p>3.9 Formwork is assembled/erected and braced to work order.</p> <p>3.10 Expansion joints are positioned to work order.</p> <p>3.11 Debris, sawdust and other waste material are removed from the formwork.</p> <p>3.12 Reinforcing fabric and bars are cut and bent as required to work order.</p> <p>3.13 Fabric and bars are tied/fixed to configuration from work order</p> <p>3.14 Stiffening rods are attached to panels as required to facilitate handling.</p> <p>3.15 Reinforcement material is located in formwork and placed on bar chairs/spacers as determined from drawings, noting clearance from formwork.</p> <p>3.16 Cast-ins. is located and secured.</p> <p>3.17 Concrete is mixed and quality is checked as per the work order from specification and placed to specified levels and</p>

	<p>grades.</p> <p>3.18 Concrete is placed to specified levels and grades and compacted to specification using immersion vibrator or other specified methods.</p> <p>3.19 Concrete is screened, finished and curing process applied to specifications.</p> <p>3.20 False work is removed as per the work order or specification.</p> <p>3.21 Concrete surface is adequately covered and protected.</p> <p>3.22 Edge boxing and braces are removed sequentially.</p> <p>3.23 Timber components are derailed, cleaned, oiled (timber panels) and stored or stacked.</p> <p>3.24 Steel components are cleaned, oiled and stored or stacked.</p> <p>3.25 Damaged formwork components are discarded or maintained after stripping.</p> <p>3.26 Screens are safely cleaned before movement where applicable.</p>		
<p>4. Maintain minor drainage and retaining walls structures</p>	<p>4.2 Schedule of maintenance repairs/work order or instructions are obtained and applied to work order.</p> <p>4.3 Access devices are located in reach of areas to be maintained or repaired and checked for safe operation.</p> <p>4.4 Defect or fault is located and area prepared for rectification.</p> <p>4.5 <b>Drainage components</b> are regularly inspected and maintained and rectified or reported faults</p> <p>4.6 Drainage components are repaired as per initial design specifications and/or engineer's redesign</p> <p>4.7 Drainage system is flushed out to clear blockages and provide clear flows of fluid</p> <p>4.8 Open drains are maintained to correct line and fall specifications</p> <p>4.9 Surfaces adjoining open drains are finished allowing ease of run off</p> <p>4.10 Adequate erosion control methods are undertaken</p> <p>4.11 Resources are selected in accordance with the task</p> <p>4.12 Excavation is carried out in accordance with task specifications and site safety plan</p> <p>4.13 <b>Pipes</b> and accessories are prepared in accordance with design method of repair</p> <p>4.14 Pipe sections are replaced and joined and aligned to line and specified fall</p> <p>4.15 Required section is backfilled</p> <p>4.16 Inspection and testing of repaired drainage system are conducted to determine effectiveness of repairs</p> <p>4.17 Minor drainage structure maintenance work is completed to</p>		
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	<p>instruction or work order.</p> <p>4.18 Other defects or faults further identified during maintenance are reported in accordance with organizational requirements.</p>
5. Inspect, clear, repair culverts and Bridge	<p>5.1 Faults in <i>culverts</i> are identified and appropriate repair requirements and specifications are determined</p> <p>5.2 Sections and joint to levels and design specifications are repaired/replaced</p> <p>5.3 Inlets and outlets are repaired/maintained in accordance with culvert design and specifications</p> <p>5.4 Follow work order/schedule of <i>repairs</i> and <i>maintenance</i> to organisational requirements</p> <p>5.5 Inspect bridge structure to confirm nature and extent of fault</p> <p>5.6 Report significant deterioration of existing faults or new Faults</p> <p>5.7 Carry out repairs and maintenance of bridge structure in accordance with details from the schedule of repairs and maintenance documentation</p> <p>5.8 Report completed repairs and maintenance, noting and documenting any new faults in accordance with organisational requirements</p> <p>5.9 Backfill is compacted</p>
6. Clean up	<p>6.1 Work area is cleared and materials disposed of or recycled in accordance with project environmental management plan.</p> <p>6.2 Plant, tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices.</p>

<b>Variables</b>	<b>Range</b>
Work instructions	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Works order given from the engineer or supervisor.</li> </ul>
Tools and equipment	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• floats, trowels, edging tools, screeds, wheelbarrows,</li> <li>• mixer, vibrators, rakes, short handle shovels, injection pumps, fixing tools</li> <li>• rods, hammers, buckets, kibbles</li> <li>• reinforcement benders, mesh and brushes</li> <li>• Levelling equipment</li> <li>• tape Measures</li> <li>• Hand Saws</li> <li>• Cutting Knives</li> <li>• Crow Bars</li> <li>• Trowels</li> <li>• Formwork</li> </ul>

Construction Materials	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Cement, water, prefabricated steel pipes</li> <li>• Aggregate, sand reinforcement steel,</li> <li>• Formwork components, curing agents,</li> <li>• Adhesives, admixtures, etc.</li> <li>• Masonry stone</li> <li>• Gabion box</li> </ul>
Environmental protection requirements	<p>may include:</p> <ul style="list-style-type: none"> <li>• Organizational/project environmental management plan</li> <li>• Waste Management</li> <li>• Water quality protection</li> <li>• Noise</li> <li>• Vibration</li> <li>• Dust And clean-up management</li> </ul>
Services	<p>May include but not limited to:</p> <ul style="list-style-type: none"> <li>• Pipe line service</li> <li>• Electric line service</li> </ul>
Drainage components	<p>may include:</p> <ul style="list-style-type: none"> <li>• Gully/Silt Traps</li> <li>• Inspection Openings</li> <li>• Manholes</li> <li>• Benches</li> <li>• Lining</li> <li>• Step Irons</li> <li>• Lids</li> <li>• Headstones</li> <li>• Back stones</li> <li>• Grates</li> <li>• Kerbs</li> <li>• Gutters</li> <li>• Inlets And Outlets</li> <li>• Gabion Baskets</li> <li>• Rip Rap</li> <li>• Wing walls</li> <li>• End walls</li> <li>• Aprons</li> <li>• Reno-Mattresses</li> <li>• Geo-fabric</li> <li>• Drain Blocks</li> <li>• Check Dams</li> <li>• Sediment</li> </ul>

	<ul style="list-style-type: none"> <li>• Silt Control</li> </ul>
Pipes	<p>may include:</p> <ul style="list-style-type: none"> <li>• Reinforced concrete</li> <li>• rigid PVC</li> <li>• Flexible PVC</li> <li>• Steel box culverts</li> <li>• Clay pipes</li> <li>• Fibre Reinforced cement (FRC)</li> </ul>
Culverts	<p>may include:</p> <ul style="list-style-type: none"> <li>• reinforced concrete pipe sections</li> <li>• Reinforced concrete box sections</li> <li>• Steel pipe</li> <li>• FRC</li> <li>• PVC</li> </ul>
Join	<p>may include:</p> <ul style="list-style-type: none"> <li>• Sleeve joints with adhesives</li> <li>• Socket And spigot with adhesives</li> <li>• Socket and spigot with rubber rings</li> <li>• Butt Joints with outside bands</li> <li>• Butt Joints with inside rendering</li> <li>• Flanged And Bolted Joining</li> </ul> <p>Welded connections</p>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must demonstrate knowledge skills and attitude to:</p> <ul style="list-style-type: none"> <li>• Use safe and effective operation of tools, plant and equipment.</li> <li>• perform: <ul style="list-style-type: none"> <li>➤ plan and prepare</li> <li>➤ conduct concreting</li> <li>➤ conduct masonry work</li> <li>➤ maintain minor drainage and retaining structures</li> <li>➤ clean up</li> </ul> </li> <li>• Identify the requirements, procedures and instructions for constructing and Maintaining Minor Drainage Structure</li> <li>• Apply implementation of requirements, procedures and techniques for the safe, effective and efficient completion of Constructing and Maintaining Minor Drainage and Retaining Structure</li> <li>• Undertake and complete constructing and maintaining minor</li> </ul>

	drainage structure that meets all of the required outcomes
Required Knowledge and Attitudes	<p>Must demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• site and equipment safety requirements</li> <li>• Material characteristics</li> <li>• Minor drainage structure construction and maintenance methods and procedures</li> <li>• concreting and masonry work principles and procedures</li> <li>• formwork</li> <li>• processes for interpreting engineering sketches</li> <li>• equipment types, characteristics, technical capabilities and limitations</li> <li>• site isolation and traffic control responsibilities and authorities</li> <li>• Operational, maintenance and basic diagnostic procedures</li> <li>• materials Safety Data Sheets and materials handling methods</li> </ul>
Required Skills	<p>Must demonstrate skill to:</p> <ul style="list-style-type: none"> <li>• Processes of communication - verbal and signaling measurement and calculation</li> <li>• Apply bonding patterns and block bonding techniques</li> <li>• Apply the techniques of constructing masonry structural systems</li> <li>• Apply articulated and pier construction</li> <li>• Apply reinforcement structures and core filling of block work</li> <li>• Apply expansion, growth and control joints</li> <li>• place and fix formwork</li> <li>• place and fix scaffolding</li> <li>• Apply measuring, cutting and bending steel reinforcement bars</li> </ul>
Resource Implications	Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.
Methods of Assessment	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview / Written Test</li> <li>• Observation / Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competency may be assessed in the work place or in a simulated work place setting



Occupational Standard: Road Construction and Maintenance Level III	
Unit Title	Conduct and Monitor Stabilizer Operations
Unit Code	<a href="#">EIS RCM3 07 0322</a>
Unit Descriptor	This unit covers the conducting and monitoring of stabiliser operations in the civil construction industry. It includes planning and preparing, conducting stabiliser pre-operations checks, operating stabilisers, relocating stabilisers, carrying out operator maintenance, and cleaning up.

Elements	Performance Criteria
1. Plan and prepare	<p>1.1. <b>Compliance documentation</b> relevant to the work activity are accessed, interpreted and applied</p> <p>1.2. Relevant drawings and job specifications to all work activities are identified and applied</p> <p>1.3. <b>Safety requirements</b> are obtained and confirmed from the <i>site</i> safety plan and organisational policies and procedures, and applied to the allotted task</p> <p>1.4. Signage requirements are identified, obtained and implemented from the project traffic management plan</p> <p>1.5. <b>Material</b> to be laid and handling procedures to be employed are determined</p> <p>1.6. Plant, <b>tools and equipment</b> to carry out tasks that are consistent with the requirements of the job are selected, checked them for serviceability, and rectified or reported for any faults</p> <p>1.7. <b>Environmental protection requirements</b> are identified from the project environmental management plan, confirmed and applied to the allotted task</p>
2. Checks stabiliser pre-operation	<p>2.1. Pre-start, start-up, park and shutdown procedures in accordance with manufacturers' and/or site-specific requirements</p> <p>2.2. Stabiliser controls and functions for serviceability, focusing on brakes, implements or other attachments and manoeuvrability are ensured carried out by operators, checked, and rectified or reported for any faults</p>
3. Operate stabiliser	<p>3.1. Site <b>hazards</b> associated with <b>stabiliser operations</b> are identified and safe operating techniques to minimise risk are used</p> <p>3.2. Operating techniques are identified and the operators are advised to apply for stabiliser to achieve optimum output in</p>

	<p>accordance with manufacturers' design specifications while achieving specified tolerances</p> <p>3.3. Stabiliser is operated in accordance with company operating procedures</p> <p>3.4. Stabiliser to produce results, including mixing materials, using <b>additives</b> and line and length are operated</p>
4. Relocate stabiliser	<p>4.1. Stabiliser safely between worksites moved in accordance with relevant codes and traffic management requirements</p> <p>4.2. Stabiliser is prepared for relocation</p>
5. Check equipment performance	<p>5.1. Inspection and fault finding are ensured conducted in accordance with manufacturers' specifications and/or organisational requirements by the operator</p> <p>5.2. Routine operational servicing and lubrication tasks are ensured carried out by the operator</p> <p>5.3. Minor maintenance is carried out</p> <p>5.4. Performance of machine is recorded constantly to enable timely repair of equipment</p>
6. Clean up	<p>6.1. Work area is cleared and materials are recycled or disposed of in accordance with project environmental management plan</p> <p>6.2. Plant, tools and equipment are cleaned, checked, maintained and stored</p>

Variable	Range
Safety requirements	<p>May include:</p> <ul style="list-style-type: none"> <li>• OHS requirements in accordance with state or territory legislation and regulations, organisational safety policies and procedures, and project safety plan, including protective clothing and equipment, use of tools and equipment, workplace environment and safety, handling of materials, use of fire fighting equipment, use of First Aid equipment, hazard control and hazardous materials and substances</li> <li>• safe operating procedures including recognising and preventing hazards associated with high voltage power lines, uneven/unstable terrain, trees, overhead service lines, bridges, surrounding buildings, obstructions, structures, facilities, dangerous materials, recently filled trenches, other machines, personnel, traffic control, working at heights, working in proximity to others, worksite visitors and the public</li> <li>• safe parking practices including ensuring access ways are clear, equipment/machinery is away from overhangs and refuelling sites, safe distances are kept from excavations, and areas secured</li> </ul>

	<p>from unauthorised access or movement</p> <ul style="list-style-type: none"> <li>• emergency procedures related to equipment operation including emergency shutdown and stopping, extinguishing equipment fires, organisational First Aid requirements and evacuation</li> </ul>
Site	<p>may include:</p> <ul style="list-style-type: none"> <li>• car parks</li> <li>• airport runways</li> <li>• container yards</li> <li>• hard stands</li> <li>• footpaths</li> <li>• bikeways</li> <li>• rural roads and highways</li> <li>• urban roads and highways</li> </ul>
Materials	<p>may include:</p> <ul style="list-style-type: none"> <li>• imported fill</li> <li>• aggregates</li> <li>• cement</li> <li>• lime</li> <li>• bitumen</li> <li>• other chemicals</li> </ul>
Tools and equipment	<p>may include:</p> <ul style="list-style-type: none"> <li>• hand tools and maintenance equipment relevant to the particular stabiliser</li> </ul>
Environmental requirements	<p>may include:</p> <ul style="list-style-type: none"> <li>• organisational/project environmental management plan</li> <li>• waste management</li> <li>• water quality protection</li> <li>• noise</li> <li>• vibration</li> <li>• dust</li> <li>• clean-up management</li> </ul>
Hazards	<p>may include:</p> <ul style="list-style-type: none"> <li>• uneven/unstable terrain</li> <li>• trees</li> <li>• fires</li> <li>• overhead and underground services</li> <li>• bridges</li> <li>• buildings</li> <li>• excavations</li> <li>• traffic</li> <li>• embankments</li> </ul>

	<ul style="list-style-type: none"> <li>• cuttings</li> <li>• structures</li> <li>• hazardous materials</li> </ul>
stabilizer operations	<p>may include:</p> <ul style="list-style-type: none"> <li>• churning up (excavating and remixing) existing fill</li> <li>• refilling in layers using the stabilised material</li> <li>• mixing materials</li> <li>• applying additives</li> <li>• achieving specified line and depth</li> <li>• enhancing the properties of the existing pavement</li> <li>• decreasing permeability</li> <li>• volume change</li> <li>• mechanical stabilization</li> <li>• chemical stabilization</li> </ul>
Additives	<p>may include:</p> <ul style="list-style-type: none"> <li>• cement</li> <li>• lime</li> <li>• bitumen</li> <li>• other chemicals where the existing material is not conducive to cement treatment</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must demonstrate knowledge, skill and attitude on:</p> <ul style="list-style-type: none"> <li>• the requirements, procedures and instructions for the conduct of stabiliser operations</li> <li>• implement of requirements, procedures and techniques for the safe, effective and efficient completion of stabiliser operations</li> <li>• work with others to undertake and complete the conduct and monitoring of stabiliser operations in a way that meets all of the required outcomes</li> <li>• consistent timely completion of stabiliser operations that safely, effectively and efficiently meets the required outcomes</li> <li>• demonstrate of the conduct and monitoring of stabiliser operations</li> <li>• Support and lead the unit/team to perform the following tasks: <ul style="list-style-type: none"> <li>➤ plan and prepare</li> <li>➤ conduct stabilizer pre-operational checks</li> <li>➤ operate stabilizer</li> <li>➤ relocate stabilizer</li> <li>➤ carry out operator maintenance</li> <li>➤ clean up</li> </ul> </li> </ul>
Required Knowledge	Demonstrates knowledge and attitudes of:

and Attitudes	<ul style="list-style-type: none"> <li>• Principles of soil technology for civil works</li> <li>• Stabiliser types, characteristics, technical capabilities and limitations</li> <li>• Operational, maintenance and basic diagnostic procedures</li> <li>• site isolation and traffic control responsibilities and authorities</li> <li>• site and equipment safety requirements</li> <li>• materials safety data sheets and materials handling methods</li> <li>• project quality requirements</li> <li>• civil construction terminology</li> <li>• methods of changing machine attachments</li> <li>• safe operating techniques in all terrain</li> <li>• basic earthworks calculations</li> <li>• civil construction activity sequences of road construction, earthworks and drainage</li> <li>• levelling techniques</li> <li>• Safe work method statement</li> </ul>
Required Skills	<p>Demonstrates skills to:</p> <ul style="list-style-type: none"> <li>• apply legislative, organisation and site requirements and procedures for conducting stabiliser operations</li> <li>• apply stabilising techniques, including pulverising, mixing, and the use of additives</li> <li>• apply calculation of material requirements, mix, application rates, uniformity and travel speed</li> <li>• organise work activities</li> <li>• select and use relevant tools and equipment safely</li> <li>• identify and report on hazards related to the worksite and work activity</li> <li>• communicate effectively to receive and clarify work instructions</li> </ul>
Resource Implications	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	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview / Written Test</li> <li>• Observation / Demonstration with Oral Questioning</li> </ul>
Context of Assessment	Competency may be assessed in the work place or in a simulated work place setting

Occupational Standard: Road Construction and Maintenance Level III	
Unit Title	Conduct and Monitor Asphalt Concrete Production
Unit Code	<a href="#">EIS RCM3 08 0322</a>
Unit Descriptor	This unit covers the conducting and monitoring of asphalt concrete production activities in the road construction. It includes planning and preparing for operation, allocating and logging resources, conduct the production operation, monitoring and reporting plant/machinery activity, and monitoring movement of materials.

Elements	Performance Criteria
1. Plan and prepare for operation	<p>1.1 <b>Compliance documentation</b> relevant to the work activity is accessed, interpreted and applied</p> <p>1.2 <b>Safety requirements</b> are obtained and confirmed from the <i>site</i> safety plan and organizational policies and procedures, and applied to the allotted task</p> <p>1.3 <b>Plant, tools and equipment</b> to carry out tasks consistent with the requirements of the job are selected, checked for serviceability and rectify or report any faults</p> <p>1.4 <b>Shift changeover details</b> and previous shift details are received, checked, interpreted and clarified</p> <p>1.5 Communications with other personnel using approved communication methods are established and maintained</p> <p>1.6 Shift activities with other <i>personnel</i> are <b>coordinated</b></p> <p>1.7 <b>Potential risks and hazards</b> and site <b>environmental issues</b> are Identified, addressed and reported</p> <p>1.8 Computer systems and equipment pre-start checks are completed</p> <p>1.9 Maintenance inspections and identified defects are recorded</p>
2. Allocate and log resources	<p>2.1 <b>Hauling equipment</b> is allocated and logged to loading equipment and log</p> <p>2.2 Data is interpreted and equipment is re-allocated to maintain productiveness and to meet changing site conditions</p> <p>2.3 <b>Employee and contractor details</b> are accessed and</p> <p>2.4 Personnel is allocated to specific types of plant/equipment to ensure maximum productiveness</p> <p>2.5 Records of individual employees' productiveness is maintained on each type of machine in operation</p>
3. Monitor and report plant/ machine activity	<p>3.1 Production requirements are determined</p> <p>3.2 Aggregate and sand regularly are tested as it arrives</p> <p>3.3 Cold feed bins are monitored to ensure sufficient raw material is maintained</p>

	<p>3.4 Proportion of material allocation is ensured and set to batch requirements</p> <p>3.5 Mix design is selected to batch requirements</p> <p>3.6 Material is ensured heated and mixed to the correct temperature and tolerance</p> <p>3.7 Material is stored ready for dispatch and loading</p> <p>3.8 Loading operations are monitored</p> <p>3.9 Mixed material is ensured regularly <i>test</i> for bitumen content and grading</p>
4. Monitor and report operational activities	<p>4.1 The current status of site operation and plant are monitored and reported.</p> <p>4.2 Data to identify the <i>location</i> of equipment on site is continuously monitored.</p> <p>4.3 From data, the location of where <i>material</i> is being moved, haul distances, and the location for dumping of materials are determined.</p> <p>4.4 Data to determine and generate reports on equipment usage, availability and productivity is interpreted.</p> <p>4.5 <i>Data for measuring operational outputs</i> and resource usage, so as to report total usage and resource consumption rates is captured.</p>
5. Monitor movement of materials	<p>5.1 The movement of loading and hauling machinery and the quantities of materials moved is logged.</p> <p>5.2 Stock levels for availability of dispatched materials are monitored and reported.</p> <p>5.3 Productivity rates and cycle times are monitored and reported.</p>

Variables	Range
Compliance documentation	<p>may include:</p> <ul style="list-style-type: none"> <li>• Legislative,</li> <li>• Organization and site requirements and procedures</li> <li>• Manufacturer's guidelines and specifications</li> <li>• Ethiopian standards</li> <li>• Acts and regulations dealing with: <ul style="list-style-type: none"> <li>➤ Worksite safety and health</li> <li>➤ Worksite inspection</li> <li>➤ OHS</li> <li>➤ Explosives</li> <li>➤ Employment and workplace relations legislation</li> <li>➤ Equal Employment Opportunity and Disability Discrimination legislation</li> </ul> </li> </ul>
Safety requirements	include:

	<ul style="list-style-type: none"> <li>• OHS requirements are to be in accordance with state or territory legislation and regulations, organisational safety policies and procedures, and project safety plan, including protective clothing and equipment, use of tools and equipment, workplace environment and safety, handling of materials, use of firefighting equipment, use of First Aid equipment, hazard control and hazardous materials and substances</li> <li>• safe operating procedures including recognising and preventing hazards associated with moving machinery, flammable, toxic and dangerous materials, personnel, working in proximity to others, worksite visitors and the public</li> <li>• emergency procedures related to equipment operation including emergency shutdown and stopping, extinguishing equipment fires, organisational First Aid requirements and evacuation</li> </ul>
Plant	<p>may include:</p> <ul style="list-style-type: none"> <li>• fixed</li> <li>• mobile plant</li> </ul>
Tools and equipment	<p>may include:</p> <ul style="list-style-type: none"> <li>• asphalt plant and loaders</li> </ul>
Shift changeover details	<p>may include:</p> <ul style="list-style-type: none"> <li>• Nature and scope of the work</li> <li>• Working conditions</li> <li>• Achievement targets</li> <li>• Site lighting arrangements</li> <li>• Defects on equipment</li> <li>• Hazards and potential hazards</li> <li>• Coordination requirements/issues</li> </ul>
Personnel	<p>may include:</p> <ul style="list-style-type: none"> <li>• Contractors</li> <li>• Drillers</li> <li>• Drivers</li> <li>• Holders of appropriate tickets</li> <li>• Licensed operators</li> <li>• Maintenance staff/tradespersons</li> <li>• Personnel authorized by site management</li> <li>• Service personnel</li> <li>• Supervisors</li> <li>• Surveyors</li> </ul>
Coordination activities	<p>may include:</p> <ul style="list-style-type: none"> <li>• Communication with personnel</li> <li>• Awareness of other support plant</li> </ul>



	<ul style="list-style-type: none"> <li>• Equipment</li> </ul>		
Potential risks and hazards	<p>may include:</p> <ul style="list-style-type: none"> <li>• Abandoned equipment</li> <li>• Adjoining pit walls</li> <li>• Adverse weather conditions (electrical storms, floods, fires)</li> <li>• Chemicals</li> <li>• Contaminants</li> <li>• Equipment</li> <li>• Fences</li> <li>• Holes</li> <li>• Materials</li> <li>• Over-hanging rocks</li> <li>• Personnel</li> <li>• Pot holes</li> <li>• Unsafe ground</li> <li>• Unstable faces</li> <li>• Vehicles</li> </ul>		
Environmental issues	<p>may include:</p> <ul style="list-style-type: none"> <li>• Drainage</li> <li>• Dust (dump)</li> <li>• Emissions</li> <li>• Flora and fauna</li> <li>• Hazardous chemicals</li> <li>• Noise</li> <li>• Recycling</li> <li>• Run-off</li> <li>• Spills</li> <li>• Waste management and disposal</li> <li>• Water quality</li> </ul>		
Hauling and loading equipment	<p>may include:</p> <ul style="list-style-type: none"> <li>• Loader</li> <li>• Excavator</li> <li>• Truck</li> <li>• Dump truck</li> <li>• Rail vehicles and wagon</li> </ul>		
Employee and contractor details	<p>may include:</p> <ul style="list-style-type: none"> <li>• Qualifications</li> <li>• Permits</li> <li>• Site authorities</li> <li>• License to operate equipment</li> </ul>		
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	<ul style="list-style-type: none"> <li>• Time-sheet details</li> <li>• Training details leave</li> </ul>
Locations	<p>may include:</p> <ul style="list-style-type: none"> <li>• Where material is being mined</li> <li>• Where equipment is at the start and end of shift</li> <li>• Haul distances</li> </ul>
Material	<p>may include:</p> <ul style="list-style-type: none"> <li>• Production material</li> <li>• Topsoil, Gravel and Ore</li> <li>• Overburden</li> </ul>
Data for measuring operational outputs	<p>may include:</p> <ul style="list-style-type: none"> <li>• Fuel</li> <li>• Drill holes and meter drilled</li> <li>• Consumables</li> <li>• Advance rail activities</li> <li>• Equipment hour meter readings</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must Demonstrate knowledge, skill and attitude on:</p> <ul style="list-style-type: none"> <li>• Supporting the implementation unit/team of the following tasks: <ul style="list-style-type: none"> <li>➢ Plan and prepare for operation</li> <li>➢ Allocate and log resources</li> <li>➢ Conduct the production operation,</li> <li>➢ Monitor and report the operation activity</li> <li>➢ Monitor movement of materials</li> </ul> </li> <li>• the requirements, procedures and instructions for conducting and monitoring asphalt concrete production</li> <li>• implementation of requirements, procedures and techniques for the safe, effective and efficient completion of conducting and monitoring asphalt concrete production</li> <li>• working with others to undertake and complete conducting and monitoring asphalt concrete production meeting all of the required outcomes</li> <li>• consistent timely conducting and monitoring asphalt concrete production safely, effectively and efficiently meets the required outcomes</li> </ul>
Required Knowledge and Attitudes	<p>Must Demonstrate knowledge and attitudes of:</p> <ul style="list-style-type: none"> <li>• operate computer systems and equipment</li> <li>• Stock leveling of dispatched materials</li> <li>• Data for measuring operational outputs and resource usage</li> <li>• Equipment usage, availability and productivity</li> </ul>

	<ul style="list-style-type: none"> <li>• Records on individual’s productivity on each type of machine operation</li> <li>• Employees and contractor’s details</li> <li>• Safety Precautionary measures, potential risks, hazards and site environmental issues</li> <li>• Plant operations</li> <li>• Batching systems</li> <li>• Mix specifications (temperatures and tolerances)</li> <li>• Production requirements</li> <li>• Bituminous materials and their characteristics</li> <li>• Aggregate and sand properties and conformance</li> <li>• Additives</li> <li>• Processes for heating bitumen and controlling temperature</li> <li>• Testing procedures</li> <li>• Equipment types, characteristics, technical capabilities and limitations</li> <li>• Basic operational, maintenance and basic diagnostic procedures</li> <li>• Processes for the calculation of material requirements and application rates</li> <li>• materials safety data sheets and materials handling methods</li> <li>• Project quality requirements</li> <li>• Civil construction terminology</li> <li>• Safe work method statements</li> </ul>
Required Skills	<p>Must Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Access and interpreting compliance documentation</li> <li>• Plan and preparing for operation</li> <li>• Apply legislative, organization and site requirements and procedures for producing asphalt products</li> <li>• Identify and addressing potential risks and hazards</li> <li>• Operate computer and its peripherals</li> <li>• Report site environment issues</li> <li>• Monitor and report stock levels for availability of dispatched materials</li> <li>• Interpret and monitor data to identify location of equipment on site</li> <li>• Organise work activities</li> <li>• Select and use relevant tools and equipment safely</li> <li>• Identify and report on hazards related to the worksite and work activity</li> <li>• communicate effectively to receive and clarify work instructions</li> </ul>

Resource Implications	Access is required to real working areas or appropriately simulated environments including working site, materials and equipment and to information on workplace and OHS practices
Methods of Assessment	Competence may be assessed through: <ul style="list-style-type: none"> <li>• Interview / Written Test</li> <li>• Observation/Demonstration with Oral questioning</li> </ul>
Context of Assessment	Competency may be assessed in the workplace or in a simulated workplace environment setting

Occupational Standard: Road Construction & Maintenance Level III	
Unit Title	Conduct and Monitor Construction of Rigid Pavement
Unit Code	<a href="#">EIS RCM3 09 0322</a>
Unit Descriptor	This unit covers the knowledge, attitudes and skills required to Conduct & monitor construction of Rigid Pavement (JRCP, CRCP, JUCP).

Elements	Performance Criteria
1. Plan and prepare work	<p>1.1 Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied</p> <p>1.2 Material quantity requirements are calculated in accordance with plans and/or specifications</p> <p>1.3 Materials appropriate to the work application are identified, obtained, prepared, safely handled and located ready for use</p> <p>1.4 <b>Compliance of documentations</b> relevant to the work activity are accessed, interpreted and applied</p> <p>1.5 <b>Safety requirements</b> from the site safety plan and organisational policies and procedures are obtained and confirmed, and applied to the allotted task</p> <p>1.6 Signage requirements from the project traffic management plan are Identified, obtained and implemented</p> <p>1.7 <b>Plant, tools and equipment</b> to carry out tasks consistent with the requirements of the job are selected, checked for serviceability and rectified or reported on any faults</p> <p>1.8 <b>Environmental protection requirements</b> from the project environmental management plan are Identified and confirmed and applied to the allotted task</p>
2. Identify of Rigid Pavement	<p>2.1 Construction of jointed plain concrete pavement (JPCP) is undertaken</p> <p>2.2 Jointed reinforced concrete pavement (JRCP) is constructed</p> <p>2.3 Continuous reinforced concrete pavement (CRCP) is constructed</p> <p>2.4 Pre-stressed concrete pavement (PCP) is constructed</p>
3. Conduct pre paving inspection	<p>3.1 Base course stability is checked/tested</p> <p>3.2 Offset pegs/profiles are Establish to line and level as specified</p> <p>3.3 Elevation is checked</p> <p>3.4 Steel reinforcement placement are checked</p> <p>3.5 Dowels are slightly coated with grease or other substance over their entire length</p>

4. Identify spacing of tie bars for transverse & longitudinal contraction joints	<p>4.1 Type of slab, type of load transfer is identified</p> <p>4.2 Effect of longitudinal slab movement on sealant and load transfer, maximum slab length, the amount of cracking and use of random joint spacing; are considered in the identification of joint spacing.</p> <p>4.3 Dowel bars are used for load transfer across the joint</p> <p>4.4 Joint shape and sealant properties are identified.</p> <p>4.5 Slab width is identified. (widths up to and including 15 feet have performed satisfactorily without a longitudinal joint)</p> <p>4.6 Longitudinal joints are tied with tie bars</p> <p>4.7 Tie bars are mechanically inserted and placed at mid-depth.</p> <p>4.8 5/8" x 40" or 1/2" x 32" bars are used when Grade 60 steel is used.</p>		
5. Identify spacing of tie bars for construction joints	<p>5.1 Joints are dowelled and butted</p> <p>5.2 Transverse construction joints are sawed and sealed</p> <p>5.3 Tie bars are designed to carry the load transfer for 10" thick pavement</p> <p>5.4 Keyway is used for pavement with 10' or more</p> <p>5.5 Tie bars are anchored firmly</p> <p>5.6 Tie bars are mechanically installed or installed as 2 part threaded tie bar and splice coupler system.</p> <p>5.6 Longitudinal construction joint is sawed and sealed.</p>		
6. Identify spacing of tie bars and Cut material	<p>6.1 Width is 3/4" or more</p> <p>6.2 Filler material is placed 3/4 to 1' below the slab surface</p> <p>6.3 Tie bar spacing for expansion joints is in accordance with specifications</p>		
7. Place, compact and vibrate the concrete	<p>7.1 Concrete is placed in horizontal layers into location to levels as indicated by markers, level pegs or lines</p> <p>7.2 Height of vertical drop of concrete is minimized to avoid segregation of concrete materials</p> <p>7.3 Poured concrete is consolidated during process using approved compaction or vibration method</p> <p>7.4 Finished levels are checked against datum using appropriate leveling device</p>		
8. Screed/level concrete	<p>8.1 Concrete is screened to correct levels and/or grades using appropriate straight edged tool/formwork mounted screed</p> <p>8.2 Roller operators are informed of the required number of passes</p> <p>8.3 Compaction process is assessed to ensure the nominated number of passes are made and uniform compaction across the pavement is achieved</p> <p>8.4 <b>Pavement</b> trimming is checked to ensure specified tolerances are achieved</p>		
9. Clean up	<p>9.1 Work area is cleared and materials disposed of, reused or recycled in accordance with legislation/regulations/codes of</p>		
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	<p>practice and job specification</p> <p>9.2 Plant, tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices</p>
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Variables	Range
Unit scope	<p>may include:</p> <ul style="list-style-type: none"> <li>• Planning and preparation is to include but not be limited to: <ul style="list-style-type: none"> <li>➤ worksite inspection,</li> <li>➤ equipment defect identification,</li> <li>➤ assessment of conditions and hazards and determination of work requirements</li> </ul> </li> <li>• Transporting of concrete may include but not be limited to: <ul style="list-style-type: none"> <li>➤ pre-mix truck,</li> <li>➤ crane and kibble and wheelbarrow</li> </ul> </li> <li>• Placing methods of concrete includes but is not limited to: <ul style="list-style-type: none"> <li>➤ wheelbarrows,</li> <li>➤ pumping equipment,</li> <li>➤ kibble, termite,</li> <li>➤ truck placed, shoveling and includes vibrating</li> </ul> </li> <li>• Compaction or vibration methods include mechanical vibrators</li> <li>• Screening is to include but not be limited to a hand screed and may include a mechanical vibrating screed and magic screeds</li> <li>• Finishing techniques for concrete are to include but not be limited to: <ul style="list-style-type: none"> <li>➤ steel trowel,</li> <li>➤ mechanical toweling machine,</li> <li>➤ broom finished, wood float, and brushed</li> </ul> </li> <li>• Methods to avoid segregation are to include but not be limited to: <ul style="list-style-type: none"> <li>➤ using a termite,</li> <li>➤ through minimizing the height of a vertical drop (no greater than 2 meters high for 20MPA at 80 slump) and</li> <li>➤ using pumps with a flexible hose</li> </ul> </li> </ul>
Compliance documentation	<p>may include:</p> <ul style="list-style-type: none"> <li>• Legislative, organizational and site requirements and procedures</li> <li>• Manufacturer's guidelines and specifications</li> <li>• Ethiopian standards</li> <li>• Employment and workplace relations legislation</li> <li>• Equal Employment Opportunity and Disability Discrimination</li> </ul>

	legislation
Occupational Health and Safety (OHS)	<p>may include:</p> <ul style="list-style-type: none"> <li>• OH&amp;S requirements are to be in accordance with legislation/regulations/codes of practice, organizational safety policies and procedures and project safety plan. This may include: <ul style="list-style-type: none"> <li>➤ protective clothing and equipment,</li> <li>➤ use of tools and equipment,</li> <li>➤ workplace environment and safety,</li> <li>➤ handling of materials,</li> <li>➤ use of fire fighting equipment,</li> <li>➤ organizational first aid,</li> <li>➤ hazard control and hazardous materials and substances</li> </ul> </li> <li>• Personal protective equipment is to include that prescribed under legislation/regulation/codes of practice and workplace policies and practices</li> <li>• Safe operating procedures are to include but not be limited to: <ul style="list-style-type: none"> <li>➤ the conduct of operational risk assessment and treatments associated with power cables (including overhead service trays, cables and conduits),</li> <li>➤ lighting, earth leakage boxes,</li> <li>➤ trip hazards,</li> <li>➤ working with dangerous materials,</li> <li>➤ working in confined spaces, surrounding structures,</li> <li>➤ restricted access barriers,</li> <li>➤ traffic control,</li> <li>➤ working at heights,</li> <li>➤ working in proximity to others,</li> <li>➤ worksite visitors and the public</li> </ul> </li> <li>• Emergency procedures related to this unit are to include but may not be limited to: <ul style="list-style-type: none"> <li>➤ extinguishing fires,</li> <li>➤ organizational first aid requirements and evacuation</li> </ul> </li> </ul>
Materials, Tools and Equipment	<p>include but not be limited to:</p> <ul style="list-style-type: none"> <li>• measuring tapes/rules,</li> <li>• shovels, screed boards,</li> <li>• chutes, trowels</li> <li>• wheel barrows,</li> <li>• brooms, trowel ling machines,</li> <li>• stipple devices, concrete mixer,</li> </ul>



	<ul style="list-style-type: none"> <li>• line pumps, kibbles, rakes,</li> <li>• compressors, vibrators,</li> <li>• mechanized dumpers and concrete placing booms</li> <li>• Materials are to include concrete, but not limited to: <ul style="list-style-type: none"> <li>➤ cement, water</li> <li>➤ Gravel</li> <li>➤ Rock</li> <li>➤ Sand</li> <li>➤ Blended materials</li> <li>➤ Stabilized materials</li> <li>➤ Quarried products</li> </ul> </li> </ul>
pavement	<p>may include:</p> <ul style="list-style-type: none"> <li>• All the materials above the sub-grade and below the wearing surface</li> <li>• May also be known as sub-base and/or base structure</li> <li>• Construction of road pavement may include: <ul style="list-style-type: none"> <li>➤ surface finish</li> <li>➤ the repair of surface defects</li> </ul> </li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must Demonstrate knowledge, skill and attitude to:</p> <ul style="list-style-type: none"> <li>• Conduct pre paving inspection</li> <li>• Plan and prepare concrete work</li> <li>• Eliminate voids in the concrete mix through vibrating machine</li> <li>• Conduct slump test</li> <li>• Cure concrete</li> <li>• Clean up workplace</li> </ul>
Required Knowledge and Attitudes	<p>Must Demonstrate knowledge of :</p> <ul style="list-style-type: none"> <li>• Workplace and equipment safety requirements</li> <li>• Quality requirements</li> <li>• General Construction terminology</li> <li>• Plant, tools and equipment types, characteristics, uses and limitation</li> <li>• Formwork techniques</li> <li>• Formwork materials</li> <li>• Processes for the calculation of material requirements</li> <li>• Material Safety Data Sheets</li> <li>• Plans, drawings and specifications</li> <li>• Materials handling, storage and environmentally friendly waste management</li> <li>• Processes for setting out and measuring</li> </ul>

	<ul style="list-style-type: none"> <li>• Line, level and plumb</li> <li>• Termite barriers</li> <li>• Safe work methods</li> </ul>
Required Skills	<p>Must Demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Prepare work instruction, plans, specifications, quality requirements and operational details</li> <li>• Conduct pre-paving inspection</li> <li>• Record and dispatching concrete</li> <li>• Place, compacting and vibrating the concrete</li> <li>• Screen/Level concrete</li> <li>• Clean , checking, and storing plant, tools and equipment</li> </ul>
Resources Implication	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>• Workplace or fully equipped assessment location with necessary tools and equipment as well as consumable materials</li> <li>• Approved assessment tools</li> <li>• Certified assessor /Assessor’s panel</li> </ul>
Methods of Assessment	<p>Assessment may include:</p> <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Demonstration/observation with oral questioning</li> </ul>
Context of Assessment	<ul style="list-style-type: none"> <li>• Competency may be assessed in the work place or in a simulated work place setting</li> <li>• The unit of competency should be assessed in conjunction with other relevant units in this occupation.</li> </ul>

<b>Occupational Standard: Road Construction and Maintenance Level III</b>	
<b>Unit Title</b>	<b>Conduct and Monitor Construction of Flexible Pavement</b>
<b>Unit Code</b>	<a href="#"><u>EIS RCM3 10 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the knowledge, attitudes and skills required to Conduct & monitor construction of Flexible Pavement (CLFP, FDAP, CRAM)

<b>Elements</b>	<b>Performance Criteria</b>
1. Plan and prepare work	<p>1.1 Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied</p> <p>1.2 Material quantity requirements are calculated in accordance with plans and/or specifications</p> <p>1.3 Materials appropriate to the work application are identified, obtained, prepared, safely handled and located ready for use</p> <p>1.4 <b>Compliance of documentations</b> relevant to the work activity are accessed, interpreted and applied</p> <p>1.5 <b>Safety requirements</b> from the <i>site</i> safety plan and organisational policies and procedures are obtained and confirmed, and applied to the allotted <i>task</i></p> <p>1.6 Signage requirements from the project <b>traffic</b> management plan are Identified, obtained and implemented</p> <p>1.7 <b>Plant, tools and equipment</b> to carry out tasks consistent with the requirements of the job are selected, checked for serviceability and rectified or reported on any faults</p> <p>1.8 <b>Environmental protection requirements</b> from the project environmental management plan are Identified and confirmed and applied to the allotted task</p>
2. Identify types of Flexible Pavement	<p>2.1 Conventional layered flexible pavement is undertaken</p> <p>2.2 Full - depth asphalt pavement is constructed</p> <p>2.3 Contained rock asphalt mat (CRAM) are constructed</p>
3. Conduct pre paving inspection	<p>3.1 Base course stability is checked/tested</p> <p>3.2 Offset pegs/profiles are establish to line and level as specified</p> <p>3.3 Elevation is checked</p> <p>3.4 Steel reinforcement placement are checked</p> <p>3.5 Dowels are slightly coated with grease or other substance over their entire length</p>
4. Place and spread materials	<p>4.1 Layer depth is determine for spreading materials and plant operators are informed accordingly</p>

	<p>4.2 Trucks are directed to correct location and the method of dispatching for load placement is specified</p> <p>4.3 Moisture content of materials are checked and adjusted uniformly</p> <p>4.4 <b>Road pavement</b> laying is assessed to ensure specified heights and the overall dimensions are achieved</p>
5. Place and compact materials	<p>5.1 Roller operators are informed of the required number of passes</p> <p>5.2 Compaction process is assessed to ensure the nominated number of passes are made and uniform compaction across the pavement is achieved</p> <p>5.3 Pavement trimming is checked to ensure specified tolerances are achieved</p> <p>5.4 Finished levels are checked against datum using appropriate leveling device</p>
6. Clean up	<p>6.1 Work area is cleared and materials disposed of, reused or recycled in accordance with legislation/regulations/codes of practice and job specification</p> <p>6.2 Plant, tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices</p>

Variables	Range
Unit scope	<p>includes:</p> <ul style="list-style-type: none"> <li>• Planning and preparation is to include but not be limited to: <ul style="list-style-type: none"> <li>➤ worksite inspection,</li> <li>➤ equipment defect identification,</li> <li>➤ assessment of conditions and hazards and determination of work requirements</li> </ul> </li> <li>• Transporting of concrete may include but not be limited to: <ul style="list-style-type: none"> <li>➤ pre-mix truck,</li> <li>➤ crane and kibble and wheelbarrow</li> </ul> </li> <li>• Placing methods of concrete includes but is not limited to: wheelbarrows, <ul style="list-style-type: none"> <li>➤ pumping equipment,</li> <li>➤ kibble, termite,</li> <li>➤ truck placed, shoveling and includes vibrating</li> </ul> </li> <li>• Compaction or vibration methods include mechanical vibrators</li> <li>• Screening is to include but not be limited to a hand screed and may include a mechanical vibrating screed and magic screeds</li> <li>• Finishing techniques for concrete are to include but not be limited to: <ul style="list-style-type: none"> <li>➤ steel trowel,</li> </ul> </li> </ul>
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	<ul style="list-style-type: none"> <li>➤ mechanical toweling machine,</li> <li>➤ broom finished, wood float, and brushed</li> <li>• Methods to avoid segregation are to include but not be limited to: <ul style="list-style-type: none"> <li>➤ using a termite,</li> <li>➤ through minimizing the height of a vertical drop (no greater than 2 meters high for 20MPA at 80 slump) and</li> <li>➤ using pumps with a flexible hose</li> </ul> </li> </ul>
compliance documentation	<p>may include:</p> <ul style="list-style-type: none"> <li>• Legislative, organizational and site requirements and procedures</li> <li>• Manufacturer’s guidelines and specifications</li> <li>• Ethiopian standards</li> <li>• Employment and workplace relations legislation</li> <li>• Equal Employment Opportunity and Disability Discrimination legislation</li> </ul>
Safety requirements	<p>may include:</p> <ul style="list-style-type: none"> <li>• OH&amp;S requirements are to be in accordance with legislation/regulations/codes of practice, organizational safety policies and procedures and project safety plan. This may include: <ul style="list-style-type: none"> <li>➤ protective clothing and equipment,</li> <li>➤ use of tools and equipment,</li> <li>➤ workplace environment and safety,</li> <li>➤ handling of materials,</li> <li>➤ use of firefighting equipment,</li> <li>➤ organizational first aid,</li> <li>➤ hazard control and hazardous materials and substances</li> </ul> </li> <li>• Personal protective equipment is to include that prescribed under legislation/regulation/codes of practice and workplace policies and practices</li> <li>• Safe operating procedures are to include but not be limited to: <ul style="list-style-type: none"> <li>➤ the conduct of operational risk assessment and treatments associated with power cables (including overhead service trays, cables and conduits),</li> <li>➤ lighting, earth leakage boxes,</li> <li>➤ trip hazards,</li> <li>➤ working with dangerous materials,</li> <li>➤ working in confined spaces, surrounding structures,</li> <li>➤ restricted access barriers,</li> <li>➤ traffic control,</li> <li>➤ working at heights,</li> <li>➤ working in proximity to others,</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>➤ worksite visitors and the public</li> <li>• Emergency procedures related to this unit are to include but may not be limited to: <ul style="list-style-type: none"> <li>➤ extinguishing fires,</li> <li>➤ organizational first aid requirements and evacuation</li> </ul> </li> </ul>
Plant	<p>May include:</p> <ul style="list-style-type: none"> <li>• rollers</li> <li>• graders</li> <li>• skid-steers</li> <li>• backhoes</li> <li>• paver</li> <li>• excavators</li> <li>• front-end loaders</li> <li>• tip-trucks</li> <li>• water carts</li> </ul>
Tools and Equipment	<p>include but not be limited to:</p> <ul style="list-style-type: none"> <li>• measuring tapes/rules,</li> <li>• shovels, screed boards,</li> <li>• chutes, trowels</li> </ul>
Environmental protection requirements	<p>May include:</p> <ul style="list-style-type: none"> <li>• Organizational/project environmental management plan</li> <li>• Waste management</li> <li>• Water quality protection</li> <li>• Noise</li> <li>• Vibration</li> <li>• Dust and clean-up management</li> </ul>
Materials	<p>May include:</p> <ul style="list-style-type: none"> <li>• wheel barrows,</li> <li>• brooms, troweling machines,</li> <li>• stipple devices, concrete mixer,</li> <li>• line pumps, kibbles, rakes,</li> <li>• compressors, vibrators,</li> <li>• mechanized dumpers and concrete placing booms</li> <li>• Materials are to include concrete, but not limited to: <ul style="list-style-type: none"> <li>➤ cement, water</li> <li>➤ Gravel</li> <li>➤ Rock</li> <li>➤ Sand</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>➤ Blended materials</li> <li>➤ Stabilized materials</li> <li>➤ Quarried products</li> </ul>
Road pavement	<p>May include:</p> <ul style="list-style-type: none"> <li>• All the materials above the sub-grade and below the wearing surface</li> <li>• May also be known as sub-base and/or base structure</li> <li>• Construction of road pavement may include: <ul style="list-style-type: none"> <li>➤ surface finish</li> <li>➤ the repair of surface defects</li> </ul> </li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must demonstrate knowledge, skill and attitude to:</p> <ul style="list-style-type: none"> <li>• Conduct pre paving inspection</li> <li>• Plan and prepared concrete work</li> <li>• Eliminate voids in the concrete mix through vibrating machine</li> <li>• Conduct slump test</li> <li>• Cure concrete</li> <li>• Clean up workplace</li> </ul>
Required Knowledge and Attitudes	<p>Must demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>• Workplace and equipment safety requirements</li> <li>• Quality requirements</li> <li>• General construction terminology</li> <li>• Plant, tools and equipment types, characteristics, uses and limitation</li> <li>• Formwork techniques</li> <li>• Formwork materials</li> <li>• Processes for the calculation of material requirements</li> <li>• Material safety data sheets</li> <li>• Plans, drawings and specifications</li> <li>• Materials handling, storage and environmentally friendly waste management</li> <li>• Processes for setting out and measuring</li> <li>• Line, level and plumb</li> <li>• Termite barriers</li> <li>• Safe work methods</li> </ul>
Required Skills	<p>Must demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• Prepare work instruction, plans, specifications, quality requirements and operational details</li> <li>• Conduct pre-paving inspection</li> </ul>

	<ul style="list-style-type: none"> <li>• Record and dispatch concrete</li> <li>• Place, compact and vibrate the concrete</li> <li>• Screen/Level concrete</li> <li>• Clean , check, and store plant, tools and equipment</li> </ul>
Resources Implication	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>• Workplace or fully equipped assessment location with necessary tools and equipment as well as consumable materials</li> <li>• Approved assessment tools</li> <li>• Certified assessor /Assessor’s panel</li> </ul>
Methods of Assessment	<p>Assessment may include:</p> <ul style="list-style-type: none"> <li>• Interview/Written Test</li> <li>• Demonstration/observation with oral questioning</li> </ul>
Context of Assessment	<ul style="list-style-type: none"> <li>• Competency may be assessed in the work place or in a simulated work place setting</li> <li>• The unit of competency should be assessed in conjunction with other relevant units in this occupation.</li> </ul>



<b>Occupational Standard: Road Construction and Maintenance Level III</b>	
<b>Unit Title</b>	<b>Monitor Installation of Concrete Kerb, Channel and Road side Fixtures</b>
<b>Unit Code</b>	<a href="#"><u>EIS RCM3 11 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the placing, forming and monitoring concrete kerb, channel and fixtures work in the civil construction industry. It includes planning and preparing, setting out and preparing for construction/installation, forming kerb and barrier strips, pouring concrete to installed formwork, finishing kerbs, channels and fixtures, installing pre-cast concrete units, repairing kerb, gutters and median barrier strips, and cleaning up.

<b>Elements</b>	<b>Performance Criteria</b>
1. Plan and prepare	1.1. Compliance documentation relevant to the work activity are accessed, interpreted and applied 1.2. Safety requirements from the site safety plan and organisational policies and procedures are obtained and confirmed, and applied to the allotted task 1.3. Signage requirements from the project traffic management plan are identified, obtained and implemented 1.4. <b>Tools</b> and equipment to carry out tasks consistent with the requirements of the job are selected, checked for serviceability and rectified or reported for any faults 1.5. <b>Environmental protection requirements</b> are identified from the project environmental management plan, and confirmed and applied to the allotted task
2. Set out construction/ installation work	2.1. Existing services are identified and protected to prevent damage 2.2. Location of <b>kerb, channel and/or fixtures</b> are set out to dimensions from <b>drawings</b> and specifications or to pre-set pegs 2.3. Driveways and other inverts are set out 2.4. Grades are checked to ensure correct fall 2.5. Formwork is constructed and checked to ensure compliance with specifications 2.6. <b>Services and conduit</b> preparation in accordance with relevant procedures are completed
3. Kerb and barrier strips	3.1. Vertical and horizontal alignment are maintained during concrete placement 3.2. Concrete is placed accurately to string line 3.3. Concrete is maintained to specified standard 3.4. Mortar is mixed and applied at quality and quantity to achieve specified finish

4. Place concrete work	<p>4.1. Concrete is place into formwork and compact</p> <p>4.2. Surface is finished to alignment specifications</p> <p>4.3. Face formwork is removed without damage to concrete following concrete set</p>
5. Perform kerbs, channels and road side fixtures finishing work	<p>5.1. Job is finished to shape in accordance with specifications or to the relevant Ethiopian standard</p> <p>5.2. Concrete is finished to specified quality and texture</p> <p>5.3. Expansion, construction and dowel joints are positioned to specification</p> <p>5.4. finished work are cured and protected during process</p>
6. Install pre-cast concrete units	<p>6.1. Base section is prepared and finished to specification for pre-cast unit installation</p> <p>6.2. Pre-cast concrete units are installed and joined</p>
7. Repair kerb, gutters and median, barrier strips	<p>7.1. Damaged areas are identified, repair requirements are assessed and carefully removed or damaged section is repaired</p> <p>7.2. Formwork or slip form machine is set up and used to replace removed section</p> <p>7.3. Concrete is placed accurately to correct alignment using concrete to the specified mix</p> <p>7.4. Concrete is finished to specification matching the shape of the kerb or gutter in place</p> <p>7.5. Area is cleared, backfilled and finished</p>
8. Clean up	<p>8.1. Work area is cleared and <i>materials</i> are disposed of or recycled in accordance with project environmental management plan</p> <p>8.2. Tools and equipment are cleaned, maintained, checked and stored</p>

Variable	Range
Tools	<p>May include:</p> <ul style="list-style-type: none"> <li>• shovels</li> <li>• rakes</li> <li>• trowels</li> <li>• forming tools</li> <li>• string lines and levels</li> <li>• concrete mixers</li> <li>• barrows</li> <li>• form machine</li> <li>• dumpy</li> <li>• laser levels</li> </ul>
Environmental protection requirements	<p>May include:</p> <ul style="list-style-type: none"> <li>• organisational/project environmental management plan</li> </ul>

	<ul style="list-style-type: none"> <li>• waste management</li> <li>• water quality protection</li> <li>• noise</li> <li>• vibration</li> <li>• dust and clean-up management</li> </ul>
Kerb, channel and/or fixtures	<p>May include:</p> <ul style="list-style-type: none"> <li>• gutters</li> <li>• median and barrier strips</li> <li>• driveways</li> <li>• inverts</li> </ul>
Drawings	<p>May include:</p> <ul style="list-style-type: none"> <li>• site plans</li> <li>• cross-sectional plans</li> <li>• structural detail for kerbs</li> <li>• channels</li> <li>• fixtures</li> </ul>
Services and conduits	<p>May include:</p> <ul style="list-style-type: none"> <li>• power</li> <li>• gas</li> <li>• water</li> <li>• telecommunications</li> </ul>
Materials:	<p>May include:</p> <ul style="list-style-type: none"> <li>• sub-soil drainage</li> <li>• concrete and concrete reinforcing materials</li> <li>• formwork materials</li> <li>• conduit and tubing</li> </ul>

<b>Evidence Guide</b>			
Critical Aspects of Competence	<p>Must demonstrate knowledge, skill and attitude on:</p> <ul style="list-style-type: none"> <li>• the requirements, procedures and instructions for placing and forming concrete kerbs, channels and fixtures</li> <li>• implementation of requirements, procedures and techniques for the safe, effective and efficient completion of placing and forming concrete kerbs, channels and fixtures work</li> <li>• working with others to undertake and complete the placing, forming and monitoring of concrete kerbs, channels and fixtures work meeting all of the required outcomes</li> <li>• consistent and timely completion of concrete kerb, channel and fixture placement and forming safely, effectively and efficiently meeting the required outcomes</li> <li>• Supporting and leading the team to perform the following tasks :</li> </ul>		
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	<ul style="list-style-type: none"> <li>➤ Plan and prepare</li> <li>➤ Set out and prepare for construction/ installation</li> <li>➤ Form kerb and barrier strips</li> <li>➤ Pour concrete to installed formwork</li> <li>➤ Finish kerbs, channels and fixtures</li> <li>➤ Install pre-cast concrete units</li> <li>➤ Repair kerb, gutters and median, barrier strips</li> <li>➤ Clean up</li> </ul>
Required Knowledge and Attitudes	<p>Demonstrates knowledge and attitudes of:</p> <ul style="list-style-type: none"> <li>• curbing profiles</li> <li>• channelling and fixtures profiles and structural features</li> <li>• concrete properties including the effects of weathering</li> <li>• concreting and related formwork techniques</li> <li>• concrete curing techniques</li> <li>• types, characteristics, uses and limitations of forming machines</li> <li>• the types of services and related conduit requirements</li> <li>• site and equipment safety requirements</li> <li>• processes for interpreting engineering drawings and sketches</li> <li>• site isolation and traffic control responsibilities and authorities</li> <li>• materials safety data sheets and materials handling methods</li> <li>• project quality requirements</li> <li>• civil construction terminology</li> <li>• set out techniques</li> <li>• Safe work method statement</li> </ul>
Required Skills	<p>Demonstrates skills to:</p> <ul style="list-style-type: none"> <li>• apply legislative, organisation and site requirements and procedures for replacing and forming concrete kerb, channels and fixtures</li> <li>• organise work activities</li> <li>• select and use relevant tools and equipment safely</li> <li>• identify and report on hazards related to the worksite and work activity</li> <li>• communicate effectively to receive and clarify work instructions</li> </ul>
Resource Implications	<p>Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and to information on workplace practices and OHS practices.</p>
Assessment Methods	<p>Competency may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview / Written Test</li> <li>• Observation / Demonstration with Oral Questioning</li> </ul>
Context of Assessment	<p>Competency may be assessed in the work place or in a simulated work place setting</p>

Occupational Standard: Road Construction and Maintenance Level III	
Unit Title	Conduct and Monitor Pavement Recycling Operations
Unit Code	<a href="#">EIS RCM3 12 0322</a>
Unit Descriptor	This unit covers the conducting and monitoring (pavement recycling) of profile planer operations in the civil construction industry. It includes planning and preparing, conducting profile planer pre-operational checks, operating profile planer, selecting, removing and fitting attachments, relocating the profile planer, carrying out profile planer operator maintenance, and cleaning up.

Elements	Performance Criteria
1. Plan and prepare	<p>1.1. <b>Compliance of documentations</b> relevant to the work activity are accessed, interpreted and applied</p> <p>1.2. <b>Safety requirements</b> from the site safety plan and organisational policies and procedures are obtained and confirmed, and applied to the allotted task</p> <p>1.3. Signage requirements from the project <b>traffic management</b> plan are Identified, obtained and implemented</p> <p>1.4. <b>Plant, tools and equipment</b> to carry out tasks consistent with the requirements of the job are selected, checked for serviceability and rectified or reported on any faults</p> <p>1.5. <b>Environmental protection requirements</b> from the project environmental management plan are Identified and confirmed and applied to the allotted task</p>
2. Check profile planer pre-operation	<p>2.1. Pre-start, start-up, park and shutdown procedures are ensured carried out in accordance with manufacturer's and/or site specific requirements by the operator</p> <p>2.2. <b>Profile planer</b> controls and functions, including implements or other <b>attachments</b>, brakes and manoeuvrability for serviceability and rectify and report any faults are checked</p>
3. Operate profile planer	<p>3.1. Site hazards associated with profile planer <b>operations</b> are identified and safe operating techniques to minimise risk are used</p> <p>3.2. Operating techniques for profile planer to achieve optimum output in accordance with manufacturer's design specifications while achieving specified tolerances are ensured identified and applied</p> <p>3.3. Profile planer is operated to work instructions</p> <p>3.4. Profile planer is operated to remove material to an agreed line and level within specified tolerances</p>

4. Select, remove and fit attachments	<p>4.1. Attachment for the task is selected</p> <p>4.2. Attachment is ensured removed and fitted according to manufacturer's manual and site requirements</p> <p>4.3. Attachment is tested to ensure correct fitting and operation</p> <p>4.4. Attachment is used in accordance with manufacturer's recommendations and design limits</p> <p>4.5. Removed attachments are cleaned and stored in designated location</p>
5. Relocate the profile planer	<p>5.1. Profile planer is moved safely between worksites, observing relevant codes and traffic management requirements</p> <p>5.2. Profile planer is prepared for relocation</p>
6. Check equipment performance	<p>6.1. Profile planer is parked safely, prepared for maintenance and shutdown</p> <p>6.2. Inspection and fault finding is conducted</p> <p>6.3. Defective parts are removed and replaced safely and effectively</p> <p>6.4. Regular programmed maintenances tasks are carried out</p>
7. Clean up	<p>7.1. Work area is cleared and materials are disposed of or recycled in accordance with project environmental management plan</p> <p>7.2. Plant, tools and equipment are cleaned, checked, maintained and stored</p>

<b>Variables</b>	<b>Range</b>
compliance documentation	<p>May include:</p> <ul style="list-style-type: none"> <li>• legislative, organisational and site requirements and procedures</li> <li>• manufacturer's guidelines and specifications</li> <li>• Ethiopian standards</li> <li>• Employment and workplace relations legislation</li> <li>• Equal Employment Opportunity and Disability Discrimination legislation</li> </ul>
Safety requirements	<p>May include:</p> <ul style="list-style-type: none"> <li>• OHS requirements in accordance with state or territory legislation and regulations, organisational safety policies and procedures, and project safety plan, including protective clothing and equipment, use of tools and equipment, workplace environment and safety, handling of materials, use of fire fighting equipment, use of First Aid equipment, hazard control and hazardous materials and substances</li> <li>• safe parking practices including ensuring access ways are clear, equipment/machinery is away from overhangs and refuelling sites, safe distance are kept from excavations, and areas secured from unauthorised access or movement</li> <li>• safe operating procedures including recognising and preventing hazards associated with uneven/unstable terrain, trees, pits, poles,</li> </ul>

	<p>trip hazards, dirt mounds, overhead service lines, bridges, surrounding buildings, obstructions, structures, facilities, dangerous materials, recently filled trenches, other machines, personnel, traffic control, working in proximity to others, worksite visitors and the public</p> <ul style="list-style-type: none"> <li>• recognising hazards and risks including uneven/unstable terrain, trees, fires, overhead and underground services, bridges, buildings, excavations, traffic, embankments, cuttings, structures and hazardous materials</li> <li>• emergency procedures related to equipment operation including emergency shutdown and stopping, extinguishing equipment fires, organisational First Aid requirements and evacuation</li> </ul>
Signage	<p>May include:</p> <ul style="list-style-type: none"> <li>• escort vehicle</li> <li>• highway traffic signs</li> <li>• site safety signage</li> <li>• temporary signage for the benefit of motorists and pedestrians</li> <li>• traffic conditions signage</li> </ul>
Traffic Management	<p>May include:</p> <ul style="list-style-type: none"> <li>• congested urban environments</li> <li>• low traffic rural areas</li> <li>• off-road un-trafficked areas</li> <li>• buildings</li> <li>• parking sites</li> <li>• pedestrian areas</li> </ul>
Tools and equipment	<p>May include:</p> <ul style="list-style-type: none"> <li>• hand tools</li> <li>• maintenance equipment relevant to the particular profile planer</li> </ul>
Environmental protection requirements	<p>May include:</p> <ul style="list-style-type: none"> <li>• organisational/project environmental management plan</li> <li>• waste management</li> <li>• water quality protection</li> <li>• noise</li> <li>• vibration</li> <li>• dust and clean-up management</li> </ul>
Profile planer	<p>May include:</p> <ul style="list-style-type: none"> <li>• a self-propelled wheeled or tracked machine designed for the purpose of in-situ milling of construction materials, and transferring the milled materials via conveyor to storage or tip trucks</li> </ul>
Attachments	<p>May include:</p> <ul style="list-style-type: none"> <li>• additional or interchangeable conveyor systems</li> </ul>

Operations	<p>May include:</p> <ul style="list-style-type: none"> <li>• asphalt pavement milling</li> <li>• edge planning</li> <li>• straight work</li> <li>• confined work (such as intersection, car park etc)</li> </ul>
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<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must demonstrate knowledge, skill and attitude on:</p> <ul style="list-style-type: none"> <li>• the requirements, procedures and instructions for conducting profile planer operations</li> <li>• implementation of requirements, procedures and techniques for the safe, effective and efficient conducting and monitoring of profile planer operations</li> <li>• working with others to undertake and complete the conducting and monitoring of profile planer operations meeting all of the required outcomes</li> <li>• consistent timely completion of conducting and monitoring of profile planer operations safely, effectively and efficiently meets the required outcomes</li> <li>• Supporting the implementation unit/team of the following tasks: <ul style="list-style-type: none"> <li>➤ Plan and prepare</li> <li>➤ Conduct profile planer pre-operational checks</li> <li>➤ Operate profile planer</li> <li>➤ Select, remove and fit attachments</li> <li>➤ Relocate the profile planer</li> <li>➤ Carry out profile planer operator maintenance</li> <li>➤ Clean up</li> </ul> </li> </ul>
Required Knowledge and Attitudes	<p>Must demonstrate knowledge and attitudes of:</p> <ul style="list-style-type: none"> <li>• profile planer types, characteristics, technical capabilities and limitations</li> <li>• basic soil types and characteristics</li> <li>• basic principles of soil compaction</li> <li>• site and equipment safety requirements</li> <li>• profile planer techniques related to essential tasks</li> <li>• processes for interpreting engineering drawings and sketches</li> <li>• operational, maintenance and basic diagnostic procedures</li> <li>• site isolation and traffic control responsibilities and authorities</li> <li>• materials safety data sheets and materials handling methods</li> <li>• project quality requirements</li> <li>• civil construction terminology</li> <li>• methods of changing machine attachments</li> </ul>



	<ul style="list-style-type: none"> <li>• safe operating techniques in all terrain</li> <li>• basic earthworks calculations</li> <li>• Safe work method statements</li> </ul>
Required Skills	<p>Must demonstrate skills to:</p> <ul style="list-style-type: none"> <li>• apply legislative, organisation and site requirements and procedures for conducting profile planer operations</li> <li>• organise work activities</li> <li>• select and use relevant tools and equipment safely</li> <li>• identify and report on hazards related to the worksite and work activity</li> <li>• communicate effectively to receive and clarify work instructions</li> </ul>
Resource Implications	Access is required to real working areas or appropriately simulated environments including working site, materials and equipment and to information on workplace and OHS practices
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview / written Test</li> <li>• Observation/demonstration with oral questioning</li> </ul>
Context of Assessment	Competency may be assessed in the workplace or in a simulated workplace environment setting

**Occupational Standard: Road Construction and Maintenance Level III**

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<b>Unit Title</b>	<b>Conduct Pile Construction Operations</b>
<b>Unit Code</b>	<a href="#"><u>EIS RCM3 13 0322</u></a>
<b>Unit Descriptor</b>	This unit covers the boring of cast in-situ piles and driving of piles in the civil construction industry. It includes planning and preparing, locating pile positions, placing concrete and establishing piling rig plants, driving piles, removing piling rigs, and cleaning up.

<b>Elements</b>	<b>Performance Criteria</b>
1. Plan and prepare	<p>1.1 Access, interpret and apply <i>compliance documentation</i> relevant to the boring of cast in-situ piles and to the driving of piles</p> <p>1.2 Obtain and confirm <i>safety requirements</i> from the <i>site</i> safety plan and organizational policies and procedures, and apply to the allotted task</p> <p>1.3 Identify, obtain and implement <i>signage</i> requirements from the project <i>traffic</i> management plan</p> <p>1.4 Select <i>plant, tools and equipment</i> to carry out tasks consistent with the requirements of the job, check for serviceability and rectify or report any faults</p> <p>1.5 Identify <i>environmental protection requirements</i> from the project environmental management plan, and confirm and apply to the allotted task</p>
2. Locate and prepare pile positions	<p>2.1 Establish location for <i>piles</i> from reference points and set put according to requirements.</p> <p>2.2 Position and check plant and related equipment for operation in accordance with standard operating procedures.</p> <p>2.3 <i>Bore</i> hole to job specification.</p> <p>2.4 Check <i>caisson</i> for conformity with design specifications.</p> <p>2.5 Install caisson in the bored hole</p> <p>2.6 Prepared caisson to receive concrete</p>
3. Place concrete	<p>3.1 Place concrete into caisson</p> <p>3.2 Vibrate concrete, removing voids and air pockets to job specifications</p>
4. Remove boring rig	<p>4.1 Relocate boring rig to next point of installation operation</p> <p>4.2 Remove boring rig from site on completion</p>
5. Locate pile positions and establish piling rig plant	<p>5.1 Establish location for piles from reference points and set out to requirements.</p> <p>5.2 Establish plant and related equipment in position and check for operation in accordance with standard operating procedures.</p> <p>5.3 Prepare and check pile for conformity.</p> <p>5.4 Identify and protect area for pile driving and surrounding working space in accordance with safety requirements.</p>

6 Drive pile	<p>6.1 Lift pile and maneuver into position using the piling rig in accordance with standard operating procedures.</p> <p>6.2 Set up piling rig and <i>drive pile</i> into place accordance with standards.</p> <p>6.3 Carry out splicing or jointing in accordance with engineers' specifications</p>
7 Remove piling rig	<p>7.1 Dismantle plant and related equipment in accordance with manufacturer's manual and standard operating procedures</p> <p>7.2 Relocate piling rig in preparation for next piling installation procedure</p>
8 Clean up	<p>8.1 Clear work area and dispose of or recycle <i>materials</i> in accordance with project environmental management plan</p> <p>8.2 Clean, check, maintain and store plant, tools and equipment</p>

Variables	Range
compliance documentation	<p>May include:</p> <ul style="list-style-type: none"> <li>• Legislative, organizational and site requirements and procedures Manufacturer's guidelines and specifications</li> <li>• Ethiopian standards</li> <li>• Employment and workplace relations legislation</li> <li>• Equal Employment Opportunity and Disability Discrimination legislation</li> </ul>
Safety requirements	<p>May include:</p> <ul style="list-style-type: none"> <li>• OHS requirements in accordance with state or territory legislation and regulations, organizational safety policies and procedures, and project safety plan, including: <ul style="list-style-type: none"> <li>➤ protective clothing and equipment,</li> <li>➤ use of tools and equipment,</li> <li>➤ workplace environment and safety,</li> <li>➤ handling of materials,</li> <li>➤ use of firefighting equipment,</li> <li>➤ use of First Aid equipment,</li> <li>➤ hazard control and hazardous materials and substances</li> </ul> </li> <li>• Safe parking practices including: <ul style="list-style-type: none"> <li>➤ ensuring access ways are clear,</li> <li>➤ equipment/machinery is away from overhangs and refueling sites,</li> <li>➤ safe distance are kept from excavations, and</li> <li>➤ areas secured from unauthorized access or movement</li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>• Safe operating procedures including: <ul style="list-style-type: none"> <li>➤ recognizing and preventing hazards associated with uneven/unstable terrain,</li> <li>➤ trees, pits, poles, trip hazards,</li> <li>➤ dirt mounds, overhead service lines,</li> <li>➤ bridges, surrounding buildings,</li> <li>➤ obstructions, structures, facilities,</li> <li>➤ dangerous materials, recently filled trenches,</li> <li>➤ other machines, personnel, traffic control,</li> <li>➤ working in proximity to others,</li> <li>➤ worksite visitors and the public</li> <li>➤ Recognizing hazards and risks including: <ul style="list-style-type: none"> <li>➤ uneven/unstable terrain, trees, fires,</li> <li>➤ overhead and underground services, bridges,</li> <li>➤ buildings, excavations, traffic, embankments,</li> <li>➤ cuttings, structures and hazardous materials</li> </ul> </li> <li>➤ Emergency procedures related to equipment operation including emergency shutdown and stopping, extinguishing equipment fires, organizational First Aid requirements and evacuation</li> </ul> </li> </ul>
Site	<p>May include:</p> <ul style="list-style-type: none"> <li>• New construction sites</li> <li>• Existing structures being renovated or extended</li> <li>• Existing structure subject to service restoration or maintenance</li> <li>• Road works</li> <li>• Earthworks</li> <li>• Harves</li> <li>• Marine</li> <li>• Bridges</li> <li>• Foundation</li> </ul>
Signage	<p>May include:</p> <ul style="list-style-type: none"> <li>• Escort vehicle</li> <li>• Highway traffic signs</li> <li>• Site safety signage</li> <li>• Temporary signage for the benefit of motorists and pedestrians</li> <li>• Barricades</li> </ul>

	<ul style="list-style-type: none"> <li>• Traffic conditions signage</li> </ul>
Traffic	<p>May include:</p> <ul style="list-style-type: none"> <li>• Congested urban environments</li> <li>• Low traffic rural areas</li> <li>• Off-road un-trafficked areas</li> <li>• Buildings</li> <li>• Parking sites</li> <li>• Pedestrian areas</li> </ul>
Plant, tools and equipment	<p>May include:</p> <ul style="list-style-type: none"> <li>• Augers, shovels and crow bars</li> <li>• Measuring tapes</li> <li>• Spirit levels</li> <li>• Plumb bobs</li> <li>• Compressors</li> <li>• Concrete vibrators</li> <li>• High pressure hoses</li> <li>• Scaffolding</li> <li>• Pile hammers (static weight, diesel injection and hydraulic)</li> </ul>
Environmental requirements	<p>May include:</p> <ul style="list-style-type: none"> <li>• Organizational/project environmental management plan</li> <li>• Waste management</li> <li>• Water quality protection</li> <li>• Noise</li> <li>• Vibration</li> <li>• Dust and clean-up management</li> </ul>
Piles	<p>May include:</p> <ul style="list-style-type: none"> <li>• Bored cast in-situ</li> <li>• May include compressed and grout crete piles</li> </ul>
Bore	<p>May include:</p> <ul style="list-style-type: none"> <li>• Auger</li> <li>• Water jetting</li> </ul>
Drive pile	<p>May include:</p> <ul style="list-style-type: none"> <li>• Pre-cast concrete and may include steel</li> <li>• Mechanically jointed pre-cast concrete</li> <li>• Temporary timber piles</li> <li>• Temporary metal sheeting piles</li> </ul>

<b>Evidence Guide</b>			
Critical Aspects of	Must demonstrate knowledge, skill and attitude to:		
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Competence	<ul style="list-style-type: none"> <li>• Plan and prepared the allotted tasks</li> <li>• Locate and prepared pile positions</li> <li>• Place concrete into caisson</li> <li>• Remove boring rig from site on completion</li> <li>• Locate pile positions and establishing piling right plant</li> <li>• Drive pile into place in accordance with standard</li> <li>• Remove piling rig in preparing for next piling installation</li> <li>• Clean, check, maintain and store plant, tools and equipment</li> </ul>
Required Knowledge and Attitudes	<p>Must demonstrate knowledge and attitudes of:</p> <ul style="list-style-type: none"> <li>• Accessing, interpreting and applying necessary documents relevant to the boring of cast in-situ piles</li> <li>• Identifying, obtaining and implementing signage requirements from the project traffic management plant</li> <li>• Selecting plant, tools and equipment to carry out tasks consistently with the requirements of the job, check for serviceability and rectify or report any faults.</li> <li>• Establishing location for piles from reference points and set out according to requirements</li> </ul>
Required Skills	<p>Must demonstrate Skill to:</p> <ul style="list-style-type: none"> <li>• install caisson in the bored hole</li> <li>• place concrete into caisson</li> <li>• remove boring rig from site on completion of work</li> <li>• lift pile and maneuver into position using the piling rig in accordance with standard operating procedures</li> <li>• set up piling rig and drive pile into place in accordance with standards</li> <li>• dismantle plant and related equipment in accordance with manufacturers' manual and standard operating procedures</li> <li>• Clean, check, maintain, and store tools and plants/ equipment properly.</li> </ul>
Resource Implications	<p>The following resources should be made available:</p> <ul style="list-style-type: none"> <li>• Access is required to real or appropriately simulated situations, including work areas, materials and equipment</li> </ul>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview / Oral questioning / Written Test</li> <li>• Observation/Demonstration with oral questioning</li> </ul>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting</p>

Occupational Standard: Road Construction and maintenance Level III	
Unit Title	Perform Road Maintenance Operation and Surface Treatment
Unit Code	<u>EIS RCM3 14 0322</u>
Unit Descriptor	This unit specifies the competence required to conduct and monitor road surface treatment and sealing operations. It includes planning, initiate and overseeing execution of tasks and preparation of reports.

Elements	Performance Criteria
1. Plan and prepared for sealing operations	<p>1.1 <b>Compliance documentation</b> tasks relevant to the work activity are accessed, interpreted and applied.</p> <p>1.2 <b>Types asphalt treatment</b> are identified as per the design specification</p> <p>1.3 <b>Types plant and equipment</b> requirement as per the job requirement are identified</p> <p>1.4 The <b>specific task information and requirements</b> relevant to civil works tasks are accessed and shared with team members.</p> <p>1.5 A job plan is prepared, in conjunction with <b>relevant team members</b>, which makes best use of the available resources and meets the task requirements.</p>
2. Initiate sealing tasks	<p>2.1 The necessary resources for the safe, effective and efficient conduct of the tasks are acquired and made available as per the design and specification requirement.</p> <p>2.2 Clear and timely instructions are issued to team members and others involved, for the safe, effective and efficient conduct of the tasks.</p> <p>2.3 Tasks are <b>set out</b> as required for the effective completion of the tasks.</p>
3. Check pre-maintenance operation	<p>3.1 <b>Road maintenance operations</b> are prepared for</p> <p>3.2 Pre-operational checks are carried out for <b>road maintenance</b> unit</p> <p>3.3 Operating components of the truck are checked for serviceability</p> <p>3.4 Tank for prevention is checked of contamination</p> <p>3.5 Tank is filled with the required <b>materials</b> to perform repair operations</p> <p>3.6 Standard mix of emulsion and/or type of asphalt is determined ready for application</p>
4. Repair damaged surfaces	<p>4.1 Start up, park, shut down procedures are carried out in accordance with manufacturers' and site requirements</p> <p>4.2 Truck is positioned according to the range of the boom</p> <p>4.3 Boom is positioned manually or automatically over the area to be repaired</p> <p>4.4 Area to be repaired is blown free of dust and debris</p>

	<p>4.5 Patching material is applied to the defective area under the pressure of compressed air</p> <p>4.6 Material quantities and additives are measured, calculated and recorded for each site</p> <p>4.7 Repairing operations are conducted, controlled and monitored to ensure that materials are placed to specification</p>
5. Over see the execution of tasks	<p>5.1 The sealing operations performance is <b>monitored</b> to ensure it achieves the <b>required outcomes</b>.</p> <p>5.2 Adjustments to sealing works practice or job plan are Initiated to ensure safe execution of work and achievement of required outcomes.</p> <p>5.3 Plant equipment and tools maintenance requirements are ensured carried out and recorded.</p>
6. Report on the execution of tasks	<p>6.1 Reports are completed and submitted as required.</p> <p>6.2 Changes to improve the safety, efficiency and effectiveness of civil works tasks are recommended.</p>
7. Clean up	<p>7.1 Work area is cleared and materials disposed of or recycled in accordance with project environmental management plan</p> <p>7.2 Plant, tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices</p>

Variables	Range
compliance documentation	<p>May include:</p> <ul style="list-style-type: none"> <li>• legislative, organisational and site requirements and procedures</li> <li>• manufacturer's guidelines and specifications</li> <li>• Ethiopian standards</li> <li>• Employment and workplace relations legislation</li> <li>• Equal Employment Opportunity and Disability Discrimination legislation</li> </ul>
Types asphalt treatment	<p>May include:</p> <ul style="list-style-type: none"> <li>• Single or double or triple asphalt surface treatment work</li> <li>• Monitor Otta Seal,</li> <li>• Sand Seal,</li> <li>• Slurry Seal Operations</li> </ul>
Tools and equipment	<p>May include:</p> <ul style="list-style-type: none"> <li>• road maintenance unit (truck) and all of its attachments</li> <li>• hoses</li> <li>• watering cans</li> <li>• hand lances</li> <li>• rakes</li> <li>• shovels</li> </ul>



	<ul style="list-style-type: none"> <li>• vibrating plates</li> <li>• jack hammers</li> <li>• brooms</li> <li>• Asphalt distributor</li> <li>• Pavers</li> <li>• Gravel spreader</li> <li>• grader</li> <li>• rollers</li> <li>• roller mats</li> <li>• dump trucks</li> <li>• loader</li> <li>• spare water jets</li> <li>• basic tool kit slurry sealing machines</li> <li>• slurry boxes</li> <li>• squeegees</li> <li>• hessian/canvas drags</li> </ul>
<p>Specific task information and requirements</p>	<p>May include:</p> <ul style="list-style-type: none"> <li>• Site geological and geotechnical data, including: <ul style="list-style-type: none"> <li>➤ rock types and characteristics</li> <li>➤ soil types and characteristics</li> </ul> </li> <li>• Site hydrological data, including: <ul style="list-style-type: none"> <li>➤ surface water</li> <li>➤ ground water</li> </ul> </li> <li>• Site meteorological data, including: <ul style="list-style-type: none"> <li>➤ rainfall</li> <li>➤ humidity</li> <li>➤ temperature</li> <li>➤ wind</li> </ul> </li> <li>• Site engineering survey data</li> <li>• Known and potential site hazards, constraints and conditions</li> <li>• Site cultural and heritage information</li> <li>• Task specifications</li> <li>• Task drawings</li> <li>• Sources of materials</li> <li>• Types of asphalt</li> <li>• Other organizations and contractors involved in the task or related tasks</li> <li>• Coordination, timing and budgeting requirements</li> </ul>

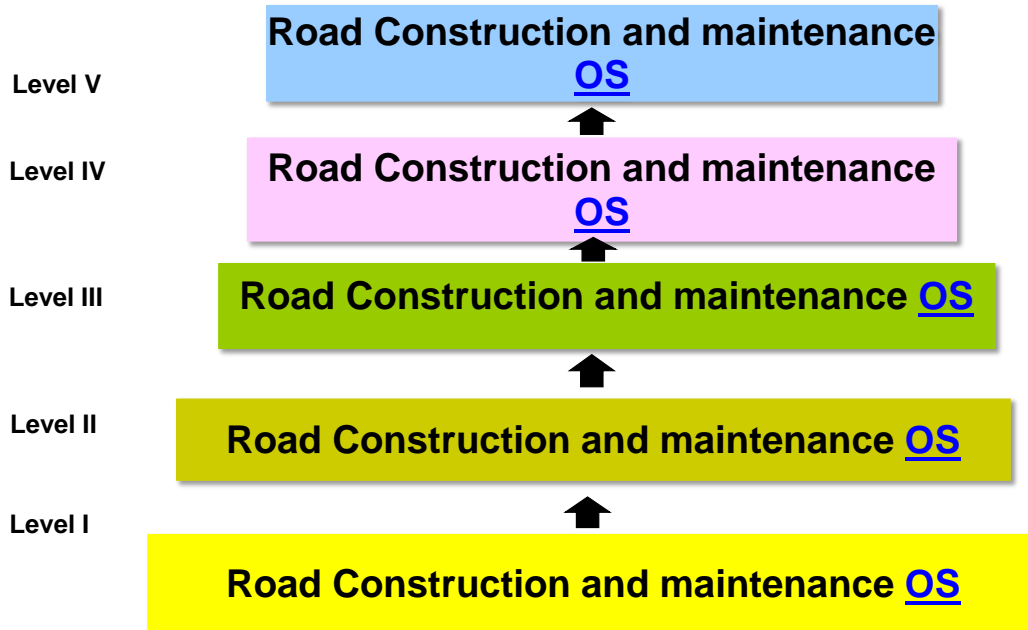
Relevant team members	<p>May include:</p> <ul style="list-style-type: none"> <li>• Other members of the organization's management team</li> <li>• Suppliers representatives</li> <li>• Sub-contractors representatives</li> <li>• Supervisors or managers of other organizations who are involved in related tasks</li> <li>• Experienced members of the team directly involved in the task</li> </ul>
Set out	<p>May include:</p> <ul style="list-style-type: none"> <li>• Control lines</li> <li>• Cleared width</li> <li>• Batters</li> <li>• Off-sets</li> </ul>
Road maintenance operations	<p>May include:</p> <ul style="list-style-type: none"> <li>• loading and unloading materials</li> <li>• cleaning damaged areas</li> <li>• digging out and replacing asphalt or bitumen surfaces</li> <li>• hand spreading asphalt</li> <li>• hand screeding</li> <li>• jack hammering</li> <li>• edge preparation ready for replacement surface</li> <li>• hand lancing emulsion</li> <li>• compacting with a vibrating plate</li> <li>• cleaning the truck sticking surfaces with distillate</li> </ul>
Road maintenance	<p>May include:</p> <ul style="list-style-type: none"> <li>• a purpose built truck fitted with a hopper, conveyor belt, tank, spreader, tools and equipment for the repair of pavement defects, set up to carry bitumen emulsion, cutback bitumen, aggregate, cold mix, asphalt, granular pavement material, tools and equipment required to prepare, fill, level and compact pavement defects</li> </ul>
Materials	<p>May include:</p> <ul style="list-style-type: none"> <li>• bitumen emulsions</li> <li>• asphalts</li> <li>• aggregates</li> <li>• water</li> <li>• cleaning agents</li> </ul>
Monitor	<p>May include:</p> <ul style="list-style-type: none"> <li>• Ongoing risk assessment</li> <li>• Engineering survey</li> <li>• Sampling and testing</li> <li>• Recording and observation of construction practice</li> </ul>

	<ul style="list-style-type: none"> <li>• General supervision</li> </ul>
Required outcomes	<p>May include:</p> <ul style="list-style-type: none"> <li>• Task specifications requirements</li> <li>• Task drawings requirements</li> <li>• Coordination requirements</li> <li>• Activity scheduling requirements</li> <li>• Unit cost requirements</li> <li>• Overall task cost requirements</li> <li>• Waste management requirements</li> </ul>

<b>Evidence Guide</b>	
Critical Aspects of Competence	<p>Must demonstrate knowledge, skill and attitude to:</p> <ul style="list-style-type: none"> <li>• Plan and prepared for sealing operations</li> <li>• Initiate sealing tasks</li> <li>• Oversee the execution of tasks</li> <li>• Set up road maintenance unit</li> <li>• Repair damaged surfaces</li> <li>• Carry out operator maintenance</li> <li>• Report on the execution of tasks</li> <li>• Clean up</li> <li>• Apply the requirements, procedures and instructions for conducting and monitoring the road surface treatment/sealing operations</li> <li>• implement the requirements, procedures and techniques for the safe, effective and efficient completion of conducting and monitoring the road surface treatment/sealing operations</li> <li>• work with others to undertake and complete conducting and monitoring the road surface treatment/sealing operations that meets all of the required outcomes</li> <li>• consistent timely completion of conducting and monitoring the road surface treatment/sealing operations that safely, effectively and efficiently meets the required outcomes</li> <li>• Demonstrate a conducting and monitoring the road surface treatment/sealing operations.</li> </ul>
Required Knowledge and Attitudes	<p>Must demonstrate knowledge and attitudes of:</p> <ul style="list-style-type: none"> <li>• site and equipment safety requirements</li> <li>• techniques of conducting and monitoring the road surface treatment operations that include: <ul style="list-style-type: none"> <li>➢ Asphalt surface treatment work</li> <li>➢ Monitor Otta Seal,</li> </ul> </li> </ul>

	<p>➤ Sand Seal and Slurry Seal Operations</p> <ul style="list-style-type: none"> <li>• paving operations</li> <li>• different types of surface treatment preparation and their characteristics</li> <li>• equipment types, characteristics, technical capabilities and limitations</li> <li>• basic operational, maintenance and basic diagnostic procedures</li> <li>• site isolation and traffic control responsibilities and authorities</li> <li>• processes for the calculation of material requirements, mix, application rates and travel speed</li> <li>• material handling methods</li> <li>• project quality requirements</li> <li>• civil construction terminology</li> <li>• safe work method statements</li> </ul>
Required Skills	<p>Must demonstrate skill and attitudes to:</p> <ul style="list-style-type: none"> <li>• apply legislative, organisation and site requirements and procedures for conducting slurry sealing operations</li> <li>• organise work activities</li> <li>• select and use relevant tools and equipment safely</li> <li>• identify and report on hazards related to the worksite and work activity</li> <li>• communicate effectively to receive and clarify work instructions</li> </ul>
Resource Implications	<p>The following resources must be provided:</p> <ul style="list-style-type: none"> <li>• Access is required to real working areas or appropriately simulated work environment including worksite, materials and equipment</li> </ul>
Methods of Assessment	<p>Competence may be assessed through:</p> <ul style="list-style-type: none"> <li>• Interview / oral questioning / written test</li> <li>• Observation/demonstration with oral questioning</li> </ul>
Context of Assessment	<p>Competence may be assessed in the work place or in a simulated work place setting</p>

**SECTOR: Economic Infrastructure**  
**SUB-SECTOR: Road Construction and Maintenance**



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This occupational standard was developed on March 2022 Adama, Oromia.

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