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Ministry of Labor and Skills

ROAD CONSTRUCTION AND MAINTENANCE LEVEL – III

CURRICULUM

Based on March, 2022 (I-V) Occupational standard (OS)

September, 2023

Addis Ababa, Ethiopia

Preface

The reformed TVET-System is an outcome-based system. It utilizes the needs of the labor market and occupational requirements from the world of work as the benchmark and standard for TVET delivery. The requirements from the world of work are analyzed and documented – considering international benchmarking – as occupational standards (OS).

In the reformed TVET-System, curricula and curriculum development play an important role with regard to quality driven comparable TVET-Delivery. The Curricula help to facilitate the training process in a way, that trainees acquire the set of occupational competences (skills, knowledge and attitude) required at the working place and defined in the occupational standards (OS).

This curriculum has been developed by a group of professional experts from different Regional TVET Bureaus, colleges, Industries, Institutes and universities based on the occupational standard for Road Construction and Maintenance Level III**.**

The curriculum development process has been actively supported and facilitated by **Ministry of Labor and Skills.**

TVET-Program Design

1.1. TVET-Program Title: Road Construction and Maintenance Level III

1.2. TVET-Program Description

The Program is designed to develop the necessary knowledge, skills and attitude of the trainees to the standard required by the occupation. The contents of this program are in line, Establish Control Points and Boundaries, Use CAD Systems to Produce Basic Engineering Drawings, Prepare Quantity Work for Estimation, Conduct Road Construction Material Sampling & Testing, Monitor Installation of Water Main, Storm and Sewer Pipelines, Construct and Maintain Minor Drainage Structures & Retaining Walls, Conduct and Monitor Stabilizer Operations, Conduct and Monitor Asphalt Concrete Production , Conduct and Monitor Construction of Ridged Pavement

With the occupational standard. The Trainees who successfully completed the Program will be qualified to work as a **road construction technician** I with competencies elaborated in the respective OS. Graduates of the program will have the required qualification to work in the **economic infrastructure** sector in the field of **Road Construction and Maintenance**

The prime objective of this training program is to equip the Trainees with the identified competences specified in the OS. Graduates are therefore expected to_in accordance with the performance criteria and evidence guide described in the OS.

1.3. TVET-Program Training Outcomes

The expected outputs of this program are the acquisition and implementation of the following units of competences:

EIS RCM3 01 0923 Establish Control Points and Boundaries
EIS RCM3 02 0923 Use CAD Systems to Produce Basic Engineering Drawings
EIS RCM3 03 0923 Prepare Quantity Work for Estimation
EIS RCM3 04 0923 Road Construction Material Sampling & Testing
EIS RCM3 05 0923 Water Main, Storm and Sewer Pipelines
EIS RCM3 06 0923 Construct and Maintain Minor Drainage Structures & Retaining Walls
EIS RCM3 07 0923 Conduct and Monitor Stabilizer Operations
EIS RCM3 08 0923 Asphalt Concrete Production
EIS RCM3 09 0923 Construction of Flexible Pavement
EIS RCM3 11 0923 Concrete Kerb, Channel and Road Side Fixtures

EIS RCM3 12 0923 Pavement Recycling Operations

EIS RCM3 13 0923 Pile Construction Operations

EIS RCM3 14 0923 Road Maintenance Operation and Surface Treatment

1.4. Duration of the TVET-Program

The Program will have duration of **1000 hours** including the on school/ Institution training and on-the-job practice or cooperative training time. Such cooperative training based on realities of the industry, nature of the occupation, location of the TVET institution, and other factors will be considered in the training delivery to ensure that trainees acquire practical and workplace experience.

NO	Unit competency	TVET Institution training		Cooperative training	Total hours	Remarks
		Theory	Practical			
1.	Establish Control Points and Boundaries	30	40	30	100	
2.	Use CAD Systems to Produce Basic Engineering Drawings	21	28	21	70	
3.	Prepare Quantity Work for Estimation	18	24	18	60	
4.	Road Construction Material Sampling & Testing	21	28	21	70	
5.	Water Main, Storm and Sewer Pipelines	24	32	24	80	
6.	Construct and Maintain Minor Drainage Structures & Retaining Walls	30	40	30	100	
7.	Conduct and Monitor Stabilizer Operations	24	32	24	80	
8.	Asphalt Concrete Production	33	44	33	110	
9	Construction of Ridged Pavement	15	20	15	50	
10	Construction of Flexible Pavement	15	20	15	50	
11	Concrete kerb, Channel and Road Side Fixtures	24	32	24	80	
12	Pavement Recycling Operations	15	20	15	50	
13	Pile Construction Operations	18	24	18	60	
14	Road Maintenance Operation and Surface Treatment	12	16	12	40	

1.4 Qualification Level and Certification

Based on the descriptors elaborated on the Ethiopian National TVET Qualification Framework (NTQF) the qualification of this specific TVET Program is Level III**.**

The trainee can exit after successfully completing the modules in one level and will be awarded the equivalent institutional certificate on the level completed. However, only institutional certificate of training accomplishment will be awarded.

1.5. Target Groups

Any citizen **with or without disability** who meets the entry requirements under items 1.7 and capable of participating in the training activities is entitled to take part in the Program.

1.7 Entry Requirements

The prospective participants of this program are required to possess the requirements or directive of the **Ministry of Labor and Skills**.

1.8 Mode of Delivery

This TVET-Program is characterized as a formal Program on **road construction technician I**. The mode of delivery is co-operative training. The time spent by the trainees in the real work place/ industry will give them enough exposure to the actual world of work and enable them to get hands-on experience.

The co-operative approach will be supported with school-based lecture-discussion, simulation and actual practice. These modalities will be utilized before the trainees are exposed to the industry environment.

Hence based on the nature of the occupation, location of the TVET institutions, and interest of the industry alternative mode of cooperative training such as apprenticeships, internship and traineeship will be employed. In addition, in the areas where industry is not sufficiently available the established production and service centers/learning factories in TVET institutions will be used as cooperative training places. The Training-Institution and identified companies have forged an agreement to co-operate with regard to the implementation of this program.

1.9. TVET-Program Structure

Unit of Competence		Module Code & Title		Training Outcomes	Duration (In Hours)
EIS RCM3 01 0322	Establish Control Points and Boundaries	EIS RCM3 M01 0923	Establishing Control Points and Boundaries	• Plan and prepare • Traversing • Establish Triangulation, Intersection and Resection • Horizontal and vertical alignment • Write description for Stations	100
EIS RCM3 02 0322	Use CAD Systems to Produce Basic Engineering Drawings	EIS RCM3 M02 0923	Using CAD Systems to Produce Basic Engineering Drawings	• . Prepare the CAD environment • Produce output & Shot down • Produce drawings & Modify existing CAD drawings	70
EIS RCM3 03 0322	Prepare Quantity Work for Estimation	EIS RCM3M 03 0923	Preparing Quantity Work for Estimation	• Gather information • Take off work quantity • Document and verify details	60

EIS RCM3 04 0322	Conduct Road Construction Material Sampling & Testing	EIS RCM3 M04 0923	Construction Material Sampling & Testing	• Sampling & Testing Requirements • Sample preparation and testing • Material Testing • Documentation and Customer Service	70
EIS RCM3 05 0322	Monitor Installation of Water Main, Storm and Sewer Pipelines	EIS RCM3 M05 0923	Water Main, Storming and Sewer Pipelines	• Installation and Testing Pipeline • Setting Out and Excavation • Water Main, Storm, and Sewer System Requirement	80
EIS RCM3 06 0322	Construct and Maintain Minor Drainage Structures & Retaining Walls	EIS RCM3 M06 0923	Constructing and Maintaining Minor Drainage Structures & Retaining Walls	• Minor concrete bridges requirement • Masonry work • Concert work • Maintain minor drainage and retaining walls structures • Inspect, clear, repair culverts and Bridge	100

EIS RCM3 07 0322	Conduct and Monitor Stabilizer Operations	EIS RCM3 M07 0923	Conducting and Monitoring Stabilizer Operations	• Requirements of stabilization • Stabilizer pre-operation • Operate stabilizer and clean up • Relocate stabilizer • Equipment performance	80
EIS RCM3 08 0322	Conduct and Monitor Asphalt Concrete Production	EIS RCM3 M08 0923	Asphalt Concrete Production	• Plan and prepare for Asphalt Concrete. • Allocate and log resources. • Monitor and report plant/ machine activity • Monitor and report operational activities. • Monitor movement of materials	110
EIS RCM3 09 0322	Conduct and Monitor Construction of Ridged Pavement	EIS RCM3 M09 0923	Conducting and Monitoring Construction of Ridged Pavement	• Plan and prepare work • Identify types of Rigid Pavement • Conduct pre paving inspection • Space construct tie bars joints and Cut material • Apply concrete work	50

EIS RCM3 10 0322	Conduct and Monitor Construction of Flexible Pavement	EIS RCM3 M10 0923	Conducting and Monitoring Construction of Flexible Pavement	• Plan and prepare work • Identify types of Flexible Pavement • Conduct pre paving inspection • Place and spread materials • Place and compact materials	50
EIS RCM3 11 0322	Conducting and Monitoring Construction of Flexible Pavement	EIS RCM3 M11 0923	Concrete curve, Channel and Road Side Fixtures	• Concrete Kerb, Channel, & Road Side Fixtures Requirement • Cast In-situ Concrete Unit • Pre-Cast Concrete Units • Repairing Kerb, Gutters, and Median, Barrier Strips	80
EIS RCM3 12 0322	Conduct and Monitor Pavement Recycling Operations	EIS RCM3 M12 0923	Conducting and Monitoring Pavement Recycling Operations	• Requirements of Pavement Recycling Operation • pre-operation and operation of profile planer • Profile planer Attachments • Relocation of Profile Planer • Equipment Performance	50

EIS RCM3 13 0322	Conduct Pile Construction Operations	EIS RCM3 M13 0923	Conducting Pile Construction Operations	• Pile construction planning • Pile positions • Boring and piling rig • Piling rig plant establishment • Drive pile and clean-up work place	60
EIS RCM3 14 0322	Perform Road Maintenance Operation and Surface Treatment	EIS RCM3 M14 0923	Performing Road Maintenance Operation and Surface Treatment	• Sealing Operations & Sealing Tasks • Check Pre-Maintenance Operation • Repair Damaged Surfaces • Oversee the Execution of Tasks • Report on The Execution of Tasks	40

*The time duration (Hours) indicated for the module should include all activities in and out of the TVET institution.

1.10 Institutional Assessment

Two types of evaluation will be used in determining the extent to which training outcomes are achieved. The specific training outcomes are stated in the modules. In assessing them, verifiable and observable indicators and standards shall be used.

The **formative assessment** is incorporated in the training modules and form part of the training process. Formative evaluation provides the trainee with feedback regarding success or failure in attaining training outcomes. It identifies the specific training errors that need to be corrected, and provides reinforcement for successful performance as well. For the teacher, formative evaluation provides information for making instruction and remedial work more effective.

Summative Evaluation the other form of evaluation is given when all the modules in the program have been accomplished. It determines the extent to which competence have been achieved. And, the result of this assessment decision shall be expressed in the term of institutional Assessment implementation guidelines.

Techniques or tools for obtaining information about trainees' achievement include oral or written test, demonstration and on-site observation.

1.11 TVET Teachers Profile

The teachers conducting this particular TVET Program are **A Level** and above who have satisfactory practical experiences or equivalent qualifications.

LEARNING MODULE 01

TVET-PROGRAMME TITLE: Road Construction and Maintenance Level III

MODULE TITLE : Establishing Control Points and Boundaries

MODULE CODE : EIS RCM3 M01 0923

NOMINAL DURATION : 100 Hours

This module covers the knowledge, skills and attitudes required to specify the competence to carry out the network of horizontal control points. 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.

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

- Plan and prepare
- Perform Traversing
- Establish Triangulation, Intersection and Resection
- Set out Horizontal and vertical alignment
- Write description for Stations

MODULE CONTENTS:

Unit One: Plan and prepare

1.1 Overview

1.2 Work instruction

1.2.1 Office Preparation

1.2.2 Field Work

1.3 Safety and signage requirements

1.3.1 Legal Requirements

1.3.2 Wearing of Personal Protective Equipment

1.3.3 Use of Traffic Control Devices

1.3.4 Animal Hazards

1.3.5 Poisonous Plants

1.3.6 Power Lines

1.3.7 Training

1.4 Tools and equipment

1.5 Environmental protection requirements

Unit Two: Perform Traversing

2.1 Overview of traversing

2.2 Types of traverses

2.3 Azimuth and bearing

2.4 Azimuth and coordinate determination

2.5 Area computation

2.5.1 Methods of computing area

Unit Three: Establish Triangulation, Intersection and Resection

3.1 Selection of triangulation

3.1.1 Triangulation Figures

3.2 Establish monuments

3.3 Classification of triangulation systems

3.4 Triangulation procedure

3.5 Measure angles and base line

3.6 Intersections

3.6.1 Methods of intersection

3.7 Resection

3.7.1 Select suitable station

3.7.2 Perform angle measurement

3.7.3 Compute the coordinates

Unit Four: Station description

4.1 Description writing

4.2 Station referencing

4.3 Documentation

Unit Five: Horizontal and vertical alignment

5.1 Alignment selection

5.1.1 Factors Affecting Choice of Route

5.2 Tangent or straight section

5.3 Horizontal or Circular curves

5.3.1 Curve designation

5.3.2 Setting out of Circular Curve

5.4 Setting out vertical curves

5.4.1 Elements of vertical curve

Learning Methods:				
For none impaired trainees	**Reasonable Adjustment for Trainees with Disability (TWD)**			
	Low Vision	**Deaf**	**Hard of hearing**	**Physical impairment**
Lecture-discussion	❖ Provide large print text ❖ Prepare the lecture in **Audio/video** ❖ Organize the class room seating arrangement to be accessible to trainees ❖ Write short notes on the black/white board using large text ❖ Make sure the luminosity of the light of class room is kept ❖ Use normal tone of voice ❖ Encourage trainees to record the lecture in audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	❖ Assign sign language interpreter ❖ Arrange the class room seating to be conducive for eye to eye contact ❖ Make sure the luminosity of the light of class room is kept ❖ Introduce new and relevant vocabularies ❖ Use short and clear sentences ❖ Give emphasis on visual lecture and ensure the attention of the trainees ❖ Avoid movement during lecture time ❖ Present the lecture in video format ❖ Summarize main points	❖ Organize the class room seating arrangement to be accessible to trainees ❖ Speak loudly ❖ Ensure the attention of the trainees ❖ Present the lecture in video format ❖ Ensure the attention of the trainees	❖ Organize the class room seating arrangement to be accessible for wheelchairs users. ❖ Facilitate and support the trainees who have severe impairments on their upper limbs to take note ❖ Provide Orientation on the physical feature of the work shop

Demonstration	❖ Conduct close follow up ❖ Use verbal description ❖ Provide special attention in the process of guidance ❖ facilitate the support of peer trainees ❖ Prepare & use simulation	❖ use Sign language interpreter ❖ Use video recorded material ❖ Ensure attention of the trainees ❖ Provide structured training ❖ Show clear and short method ❖ Use gesture ❖ Provide tutorial support (if necessary)	❖ Illustrate in clear & short method ❖ Use Video recorded material ❖ Ensure the attention of the trainees ❖ Provide tutorial support (if necessary)	❖ Facilitate and support the trainees having severe upper limbs impairment to operate Equipment/ machines ❖ Assign peer trainees to assist ❖ Conduct close follow up ❖ Provide tutorial support (if necessary
Group discussion	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	❖ Use sign language interpreters ❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	❖ Introduce the trainees with their peers

Exercise	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/practical training ❖ Introduce new and relevant vocabularies	❖ Conduct close follow up and guidance ❖ Provide tutorial support if necessary ❖ provide special attention in the process/ practical training	❖ Assign peer trainees ❖ Use additional nominal hours if necessary
Individual assignment	❖ prepare the assignment questions in large text ❖ Encourage the trainees to prepare and submit the assignment in large texts ❖ Make available recorded assignment questions ❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy	❖ Use sign language interpreter ❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having speech challenges
Written test	❖ Prepare the exam in large texts ❖ Use interview as an option if necessary ❖ Prepare the exam in audio format ❖ Assign human reader	❖ Prepare the exam using short sentences, multiple choices, True or False, matching and short answers ❖ Avoid essay writing ❖ Time extension	❖ Prepare the exam using short sentences, multiple choices, true or false, matching and short answers if necessary.	❖ Use oral response as an option to give answer for trainees having severe upper limb impairment
Demonstration /Observation	❖ Brief the instruction or provide them in large text ❖ Time extension	❖ Use sign language interpreter ❖ Brief on the instruction of the exam ❖ Provide activity-based/	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up

ASSESSMENT CRITERIA:

Unit one: Plan and prepare

- Prepare work instructions
- Apply safety and signage requirements
- Differentiate tools and equipment
- Identify environmental protection requirements

Unit Two: Perform traversing

- Identify Types of traverses
- Measure Azimuth
- Carry out Traversing
- Compute Azimuth and bearing
- Fill the traverse field book
- Calculate area

Unit Three: Establish Triangulation, intersection and re- section

- Select triangulation satiation
- Establish monuments
- Identify triangulation procedures
- Differentiate triangulation figures
- Measure angles and base line
- Use intersection and resection
- Perform intersection and resection measurement
- Compute stations coordinate

Unit Four: Write the description for Stations

- Write descriptions for satiation.
- Locate stations with reference.
- Document station information.

Unit Five: Set out Horizontal and Vertical alignment

- Select route alignment
- Sett out of horizontal curve.
- Sett out of vertical curve.
- Use labor based methods

Document of leveling result

LEARNING MODULE 02

TVET-PROGRAMME TITLE: Road Construction & Maintenance Level III

MODULE TITLE: Using CAD Systems to Producing Basic Engineering Drawings

MODULE CODE: EIS RCM3 M02 0923

NOMINAL DURATION: 70 Hours

MODULE DESCRIPTION: This module covers producing basic engineering drawings using a CAD system, under the direction of a supervisor.

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

- Prepare the CAD environment.
- Produce drawings & Modify existing CAD drawings
- Produce output & Shot down

MODULE CONTENTS:

Unit One: CAD Environment

1.1 Identifying CAD software for Basic Engineering Drawings

- 1.1.1 AutoCAD Terminology
- 1.1.2 CAD software
- 1.1.3 CAD Operating procedures
- 1.1.4 Computer Operation:
- 1.1.5 Version of AutoCAD
- 1.1.6 Benefits/Use of AutoCAD

1.2 CAD Package

- 1.2.1 How to install AutoCAD 2007
- 1.2.2 How to Start AutoCAD
- 1.2.3 Open Existing Drawings
- 1.2.4 Drawing Principles:

1.3 Screen Display Areas and Basic Parameters

- 1.3.1 Screen display areas
- 1.3.2 Basic parameters:

Unit Two: Draw & Modify Existing CAD Drawings

2.1 Coordinate Entry System

- 2.1.1 Absolute Coordinate Entry
- 2.1.2 Relative Coordinate Entry

2.1.3	Polar coordinate entry
2.2	Basic CAD drawing
2.3	Standard operating procedures
2.4	Review CAD drawings
2.5	Locating and modifying existing CAD drawings
2.5.1	Locating CAD drawings
2.5.2	Modifying CAD drawings
2.6	Simple drawings:
Unit Three: Producing Output & Shut Down	
3.1	Saving drawing files.
3.1.1	Saving AutoCAD file as PDF:
3.1.2	Saving AutoCAD file as DWG:
3.1.3	Saving AutoCAD file as JPEG:
3.2	Printing out drawing files
3.3	Shutting down Programs and computer

ASSESSMENT CRITERIA:

UNIT.1. CAD Environment

- Identify CAD software
- Boot CAD package.
- Set Screen display areas and basic parameters

UNIT.2. Draw & Modify Existing CAD Drawings

- Identify Coordinate Entry System
- Create basic CAD drawings.
- Prepare drawings.
- Review CAD drawings
- Locate and modify existing CAD drawings..

UNIT.3. Produce output & Shot down

- Save drawing files.
- Print out draw files.
- Shut down Programs and computer

LEARNING MODULE 03
TVET-PROGRAMME TITLE: Road construction and maintenance Level III
MODULE TITLE: Preparing Quantity Work for Estimation
MODULE CODE: EIS RCM3 M 0923
NOMINAL DURATION:60 Hours
MODULE DESCRIPTION: This module covers 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,
LEARNING OUTCOMES At the end of the module the trainee will be able to: • Gather information • Take off work quantity • Document and verify details
MODULE CONTENTS: **Unit One: Gather Information** 1.1 Obtaining customer requirements. 1.2 Accessing and inspecting plan. 1.3 Developing delivery detail product. **Unit Two: Take Off Work Quantity** 2.1 Planning and sequencing work tasks. 2.2 Preparing take off and bill of quantity format. 2.3 Preparing detail description/specification materials. 2.4 Measuring on site book. 2.5 Summarizing and put in BOQ format. **Unit Three: Document and Verify Details** 3.1 Verifying detail work. 3.2 Preparing tender. 3.3 Details documenting

ASSESSMENT CRITERIA:

Unit One: Gather information

- Obtain customer requirements.
- Access and inspect plan.
- Develop delivery detail.

Unit Two: Take off work quantity

- Plan and sequence work tasks.
- Prepare take off and bill of quantity format.
- Prepare materials description/specification.
- Measure on site book.
- Summarize BOQ format.

Unit Three: Document and verify details

- Verify detail work.
- Prepare tender.
- Document details

LEARNING MODULE 04

TVET-PROGRAMME TITLE: Road Construction and Maintenance Level III

MODULE TITLE : Road Construction Material Sampling & Testing

MODULE CODE : EIS RCM3 M04 0923

NOMINAL DURATION : 70 Hours

MODULE DESCRIPTION : This module 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). 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.

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

- Plan and prepare sampling and testing requirements
- Prepare and Take samples
- Conduct Material testing
- Record and Report test results & Documentation

MODULE CONTENTS:

Unit One: Sampling & Testing Requirements

1.1 Basic Concept of Sampling and Testing

1.2 Work Instructions & Requirements

1.3 Safety Requirement

1.3.1 Personal Protective Equipment

1.3.2 Safety regulations

1.3.3 Hazards/risks

1.3.4 Occupational Health and Safety (OHS) procedures

1.3.5 Contingency measures

1.4 Environmental Protection Requirement

1.5 Wastes and environmental impacts

1.5.1 Safe disposal of hazardous materials and other laboratory wastes.

1.6 Construction materials.

1.7 Sampling & Testing, Tools & Equipment

1.7.1 Sample Containers and Bags

Unit Two: Sample Preparation and Testing

2.1Basic concept of sample preparation and testing

2.1.1 Sample Preparation:

2.1.2 Testing:

2.2 Containers and Sampling Tools

2.2.1 Importance of Using Clean Containers and Tools:

2.2.2 Selection of Appropriate Containers and Tools:

2.2.3 Ensuring Containers and Tools are Free from Contaminants:

2.3Taking Samples

2.3.1 Approved Procedures and Job Instructions:

2.3.2 Adhering to Sampling Methods Specified by Relevant Standards:

2.3. Techniques for Sample Collection

2.4 Handling, Labeling, and Storage of Samples

2.4.1 Importance of Proper Handling, Labeling, and Storage:

2.4.2 Approved Procedures and Job Instructions for Sample Handling:

2.4.3 Ensuring Samples are Labeled Accurately to Avoid Confusion or Misidentification:

2.4.4 Proper Storage Conditions to Maintain Sample Integrity and Prevent Degradation:

2.5 Physical Separation of Samples

2.5.1 Understanding the need for physical separation of samples

2.5.2 Techniques for separating samples

2.5.3 Proper labeling and documentation of sub-samples

2.6 Chemical Separation of Samples

2.6.1 Importance of chemical separation in certain testing procedures

2.6.2 Approved procedures for chemical separation

2.6.3 Ensuring accuracy and precision in the separation process

2.7 Placing Samples in Transport Media

2.7.1 Appropriate Transport Media:

2.7.2 Identifying Suitable Transport Media:

2.7.3 Proper Packaging and Labeling for Transportation:

2.8 Monitoring and Controlling Sample Conditions

2.8.1 Importance of Monitoring and Controlling Sample Conditions:

2.8.2 Techniques for Maintaining Sample Integrity:

2.8.3 Implementing Measures to Prevent Contamination or Degradation:

2.9 Distribution of Samples

Unit three: Material Testing

3.1 Material Testing Equipment

3.1.1 Concrete Testing Equipment

3.2 Laboratory testing

3.2.1 Concrete test

3.2.2 Tensile test

3.2.3 Bitumen test

3.2.4 Determination of Ductility Bitumen test

3.2.5 Determination of viscosity bitumen test

3.3 Clean up

Unit Four: Documentation and Customer Service

4.1 Logging Samples

4.2 Customer Service

ASSESSMENT CRITERIA:

Unit One. Sampling &Testing requirements

- Define Basic Concept of Sampling and Testing
- Confirm and apply Work instructions material testing
- Obtain Safety requirements
- Operate tools and equipment.
- Use Construction materials
- Identify Environmental protection requirement

Unit Two. Sampling

- Define Basic concept of sample preparation and testing
- Obtain Containers and Sampling Tools
- Take Samples
- Hand, Label, and Store Samples
- Perform Physical Separation of Samples
- Perform Chemical Separation of Samples
- Place appropriate Transport Media for Samples
- Monitor and Control Sample Conditions
- Distribute of Samples.

Unit 3 Material Testing

- Operate techniques of testing equipment
- Operate laboratory tests
- Clean up

Unit Four. Documentation & Customer Service Issues

- Log samples
- Address customer service issues

LEARNING MODULE 05
TVET-Programme Title: Road Construction and Maintenance Level III
Module Title : Water Main, Storm and Sewer System
Module Code : EIS RCM3 M05 0923
Nominal Duration : 80 hours
Module Description : This module covers the knowledge, skill, and attitude of monitoring installation of water main, storm and sewer pipeline system in the civil construction industry. It includes water main, Storm, and semer system requièrent, setting out and excavation site, and installation and testing pipeline.
LEARNING OUTCOMES At the end of the module the trainee will be able to: • Identify water main, storm, and sewer system requirement • Set out and excavate site • Install and test pipeline
MODULE CONTENTS: **Unit One. Water Main, Storm, and Sewer System Requirement** 1.1 Basic Concept of Water Main, Storm, and Sewer System 1.2 Compliance Documentation 1.3 Safety Requirements 1.4 Signage Requirements 1.5 Tools, Equipment, and Plant 1.6 Environmental Protection Requirements **Unit Two. Setting Out and Excavation** 2.1 Preparation for Setting out and Excavation 2.2 De-Watering Requirements 2.3 Setting Out Pipeline System 2.4 Excavation Pipeline System 2.5 Supporting Mechanism **Unit Three**. **Installation and Testing Pipeline** 3.1 Lowering, Placing and Joining Pipeline 3.2 Placing Pipes and Fit Valves, Fittings and Flow Control Devices 3.3 Checking Alignment Level and Grade 3.4 Positioning and Checking Pipeline Support

3.5 Backfill Procedure

3.6 Constructing Valve Chambers, Minor Structures and Thrust Blocks

3.7 Constructing Manholes

3.8 Test for Pipelines Performance

3.9 Cleaning Up Work Area

Assessment Criteria

Unit One: Plan and Prepare for Water Main, Storm, and Sewer System

- Introduce basic concept of water main, storm, and sewer system
- Interpret and apply compliance documentation
- Follow safety requirements
- Identify & implement signage requirements
- Select and use tools, equipment, and plant
- Identify, confirm and apply environmental protection requirements

Unit Two: Set out and excavate site

- Prepare for setting out and excavation
- Determine and apply de-watering requirements
- Determine location, alignment direction, and set out works
- Advise plant operator of excavation requirements and monitor levels
- Install pipeline system support mechanism

Unit Three: Install and test pipeline

- Place and join pipes in position
- Place pipes and fit valves, fittings and flow control devices
- Check alignment level and grade
- Position and check pipeline support
- Monitor backfill procedure
- Construct valve chambers, minor structures and thrust blocks
- Construct manholes
- Identify test for pipelines performance
- Apply clean-up work area

LEARNING MODULE 06

TVET-PROGRAMME TITLE: Road Construction and Maintenance Level III

MODULE TITLE: Constructing and Maintain Minor Drainage structures and Retaining Walls

MODULE CODE: EIS RCM3 M06 0923

NOMINAL DURATION: 100Hours

MODULE DESCRIPTION: This Module 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. This Module 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

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

- Constructing and maintaining minor concrete bridges
- Conduct masonry work abutment and Wing wall
- Conduct concreting work
- Maintain minor drainage and retaining walls structures
- Inspect, clear, repair culverts and Bridge

MODULE CONTENTS:

Unit One: Minor Concrete Bridges Requirement

1.1 Basic Concept Minor Concrete Bridges

1.2 Work Instructions And Compliance Document

1.3 Safety Requirements

1.4 Plant, Tools And Equipment

1.5 Storm Water Diversion Requirement

1.6 Environmental Protection Requirements

Unit Two: Masonry Work

2.1 Preparation

2.2 Determine Masonry Structures

2.3. Construction

2.4. Install Tie Down

2.5 Finish Joints To Laid Face Brickwork

2.6 Brush Down Masonry

Unit Three: Concert Work

3.1 Inspection

3.2 Erection Of Formwork

3.3 Reinforcement

3.4 Concrete Pouring

3.5 Curing

Unit Four: Maintain Minor Drainage And Retaining Walls Structures

4.1 Preparation

4.2 Maintenance And Repair

4.4. Completion

4.5. Back Fill

4.6 Report Drainage Fault

Unit Five: Inspect, Clear, Repair Culverts And Bridge

5.1 Inspection

5.2 Repairing Sections And Joint

5.3 Repairing Inlet And Outlet

5.4 Repair And Maintenance

ASSESSMENT CRITERIA:

Unite one Minor concrete bridges requirement

- Identifying Basic concept minor concrete bridges
- work instructions and compliance document
- Identifying Safety Requirements
- Identifying Tools and equipment
- Identifying water diversion requirement
- Apply Environmental protection requirements

Unit Two: Masonry work

- Prepare masonry work
- Construct masonry work
- Finish masonry work

Unit Three: Concert work

- Prepare concert work
- Prepare Erection of Formwork
- Prepare Reinforcement Concert work
- Identify Concrete Pouring

Unit Four: Maintain minor drainage and retaining walls structures

- Prepare maintain minor drainage structures
- Maintain and Repair maintain minor drainage structures
- Couplet maintain minor drainage structures

Unit Five: Inspect, clear, repair culverts and Bridge

- Inspect culverts and Bridge
- Repair and Maintenance culverts and Bridge
- Inspect Bridge

LEARNING MODULE 07
TVET-PROGRAMME TITLE: Road Construction and Maintenance Level III
MODULE TITLE: Conducting and Monitor Stabilizer Operations
MODULE CODE: EIS RCM3 M07 0923
NOMINAL DURATION: 80 Hours
MODULE DESCRIPTION : This module covers the conducting and monitoring of stabilizer operations in the civil construction industry. It includes planning and preparing, conducting stabilizer pre-operations checks, operating stabilizers, relocating stabilizers, carrying out operator maintenance, and cleaning up.
LEARNING OUTCOMES At the end of the module the trainee will be able to: • Requirements of stabilization • Stabilizer pre-operation • Operate stabilizer and clean up • Relocate stabilizer • Equipment performance
MODULE CONTENTS: **Unit one: Requirements of Stabilization** 1.1 Compliance documentation. 1.2 Relevant drawings and specifications 1.3 Safety requirement and Signage 1.4 Plant, tools and equipment 1.5 Work materials and quantity 1.6 Environmental protection **Unit Two: Stabilizer pre-operation** 2.1 Pre-start, start-up, park and shutdown procedures. 2.2 Stabilizer controls and functions **Unit Three: Operate stabilizer and clean up** 3.1 Stabilizer site hazard. 3.2 Stabilizer operation techniques 3.3 Operate stabilizer. 3.4 Additive mixing material

Unit Four: Relocate stabilizer

4.1 Stabilizer safely between worksites.

4.2 locating technique

Unit Five: Equipment performance

5.1 Ensuring inspection and fault finding

5.2 Servicing and lubrication

5.3 Minor maintenance

5.4 Recording performance of machine and equipment

ASSESSMENT CRITERIA:

Unit one: Requirements of stabilization

- Access, interpret and apply compliance documentation
- Identify and Apply relevant drawings and specifications
- Apply Safety requirement
- Identify, obtain and implement Signage implementation
- Select, check and use of plant, tools and equipment
- Handle and lay work materials
- Identify environmental protection
- Calculate material quantity

Unit Two: Stabilizer pre-operation

- Pre-start, start-up, park and shutdown procedures.
- Stabilizer controls and functions

Unit Three: Operate stabilizer and clean up

- Identify stabilizer site hazard.
- Identify and apply stabilizer operation techniques
- Operate stabilizer.
- Operate and use additive mixing material

Unit Four: Relocate stabilizer

- Move stabilizer safely between worksites.
- Prepare locating technique

Unit Five: Equipment performance

- Carry out routine operational service and lubrication tasks.
- Carry out minor maintenance.
- Record performance of machine and equipment

LEARNING MODULE 08
TVET-PROGRAMME TITLE: Road Construction & Maintenance Level III
MODULE TITLE: Asphalt Concerte Production
MODULE CODE: EIS RCM3 M08 0923
NOMINAL DURATION: 110Hours
MODULE DESCRIPTION: This module 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.
LEARNING OUTCOMES At the end of the module the trainee will be able to: • Plan and prepare for operation. • Allocate and log resources. • Monitor and report plant/ machine activity • Monitor and report operational activities. • Monitor movement of materials
MODULE CONTENTS: **Unit1. Plan and prepare for operation.** 1.1.Relevance Documents 1.2.Safety Requirements 1.3.Plant, Tools And Equipment 1.4.Shifting Changeover Details and Communications 1.5.Potential Risks, Hazards and Environmental Issues 1.6.Application of Computer Systems to recording Maintenance Defects. **Unit 2.Allocate and log resources** 2.1.Hauling operation and allocate equipment's. 2.2.Re-Allocate Construction Equipment 2.3.Production requirements 2.4.Personnel allocation for production 2.5. record individual output **Unit 3. Monitor and report plant/ machine activity** 3.1.Production requirement 3.2.Aggregate and Sand Test

3.3.Monitor supply of material to the cold bin

3.4.Set proportion of material to batch requirements

3.5.Store of mixed Material

3.6.Test of mixed material

Unit 4. **Monitor and report operational activities**

4.1.Report site operation and plant

4.2.Location of equipment and material

4.3. Report equipment usage and productivity

4.4.Data for measuring operational outputs

Unit 5. Monitor movement of materials

5.1.Log movement machinery and quantity of materials

5.2.Monitor and reporting stock levels

5.3.Monitor and reporting productivity rates.

ASSESSMENT CRITERIA:

Unit One. Plan and Prepare for Operation.

- Over view of plan and preparation asphalt concrete
- Apply Relevance documents
- Apply safety requirements
- Selecting plant, tools and equipment.
- Explain coordinating shift activities with other
- Identify Potential risks, hazards on environmental issues
- Use computer systems and equipment's to recording maintenance defects.

Unit Two. Allocate and log resources

- Manage and monitor of Hauling operation
- Explain methods of allocate and re-allocate equipment's
- Determine Production requirements
- Identify Personnel allocation for production
- Show methods of recording individual output

Unit Three. Monitor And Report Plant/ Machine Activity

- Determine production requirements
- Test aggregate and sand
- Monitor supply of material to the cold bin
- Set proportion of material to batch requirements
- Select Storing of mixed Material
- Test Mixed material

Unit Four. Monitor and report operational activities

- Introduce report site operation and plant
- Identify Location of equipment and material
- Identify Report equipment usage and productivity
- Explain data for measuring operational outputs

LEARNING MODULE 09
TVET-PROGRAMME TITLE: Road Construction and Maintenance Level III
MODULE TITLE : **Construction of Rigid Pavement**
MODULE CODE: **EIS RCM3 M09 0923**
NOMINAL DURATION :50 Hours
MODULE DESCRIPTION : This module covers the knowledge, attitudes and skills required to Conduct & monitor construction of Rigid Pavement (JRCP, CRCP, JUCP).
LEARNING OUTCOMES At the end of the module the trainee will be able to: • Plan and prepare work • Identify types of Rigid Pavement • Conduct pre-paving inspection • Identify Space construct tie bars joints and Cut material • Apply concrete work
MODULE CONTENTS: **Unit 1. Plan and prepare work.** 1.1. Define Basic concept of rigid pavement 1.2. Identify compliance documentation 1.3. Apply worksite instructions 1.4. Identify material quantity requirements 1.5. Identify Safety and Signage Requirements 1.6. Select Plant ,Tools and equipment 1.7. Apply Environmental protection requirements **Unit 2. Types of Rigid Pavement** 2.1 Identify types of Rigid Pavements 2.2 Construct Jointed Plain Concrete Pavement 2.3 Construct Jointed Reinforced Concrete Pavement 2.4 Construct Continuous Reinforced Concrete Pavement 2.5 Construct Pre-Stressed Concrete Pavement **Unit 3**. **Conduct pre- paving inspection** 3.1 Define Over view of pre-paving inspection 3.2 Checking base course stability 3.3 Establishing offset pegs/profiles

3.4 Checking steel reinforcement placement

Unit 4. Identify Space construct tie bars joints and Cut material

4.1 Define overview of Spacing Tie bar transverse & longitudinal joints

4.2 Identify types of slab and load transfer.

4.3 Identify Tie bar Longitudinal and Transverse construction Joints

4.4 Place Dowel and tie Bars Joints Shape And Sealant

4.5 Identify space of tie bars and Cut material

Unit 5. Concrete work

5.1 Apply Place Concrete

5.2 Check poured concrete and finished level

5.3 Concrete Screed Level

ASSESSMENT CRITERIA:

Unit.1Plan and prepare work

- Define Basic concept of rigid pavement
- Identify compliance documentation
- Apply worksite instructions
- Identify material quantity requirements
- Identify Safety and Signage Requirements
- Select Plant ,Tools and equipment
- Apply Environmental protection requirements

Unit.2 Types of Rigid Pavement

- Identify types of Rigid Pavements
- Construct Jointed Plain Concrete Pavement
- Construct Jointed Reinforced Concrete Pavement
- Construct Continuous Reinforced Concrete Pavement
- Construct Pre-Stressed Concrete Pavement

Unit.3 Conduct pre paving inspection

- Define Over view of pre-paving inspection
- Check base course stability
- Establish offset pegs/profiles
- Check steel reinforcement placement

Unit.4. Identify Space construct tie bars joints and Cut material

- Define overview of Spacing Tie bar transverse & longitudinal joints
- Identify types of slab and load transfer.
- Identify Tie bar Longitudinal and Transverse construction Joints
- Place Dowel and tie Bars Joints Shape And Sealant
- Identify space of tie bars and Cut material

Unit.5 Concrete work

- Apply Place Concrete
- Check poured concrete and finished level
- Concrete Screed Level

LEARNING MODULE 10

TVET-PROGRAMME TITLE: Road Construction and Maintenance Level III

MODULE TITLE: Construction of Flexible Pavement

MODULE CODE:EIS RCM3 M10 0923

NOMINAL DURATION: 50 Hours

MODULE DESCRIPTION: This module covers the knowledge, attitudes and skills required to Conduct & monitor construction of Flexible Pavement (CLFP, FDAP, CRAM)

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

- Plan and Prepare Work
- Identify Types of Flexible Pavement
- Conduct Pre-Paving Inspection
- Place, spread and compact materials

MODULE CONTENTS:

UNIT.1 Plan and prepare work

1.1 Define the basic concept of flexible pavement

1.2 Identify compliance documentation

1.3 Apply worksite instructions

1.4 Identify material quantity requirements

1.5 Identify Safety and Signs t requirements

1.6 Select plant, tools and equipment

1.7 Identify Environmental protection requirements

UNIT.2 Types of Flexible Pavement

2.1.Define Over view of flexible pavement

2.2.Undertaken Conventional Layer Flexible Pavement

2.3.Construct full - depth asphalt pavement

2.4.Construct contained rock asphalt mat

UNIT.3 Conduct pre-paving inspection

3.1 Define overview of pre-paving inspection

3.2 Identify base course stability

3.3 Apply establish offset pegs/profiles

UNIT 4. Place, spread and compact materials

4.1 Determine road pavement layer and depth of spread materials
4.2 Specified trucks load placement
4.3 Checking moisture content and adjust uniformly.
4.4 Informed pavement compaction and roller operators
4.5 Checking pavement trimming and finishing levels

ASSESSMENT CRITERIA:

UNIT.1. Plan and prepare for work

- Define the basic concept of flexible pavement
- Identify compliance documentation
- Apply worksite instructions
- Identify material quantity requirements
- Identify Safety and Signs t requirements
- Select plant ,tools and equipment
- Identify Environmental protection requirements

UNIT.2. types of Flexible Pavement

- Define Over view of flexible pavement
- Identify Conventional Layer Flexible Pavement
- Construct full - depth asphalt pavement
- Construct contained rock asphalt mat

UNIT.3 Conduct pre-paving inspection

- Define overview of pre-paving inspection
- Identify base course stability
- Apply establish offset pegs/profiles

UNIT.4 Place, spread and compact materials

- Determine road pavement layer and depth of spread materials
- Specified trucks load placement
- Checking moisture content and adjust uniformly.
- Informed pavement compaction and roller operators
- Checking pavement trimming and finishing levels

LEARNING MODULE 11
TVT-Programme Title: Road Construction and Maintenance Level 3
Module Title : Concrete Kerb, Channel and Road Side Fixtures
Module Code : EIS RCM3 M11 0923
Nominal Duration : 80Hours
Module Description : This module covers specific unit of competence, which contains knowledge, skills and attitude required to install concrete kerb, channel, and road side fixtures work in the civil construction industry. It includes concrete kerb, channel, & road side fixtures requirement, cast in-situ concrete unit, pre-cast concrete units, and repairing kerb, gutters, and median, barrier strips finishing work, pre-cast concrete units, and repairing kerb, gutters, and median, barrier strips.
Learning Outcomes: At the end of the module the trainee will be able to: • Concrete Kerb, Channel, & Road Side Fixtures Requirement • Cast In-situ Concrete Unit • Pre-Cast Concrete Units • Repairing Kerb, Gutters, and Median, Barrier Strips
Module Contents: **Unit One: Concrete Kerb, Channel, & Road Side Fixtures Requirement** 1.1. Basic Concept of Concrete Kerb, Channel, and Road Side Fixtures 1.2. Compliance Document 1.3. Safety Requirement 1.4. Signage Requirement 1.5. Tools and Equipment 1.6. Environmental Protection Requirement **Unit Two: Cast In-situ Concrete Unit** 2.1. Existing Services 2.2. Setting Out Kerb, Channel, and Road Side Fixtures 2.3. Formwork and Concrete Work 2.4. Cleaning Up Construction Work Area, Martials, and Tools **Unit Three: Pre-Cast Concrete Units** 3.1. Base Section for Pre-Cast Unit Installation

3.2. Installing and Joining Pre-Cast Concrete Units

Unit Four: Repairing Concrete Units

4.1. Damaged Areas

4.2. Setting Up Formwork for Repairing Concrete Units

4.3. Placing Concrete for Repairing Concrete Units

4.4. Finishing Concrete for Repairing Concrete Units

4.5. Clearing, Backfilling and Finishing Area

Assessment Criteria:

Unit One. Identify concrete kerb, channel, & road side fixtures requirement

- Introduce concrete kerb, channel, and road side fixtures
- Identify compliance document
- Select and apply safety requirement
- Identify and apply signage requirement
- Identify and apply tools and equipment
- Identify environmental protection requirement

Unit Two. Install cast in-situ concrete unit

- Identify and protect existing services.
- Set out kerb, channel, and road side fixtures.
- Install formwork and cast concrete work.
- Apply clean up construction work area, martials, and tools.

Unit Three. Install pre-cast concrete units

- Prepare and finish base section for pre-cast unit installation.
- Install and join pre-cast concrete units.

Unit Four. Repair concrete units

- Identify and repair damaged areas
- Set up formwork for repairing concrete units
- Place concrete for repairing concrete units
- Finish concrete for repairing concrete units
- Clean, backfill, and finish area

LEARNING MODULE 12

TVET-PROGRAMME TITLE: Road Construction and Maintenance Level III

MODULE TITLE: Conducting and Monitoring Pavement Recycling Operations

MODULE CODE: EIS RCM3 M12 0923

NOMINAL DURATION:50Hours

MODULE DESCRIPTION: This Module 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.

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

- Requirements of Pavement Recycling Operation
- Pre-operation and operation of profile planer
- Profile planer Attachments
- Relocation of Profile Planer
- Equipment Performance

MODULE CONTENTS:

Unit One: Requirements of Pavement Recycling Operation

1.1 Over view of pavement recycling operation

1.2 Compliance documentation.

1.3 Safety requirement and Signage

1.4 Plant, tools and equipment

1.5 Environmental protection requirements

Unit Two: pre-operation and operation of profile planer

2.1 Overview of Profile planer

2.2 Pre-start, start-up, and park and shutting down procedures

2.3 Profile planer controls and functions

2.4 Hazard identification

2.5 Profile planer operating techniques.

2.6 Profile planer operation.

2.7 Material remove and Clear work area

Unit Three: Profile planer Attachments

3.1 Select attachment task

3.2 Remove and fit requirement

3.3 Test attachment

3.4 Use of attachment

3.5 Clean and store removed attachments.

Unit Four: Relocation of Profile Planer

4.1 Move Profile planer safely

4.2 Relocate profile planer

Unit Five: Equipment Performance

5.1 Prepare, park safely, and shutdown.

5.2 Fault inspection.

5.3 Defective parts.

ASSESSMENT CRITERIA:

Unit One: Requirements of Pavement Recycling Operation

- Access, interpret and apply compliance documentation
- Obtain, confirm, and apply safety and signage requirement
- Select, check and report of plant, tools and equipment
- Identify, confirm and apply environmental protection requirements

Unit Two: pre-operation and operation of profile planer

- Ensuring pre-start, start-up, and park and shutting down procedures.
- Checking profile planer controls and functions
- Identify hazard and safe operating techniques
- Identify and apply Profile planer operating techniques
- Operate profile planer
- Operate material removing and Clearing work area

Unit Three: Profile planer Attachments

- Select attachment task
- Remove and fitting requirement
- Test and fitting operation
- Use of attachment
- Clean and store removed attachments.

Unit Four: Relocation of Profile Planer

- Observe Moving Profile planer safely
- Prepare relocate profile planer

Unit Five: Equipment Performance

- Prepare, park safely, and shutdown.
- Conduct fault inspection.
- Maintain, remove, and replace defective parts.

LEARNING MODULE 13
TVET-PROGRAMME TITLE: Road Construction & Maintenance Level III
MODULE TITLE: Conducting Pile Construction Operations
MODULE CODE: EIS RCM3 M13 0923
NOMINAL DURATION: 60Hours
MODULE DESCRIPTION: This module 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.
LEARNING OUTCOMES At the end of the module the trainee will be able to: • Pile construction planning • Pile positions • Boring and piling rig • Piling rig plant establishment • Drive pile and clean-up work place

MODULE CONTENTS:

Unit One: Pile Construction Planning

1.1 Relevance document

1.2 Safety requirements.

1.3 Traffic signage.

1.4 Plant, tools and equipment.

1.5 Environmental protection

Unit Two: pile positioning

2.1. Establish location, position for pile and plant

2.2. Boring hole.

2.3.Caisson pile construction

2.4. Placing concrete and vibrating.

Unit Three: Boring and Piling Rig

3.1. Boring and piling rig.

3.2. Remove boring and pile rig.

Unit Four: Pile Positions and Rig Plant Establishment

4.1.piles location and establishment

4.2.pile equipment

4.3.piling area

Unit Five: Drive Pile and Clean-Up Workplace

5.1 Lifting pile and maneuver

5.2 drive pile

5.3 splicing or jointing

5.4 workplace and equipment cleaning

ASSESSMENT CRITERIA:

Unit 1. Plan and prepare for work

- Interpret relevance document
- Obtain Safety requirements.
- Identify, obtain and implement traffic signage.
- Select plant, tools and equipment.
- Identify environmental protection

Unit.2. Pile Positions

- Interpret how to establish, location, position for pile and plant with related equipment
- Introduce boring hole.
- Check, install and prepare caisson.
- Explain place concrete and vibrating

Unit 3. Boring And Piling Rig

- Locate boring and piling rig.
- Remove boring and pile rig.

Unit 4. Pile positions and rig plant establishment

- Set out and establish location for piles.
- Prepare plant and check pile equipment
- protect piling area

Unit 5. Drive pile and cleaning

- Lift pile and maneuver
- Set up piling rig and drive pile
- Carry out splicing or jointing
- clean up workplace and equipment

LEARNING MODULE 14

TVET-PROGRAMME TITLE: Road construction and maintenance Level III

MODULE TITLE: Performing Road Maintenance Operation and Surface Treatment

MODULE CODE: EIS RCM3 M14 0923

NOMINAL DURATION: 40 Hours

MODULE DESCRIPTION: This module covers 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.

LEARNING OUTCOMES

At the end of the module the trainee will be able to:

- Plan and prepared for sealing operations
- Check pre-maintenance operation
- Repair damaged surfaces
- Oversee the execution of tasks
- Report the Execution of Tasks

MODULE CONTENTS:

Uinit One: Sealing Operations and sealing tasks

1.1 Sealing Operations

1.1.1 Concepts of Road Maintenance Operation and Surface Treatment

1.1.2 Compliance documentation

1.1.3 Asphalt treatments

1.1.4 Types of Plant and Equipment

1.1.5 Specific task information and requirements

1.1.6 Signs and Safety Equipment

1.1.7 Job plan

1.2 Sealing tasks

1.2.1 Acquire and make available the necessary resources

1.2.2 Clear and timely instruction

1.2.3 Set out tasks

Unit Two: Check pre-maintenance operation

2.1 Road maintenance operation

2.1.1 Types of road maintenance

2.2 Pre-operational road maintenance unit

2.2.1 Importance of Pre-Operational Checks:

2.2.2 Components of a Road Maintenance Unit:

2.3 Operating components of the truck

2.3.1 Significance of Pre-Maintenance Operations:

2.3.2 Operating Components of the Truck:

2.4 Checking the tank for prevention of contamination

2.4.1 Importance of Pre-Maintenance Tank Contamination Prevention Check:

2.4.2 Procedure for Pre-Maintenance Tank Contamination Prevention Check:

2.5 Filling the tank with required materials

2.5.1 Bitumen emulsions are a mixture of bitumen, water, and emulsifying agent

2.6 Standard mix of asphalt and emulsion

2.6.1 Asphalt:

2.6.2 Emulsion:

Unit Three: Repair damaged surfaces:

3.1 Start up, park, shut down procedures

3.2 Truck and Boom positioning

3.2.1 Truck positioning

3.2.2 Boom positioning

3.3 Area preparation

3.4 Material Patching and quantities

3.4.1 Patching material application

3.4.2 Material quantities and additives.

3.5 Repairing operations

Unit Four: Oversee the execution of tasks

4.1 Performance of sealing operations

4.1.1 Ongoing Risk Assessment:

4.1.2 Engineering Survey:

4.1.3 Sampling and Testing:

4.1.4 Recording and Observation of Construction Practice:

4.1.5 Required Outcomes:

4.2 Sealing works practice or job plan

4.2.1 Importance of Adjustments to Sealing Works Practice:

4.2.2 Factors to Consider when Initiating Adjustments:

4.2.3 Benefits of Initiating Adjustments:

4.3 plant, equipment and tools maintenance requirements

4.3.1 Importance of Plant Equipment and Tools Maintenance

4.3.2 Maintenance Procedures for Plant Equipment and Tools:

4.3.3 Recording Maintenance Activities:

Unit Five: Report the Execution of Tasks

5.1 Completing and submitting reports

5.1.1 Importance of Reports in Road Maintenance Operations:

5.1.2 Submission of Reports:

5.2 Recommending changes to tasks

5.2.1 Improving Safety:

5.2.2 Improving Effectiveness:

ASSESSMENT CRITERIA:

Unit One: Plan and Prepared for Sealing Operations

- Understand Concepts of Road Maintenance Operation and Surface Treatment
- Access ,interpret and apply compliance documentation
- Identify the types of asphalt treatment
- Identify the plant and equipment requirements
- Access and share specific task information and requirements
- Prepare a job plan
- Acquire and make available necessary resources
- Clear and timely instructions to team members
- Set out tasks

Unit Two. Check Pre-Maintenance Operation

- Prepare road maintenance operation.
- Carry out pre-operational road maintenance unit.
- Check operating components of truck
- Check the tank for prevention of contamination
- Fill the tank with required materials
- Determine standard mix of emulsion and/or type of asphalt.

Unit Three. Repair Damaged Surfaces

- Carry out start-up, park, and shut-down procedures
- Position Truck and Boom
- Blow the area to be repaired
- Apply Material Patching and Measure quantities
- Conduct, control, and monitor repairing operations

Unit Four: Oversee the Execution of Tasks

- Monitor the performance of sealing operations
- Initiate adjustments to sealing works practice or job plan
- Ensure plant equipment and tools maintenance and recording requirements

Unit Five. Report on The Execution of Tasks

- Complete and submit required reports
- Recommend changes to tasks

Annex: resource requirements

Item no.	Category/item	Description/ specifications	Quantity	Recommended ratio (item: trainee)
A.	**Learning Materials**			
1.	TTLM	TTLM prepared by the trainer	5	1:5
2.	Reference books			
2.1	Beginning Auto CAD 2022 exercise workbook For windows®	Cheryl r. Shrock, steve heather2022	5	1:5
2.2	Road materials and pavement design	Taylor and francis	5	1:5
2.3	Pavement design manual volume one	Ethiopian Road Authority 2013	5	1:5
2.4	Pile foundations in engineering practice	Shamsherprakash, hari d. Sharma	5	1:5
2.5	Pile foundations design and construction	Paperback – january 1, 2006 by mittal (author)	5	1:5
2.6	Rural road maintenance training modules for contractors	Module-7 routine maintenance work method	15	3:5
2.7	Journals/publication/magazines	Electronic (open access journal)	5	1:5
2.8	Irrigation and Drainage Engineering	Asst. Prof. Dr. Rasoulm.khalaf	5	1:5
B.	**Learning Facilities & Infrastructure**			
1	Chair	Pu molded foam 595x 580x 830 mm	25	1:1
2	Duster	Magnetic duster	1	1:25
3	Laptop	Hp /lenovo	1	For trainer
4	Printer	Input capacity 900 sheets “device memory	1	

		1 gb		
5	Projector	Full hd 1080p	1	For trainer
6	Screen	Simple portable width 121.92 cmviewing height 182.88 cm	1	For trainer
7	White board	Frame material aluminium 5760 × 3840 pixels		
C.	**Consumable Materials**			
1	Aggregate	0.0,02,0.4 crushed stone	3 truck (48m³)	1:25 (as required)
2	Asphalts	Sea sand	1truck (16m³)	1:25
3	Australia timber	2cm*20cm*m	12ps	1:2
4	Backfill	M3	As require	1:3
5	Bedding materials	M3	As require	1:1
6	Benzyl			
7	Bitumen	Bitumen grade 80/100	Drum	
8	Bitumen emulsions	Local area	1truck (16m³)	1:25
9	Black wire	5kg 0.3mm 25kg-40kg per roll	5	1: 5
10	Blend	Graduation requirement Passing sieve size	1	1:25
11	Calculator	Casio fx -82 black scientific calculator	25	1:1
12	Cement	OPC 50kg	25 bag	1:1
13	Cleaning agents	.material stabilized	1	1:25
14	Concrete	Pipe 3’ and above	As require	1:1
15	Concrete and concrete	C-25 and dia of 8,10	30 pcs	1:1

	reinforcing materials	and 12		
16	Conduit and tubing	Plastic	10 pcs	1:3
17	Duster	(l x w x h): 6 x 1.5 x 2 Magnetic duster	1	1:25
18	Formwork materials	4x0.2m	30 pcs	1:1
19	Gravel	0.0,02,0.4 crushed stone	3 truck ($48m^3$)	1:25 (as required)
20	Imported fill	As required		
21	Kerosene			
22	Lime	A hydrated lime	25 bag	1:1
23	Marker	white board	25	1:1
24	Mechanical stabilization	400 psi for cylindrical	Kg	
25	Meter	5m,50m rubber tape	10	2:5
26	Nail	Different size	25kg	1:1
27	Other chemicals	As required		
28	Pen	Ball pen	25	1:1
29	Picks	Head material cast iron Handle length 800 mm handle material wood	6pack	1:5
30	Pipe	Dia 50,75 and 3''	As require	1:1
31	Plain rods	Ø12mm	5pcs	1:5
32	Quarried	Local area product	1	1:25
33	Reinforcement bar	Dia. 8-24mm		
34	Sand	River	$13m^3$	1:2
35	Spacer/spreader	Ø6mm	25	1:1
36	Stabilized	. Material stabilized	1	1:25
37	Stone	Local area	1truck ($16m^3$)	1:25
38	Sub-soil drainage	Concrete pipe	6pack	1:5
39	Water	Pure	250 litt	10:
D.	**Tools and Equipment**			

1	Aggregate dryer	Item number sd4.5 Dia x length4.5′ x 30′production 60 tph Burner size15 btubaghouse 8,000 a	1	1:25
2	Air compressor	Horse power 5 hp air tank capacity 220l		
3	Asphalt distributor	Automatic 40～400t/h	1	1:25
4	Augers	Drill hole diameter: >300mm Drill hole depth:50-70m Drilling way: rotary	1	1:25
5	Automatic levels	Magnification + 32 , image- erect , objective aperture: 36mm, field of view : 1 degree 20^0, accuracy:- +-0.3 , net wet – 1.8kg with accessories	5 pcs Each	1:5
6	Backhoes	Hydraulic system	1	1:25
7	Bar bender	dia.14mm 60cm	12	1:2
8	Barrows	Load 180kg Water capacity 80l	5	1:5
9	Baw saw	Ms china bow saw for construction	5 pcs	1:5
10	Bolt cutters	Rs pro 460 mm steel bolt cutter	5pcs	1:5
11	Brooms	Wooden broom handle	5	1:5
12	CBR testing device		1	1:25

13	Chutes	Metal: aluminum-coated; a 463/a 463m, type 1 with not less than t1-40 (t1m-120).	5pcs	1:5
14	Compaction test apparatuses	Proctor compaction	1	1:25
15	Concrete compressive test machine	Capacity1000kn pressure gauge 1000kn	1	1:25
16	Concrete mixers	Drum volume135 lt. Mixing volume125 lt. Mixing capacity2-3 m /h (diesel engine powered	1	1:30
17	Concrete vibrators	Vib.headdia 61mm hose:4m 18.0kg Hose:6m 19.9 18a 48vthree phase	1	1:25
18	Crane	Max. Carrying capacity 60 t at reach 3 m	1	1: 25
19	Crow bars	Size 10 inch Material stainless steel	5	1:5
20	Cutting knives	Hudson bay axe hand with wood	10	2:5
21	Dump trucks	Sino truck payload 35t	1	1:25
22	Excavator	Engine power 67 kw	1	1:25
23	Floats	Wooden craft 12”x5”	5 pcs	1:5
24	Formwork	Plywood and sawn timber	15	For required
25	Front end loaders	Lt mg 6ton hydraulic - mechanical	1	1:25
26	Graders	Weight: 15.5t – standard tyres: 17.5-25-	1	1:25

		12pr		
27	Gravel spreader	Manual gravel spreader	1	1:25
28	Grinders	Rated voltage 220-240v/110v Rated 2000/2300w	As require	1:25
29	Hammers	Weight 5kg	As require	1:25
30	Hand lances	Folding pattern stee	5	1:5
31	Handsaws	Steel hand saw	10	2:5
32	Hessian	Brown 320kg/roll	1	1:25
33	High pressure hoses			
34	Hose-level	Transparent hard 0.5mm diameter	50m	10:5
35	Hoses	Radiator hose	1	1:25
36	Jack hammers	Makita mt 1510w	3	3:5
37	Leveling equipment	Accuracy 0.5 in Rand flok	1pcs	1:25
38	Lifting equipment	Capacity 500kgs to 3ton Power source hydraulic	1pcs	1:25
39	Line level	80x120mm length 4-6cm	15 pics	1:2
40	Liquid limit apparatuses	Net weight: 6.2kgs get brass	1	1:25
41	Loader	Certification: ce, iso9001: 2000 Condition: new Rated load: 6-9t Transmission: hydraulic-mechanical	1	1:25
42	Measuring tape	5m-100m	25	1:1

43	Mixer	China 230l powerful electric concrete mixer	1 pcs	1:25
44	Mould	1000cc	5 pcs	1:5
45	Oxy-acetylene equipment	With shank mixer, swaged detachable tips of various sizes	1	1:25
46	Pavers	Automatic pavers	1	1:25
47	Pile hammers			
48	Plain rods	Ø12mm	5pcs	1:5
49	Plumb bob	Vrs 250 grams	13	1:2
50	Rake	35 minimum to 48 maximum in hardened zone of the teeth. Fixed to a handle	25	1:1
51	Reinforcement benders	14mm new manual rebar bender steel bar bending	5 pcs	1:5
52	Rollers	3 ton vibratory road roller	1	1:25
53	Saws	Weight 126 kg Cutting depth 180 mm Disc ø 500 mm Engine manuf.		
54	Scaffolding	Length : 1.80mtr Width : 0.80 mtr Maximum load per platform 225 kg and for the	1	1:25
55	Scaffolding components	Ø8cm eq. Tree	5pcs	1:5
56	Shovels	Dimension 295mmx270mm	1pcs	1:25
57	Skid-steers	Cutter pillar skid steers	1	1:25
58	Slurry boxes	Hydraulic front axel lift	1	1:25

59	Spacer/spreader	Ø6mm	25	1:1
60	Spade	Mild steel	25	1:1
61	Spare water jets	Car washer water spray jet	1	1:25
62	Spirit levels	Steel with 80m	5	1:5
63	Squeegees	Stainless steel handle plastic	10	2:5
64	String lines	Brick layer 2mm thick,100m	5 roll	1:5
65	String lines and levels	Nylon 50m	As required	1:30
66	Tape measures	Stainless steel measuring tape size 5mx19mm	25	1:1
67	Tensile strength machine	Ranges least counts, 0.125 n · 0.25n ; elongation scale l.c. 0.01 mm, 0.01 mm	1 pcs	1:25
68	Tip-trucks	Sino truck payload 35t	1	1:25
69	Tool kits	Chrome vanadium steel handle pp	2	2:25
70	Trowels	Brick trowel wood handle	5 pcs	1:5
71	Truck	Horse power : 336hp Drive model : 6x4 Payload : 35t Cargo box size : 6000*2300*1000mm Tires : 12.00r20	1	1:25
72	Vibrating plates	Plate compactor 30cm/s	1	1:25
73	Vibrators	Electrical concrete vibrator 380v	1 pcs	1:25

74	Water carts	15,000-liter capacity hydraulic controlled water	1	1:25
75	Watering cans	Blue plastic water can weight 2-4kg	5	1:5
76	Wheelbarrows	Wheelbarrow for construction capacity 200k9g.	5 pcs	1:5
77	Wire nippers	Ms diagonal wire cutter size 6inch	5 pcs	1:5
78	Wire ties	Roll	1	1:25

The trainers who modify the curriculum

Name	Qualification	Field of Study	Institute	Phone Number	Email
Ashagre Bibiso	B	Road Construction (B.Sc.)	Wolaita Sodo Polytechnic College	0912304708	ashagrebibiso@gmail.com
Bekalu Yibeltal	A	Structural Engineer (M.Sc.) Civil Engineering (B.Sc.)	FTVTI	0911271096	fikruyibetal@gmail.com
Belete Aweke	B	Road Construction (B.Sc.)	Bahir Dar Polytechnic College	0910974355	beleteyc@gmail.com
Habib Surur	B	Road Construction (B.Sc.)	Hawassa Polytechnic College	0979798778	Habibsurur0@gmail.Com
Mohammed Seid	A	Surveying (B.Sc.) Construction Technology and Management (M.Sc.)	FTVTI	0914053274	muha.seid@gmail.com
Nigussie Teshome	A	Geotechnical Engineering (M.Sc.) Civil Engineering (B.Sc.)	Arba Minch Polytechnic and Satellite Institute	0913767770	teshomeng@gmail.com
Wondwesn Girma	A	Construction Technology and Management (M.Sc.) Civil Engineering (B.Sc.)	Harar Polytechnic College	0912778365	wondwesngirma@gmail.com
Zekarias Gebre	B	Civil Engineering (B.Sc.)	General Wingate Polytechnic College	0912421317	thekey1502@gmail.Com

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