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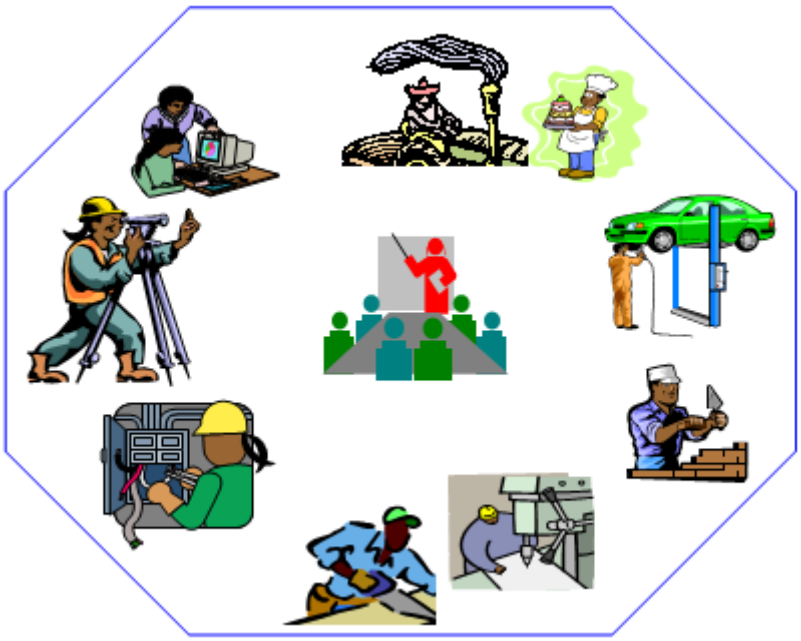
MINISTRY OF LABOR AND SKILLS

ROAD CONSTRUCTION AND MAINTENANCE

LEVEL – II



CURRICULUM

Based on March, 2021 (V- I) Occupational standard (OS)

March, 2022

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 – taking into account 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 II.**

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 II

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 with the occupational standard. The Trainees who successfully completed the Program will be qualified to work as **Assistance Road worker II** 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 **Establish Labor-based Control Points, Produce Detailed Engineering Drawings, Conduct and Support Pit Run Material Production Operation, Conduct Sampling, Specimen Preparation and Material Testing, Identify, Locate and Protect Underground Services, Conduct Labor based Earthwork**

, Install Trench Support, Construct Reinforcement Dowels and Tie Bars, Conduct labor-based Rigid Asphalt Pavement, Conduct Labor based flexible asphalt pavement, Place and Fix Reinforcement Materials, Establish Labor-based Control Points, Form Ford/Vented Structure and Pave Ditch, Construct, Lay and Maintain Pipe, Box and Slab Culverts, Conduct Road Performance Condition, Perform Minor Road Maintenance Operation, Install Pre-cast Bridge Elements, Prevent and Eliminate MUDA, 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 RCM2 01 0322 Establish Labor-based Control Points

EIS RCM2 02 0322 Produce Detailed Engineering Drawings

EIS RCM2 03 0322 Conduct and Support Pit Run Material Production Operation

EIS RCM2 04 0322 Conduct Sampling, Specimen Preparation and Material Testing

EIS RCM2 05 0322 Identify, Locate and Protect Underground Services

EIS RCM2 06 0322 Conduct Labor based Earthwork

EIS RCM2 07 0322 Install Trench Support

EIS RCM2 08 0322 Construct Reinforcement Dowels and Tie Bars

EIS RCM2 09 0322 Conduct labor-based Rigid Asphalt Pavement

EIS RCM2 10 0322 Conduct Labor based flexible asphalt pavement

EIS RCM2 11 0322 Place and Fix Reinforcement Materials

EIS RCM2 12 0322 Produce and Install Pre-Cast Concrete Elements

EIS RCM2 13 0322 Form Ford/Vented Structure and Pave Ditch

EIS RCM2 14 0322 Construct, Lay and Maintain Pipe, Box and Slab Culverts

EIS RCM2 15 0322 Conduct Road Performance Condition

EIS RCM2 16 0322 Perform Minor Road Maintenance Operation

EIS RCM2 17 0322 Install Pre-cast Bridge Elements

EIS RCM2 18 0322 Prevent and Eliminate MUDA

1.4.Duration of the TVET-Program

The Program will have duration of **1180 *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.

s.no	Unit competency	TVET Institution training		Cooperative training	Total hours	Remarks
		Theory	Practical			
1.	Establish Labor-based Control Points	**19.5**	**26**	**19.5**	**65**	
2.	Produce Detailed Engineering Drawings	**18**	**24**	**18**	**60**	
3.	Conduct and Support Pit Run Material Production Operation	**18**	**24**	**18**	**60**	
4.	Conduct Sampling, Specimen Preparation and Material Testing	**36**	**48**	**36**	**120**	
5.	Identify, Locate and Protect Underground Services	**15**	**20**	**15**	**50**	
6.	Conduct Labor based Earthwork	**6**	**8**	**6**	**20**	
7.	Install Trench Support	**15**	**20**	**15**	**50**	
8.	Construct Reinforcement Dowels and Tie Bars	**24**	**32**	**24**	**80**	
9.	Conduct labor-based Rigid Asphalt Pavement	**15**	**20**	**15**	**50**	
10.	Conduct Labor based flexible asphalt pavement	**27**	**36**	**27**	**90**	
11.	Place and Fix Reinforcement Materials	**15**	**20**	**15**	**50**	
12.	Produce and Install Pre-Cast Concrete Elements	**24**	**32**	**24**	**80**	
13.	Form Ford/Vented Structure and Pave Ditch	**18**	**24**	**18**	**60**	
14.	Construct, Lay and Maintain Pipe, Box and Slab Culverts	**22.5**	**30**	**22.5**	**75**	
15.	Conduct Road Performance Condition	**15**	**20**	**15**	**50**	

16.	Perform Minor Road Maintenance Operation	**27**	**36**	**27**	**90**	
17.	Install Pre-cast Bridge Elements	**15**	**20**	**15**	**50**	
18.	Prevent and Eliminate MUDA	**24**	**32**	**24**	**80**	

1.5. 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 II**.**

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.

1.6. 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 assistance Road worker **II**. 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 RCM2 01 0322	Establish Labor-based Control Points	EIS RCM2 M01 0322	Establishing Labor-based Control Points	• Plan and prepare • Set out Horizontal alignment • Set out Vertical alignment	65
EIS RCM2 02 0322	Produce Engineering Drawings & Sketch	EIS RCM2 M02 0322	Producing Engineering Drawings & Sketch	• Determine drawing requirements • Produce detail drawings • Issue and/or file drawing	60
EIS RCM2 03 0322	Conduct and Support Pit Run Material Production Operation	EIS RCM2 M03 0322	Conducting and Supporting Pit Run Material Production Operation	• Plan and prepare • identify Road Construction materials • Conduct, production of selected quarry materials, •	60
EIS RCM2 04 0322	Conduct Sampling, Specimen	EIS RCM2 M04 0322	Conducting Sampling, Specimen Preparation and Material Testing	• Plan and prepare for work • Take samples • Conduct material testing	120

	Preparation and Material Testing			• (Including Specimen Preparation)Conduct preparation of stabilized construction materials • Identify hazards and risks • Control hazards and risks	
EIS RCM2 05 0322	Identify, Locate and Protect Underground Services	EIS RCM2 M 05 0322	Identifying, Locating and Protecting Underground Services EIS RCM2 05 0322	• Plan and prepare • Identify underground services • Locate and Protect underground services • Clean up	50
EIS RCM2 06 0322	Conduct Labor based Earthwork	EIS RCM2 M06 0322	Conducting Labor based Earthwork	• Plan and prepare work • Carry out Clearing and Grubbing operation • Set out sub-grade • Form earth works • Place and compact sub-grade replacement materials • Clean up	20
EIS RCM2 07 0322	Install Trench Support	EIS RCM2 M07 0322	Installing Trench Support	• Plan and prepare • Install trench shoring	50

				• Remove trench shoring • Clean up	
EIS RCM2 08 0322	Construct Reinforcement Dowels and Tie Bars	EIS RCM2 M 08 0322	Constructing Reinforcement Dowels and Tie Bars	• Plan and prepare • Set up and test equipment • Cut material • Heat and bend material • Complete work and clean up	80
EIS RCM2 09 0322	Conduct labor-based Rigid Asphalt Pavement	EIS RCM2 M09 0322	Conducting labor-based Rigid Asphalt Pavement	• Plan and prepare for work • Prepare to Construct Plum Rigid Concrete Surface • Identify types of labor-base Rigid Pavement • Lay labor base rigid Concrete pavement. • Check final • finishing work & Clean Up	50
EIS RCM2 10 0322	Conduct Labor based flexible asphalt pavement	EIS RCM2 M10 0322	Conducting Labor based flexible asphalt pavement	• Plan and prepare for work • Undertake road base preparations • Identify types of flexible pavement • Apply prime coat	90

				• Lay flexible asphalt manually • Clean up •	
EIS RCM2 11 0322	Place and Fix Reinforcement Materials	EIS RCM2 M11 0322	Placing and Fixing Reinforcement Materials	• Plan and prepare • Prepare for reinforcement placement • Place and fix reinforcement • Check reinforcement • Clean up	50
EIS RCM2 12 0322	Produce and Install Pre-Cast Concrete Elements	EIS RCM2 M12 0322	Producing and Installing Pre-Cast Concrete Elements	• Plan and prepare for work • Prepare concreting works materials • Set out for concrete work • Install reinforcement and Erect formwork • Carry out concrete work • Strip formwork • Erect concrete crash barriers man hole and ditch cover • Install Precast Element • Clean up	80

EIS RCM2 13 0322	Form Ford/Vented Structure and Pave Ditch	EIS RCM2 M13 0322	Forming Ford/Vented Structure and Pave Ditch	• Plan and prepare ford structure work • Construct ford/ vented structure and paved ditches • Maintain Ford, culvert pipes and ditch structures • Clean up	60
EIS RCM2 14 0322	Construct, Lay and Maintain Pipe, Box and Slab Culvert	EIS RCM2 M14 0322	Constructing, Laying and Maintaining Pipe, Box and Slab Culvert	• Plan and prepare • Set out and excavate foundation • Construct Pipe, box/slab culvert and check dam • Lay pipe • Maintain pipe, box, /slab culvert and check dam • Clean up	75
EIS RCM2 15 0322	Conduct Road Performance Condition	EIS RCM2 M15 0322	Conducting Road Performance Condition	• Prepare plan • Implement traffic operation and safety measures • Identify gravel roads performance measures • Report on maintenance	50

EIS RCM2 16 0322	Perform Minor Road Maintenance Operations	EIS RCM2 M16 0322	Performing Minor Road Maintenance Operations	• Plan and prepare • Check pre-maintenance operation • Repair damaged surfaces • Check equipment performance • Carry-out routine maintenance work • Carry-out periodic maintenance work • Carry-out emergency maintenance • Summary of report of the work achieved • Clean up	120
EIS RCM2 17 0322	Install Pre-Cast Bridge Elements	EIS RCM2 M17 0322	Installing Pre-Cast Bridge Elements	• Plan and prepared • Install bearings • Install girders • Install pre-cast parapet units • Finish parapet • Install concrete bridge deck • Fix bridge fittings • Clean up	70

EIS RCM2 18 0322	Prevent and Eliminate MUDA	EIS RCM2 M18 0322	Preventing and Eliminating MUDA	• Prepare for work • Identify MUDA and problem • Analyze causes of a problem. • Eliminate MUDA and Assess effectiveness of the solution. • Prevent occurrence of wastes and sustain operation.	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 **B Level** and above who have satisfactory practical experiences or equivalent qualifications

LEARNING MODULE 1

TVET-PROGRAMME TITLE: Road Construction & Maintenance Level II

MODULE TITLE: Establishing Labor-based Control Points

MODULE CODE: EIS RCM2 M01 0322

NOMINAL DURATION:65 Hours

MODULE DESCRIPTION: This module 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 centerline 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:

LO1. Plan and prepare

LO2. Set out Horizontal alignment

LO3. Set out Vertical alignment

MODULE CONTENTS:

LO1. Plan and prepare

1.1 Obtaining, confirming and applying Work instructions.

1.2 Safety requirements.

1.3 Signage requirements.

1.4 Selecting tools and equipment.

1.5 Checking labor based leveling equipment/profile board.

1.6 Identifying Environmental protection requirements.

LO2. Set out Horizontal alignment

2.1 Establishing straight section route alignment.

2.2Joining established points to make Smooth curve.

2.3 Set out cross sections

2.4 Establishing offset pegs.

LO3. Set out Vertical alignment

3.1 Establishing straight grades.

3.2 Establishing sags or dips.

3.3 Establishing crests or humps.

3.4 Set-up leveling instruments/profile board.

3.5 Documenting leveling Results

Learning Methods:				
For none impaired trainees	**Reasonable Adjustment for Trainees with Disability (TWD)**			
	Low Vision	**Deaf**	**Hard of hearing**	**Physical impairment**
Lecture-	❖ 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	❖ 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

		❖ Summarize main points		
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 ❖ Implement with drawing tools	❖ use Sign language interpreter ❖ Use video recorded material ❖ Ensure attention of the trainees ❖ Provide structured training ❖ Show clear and short method ❖ Use gesture ❖	❖ 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 equipments/ 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	❖ Introduce the trainees with their peers

			members to speak loudly	
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 ❖ (if necessary) ❖ Time extension	❖ 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 ❖ Time extension for trainees having severe upper limb impairment
Demonstration /Observation	❖ Brief the instruction or provide them in large text ❖ Time extension	❖	❖	

ASSESSMENT CRITERIA:

LO.1. Plan and prepare

- Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied to the allotted task
- Environmental protection requirements are identified from the project environmental management plan, confirmed and applied to the allotted task
- Signage requirements are identified and obtained from the project traffic management plan and observed
- 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
- Labor based leveling equipment/profile board is checked for serviceability, within specified tolerances and any faults are reported
- Safety requirements are obtained from the site safety plan and organizational policies and procedures, confirmed and applied to the allotted task

LO.2. Set out Horizontal alignment

- The established points are joined to make a smooth curve as per the given or agreed design requirement
- The straight section between the points of intersection (PIs) are established as per the given or agreed design requirement or selected route alignment.

LO.3. Set out Vertical alignment

- The straight grades are established as per the given or agreed design & specification requirement.
- Results of leveling procedure are documented and closed out to organizational requirements
- The crests or humps are established as per the given or agreed design & specification requirement.
- labor based leveling instruments/profile board are set-up and correctly used in accordance with standard operating procedures and/or manufacturers' guidelines
- The sags or dips are established as per the given or agreed design & specification requirement

Annex: Resource Requirements

Establish Labor-based Control Points EIS RCM2 01 0322				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	***Learning Materials***			
1.	TTLM	TTTLM prepared by the trainer	5	1:5
2.	Reference Books			
2.1	Fundamental of surveying	S.K.Roy 2nd edition	5	1:5
2.2	Surveying	Vol.II D.r B.C.Punmia	5	1:5
	LECTURE NOTES ON SURVEYING Course Code: 3CE4-05 B.TECH III Semester	Prepared By: Mr. Prateek Sharma Assistant Professor	5	1:5
2.3	LAND SURVEYING PRACTICAL	Mala Babagana Gutti1 and Ani Abdulfatah Musa2 Email: malabgutti@gmail.com1, abusco20@gmail.com	5	1:5
2.4	Surveying Instruments.	Lewis, M. J. T. (2001).	5	1:5
	An Elementary Highway Design (pp.24)	Edition: FirstChapter: 3Editors: Kolita S. Weerasekera	5	1:5
	Introduction to Surveying	Second Edition ***Author Michael Minchin***		
	Engineering survey	6th edition	5	1:5
2.3	ASTM, American Society for Testing and Materials (ASTM). West	2004	5	1:5

	Conshohocken, Pa, USA.			
2.4	ERA manual	2013 edition	10	1:3
B.	***Learning Facilities & Infrastructure***			
1.	Lecturing room	8m*6m	1	1:25
2.	Chair with Tablet Arm	“Type Office Furniture" “PU molded foam” 595W x 580D x 830H (mm	25	1:1
3.	Printer	Lesser jet Input Capacity 900 sheets “Device Memory1GB” “Display WVGA 5.0" Colour Touchscreen LCD” Dimensions(W x D x H) 438 x 373 x 312mm Weight Approx. 9.2 kg	1	1:1
4	Laptop	Hp or Lenovo	1	For trainer
5	projector	Full HD 1080p	1	For trainer
6	screen	Viewing Width 121.92 cm Viewing Height 182.88 cm Type Pull-Down Screen Viewing Angle 160 degree Frame Depth5 cm Weight 10 kg		
7	White board	Frame Material Aluminium 5760 × 3840 pixels	1	1:25
	duster	Dimensions (L x W x H): 6 x 1.5 x 2	1	1:25
C.	***Consumable Materials***			
1.	paper	Double A A4	1 packet	
2	pen	Nib Size 0.7 mm	25	1:1
5	pigs	Wood or metal	As	1:25

			require	
6	string	3mm polyethylene twine plastic string roll	5roll	1:5
D.	***Tools and Equipments***			
1.	Line level	Mini Level 3"	5	1:5
2	Meter	5m-50m	5	1:5
3	Profile board	2m rod and 60 + shape flat sheet.	8	1:3

LEARNING MODULE 02

TVET-PROGRAMME TITLE: Road construction and maintenance Level II

MODULE TITLE: Producing Engineering Drawings & Sketch

MODULE CODE: EIS RCM2 M02 0322

NOMINAL DURATION: 60 Hours

MODULE DESCRIPTION: This module producing Technical drawings view components Like 2D, 3D,Paper Size,Titl Blocks, Drawing Scale & Othre Components are completed with dimansions details and road structure skecths.

LEARNING OUTCOMES

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

LO1. Determine drawing requirements

LO2. Produce detail drawings

LO3. Issue and/or file drawing

MODULE CONTENTS:

LO1. Determine drawing requirements.

1.1 Checking and interpreting drawing requirements

1.2 Requiring sources of information.

1.3 Scope of drawing

LO2. Produce detail drawings

2.1 Completing drawing details

2.2 2D and 3D view

2.3 Determining and inserting Dimension of components

2.4 Appropriate symbol and drawing

2.5 Draw 1st and 3rd angle projection

2.6 Producing detail drawing

2.7 Assembly drawing

2.8 Auxiliary view

2.9 Producing road and road structure sketches:

- Pipe culvert
- Box culvert
- Slab culvert and other bridges
- Road 2d, 3d and road section

LO3. Issue and/or file drawing

3.1 labelling and sorting drawing

3.2 Issueing Drawing

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	❖ 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	❖ 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

	physical feature of the work shop ❖ Summarize main points	❖ Present the lecture in video format ❖ Summarize main points		
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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up	❖ Facilitate the integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees	❖ Introduce the trainees with their peers

	❖ Brief the thematic issues of the work	❖ Introduce the trainees with other group member	with other group member ❖ Inform the group members to speak loudly	
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	❖ Use sign language interpreter ❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	

	❖ Facilitate the trainees to prepare and submit the assignment in soft or hard copy			

ASSESSMENT CRITERIA:

LO.1 Determine drawing requirements

- Drawing requirements are checked and interpreted from work order or similar.
- Required information is sourced from workshop manuals, customer specifications, product suppliers, designers or similar.
- Scope of drawing including Top view,Front,Rear Elevation right and left side elevations , additional required information and resources is planned

LO.2 Produce detail drawings

- **Drawing** details including assembly and components are completed.
- D Drowings means two dimansional veiw drowing(X,Y)Coordnate
- D:- means Three dimansional veiw drowing(X,Y,Z)Coordnate
- Dimensions of various components are determined and inserted where statrting and ending refernce required.
- Appropriate symbols for limits and fits, surface texture and **geometric tolerances** are included.
- **Simple components or layouts** are drawn in third angle projection.
- An auxiliary view is drawn of a component, given two views.
- Correct convention for **parts** is shown.
- Detailed drawing is produced in third angle projection, including auxiliary views, sections and assemblies

LO.3 Issue and/or file drawing

- Drawings are labelled and sorted in accordance with organization procedures and format
- Drawing is issued and/or filed according to workplace procedures.

Annex: Resource Requirements

(EIS RCM2 M02 0322) **Producing Engineering Drawings & Sketch**				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	***Learning Materials***			
1.	TTLM	Prepared by the trainer	25	1 : 1
2	Handouts	Prepared by the trainer	25	1:1
3.	Reference books		.	.
3.1	Engineering drawing	54 edition	5	1:5
B.	***Learning Facilities & Infrastructure***			
1.	Lecture room	8 x 7m	1	1:25
2.	Drawing Table	1mx0.8m 0 to 50 degrees	25	1:1
3.	Lap top	Core i 5/ 7, CPU@ 2.80Gz, RAM 8GB,	1	For trainers
4	LCD projector	HD	1	For trainers
5	Printer	ChromaLife100 inks Mono Print Speed Approx. 15.0 imp	1	For trainers
6	Copy machine	Canon image RUNNER 2520 Canon Custom Processor, 400MHz	1	For trainers
7	White board	Smooth surface	1	1:25
8	Screen	64”white cotton	1	1:25

C.	***Consumable Materials/ Stationary***			
1	scotch tape	Conforms to BS 3924 and UL510 0.178mm thickness	5 pcs	1:5
2.	Pencil	HB, 2HB, 4H	25 pcs	1:1
3	pen & ink	Red, blue and black	25 pcs	1:1
4	Eraser	For Drawing Standard	25pcs	1:1
5	graph paper	(mm) paper	25 pcs	1:1
6	tracing paper	Hp natural tracing paper 24”x150”	25 pcs	1:1
7	fixer with lead	0.5, 0.7	25 pcs	1:1
8	Paper	A1,A2,A3,A4 (80gsm)	10 Pack	
7	Millimeter paper	Printable graphic paper 1239 x1753	25 roll	1:1
8	Duster	For White & black board	1	1:25

LEARNING MODULE 03
TVET-PROGRAMME TITLE: Road Construction and Maintenance Level II
MODULE TITLE: Conducting and Supporting Pit Run Material Production Operation
MODULE CODE: EIS RCM2 M 03 0322
NOMINAL DURATION: 60 Hours
MODULE DESCRIPTION: This module covers the skills, knowledge and attitudes required to conduct and support pit run material production operation. It includes plan and prepare; conduct survey, testing and identification of type and location of material operation; conduct and support and run production of borrow and selected materials, quarry materials, and natural sand operation.
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Plan and prepare **LO2.** Identify Road Construction materials **LO3.** Conduct, production of selected quarry materials,
MODULE CONTENTS: **LO.1 Plan and prepare** 1.1 Type and sources of Information 1.2 Obtaining and applying OHS requirement 1.3 Identifying Signage requirements 1.4 Selecting Plant, tools and equipment 1.5 Identifying appropriate materials 1.6 Communicating civil construction employment 1.7 Identifying environmental protection requirements **LO.2 Identify Road Construction materials** 2.1 Identifying materials location 2.2 Identifying investigation techniques 2.3 Preparing tools and equipment 2.4 Sampling Material

2.5 Identifying overburden materials

2.6 Identifying and Operating testing

2.7 Carrying out field and laboratory tests

2.8 Checking quality and quantity of materials

2.9 Sources of materials

LO.3 Conduct, production of selected quarry materials

3.1 Obtaining quarry site

3.2 Developing Access road to quarry

3.3 Selecting appropriate equipment

3.4 Removing overburden materials

3.5 Conducting material production

3.6 Monitoring material production process

3.7 Stock produced material

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	❖ 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	❖ 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

	audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	during lecture time ❖ Present the lecture in video format ❖ Summarize main points		
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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the	❖ Facilitate the integration of trainees with group	❖ Introduce the trainees with their peers

	❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	
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	❖ prepare the assignment questions in large text	❖ Use sign language interpreter	❖ Provide briefing /orientation on the	

assignment	❖ 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	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having

		was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension		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 ❖ (if	❖ 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 ❖ Time extension for trainees having severe upper limb impairment

	necessary) ❖ Time extension			
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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO.1 Plan and prepare

- Types and sources of Information are obtained, confirmed and applied to the allotted task.
- Appling are obtained from the sit safety plan and organizational policies and procedures, confirmed and applied to the allotted task.
- Signage requirements are identified and obtained from the project traffic management plan.
- ***Plant, tools and equipment*** selected to carry out tasks are checked for serviceability and
- any faults are rectified and reported
- Materials appropriate to the work application are identified, safely handled and located
- ready for use.
- Civil construction employment conditions, responsibilities and obligations are communicated
- Environmental protection requirements are identified from the project environmental management plan or appropriate regulatory specifications

LO.2 Identify Road Construction materials

- Location of the material is identified
- Construction materials investigation techniques are identified.
- Required tools, equipment and data are prepared.
- Materials are sampled as per the specification.
- Thickness of the overburden material is identified
- Operation techniques for testing apparatus are identified.
- Field and laboratory tests are carried out in accordance with the technical specification
- Quality and quantity of construction materials are checked.
- Sources of construction materials are identified

LO.3. Conduct, production of selected quarry materials

- Acquisition of the quarry sit is obtained
- Access road to the quarry site is developed

- Appropriate equipment for production is selected
- Overburden materials are removed
- Material production from approved quarry is supported and conducted.
- Material production process is monitored according to technical specification
- The produced material is stock piled ready.

Annex: Resource Requirements

EIS RCM2 M 03 0322 Conducting and Supporting Pit Run Material Production Operation				
Item No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Learner)
A.	***Learning Materials***	Prepared by the trainers Module 01		
1.	TTLM	Prepared by Trainers	5	1:5
2	Reference Books		5	1:5
2.1	Road construction material	J . Kisunge		
2.2	Soil and rock contraction material	V.N.S Murthy		
3.	Journals/Publication/Magazines		5	1:5
B.	***Learning Facilities & Infrastructure***		1	1:25
1.	Lecture Room	8 X 6m	1	1:25
2.	Library		1	1:25
3.	work place			
4.	Internet Room		1	1:25
5	White board	1220mm x2440mm, double-faced,	1	1:25
6	LCD projector	Contrast ratio3000 to 1 with Auto Iris on and Normal Power Brightness, 4200 Lumens		1:25
7	Printer	10x15cm: Appr...Colour Print Speed: Approx. 10.0 ipm Print Resolution: Up to 9600, x 2400 dpi	1	1:25
8	Copy machine	Printing method: BW Laser Beam Printing Print Speed: 22ppm (A4),	1	1:25

		11ppm (A3) Print Resolution: 600 dpi x 600 dpi		
C.	***Consumable Materials***			
1	Pencil	HB, 2HB, 4H	25 pcs	1:1
2	pen & ink	Red, blue and black	25 pcs	1:1
3	Eraser	For Drawing Standard	25pcs	1:1
D.	***Tools and Equipments***			
1.	Sieve shaker with Sieve	Particle Size Range: #4 sieve Full Height Sieve Capacity (including pan) Frequency 50/60 Hz Voltage 220V	1	1:25
2	Losangeles Abrasion machine	steel cylinder of 711 mm inside diameter x 508 mm inside length,	1	1:25
3.	Balance	Digital balance calibration. Sets range from 1 mg - 500 mg ...	1pcs	1:25
4.	Mould	10mm thick steel Diameter 100mm Internal Dia127.3mm Height 1000CC Volume Hammer Weight 3 KG.	5pcs	1:5
5.	Oven	A.C. Motor0.5 H.P Capacity: 100-150 kg.	10pcs	2:5
6.	Arrow boards	LED lamps. The highly visible arrow board measures 2400 mm long x 1200	10pcs	2:5

		mm high,		
7	CBR	diameter of 50 mm (1.969 in), *standard* rate of 1.25 mm	1	1:25
8.	Tamper	*Weight* (Kg): 4, 1. Rated voltage/Frequency (V~Hz): 220-240 V / 50-60 Hz. • Input power (W): 1100.	5	1:5
9	Vicat Apparatus	2 x conical plungers, 8 mm dia; 2 x Plexiglas plates 108 x 108 x 6 mm; 2 x *Vicat* moulds 65-75 mm dia. Conical plunger + weight = 115 g	1	1:25
10	Slump cone	a height of 12-in (300 mm), a bottom diameter of 8-in (200 mm) and an upper diameter of 4-in (100 mm).	5	1:5

LEARNING MODULE 04
TVET-PROGRAMME TITLE: Road construction and maintenance Level L2
MODULE TITLE: Conducting Sampling, Specimen Preparation & Material Testing
MODULE CODE: EIS RCM2 M04 0322
NOMINAL DURATION: .120 Hours
MODULE DESCRIPTION: This module covers conduct construction material sampling and testing operations. It includes the planning and preparation for work, take samples, conducting material testing, conduct preparation of stabilized construction materials, identify hazards and risks, and controlling hazards and risks.
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Plan and prepare for work **LO2.** Take samples **LO3.** Conduct material testing(Including Specimen Preparation) **LO4.** Conduct preparation of stabilized construction materials **LO5.** Identify hazards and risks **LO6.** Control hazards and risks
MODULE CONTENTS: **LO1. Plan and prepare for work** 1.1 Obtaining, confirming, and applying work instructions 1.2 Safety requirements 1.3 Using and handling Construction materials 1.4 Selecting Plant, tools and equipment 1.5 Environmental protection requirements **LO2. Take samples** 2.1 Obtaining sampling tools 2.2 Take Sample

2.3 Handling, labeling and storing of samples
2.4 Obtaining and handling OHS procedures for samples
2.5 Reporting & documentation

LO3. Conduct material testing(Including Specimen Preparation)

3.1 Identifying Hazards associated with testing operations
3.2 Operating techniques
3.3 Carrying out of field and laboratory tests
3.3.1 Field tests:
3.3.1.1 Types of In-situ density test
3.3.1.2 Moisture content determination
3.3.1.3 Slump test
3.3.2 Laboratory tests:
3.3.2.2 Permeability of soils
3.3.2.2 Moisture and density relation (Proctor test)
3.3.2.3 California Bearing Ratio(CBR) test
3.3.2.4 Flakiness Index determination
3.3.2.5 Elongation Index determination
3.3.2.6 Water absorption of coarse aggregates
3.3.2.7 Rock compressive test

LO.4 Conduct preparation of stabilized construction materials

4.1 Using construction materials and additives (stabilizers)
4.2 Hazard of soil stabilizer
4.3 Identifying technique of soil stabilization

LO. 5 Identify hazards and risks

5.1 Safety regulations.
5.2 Hazards/risks in the workplace
5.3 Types of contingency measures

LO. 6 Control hazards and risks

6.1 OHS procedures
6.2 Types and uses of personal protective equipment

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	❖ 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	❖ 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

	audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	during lecture time ❖ Present the lecture in video format ❖ Summarize main points		
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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the	❖ Facilitate the integration of trainees with group	❖ Introduce the trainees with their peers

	❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	
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	❖ prepare the assignment questions in large text	❖ Use sign language interpreter	❖ Provide briefing /orientation on the	

assignment	❖ 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	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having

		was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension		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 ❖ (if	❖ 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 ❖ Time extension for trainees having severe upper limb impairment

	necessary) ❖ Time extension			
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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA

LO1: Plan and prepare for work

- Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied to the allotted task/
- Safety requirements are obtained from the working place safety plan and organizational policies and procedures, confirmed and applied to the allotted task
- Construction materials to be used and handling procedures to be employed are determined according to specifications
- Plant, tools and equipment selected to carry out tasks are consistent with the requirements of the job, checked for serviceability and any faults are rectified reported
- Environmental protection requirements are identified from the organization environmental management plan, confirmed and applied to the allotted task

LO2: Take samples

- Suitable clean containers and sampling tools are obtained
- Sample is taken in accordance with approved procedure/job instructions/standards/ sampling methods
- Sample is handled, labeled and stored in accordance with approved procedure/job instructions/standards/ sampling methods
- OHS procedures for obtaining and handling samples are adhered to throughout the process including handling hazards and risks
- Necessary reports and documentation are accomplished in accordance with organization standards and format.

LO3: Conduct material testing(Including Specimen Preparation)

- Hazards associated with testing operations are identified and safe operating techniques are used to minimize risk
- Operating techniques in the use of testing equipment are identified and applied to achieve optimum output in accordance with manufacturers' design specifications while achieving

specified tolerances

- Operations of field and laboratory tests are carried out in accordance with the work specific requirements.

LO4: Conduct preparation of stabilized construction materials

- Proper handling of construction materials and additives (stabilizers) used for the preparation of the mix.
- Site hazards associated with the preparation of stabilized construction materials are identified and safe operational techniques are used to minimize risk.
- Preparation techniques for stabilized construction materials are identified and applied to achieve optimum output in accordance with technical specification.

LO5: Identify hazards and risks

- Safety regulations and workplace safety and hazard control practices and procedures are clarified based on organization procedures
- Hazards/risks 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
- Contingency measures during workplace accidents, fire and other emergencies are recognized and established in accordance with organization procedures
- **LO6: Control hazards and risks**
- Occupational Health and Safety (OHS) procedures for controlling hazards/risks in workplace are consistently followed
- Procedures for dealing with workplace accidents, fire and emergencies are followed in accordance with organization OHS policies
- Personal protective equipment (PPE) is correctly used in accordance with organization OHS procedures and practices
- Appropriate assistance is provided in the event of a workplace emergency in accordance with established organization protocol

Annex: Resource Requirements

Conducting Sampling, Specimen Preparation & Material Testing EIS RCM2 M04 0322				
Item No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Learner)
A.	***Learning Materials***	Prepared by the trainers Module 01		
1.	TTLM	Prepared by Trainers	5	1:5
1.	TTLM	Prepared by the trainers Module 01	15pcs	1:2
2.	Textbooks			
3.	Reference Books			
4.	Journals/Publication/Magazines			
B.	*Learning Facilities & Infrastructure*			
1.	Lecture Room	10 X 10m	1	1:30
2.	Library	15 X 15m	1	1:30
3.	Workshop or work place	10 X 10m	1	1:30
C.	*Consumable Materials*			
1.	Selected material	M3	5	1:5
2.	Borrow material	M3	5	1:5
3.	Natural gravel	M3	5	1:5
4.	Crushed aggregate	M3	5	1:5
5.	Rock	M3	5	1:5
6.	Sand	M3	5	1:5
7.	Cement	KG	5	1:5
8.	Reinforcement bar	Dia 8,10,12	10	1:10
D.	*Tools and Equipment's*			
1	Hardboard	3.2mm thickness With size of 2440mmx1220mm	6pcs	1:5
2	Ruler	Stainless Steel	6pcs	1:5
3	Glass plate	100.5x73x1.1mm	5	1:25
4	Scoop	Material Stainless Steel Size 0-2kg	5	1:25
5	Spatula	Edge Blade Width:	5	1:25

		75mm Blade Length:100mm BladeThickness:1 mm		
6.	Arrow boards	LED lamps. The highly visible *arrow board* measures 2400 mm long x 1200 mm high, and .	10pcs	2:5
7	CBR	with a diameter of 50 mm (1.969 in), *standard* rate of 1.25 mm/	1	1:25

LEARNING MODULE 05
TVET-PROGRAMME TITLE: Road Construction And Maintenance Level II
MODULE TITLE: Identifying Locate and Protect Underground Services
MODULE CODE: EIS RCM2 M05 0322
NOMINAL DURATION: 50 Hours
MODULE DESCRIPTION: **T**his Module covers the identification, location and protection of underground services in the civil construction industry. It includes planning and preparing, locating underground services, and cleaning up
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Plan and prepare **LO2.** Identify underground services **LO3.** Locate and Protect underground services **LO4.** Clean up
MODULE CONTENTS: **LO1. Plan and prepare** 1.1 Understand work instructions and relevant document 1.2 Safety Requirement 1.3 Signage Application for traffic management 1.4 Selecting Plant, tools and equipment 1.5 Environmental protection requirements **LO2. Identify underground services** 2.1 Obtaining and preparing Information search requirements 2.2 Identifying Types and Use Service & utility 2.3 Determine Location, alignment direction, level and grade of services utilities **LO3. Locate and Protect underground services** 3.1 Obtain details of services and utilities location 3.2 Determining owners of the services and/or utilities

3.3 Contacting Owners of the services and/or utilities

3.4 Selecting tools and equipment for service

3.5 Using Visual or physical means of search for services

3.6 Moving, protecting and supporting Services/utilities

3.7 Reporting of damaged services/utilities

LO4. Clean up

4.1 Clearing work area

4.2 Disposing or recycling materials

4.3 Cleaning, Checking, Maintaining and Storing

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	❖ 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	❖ 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

	audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	during lecture time ❖ Present the lecture in video format ❖ Summarize main points		
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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the	❖ Facilitate the integration of trainees with group	❖ Introduce the trainees with their peers

	❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	
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	❖ prepare the assignment questions in large text	❖ Use sign language interpreter	❖ Provide briefing /orientation on the	

assignment	❖ 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	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having

		was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension		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 ❖ (if	❖ 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 ❖ Time extension for trainees having severe upper limb impairment

	necessary) ❖ Time extension			
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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO.1 Plan and prepare

- ***Compliance documentation*** relevant to the work activity are accessed, interpreted and applied
- ***Safety requirements*** from the ***site*** safety plan and organizational policies and procedures are obtained and confirmed, and applied to the allotted task
- ***Signage*** requirements from the project ***traffic*** management plan are identified, obtained and implemented
- Plant, ***tools and equipment*** to carry out tasks consistent with the requirements of the job are selected, checked for serviceability and rectified or any faults are reported
- ***Environmental protection requirements*** from the project environmental management plan are identified, and confirmed and applied to the allotted task

LO.2 Identify underground services

- Information for search requirements are obtained and prepared prior to making contact with the service provider (dial before you dig)
- Identify Types of underground ***utility & Service*** and Their Use
- Location, alignment direction, level and grade of services and/or utilities are determined from the plans and location details

LO.3 Locate and Protect underground services

- Details of services and utilities location is obtained from the site owners
- Emergency numbers, contact details and procedures for types and ***owners of the services and/or utilities*** are determined.
- Owners of the services and/or utilities contacted to obtain plans and location details.
- Appropriate plant/equipment, and search are selected for services and/or utilities on which construction may impact.
- Visual or physical means are used to search for services and/or utilities prior to commencing construction Cleared and waste materials are disposed of as per the work order
- Services/utilities from the construction process in conjunction with the service and/or

utility owner are moved, protected and supported

- Any damage to services/utilities during physical determination (potholing) that occurs during search are reported to asset owner in accordance with asset owners' requirements

LO.4 Clean up

- Work area is cleared and materials are disposed of or recycled in accordance with project environmental management plan
- Tools and equipment are cleaned, checked, maintained and stored

Annex: Resource Requirements

EIS RCM2 M05 0322 Identifying Locate and Protect Underground Services				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	**Learning Materials**			
1.	TTLM	TTTLM prepared by the trainer	5	1:5
2	Reference Books			
2.1.	1.contractor's hand book labor-based road works	Republic of Zambia Ministry of Works and Su pply Roads Department, Roads Training School	5	1:5
2.2	1. Labour Based Road Construction and Maintenance	ERA Ginchi-Chancho Training Center	5	1:5
B.	**Learning Facilities & Infrastructure**			
1.	Class room	8mx6m	1pcs	1:25
2.	Whit-board/Blackboard	240 x 120 cm	1pcs	1:25
3.	Arm Chair		25	1:1
4.	Workshop	10mx10m	1	1:25
6.	Laptop or Computer	32-bit OS; 4 GB RAM; Intel core i5 (Processor)	1pcs	For trainer
7.	Library	Per section 105 – 180 m2	180 m2	
8.	Printer		1pcs	1:25

9.	Photocopier		1 pcs	1:25
10.	Internet room	5mx5m	1	1:25
C.	***Consumable Materials***			
1.	peg	Eucalypts tree Ø 6cm	250pcs	10:1
2.	PVC conduit	HDPE fitting	150	6:1
3.	String	3-5mm nylon rope construction string	25	1:1
D.	***Tools and Equipments***			
1.	Tape Measures	Stainless steel measuring tape size 5mx19mm	25	1:1
2	Tape Measures	Fiber water proof measuring tape 50 m	25	1:1
3	Pick Axes	mild steel1.8kg MS India	5	1:5
4	Sprit Level	1m-1.5m aluminum frame and digital sprit level	13	1:2
5.	Shovel	Wooden handle shovel (Belcha) MS mouth		

LEARNING MODULE 06
TVET-PROGRAMME TITLE: Road Construction and Maintenance Level II
MODULE TITLE: Conducting Labor based Earthwork
MODULE CODE: EIS RCM2 M06 0322
NOMINAL DURATION: .120... Hours
MODULE DESCRIPTION: This module covers the conduct of earthworks in the civil construction industry. It includes planning and preparing work, clearing & grubbing, setting out sub-grades, forming earthworks, placing and compacting sub-grading replacement materials, and cleaning up.
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Plan and prepare work **LO2.** Carry out Clearing and Grubbing operation **LO3**. Set out sub-grade **LO4.** Form earth works **LO5.** Place and compact sub-grade replacement materials **LO6** Clean up
MODULE CONTENTS: **LO1.** Plan and prepare work 1.1 Accessing, Interpreting and applying compliance document 1.2 Safety requirement 1.3 Identifying and implement Signage requirements 1.4 Checking and using plant, tools and equipment 1.5 Identifying Compaction standards and testing requirements 1.6 Environmental protection requirements **LO2. Carry out Clearing and Grubbing operation** 2.1 Setting out road width & length 2.2 Informing Labor forces and equipment operators 2.3 Removing Bush , stamp, top soil & boulders

2.4 Disposal of Waste Material

LO3. Set out sub-grade

3.1 Setting out Plans

3.2 Establishing Profiles to center line and level

3.3 Setting out Road boundary

LO4. Form earth works

4.1 Informing Plant (equipment) operators

4.2 Assessing Earthwork

4.3 Monitoring layer thickness and moisture content

4.4 Monitoring stabilization material

4.5 Removing damage geo-synthetic material

4.6 Placing geo-synthetic material

LO5. Place and compact sub-grade replacement materials

5.1 Identifying, removing and storing Unsuitable material

5.2 Replacement/stabilized material

5.3 Informing Roller operators

5.4 Assessing compaction process.

LO6. Clean up

6.1 Clearing Work area

6.2 Cleaning, checking, maintaining and storing Plant, tools and equipment

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	❖ 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	❖ 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

	audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	during lecture time ❖ Present the lecture in video format ❖ Summarize main points		
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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the	❖ Facilitate the integration of trainees with group	❖ Introduce the trainees with their peers

	❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	
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	❖ prepare the assignment questions in large text	❖ Use sign language interpreter	❖ Provide briefing /orientation on the	

assignment	❖ 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	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having

		was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension		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 ❖ (if	❖ 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 ❖ Time extension for trainees having severe upper limb impairment

	necessary) ❖ Time extension			
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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO.1 Plan and prepare work

- ***Compliance documentation*** relevant to the work activity are accessed, interpreted and applied
- ***Safety requirements*** are obtained and confirmed from the ***site*** safety plan and organisational policies and procedures, and applied to the allotted task
- Signage requirements are identified, obtained and implemented from the project traffic management plan
- ***Plant, tools and equipment*** to carry out tasks consistent with the requirements of the job are selected, checked for serviceability and rectified or any faults are reported
- Compaction standards and testing requirements are correctly identified
- ***Environmental protection requirements*** are identified from the project environmental management plan, and confirmed and applied to the allotted task

1. **LO.2 Carry out Clearing and Grubbing operation**

- Clearing road width & length is set out as per the work order
- Labour forces and equipment operators are informed of the job requirements
- Bush clearing, stamp, top soil & boulders are removed using equipment and/or labours as appropriate as per the work order.
- Cleared & removed materials are disposed in accordance to the work order.

LO.3 Set out sub-grade

- Plans are set out from survey controls
- Profiles are established to centre line and level
- Road boundaries are set out

LO.4 Form earth works

- Plant (equipment) operators are informed of job requirements
- ***Earthworks*** are assessed to ensure that the specified height is achieved, with allowances for the pavement courses and the overall dimensions
- Uniform layer thickness and moisture content are monitored to ensure

consistency with specifications

- Stabilisation of existing ***material*** is monitored
- Surface area protrusions are removed to prevent damage to geo-synthetic material
- Geo-synthetic material is place to manufacturer's specifications

LO.5 Place and compact sub-grade replacement materials

- Unsuitable material is identified, removed and stored separately
- Imported replacement/stabilised material is placed as specified
- Roller operators are informed of the required number of passes
- Compaction process is assessed to ensure nominated number of passes are made to achieve uniform compaction across the subgrade

LO.6 Clean up

- Work area is cleared and materials are disposed of or recycled in accordance with project environmental management plan
- Plant, tools and equipment are cleaned, checked, maintained and stored

Annex: Resource Requirements

EIS RCM2 M06 0322 Conduct Labor based Earthwork				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	***Learning Materials***			
1.	Plan	Cross section & plain view drawing	1	1 : 25
2.	TTLM	Prepared by the trainer	1	1 : 25
3	Textbooks	TTLM	1	1 : 25
4	Reference Books	Pavement analysis and design 2nd edition	5	1:5
5	Video sets on road construction operation	Labor based road constriction	5	5:25
6	Journals/Publication/Magazines			
B.	***Learning Facilities & Infrastructure***			
1.	Lecture Room	15 x 15m	1	1:25
2.	Work area	100mx100m	1	1;25
3.				
C.	***Consumable Materials***			
1.	Sample of Geo-synthetic material	Standard	2	1:12.5
2	Stabilizing Material	Lime	bag	1:25
3	Earthwork material	Selected material	1	1:25

D.	***Tools and Equipments***			
1.	LCD	HD	1	1:25
2	Measuring tape	Rolling & still	5	1:5
3	String Lines	Rolled	5	1:5
4	Shovel	Metal and wooden	5	1:5
5	Leveling equipment	Standard	5	1:5
6	Pig	1m height	50	1:5
7	Hammers	Claw hammer	5	1:5
8	All relevant heavy equipment will be observed on project site			

LEARNING MODULE 7

TVET-PROGRAMME TITLE: Road Construction & Maintenance Level II

MODULE TITLE: Installing Trench Support

MODULE CODE: EIS RCM2 M07 0322

NOMINAL DURATION: 50 Hours

MODULE DESCRIPTION: This module covers the installation of trench support in the civil construction industry. It includes planning and preparing, installing trench shoring, removing trench shoring, and cleaning up.

LEARNING OUTCOMES

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

LO1. Plan and prepare

LO2. Install trench shoring

LO3. Remove trench shoring

LO4. Clean up

MODULE CONTENTS:

LO1. Plan and prepare

1.1. Accessing, interpreting and Appling *Compliance documentation*

1.2. .Safety requirements

1.3. Traffic control signage requirements

1.4. Selecting plant, tools and equipment.

1.5. Environment protection requirements

LO2. Install trench shoring.

2.1 Communicating Plant operator

2.2 Determining and preparing shoring method.

2.3 Setting out shoring.

2.4 Erecting and positioning shoring

2.5 Securing and checking shoring.

2.6 Cleaning excavation site.

2.7 Using ladders to site safety.

LO3. Remove trench shoring

3.1 Releasing Jacking mechanisms and removing ladders

3.2 Checking and preparing shoring for lift.

3.3 Removing shoring.

LO4. Clean up

4.1 Clearing work area

4.2 Disposing or recycling material.

4.3 Cleaning tools and equipment.

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	❖ 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	❖ 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

	audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	during lecture time ❖ Present the lecture in video format ❖ Summarize main points		
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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the	❖ Facilitate the integration of trainees with group	❖ Introduce the trainees with their peers

	❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	
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	❖ prepare the assignment questions in large text	❖ Use sign language interpreter	❖ Provide briefing /orientation on the	

assignment	❖ 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	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having

		was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension		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 ❖ (if	❖ 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 ❖ Time extension for trainees having severe upper limb impairment

	necessary) ❖ Time extension			
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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO.1. Plan and prepare

- Compliance documentation are accessed, interpreted and applied relevant to the work activity
- Safety requirements are obtained and confirmed from the site safety plan and organizational policies and procedures, and applied to the allotted task
- Traffic control signage requirements are identified, obtained and implemented from the project traffic management plan
- Environmental protection requirements are identified from the project environmental management plan, and confirmed and applied to the allotted task
- Plant, tools and equipment are selected to carry out tasks consistent with the requirements of the job, checked for serviceability and rectified or reported any faults

LO.2. Install trench shoring

- Plant operator is communicated with to ensure the excavation of trenches complies with site plan, line and depth
- Shoring method is determined and prepared
- Ladders are provided for access and egress to site safety plan requirements
- Positioning of shoring is set out
- Shoring is secured in position and checked to ensure structural conformity with regulations
- Excavation is cleaned out by hand to job requirements
- Shoring is positioned or erected within the trench

LO.3. Remove trench shoring

- Jacking mechanisms are released and ladders are removed
- Shoring is removed from trench and stored it on site
- Shoring is checked and prepared it for lifting from the trench
- The sags or dips are established as per the given or agreed design & specification requirement.

LO4. CLEAN UP.

- Work area is cleared and materials are disposed of or recycled in accordance with project environmental management plan
- Tools and equipment are cleaned, checked, maintained and stored

Annex: Resource Requirements

Installing Trench Support EIS RCM2 M07 0322				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	***Learning Materials***			
1.	TTLM	TTTLM prepared by the trainer	5	1:5
2.	Reference Books			
2.1	excavation Systems Planning, Design, and Safety	Joe Turner 3rd edition	5	1:5
2.2	Text Book Building Construction	January 1, 2013 by Sharma (Author)	5	1:5
2.3				
2.3	ASTM, . American Society for Testing and Materials (ASTM). West Conshohocken, Pa, USA.	2004	5	1:5
2.4	ERA manual	2013 edition	10	1:3
B.	***Learning Facilities & Infrastructure***			
1.	Lecturing room	8*6	1	1:25
2.	Chair	"Type Office 595W x 580D x 830H (mm	25	1:1
3.	Printer	Input Capacity	1	

		900sheets “Device Memory1 GB” Dimensions (W x D x H) 438 x 373 x 312mm		
4	Laptop	Hp or Lenovo		
5	projector	Full HD 1080p	1	For trainer
6	screen	Viewing Width 121.92 cm Viewing Height 182.88 cm Frame Depth5 cm Weight 10 kg	1	For trainer
	duster	Dimensions 6 x 1.5 x 2cm	1	1:25
C.	***Consumable Materials***			
1.	paper	A4	1	1:25
2	pen	lexis	1pac	1:25
5	pigs	Wood or metal	5	1:5
6	string	3mm polyethylene twine plastic string roll	10	1:2.5
D.	***Tools and Equipment’s***			
1.	Line level	3 inch	5	1:5
	picks			
	shovels	Dimension, full 295 x 225 mm Hole diameter:		

		front side 36mm, back side 40 mm without handle		
	chains	1.5 ton lift lever chain block	1	1:100
	Meter			
2	Profile board	Metallic adjustable + shape flat sheet		

LEARNING MODULE 08
TVET-PROGRAMME TITLE: Road construction and maintenance Level II
MODULE TITLE: Constructing Reinforcement Dowels and Tie Bars
MODULE CODE: EIS RCM2 M08 0322
NOMINAL DURATION: 80 Hours
MODULE DESCRIPTION: This module covers the knowledge, attitudes and skills required in constructing reinforcement dowels and tie bars for concrete pavement
LEARNING OUTCOMES : At the end of the module the trainee will be able to: **LO1.** Plan and prepare **LO2.** Set up and test equipment **LO3.** Cut material **LO4.** Heat and bend material **LO5.** Complete work and clean up
MODULE CONTENTS: **LO1. Plan and prepare.** 1.1 . Applying work instruction 1.2 Safety requirements 1.3 Identification of Signage & implementation 1.4 Selecting of tools and equipment 1.5 Calculating Material quantity requirement 1.6 Identifying material appropriate to work 1.7 Environmental protection requirements **LO2. Set up and test equipment** 2.1.Occupational Health and safety (OHS) 2.2. Selecting of fire extinguisher 2.3 Purging lines of prior to lighting 2.4 Testing Equipment for corrective action 2.5 Selecting Correct pressures and cutting tips

LO3. Cut material

3.1 Marking and clamping Material

3.2. Lighting of Torch

3.3 .Adjusting Flame setting

3.4. Correct Cutting position

3.5 .Tied/jointed reinforcing bars

LO4. Heat and bend material

4.1. Marking and clamping Material

4.2. Lighting of Torch

4.3 . Applying Heat

4.4. Bending Material

LO5. Complete work and clean up

5.1 Switching off torch

5.2. Gas supply shutting off

5.3 Clearing work area

5.4. Cleaning, checking, maintaining and storing Plant, tools and equipment

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	❖ 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	❖ 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

	audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	during lecture time ❖ Present the lecture in video format ❖ Summarize main points		
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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the	❖ Facilitate the integration of trainees with group	❖ Introduce the trainees with their peers

	❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	
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	❖ prepare the assignment questions in large text	❖ Use sign language interpreter	❖ Provide briefing /orientation on the	

assignment	❖ 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	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having

		was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension		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 ❖ (if necessary) ❖ Time	❖ 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 ❖ Time extension for trainees having severe upper limb impairment

	extension			
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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

Assessment Criteria

LO1. Plan and prepare

- Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied
- Safety requirements are followed in accordance with safety plans and policies
- Signage/barricade requirements are identified and implemented
- ***Tools and equipment*** to carry out tasks are selected and ensured to be consistent with the requirements of the job, checked for serviceability and any faults rectified or reported prior to commencement
- Material quantity requirements are calculated in accordance with plans and/or specifications
- ***Materials*** appropriate to the work application are identified, obtained, prepared, safely handled and located ready for use
- Environmental protection requirements are identified for the project in accordance with environmental plans and regulatory obligations and applied

LO2. Set up and test equipment

- Correct fire extinguisher is selected and located to be readily accessible prior to and during operations
- Regulators are attached to Oxy and Acetylene bottles in accordance with manufacturers' specifications and **Occupational Health and Safety(OHS)** regulations
- Lines are purges to manufacturers' recommendations prior to lighting up
- Equipment is tested for leaks and corrective action undertaken or faults reported
- Correct pressures and cutting tips are selected in accordance with material to be cut and manufacturers' specifications

LO3. Cut material

- Material is accurately marked and secured or clamped ready for cutting
- Torch is lit correctly and safely according to manufacturers' specifications
- Setting of flame is adjusted for cutting to manufacturers' recommendations
- Correct cutting position is adopted during cutting to set out mark

LO4. Heat and bend material

- Material is accurately marked and secured to clamped ready for cutting
- Torch is lit correctly and safely according to manufacturers' specifications
- Heat is applied to specified material and weakening effects of the heating process are minimized
- Material is bent to specification and correctly cooled

LO5. Complete work and clean up

- Torch is switched off according to manufacturers' specifications
- Gas supply is shut off according to manufacturers' specifications
- Work area is cleared and materials disposed of, reused or recycled in accordance with legislation/regulations/codes of practice and job specification
- Plant, tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practice

Annex: Resource Requirements

(EIS RCM2 M08 0322) **Constructing Reinforcement Dowels and Tie Bars**				
Item No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Learner)
A.	***Learning Materials***			
1.	TTLM	Prepared by the trainer	1	1 : 25
3.	Reference Books			
3.1	Welding Handbook	14th edition 2nd revision	12	2:25
B.	***Learning Facilities & Infrastructure***			
1.	Lecture room	8 x 10m	1	1:25
2.	Lap tob	Core i 5/ 7, CPU@ 2.80Gz, RAM 8GB,	1	For trainer
3	LCD projector	HD	1	For trainer
4	Printer	Speed Approx. 15.0 imp	1	For trainer
7	Screan	64”	1	1:25
1.	Lecture Room	10m x6m	1	1:25
C.	***Consumable Materials***			

1	Electrode	Packet	1	1:25
2	Steel	Angular ,tabular Ltz	2	1:5
3	Oxygen	Cylinder	2	1:5
4	Plain bars	4Ø rebar	10	2:5
5	Deformed bars	8Ø,10Ø, 12Ø	10	2:5
6	Wire tie	1.40mm x 1.20kgs Copper	1 roll	1:25
D.	***Tools and Equipment***			
1	Welding Machine	220-250V single phase	1	1:25
2	Hacksaw	Heavy duty tubular steel frame with nickel plated standard 12”	25	1:1
3	Grinder	Voltage 220-240V	5	1:5
4	Bolt cutters	18" power link cutter	25	1:25
5	Clamps	Heavy duty 250mm	10	2:5
6	Meters	Steel 30m and 5m	25	1:1

7	Reinforcement bender	Manual Rebar Bending Machine, steel plate	5	2:5
9	Wire nipper	High Carbon Steel (102 x 50 x 9.4)mm	25	1:1
10	mesh sheets plain bars	**Mild Steel Plain bars**	16	4:5
11	mesh sheets deformed bars	2m x 2m x 15 cm x 6mm	16	4:5

LEARNING MODULE 9

TVET-PROGRAMME TITLE: Road Construction & Maintenance Level II

MODULE TITLE: Conducting labor-based Rigid Asphalt Pavement

MODULE CODE: EIS RCM2 M09 0322

NOMINAL DURATION:80 Hours

MODULE DESCRIPTION: This module covers labor-base rigid asphalt paving of pavers in the road construction industry. It includes planning and preparing for work, preparing to lay paving, laying surfacing, and cleaning up.

LEARNING OUTCOMES

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

LO1 Plan and prepare for work

LO2 Prepare to Construct Plum Rigid Concrete Surface

LO3 Identify types of labor-base Rigid Pavement

LO4 Lay labor base rigid Concrete pavement.

LO5 Check final finishing work & Clean Up

MODULE CONTENTS:

LO1. Plan and prepare for work

1.1 Interpreting and applying relevant compliance documentation.

1.2 Obtaining safety requirements.

1.3 Identifying and implementing Signage.

1.4 Selecting tools and equipment.

1.5 Identifying environmental protection requirement.

1.6 Locating paving area.

1.7 Selecting pavement material.

LO2. Prepare to Construct Plum Rigid Concrete Surface

2.1 Setting out and placement of formwork.

2.2 Excavating to specified depth.

2.3 Preparing drainage pipes culverts and box culvert.

2.4 Preparing Sub-soil and footing.

2.5 Selecting base material.

2.6 Preparing mixing and placing plums.

2.7 Finishing concrete work.

2.8 Cleaning Surface

LO3. Identify types of labor-base Rigid Pavement

3.1 Undertaking Construction of plum rigid concrete surface.

3.2 Paving un-reinforced concrete (UPC),

3.3 Paving Reinforced concrete (RPC)

3.4 Paving *"hyson cells²"* or geo-cells.

LO4. Lay labor base rigid Concrete pavement.

4.1 Lean concrete bedding.

4.2 Placing stone, mixing and pouring concrete.

4.3 Mixing mortar for masonry paving.

4.4 Cutting to form edges

4.5 Laying Paving units

4.6 Finalize concrete layer

4.7 Completing Edges

4.8 completing Compaction, mortaring and sweeping work

4.9 Maintaining Finish level

LO5. Check final finishing work & Clean Up

5.1 Cleaning finished pavement.

5.2 Clearing work area and materials disposed or recycled.

5.3 Checking formwork removing.

5.4 Completing joint filling.

5.5 Checking shoulder and slope.

5.6 Completing protection works.

5.7 Cleaning, checking, maintaining and storing tools and equipment.

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	❖ 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	❖ 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

	audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	during lecture time ❖ Present the lecture in video format ❖ Summarize main points		
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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the	❖ Facilitate the integration of trainees with group	❖ Introduce the trainees with their peers

	❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	
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	❖ prepare the assignment questions in large text	❖ Use sign language interpreter	❖ Provide briefing /orientation on the	

assignment	❖ 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	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having

		was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension		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 ❖ (if necessary) ❖ Time	❖ 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 ❖ Time extension for trainees having severe upper limb impairment

	extension			
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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO.1. Plan and prepare

- Compliance documentation are accessed, interpreted and applied relevant to the work activity
- Safety requirements are obtained and confirmed from the site safety plan and organizational policies and procedures, and applied to the allotted task
- Traffic control signage requirements are identified, obtained and implemented from the project traffic management plan
- Environmental protection requirements are identified from the project environmental management plan, and confirmed and applied to the allotted task
- Plant, tools and equipment are selected to carry out tasks consistent with the requirements of the job, checked for serviceability and rectified or reported any faults

LO.2. Install trench shoring

- Plant operator is communicated with to ensure the excavation of trenches complies with site plan, line and depth
- Shoring method is determined and prepared
- Ladders are provided for access and egress to site safety plan requirements
- Positioning of shoring is set out
- Shoring is secured in position and checked to ensure structural conformity with regulations
- Excavation is cleaned out by hand to job requirements
- Shoring is positioned or erected within the trench

LO.3. Remove trench shoring

- Jacking mechanisms are released and ladders are removed
- Shoring is removed from trench and stored it on site
- Shoring is checked and prepared it for lifting from the trench
- The sags or dips are established as per the given or agreed design & specification requirement.

LO4. CLEAN UP.

- Work area is cleared and materials are disposed of or recycled in accordance with project

environmental management plan

- Tools and equipment are cleaned, checked, maintained and stored

Annex: Resource Requirements

Conducting labor-based Rigid Asphalt Pavement EIS RCM2 M09 0322				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	***Learning Materials***			
1.	TTLM	TTTLM prepared by the trainer	5	1:5
2.	Reference Books			
2.1	Concrete technology		5	1:5
2.2	Properties of concrete	5th edition	5	1:5
2.3	Reinforced Concrete Fundamentals,	5th Edition	5	1:5
2.3	fundamentals of Building Construction: Materials and Methods,	5th Edition	5	1:5
2.3	Understanding the Rheology of Concrete	Edited by Nicolas Roussel	5	1:5
2.3	ASTM, . American Society for Testing and Materials (ASTM). West Conshohocken, Pa, USA.	2004	5	1:5
2.4	ERA manual	2013 edition	10	1:3
B.	***Learning Facilities & Infrastructure***			
1.	Lecturing room	8m*6m“		

2.	Chair	595W x 580D x 830H (mm		
3.	Printer	Maximum Paper 900 sheets "Device Memory 1 GB" Dimensions (W x D x H) 438 x 373 x 312mm		
	Duster	Dimensions (L x W x H): 6 x 1.5 x 2	1	1:25
5	projector	Full HD 1080p	1	For trainer
6	screen	Viewing Width 121.92 cm Viewing Height 182.88 cm Frame Depth 5 cm	1	For trainer
7	White board	Frame Material Aluminium 5760 × 3840 pixels 19.2 × 12.8 in	1	1:25
C.	***Consumable Materials***			
1.	paper	A4		
2	pen	lexis		
5	pigs	Wood or metal		

6	string	3mm polyethylene twine plastic string roll	5 roll	1:5
8				
D.	***Tools and Equipments***			
1.	Line level	Aluminum “100 mm long”	5	1:5
2	Drum lifter	Load Capacity 450 kg Drum Size 30 Gallon,Steel (Ø450×700), Gallon,Steel(Ø572×900), or 210L Plastic Lifting Height 600 mm Outline Dimensions (mm) 1080×850×1370		
	wheelbarrow	Product Dimensions (135.9 x 64.8 x 65 cm)		
4	Shovels	Dimension, full piece: 295 x 225 mm	25	1:1

		Hole diameter: front side 36mm, back side 40 mm without handle		
5	Builders wheelbarrows	Weight capacity 250kg	5	1:5
6	Steel tape,;	5m and 50m	25	1:1
7	drums	Capacity 480 Liters Diesel	1	1:25
8	Motorized bitumen sprayer	Fuel consumption 4 l/h Weight (without a tank): 135 кg. asphalt emulsion tank: 200 L	1	1:25
7	Meter	5m	25	1:1
2	Profile board		5	1:5

LEARNING MODULE 10
TVET-PROGRAMME TITLE: Road construction and maintenance Level L2
MODULE TITLE: Conducting Labor based flexible asphalt pavement
MODULE CODE: EIS RCM2 M10 0322
NOMINAL DURATION: .90... Hours
MODULE DESCRIPTION: This module covers the knowledge, attitudes and skills required in Conduct Labor based flexible asphalt pavement in the civil construction industry. It includes planning and preparing, Conducting Labor based flexible asphalt pavement.
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Plan and prepare for work **LO2.**Undertake road base preparations **LO3.**Identfy types of flexible pavement **LO4.**Apply prime coat **LO5.**Lay flexible asphalt manually **LO6.**Clean up
MODULE CONTENTS: **LO1. Plan and prepare for work** 1.1 Accessing, interpreting and applying Compliance documentation 1.2 Safety requirements 1.3 Signage requirements 1.4 Tools and equipment 1.5 Environmental protection requirements 1.6 Identifying Area and location of paving 1.7 Calculating paving area and selecting material **LO2. Undertake road base preparations** 2.1 Setting out Location and shape of paving area 2.2 positioning Drainage pipes 2.3 preparing Sub-grade

2.4 selecting Base material

2.5 cleaning Surface

2.6 Compaction

2.7 Level the surface

2.8 Surface Texture

2.9 Surface Regularity

2.10 Cleaning the Base

2.11 Dampening of the Base

LO3. Identify types of flexible pavement

3.1 constructing Conventional layered flexible pavement

3.2 constructing Full - depth asphalt pavement

3.3 constructing rock asphalt mat (CRAM)

LO.4 Apply prime coat

1.1 Applying adhesion between the base and bituminous seal

1.2 water vapor from the base

1.3 absorption of binder

1.4 spraying Bitumen primes

1.5 spraying Low viscosity, medium curing cutback bitumen

1.6 Inverting emulsion prime

LO. 5 Lay flexible asphalt manually

5.1 Layer asphalt sand sheet

5.2 Filler

5.3 Bituminous Material

5.4 Mixing

5.5 Spreading and hauling

5.6 setting out Edge boards

5.7 spreading and compacting Sand and aggregate

5.8 grading Paving surface

5.9 mixing Mortar for masonry paving

5.10 cut Pavers to form edges

5.11 Laing Paving units

5.12 Completing Edges

5.13 completing Compaction, mortaring and sweeping work

5.14 maintaining Finish level

LO6.Clean up

6.1 cleaning Paving finish

6.2 clearing Work area

6.3 cleaning, checking, maintaining and storing Tools and equipment

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	❖ 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	❖ 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

	audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	during lecture time ❖ Present the lecture in video format ❖ Summarize main points		
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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the	❖ Facilitate the integration of trainees with group	❖ Introduce the trainees with their peers

	❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	
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	❖ prepare the assignment questions in large text	❖ Use sign language interpreter	❖ Provide briefing /orientation on the	

assignment	❖ 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	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having

		was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension		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 ❖ (if necessary) ❖ Time	❖ 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 ❖ Time extension for trainees having severe upper limb impairment

	extension			
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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA

LO1. Plan and prepare for work

- ***Compliance documentation*** relevant to the work activity are accessed, interpreted and applied
- ***Safety requirements*** are obtained and confirmed from the ***site*** safety plan and organizational policies and procedures, and applied to the allotted task
- Signage requirements are identified, obtained and implemented from the project ***traffic*** management plan
- ***Tools and equipment*** to carry out tasks are selected consistent with the requirements of the job, checked for serviceability and rectified or reported any faults
- ***Environmental protection requirements*** are identified from
- the project environmental management plan, and confirmed
- and applied to the allotted task
- Area and location of paving are identified from job ***drawings***
- Paving requirements and selected ***material*** are calculated to meet required finish of surface and pattern

LO2. Undertake road base preparations

- Location and shape of paving area are set out to dimensions from job drawings
- Drainage pipes are positioned in sub-soil to local regulations
- Sub-soil and footing are prepared in accordance with specifications
- Base material is selected in accordance with manufacturer's specifications for identified substrate
- Surface is cleaned free of loose material and dust where paving is to be bonded to substrate
- Compaction (or density): The required density of the base should be confirmed by Sand Replacement Tests.
- Level the surface: Construction to the design levels with particular attention to layer thickness, vertical alignment and relative level above the drain inverts.

- Surface Texture: The surface of the base should have a tightly knit structure with sufficient fines to bind the coarse particles.
- Surface Regularity: The base should be checked with a 3 m straight edge both across and parallel to the center line. Irregularities greater than +/- 6 mm should be corrected.
- Cleaning the Base: Before the prime and seal is applied, the base must be cleaned of all foreign matter (debris, animal droppings and rubbish) and thoroughly swept to remove all dust from the surface.
- Dampening of the Base: The prime will not penetrate into and bond properly to the base if the surface is completely dry.

LO3. Identify types of flexible pavement

- Conventional layered flexible pavement is constructed
- Full - depth asphalt pavement is constructed
- Contained rock asphalt mat (CRAM) is constructed

LO4. Apply prime coat

- Assists in promoting adhesion between the base and the newly applied bituminous seal;
- Inhibit ingress of water into the base, whilst not hampering the migration of water vapor from the base;
- Limit the absorption of binder from the next spray application; the upper 4-10 mm of the base to accommodate light construction traffic is bound
- Bitumen primes is sprayed
- Low viscosity, medium curing cutback bitumen such as MC-30, MC-70, or, in some circumstances, MC-250 emulsion primes are sprayed
- Inverted emulsion prime is typically manufactured from MC 30, slightly cut back further and then water is added.

LO5. Lay flexible asphalt manually

- Layer asphalt sand sheet: is a wearing course bituminous mixture composed of continuous graded natural sand and asphalt materials are mixed in central plant (or on site)
- Filler: Filler needs to be used, the filler material could be limestone dust, dolomite dust, Portland

cement fly ash, cement kiln dust or other non-plastic mineral material from sources is approved.

- Bituminous Material: can be any type of bitumen as per the recommended design
- Mixing: proportion of mixture materials shall be in accordance with job mix formula which is determined and approved
- Spreading and hauling: before spreading the mixture material the procedure requirements should be satisfied.
- Edge boards are positioned to set out and specifications
- Sand and aggregate are spread and compacted to specifications
- Paving surface is graded, where drainage is necessary, to fall evenly without ponding to outlets or surface run off system provided
- Mortar is mixed for masonry paving to specifications
- Pavers are cut to form edges ensuring fit and minimum wastage of material
- Paving units are laid to designed pattern
- Edges are completed to specification
- Compaction, mortaring and sweeping work are completed to specifications
- Finish level is maintained across junctions between different levels

LO6.Clean up

- Paving is finished cleaned to requirements
- Work area is cleared and materials are disposed of or recycled in accordance with project environmental management plan
- Tools and equipment are cleaned, checked, maintained and stored

Annex: Resource Requirements

Conducting Labor based flexible asphalt pavement EIS RCM2 M10 0322				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	***Learning Materials***			
1.	TTLM	TTTLM prepared by the trainer	5	1:5
1.	TTLM	Prepared by the trainers Module 01	15pcs	1:2
2.	Textbooks			
3.	Reference Books			
4.	Journals/Publication/Magazines			
B.	*Learning Facilities & Infrastructure*			
1.	Lecture Room	10 X 10m	1	1:30
2.	Library	15 X 15m	1	1:30
3.	Workshop or work place	10 X 10m	1	1:30
C.	*Consumable Materials*			
1.	Aggregates	M3	5m3	1:5
2.	sand	M3	5m3	1:5
3.	Bitumen		30 pcs	1:1
D.	*Tools and Equipment's*			
1	Shovels;	Full dimension 295x225mm Weigkt 1kg	5	1:5
2	Brooms;	Length 40 cm width 5.5 cm	5	1:5
3	Builders' wheelbarrows	(capacity ± 65 – 67 liters);	5	1:5
4	Hammer;	5kg rectangular	5	1:5
5	ranging rods, , pegs and	Eucalypts tree Ø 6cm	25	1:1
6	Reinforced paper,	4 rolls x 1 meter wide;	5	1:5

7	Steel pegs,	300 mm x 9 mm	10	1;2.5
8	Chalk-line equipment;	3-wheel, 35lb capacity efficient dryline chalker	1	1:30
9	Steel tape	50 m;	5	1:5
10	Suitably sized vibratory pedestrian roller	Walk Speed 0-4.5km/h Gradeability32% Drive Type Load 66N/cm Vibration Frequency 70HZ Exciting Force 20KN Water Tank 20L Hydraulic Oil Tank 15L 510kg Manual and Electric	1	1:30
11	Motorized bitumen hand sprayer;	Fuel consumption 4 l/h Weight without tank) 135kg Asphalt emulation tank 200 l		
13	string lines,	50m lengths and in high visibility colours.		

LEARNING MODULE 11
TVET-PROGRAMME TITLE: Road Construction And Maintenance Level II
MODULE TITLE: Placing and Fix Reinforcement Materials
MODULE CODE: EIS RCM2 M11 0322
NOMINAL DURATION: 50 Hours
MODULE DESCRIPTION: **T**his Module covers the placement and fixing of reinforcement materials in the civil construction industry. It includes planning and preparing, preparing for reinforcement placement, placing and fixing reinforcement, checking reinforcement prior to concrete pour, and cleaning up
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Plan and prepare **LO2.** Prepare for reinforcement placement **LO3.** Place and fix reinforcement **LO4.** Check reinforcement **LO5.** Clean up
MODULE CONTENTS: **LO1. Plan and prepare** 1.1 Accessing, interpreting and applying *Compliance documentation* 1.2 Safety Requirements 1.3 Signage Requirements 1.4 Selecting tools and equipment 1.5 Checking stock of reinforcement material 1.6 Checking and Reporting fault 1.7 Environmental protection requirements **LO2. Prepare for reinforcement placement** 2.1 Checking formwork 2.2 Cutting, bending and tie Reinforcement bars 2.3 Aattaching Stiffening rods 2.4 Locating Bar chairs/spacers

LO3. Place and fix reinforcement

3.1 Placing reinforcement sheet

3.2 Locating reinforcement bar

3.3 Locating Reinforcement is

3.4 Supporting and securing Reinforcement material

3.5 Securing Cast-in items to reinforcement

3.6 Covering and protecting of protruding reinforcement material

LO4. Check reinforcement

4.1 checking location and fixing reinforcement position

4.2 checking spacing and Overlap of reinforcement material

LO5. Clean up

1.8 Clearing work area

1.9 Checking, cleaning and maintaining tools and equipment

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	❖ 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	❖ 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

	audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	during lecture time ❖ Present the lecture in video format ❖ Summarize main points		
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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the	❖ Facilitate the integration of trainees with group	❖ Introduce the trainees with their peers

	❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	
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	❖ prepare the assignment questions in large text	❖ Use sign language interpreter	❖ Provide briefing /orientation on the	

assignment	❖ 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	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having

		was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension		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 ❖ (if necessary) ❖ Time	❖ 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 ❖ Time extension for trainees having severe upper limb impairment

	extension			
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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO.1 Plan and prepare

- ***Compliance documentation*** relevant to the work activity are accessed, interpreted and applied
- ***Safety requirements*** from the ***site*** safety plan and organizational policies and procedures are obtained and confirmed, and applied to the allotted task
- ***Signage*** /barricade requirements are identified, obtained and implemented from the project traffic management plan
- Plant, ***tools and equipment*** to carry out tasks are selected
- consistent with the requirements of the job, checked for
- serviceability and rectified or reported any faults
- Stock of ***reinforcement materials*** are checked for correct type and quantity against reinforcement schedule and details in plans/specifications
- ***Environmental protection requirements*** are identified from the project environmental management plan, and confirmed and applied to the allotted

LO.2 Prepare for reinforcement placement

- Formwork is checked for completion and conformity to receive reinforcement
- Reinforcement bars are cut and bent to required set out and plans/specifications
- Bars are tied to designed configuration
- Reinforcement sheets are cut to required sizes
- Stiffening rods are attached to panels as required to facilitate handling processes
- Bar chairs/spacers are located to requirements of reinforcement schedule and plans/specifications

LO.3 Place and fix reinforcement

- Fabric reinforcement sheets are placed into position in accordance with engineer's drawings and specifications
- Reinforcement bars are located and positioned
- Reinforcement is located and placed using bar chairs,
- ligatures and spacers
- Reinforcement material is supported and secured into position
- Cast-in items to reinforcement is secured
- Ends covered and protected of protruding reinforcement material

LO.4 Check reinforcement

- Location and position of reinforcement and fixing ties are checked to reinforcement for accuracy
- Depth of coverage, clearance, spacing and overlap of reinforcement material are checked in accordance with engineer's drawings/job specifications

LO.5 Check reinforcement

- Work area is cleared and materials are disposed of or recycled in accordance with project environmental management plan
- Plant, tools and equipment are cleaned, checked, maintained and stored

Annex: Resource Requirements

EIS RCM2 M11 0322 Placing and Fix Reinforcement Materials				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	***Learning Materials***			
1.	TTLM	TTTLM prepared by the trainer	5	1:5
2	Reference Books			
2.1.	1.contractor's hand book labor-based road works	Republic of Zambia Ministry of Works an d Supply Roads Department, R oads Training School	5	1:5
2.2	2. Labour Based Road Construction and Maintenance	ERA Ginchi-Chancho Training Center	5	1:5
2.3	Design of reinforced concrete	Russel H. Brown Ninth edition	5	1:5
B.	***Learning Facilities & Infrastructure***			
1.	Class room	8mx6m	1pcs	1:25
2.	Whit-board/Blackboard	240 x 120 cm	1pcs	1:25
3.	Arm Chair		25	1:1
4.	Workshop	10mx10m	1	1:25
6.	Laptop or Computer	32-bit OS; 4 GB RAM; Intel core i5 (Processor)	1pcs	For trainer
7.	Library	Per section 105 – 180 m2	180 m2	
8.	Photocopier		1 pcs	1:25

9.	Internet room	5mx5m	1	1:25
C.	***Consumable Materials***			
1.	Plain rods	Ø12mm	6pcs	1:5
2.	Spacer/spreader	Ø6mm	30	1:1
3.	Wire ties	Roll	1	1:30
4	Pipe sections	½¨	6pcs	1:5
5	scaffolding components	Ø8cm Eq. tree	6pcs	1:5
6	structural steel sections		6pcs	1:5
D.	***Tools and Equipments***			
1.	Tape Measures	Stainless steel measuring tape size 3mx19mm	25	1:1
2	Bolt cutters	RS PRO 460 mm steel bolt cutter	5pcs	1:5
3	Reinforcement benders	14mm new manual rebar bender steel bar bending	5pcs	1:5
4	Wire nippers	MS diagonal wire cutter size 6inch	5pcs	1:5
5	Tie wire reels	Steel fixer tie wire reel	5pcs	1:5

LEARNING MODULE 12

TVET-PROGRAMME TITLE: Road Construction and Maintenance Level II

MODULE TITLE: Producing and Install Pre-Cast Concrete Elements

MODULE CODE: EIS RCM2 M12 0322

NOMINAL DURATION.80. Hours

MODULE DESCRIPTION: This module covers the required skills, attitudes and knowledge in producing pre-cast concrete and installs pre-cast concrete elements units.

LEARNING OUTCOMES

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

LO1. Plan and prepare for work

LO2. Prepare concreting works materials

LO3. Set out for concrete work

LO4. Install reinforcement and Erect formwork

LO5. Carry out concrete work

LO6. Strip formwork

LO7. Erect concrete crash barriers man hole and ditch cover

LO8. Install Precast Element

LO9. Clean up

MODULE CONTENTS:

LO1. Plan and prepare for work

1.1 Confirming and operate work instruction

1.2 Accessing, Interpreting and applying compliance document

1.3 safety requirement

1.4 Identifying and implement Signage requirement

1.5 selecting and use plant, tools and equipment

1.6 Identify and Preparing work Materials

1.7 Calculating material quantity

1.8 Identified environmental requirement

LO2. Prepare concreting works materials

2.1 Determining Location of steel reinforcement and formwork

2.2 Checking Reinforcement

2.3 Selecting formwork components

2.4 **.** Using and selecting fixing/fasteners

LO3. Set out for concrete work

3.1 Setting String lines

3.2 Checking grades

3.3 Identifying and protecting services from prevent damage

LO4. Install reinforcement and Erect formwork

4.1 Cutting & Bending of Reinforcing fabric/bar

4.2 Fixing & Tying of Fabric and bars

4.3 Attaching Stiffening rod

4.4 Locating Reinforcement material

4.5 located and secured Cast-ins are

4.6 Preparing and erect formwork

4.7 Setting out Formwork

4.8 Assembling and erect formwork

4.9 Removing of waste material

4.10 Appling Form release agent is

LO5. Carry out concrete work

5.1. Transporting of concrete

5.2. Discharge and controlling a concrete pump

5.3. Placing a concrete

5.4. Compacting concrete

5.5. Finishing Concrete and Appling a concrete curing process

5.6. Positioning and Installing control joint

5.7. Positioning dowel joints

5.8. Covering and protecting concrete surface

LO6. Strip formwork

6.1. Removing edge boxing

6.2. Cleaning and storing timber component

6.3. Cleaning ,oiling and storing steel components

6.4. Disposing of damaged formwork

6.5. Cleaning and Screens before movement strip formwork

LO7. Erect concrete crash barriers man hole and ditch cover

7.1. Setting out of concrete crash barriers

7.2. Erecting and installing barriers man hole& ditch cov

7.3. Joining barrier man hole & ditch cover

7.4. Finishing barriers man hole & ditch cover

LO8. Install Precast Element

8.1 Determining precast element

8.2 Check precast dimension and quality

8.3 Install Precast Element

8.4 Identifying and locating placement of brackets/bolts

LO9. Clean up

9.1. Clearing of work area

9.2.Stored or stacked unused material

9.3. Check , maintain and stored tool and equipment

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	❖ 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	❖ 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

	❖ 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	❖ Present the lecture in video format ❖ Summarize main points		
Demonstration	❖ Conduct close follow up	❖ use Sign language interpreter	❖ Illustrate in clear & short method	❖ Facilitate and support the trainees

	❖ Use verbal description ❖ Provide special attention in the process of guidance ❖ facilitate the support of peer trainees ❖ Prepare & use simulation	❖ Use video recorded material ❖ Ensure attention of the trainees ❖ Provide structured training ❖ Show clear and short method ❖ Use gesture ❖ Provide tutorial support (if necessary)	❖ Use Video recorded material ❖ Ensure the attention of the trainees ❖ Provide tutorial support (if necessary)	having severe upper limbs impairment to operate equipments/ 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	❖ 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	❖ Introduce the trainees with their peers

	other group member ❖ Brief the thematic issues of the work		❖ Inform the group members to speak loudly	
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	❖ Use sign language interpreter ❖ Provide briefing	❖ Provide briefing /orientation on the assignment	

	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	/orientation on the assignment ❖ Provide visual recorded material	❖ 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	❖ 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 ❖ Time extension for trainees having severe upper limb impairment

	reader ❖ (if necessary) ❖ Time extension			
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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO.1. Plan and prepare for work

- Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied
- Compliance documentation relevant to the work activity are accessed, interpreted and applied
- Safety ***requirements*** are followed in accordance with safety plans and policies
- Signage/barricade requirements are identified and implemented
- Plant, ***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 prior to commencement
- ***Materials*** appropriate to the work application are identified, obtained, prepared, safely handled and located ready for use
- Material quantity requirements are calculated in accordance with plans and/or specifications
- Environmental protection requirements are identified for the project in accordance with environmental plans and regulatory obligations and applied

LO.2. Prepare concreting works materials

- Location of steel reinforcement and formwork is determined from drawings and reinforcement schedule
- Reinforcement is checked against reinforcement drawings and specifications
- Formwork components/materials are selected consistent with job
- Fixing/fasteners are selected and used consistent with requirements of the job

LO.3. Set out for concrete work

- String lines are set accurately from existing pegs
- Grades are checked to ensure correct fall
- Services are identified and protected to prevent damage

LO.4. Install reinforcement and Erect formwork

- Reinforcing fabric and bars are cut and bent as required to project drawings and specifications
- Fabric and bars are tied/fixed to configuration from project drawings and specifications
- Stiffening rods are attached to panels as required to facilitate handling
- Reinforcement material is located in formwork and placed on bar chairs/spacers as determined from drawings, noting clearance from formwork
- Cast-ins are located and secured
- Work area is cleared and surface prepared for safe erection of formwork
- Formwork is set out to requirements of drawings and specifications
- Formwork is assembled/erected to specifications
- Debris, sawdust and other waste material are safely removed from formwork

- Form release agent is applied to manufacturers' specifications

LO5. Carry out concrete work

- Concrete is transported correctly with wheelbarrow and discharged into formwork, using correct manual handling techniques
- Discharge of concrete from the concrete pump line and/or chute into the formwork is controlled correctly
- Concrete is placed correctly as per instructions and screed to specified levels and grades
- Concrete is compacted to specification using immersion vibrator or other specified method
- Concrete is finished and curing process applied to specifications
- Control joints are positioned and installed to specification and to current standards
- Dowel joints are positioned to specification
- Concrete surface is adequately covered and protected

LO.6. Strip formwork

- Edge boxing and braces are removed carefully, safely and sequentially
- Timber components are de-nailed, cleaned and stored or stacked

- Steel components are cleaned, oiled and stored or stacked
- Damaged formwork components are discarded after stripping
- Screens are safely cleaned before movement where applicable

LO7. Erect concrete crash barriers man hole and ditch cover

- Position of ***concrete crash barriers*** are set out according to job drawings and specifications
- Barriers man hole & ditch cover are erected and/or installed in the correct location
- Barriers man hole & ditch cover are joined according to manufacturer's specifications
- Barriers man hole & ditch cover are sealed and finished against weather

LO8. Install Precast Element

- Determine ***Precast Element*** and position from project drawings and specifications
- Check Precast dimensions and materials for quality
- Install Precast Element as required
- Identify and install locating brackets/bolts in preparation for the placement of precast

LO9. Clean up

- Work area is cleared and materials are disposed of or recycled in accordance with project environmental management plan
- Unused materials are stored or stacked
- Plant, tools and equipment are cleaned, checked, maintained and stored

Annex: Resource Requirements

EIS RCM2 M12 0322 Producing and Install Pre-Cast Concrete Elements				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	***Learning Materials***			
1.	TTLM	TTTLM prepared by the trainer	1	1:5
2.	Precast Concrete Structures, 2nd Edition			
4.	Journals/Publication/Magazines			
1	https://www.usbr.gov/tsc/techreferences/mands/mands-pdfs/JointSpacingForConcreteStructures_09-2016_508.pdf			
B.	***Learning Facilities & Infrastructure***			
1.	Lecture Room	8m x6m	1	1:25
C.	***Consumable Materials***			
1.	Timber	Australia	5	1:5
2	Nails	N0 (10,8,7)	1pac	1:25
3	Cement	Ppc,opc	5	1:5
4	Sand	River sand	3m3	1:25
5	Aggregate	Crushed (02,03)	M3	1:5

6	Reinforcing steel	*By diameter (8mm, 10mm)*	*5meter*	*1:5*
7	Binding wire	*Black wire*	*1kg*	*1:25*
8	Oil	Realizing	*5liter*	*1:5*
9	Admixtures	Retard	1	1:25
1				
D.	***Tools and Equipments***			
1.	Panel	steel	5	1:5
2	Hammer	By kg (3, 5,10kg)	5 pcs	1:5
3	saw	Wood	5	1:5
4	Measuring tape	Steel or rolled	5	1:5
5	Masson Square	90 degree	5	1:5
6	Rope	Made of metal and wood	5	1:5
7	Axe	Made of metal and wooden	5	1:5
8	Spade	Made of metal and wooden		
9	Vibrator	Heavy duty	1	1:25
10	Sprit Level	60cm; 120cm	5 pcs	1:5
11	Float	Made of wooden	5	1:5
12	Trowels	Made of steel	5	1:5
13	Wheel barrows	25kg capacity	5	1:5
14	Bucket	Standard	5	1:5
15	Rakes	Made of metal and wooden	25	1:1
16	Shovel	Made of metal and wooden	5	1:5

LEARNING MODULE 13
TVET-PROGRAMME TITLE: Road Construction and Maintenance Level II
MODULE TITLE: Form Ford/Vented Structure and Pave Ditch
MODULE CODE: EIS RCM2 13 0322
NOMINAL DURATION: 50 Hours
MODULE DESCRIPTION: This module specifies the competency required to construct and maintain ford, vented ford and paved ditch**.** It includes the minimum criteria for competency assessment. The unit covers planning and preparation for work, the maintenance of draining system components, excavation for drainage repairs, and repair of drainage systems, the inspection and repair of pipe drainage work finalization activities
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Plan and prepare ford structure work **LO2**. Construct ford/ vented structure and paved ditches **LO3.** Maintain Ford, culvert pipes and ditch structures **LO4.** Clean up
MODULE CONTENTS: **LO.1 Plan and prepare ford structure work** 1.1 Obtained, confirming and applying work requirement 1.2 Safety requirements 1.3 Identifying traffic Signage 1.4 Selected Plant, tools and equipment 1.5 Identifying Construction materials 1.6 Determining temporary storm water diversion 1.7 Identifying and applying Environmental protection requirements. **LO.2 Construct ford/ vented structure and paved ditches** 2.1 Locating alignment and grade of ford/vented 2.2 Determining and applying dewatering

2.3 Guiding Laborers

2.4 Compacting culvert or ford /ditch bed

2.5 Setting out ford, culvert pipes or ditch

2.6 Mixing mortar materials

2.7 Checking Alignment level and grade

2.8 Pointing and plastering culvert pipes

2.9 Constructing head walls

2.10 Carrying out backfill.

2.11 Surfacing reinforced concrete slab.

2.12 Constructing Aprons on upstream and downstream sides.

2.13 Placing Marker stones

LO.3 Maintain Ford, culvert pipes and ditch structures

3.1 Inspecting and maintaining ford, culvert pipes, ditch components.

3.2 Determining location of repairs.

3.3 Carrying out excavation.

3.4 Preparing masonry stones/ block and pipes.

3.5 Replacing masonry stones/ block and pipes.

3.6 Installing packing pipe line.

3.7 Jointing junction of pipe section.

3.8 Backfilling

3.9 Inspecting, testing and repairing ford.

3.10 Maintaining ford or culvert pipes.

3.11 Adjoining surfaces of ford or culvert pipes.

3.12 Clearing ford or culvert pipes blockages.

3.13 Adequating erosion control.

3.14 Compacting backfill.

LO.4 clean up

4.1 Clearing working area.

4.2 Sealing and storing unused materials

4.3 Cleaning plant, tools and equipment.

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	❖ 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	❖ 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

	audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	during lecture time ❖ Present the lecture in video format ❖ Summarize main points		
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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the	❖ Facilitate the integration of trainees with group	❖ Introduce the trainees with their peers

	❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	
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	❖ prepare the assignment questions in large text	❖ Use sign language interpreter	❖ Provide briefing /orientation on the	

assignment	❖ 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	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having

		was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension		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 ❖ (if necessary) ❖ Time	❖ 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 ❖ Time extension for trainees having severe upper limb impairment

	extension			
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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO.1 Plan and prepare ford structure work

- Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied to the allotted task
- Safety requirements are obtained from the site safety plan and organizational policies and procedures, confirmed and applied to the allotted task
- Signage requirements are identified and obtained from the project traffic management plan and implemented
- Environmental protection requirements are identified from the project environmental management plan, confirmed and applied to the allotted task
- Construction ***materials*** appropriate to the work application are identified, safely handled and located ready for use
- Temporary storm water diversion requirement is determined in accordance with existing drainage outlets, site requirements and planned schedule of construction
- Plant, 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

LO.2 Construct ford/ vented structure and paved ditches

- Location, alignment direction, level and grade of **ford/vented ford** drainage structures and paved ditch system is determined from job drawings/specifications
- Dewatering requirements are determined and applied
- Laborers are guided of excavation requirements and levels are monitored
- A suitable culvert or ford or ditch bed is level and compacted between cut-off walls according to specifications.
- Ford or culvert pipes or ditch are set out according to the drawings and specifications
- Mortar materials are prepared and mixed in accordance with specification
- Alignment level and grade is checked continuously for conformance with design plans and

specifications

- ***Marker stones*** are placed along both sides of road surface slab according to specification.
- Culvert pipes plastered and pointed in accordance with drawings and specifications
- Head walls are constructed in accordance with drawings and specifications
- Reinforced concrete road surface slab in accordance with drawings and specifications
- ***Aprons*** are constructed on upstream and downstream sides of the culvert pipe according to specification.
- Backfill space between culvert pipes is carried out in accordance with drawings and specifications.

LO.3 Maintain Ford, culvert pipes and ditch structures

- Ford, culvert pipes, ditch components are regularly inspected and maintained as per asset requirements and faults are rectified or reported
- Location of repairs is determined from works order and confirmed on site
- Excavation is carried out in accordance with task specification and site safety plan
- Masonry stones/ block and pipes are prepared in accordance with designed method of repair
- Masonry stones/ block and pipes are replaced, joined and aligned to line and specified fall/slope
- Packing is installed to maintain alignment of pipe line
- Joints are made to pipe section junctions in accordance with specification requirements
- Required section is backfilled in accordance with specifications
- Inspection and testing of repaired Ford or culvert pipes or ditch system are conducted to determine effectiveness of repairs in accordance with specifications
- Ford or culvert pipes or ditch are maintained to correct line and fall/slope to specifications
- Surfaces adjoining ford or culvert pipes or ditch are finished allowing ease of runoff in accordance with specifications

- Backfill is compacted to specifications
- Adequate erosion control methods are undertaken in compliance with specifications
- Ford or culvert pipes or ditch structure system is flushed out to clear blockages and provides clear flow of water.

LO.4 Clean up

- Unused materials are sealed and stored/packed in accordance with standard material handling practices and techniques
- Plant, tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices
- Work area is cleared and materials disposed of or recycled in accordance with project environmental management plan

Annex: Resource Requirements

EIS RCM2 M 13 0322 Form Ford/Vented Structure and Pave Ditch				
Item No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Learner)
A.	***Learning Materials***			
1.	TTLM	Prepared by Trainers	5	1:5
2	Reference Books		5	1:5
2.1	ERA manual	2013	5	1:5
3.	Journals/Publication/Magazines			
B.	***Learning Facilities & Infrastructure***		1	1:25
1.	Lecture Room		8m*6 m	1:25
2.	Library			
3.	Workshop or work place			
4.	Internet Room		1	1:25
B	***Consumable Materials***			
6	Brick	25*12*6cm	750pcs	30:1
7	Block	40*20*15cm class A	375pcs	15:1
8	Stone		$25m^3$	1:1
9	Reinforcing bar	Grade 40 dia 6,8,10,12	6m	1:25
10	Sand	M^3	$5m^3$	1:5
11	Aggregate	00,1,2cm Grain size M^3	$5m^3$	1:5
12	Cement	OPC or PPC	5qu.	1:5
13	Formwork	Australia timber	5pcs	1:5
14	Water	Clean and free from chemicals		
15.	Additives if required	Additive chemicals 5L		
16	Concrete pipe	Hollow Concrete pipe dia 20,40,100cm	pcs	
C	***Tools and Equipment's***			

3.	Scaffolding	Material Aluminum Weight 13kg dimension L*W*H 120*40*66cm	5pcs	1:5
4.	Material hoist	Hydraulic lifting 150 kg	1pcs	1:25
5.	Forklifts	Capacity of 1000-2000kg	1pcs	1:25
6.	Small mixer	260ml portable cement mixer electric motor 1h.p	1pcs	1:25
7	Vibrator	Frequencies of 2800-15000rpm	1pcs	1:25
8.	Shovels	Squire wood handle Material steel shovel size 21*17cm	15pcs	3:5
9	Hammers	wood handle 5kg rectangular steel	10pcs	2:5
10	Buckets	20 Liter capacity plastic Bucket	5pcs	1:5

LEARNING MODULE 14
TVET-PROGRAMME TITLE: Road construction and maintenance Level II
MODULE TITLE: **Constructing, Laying and Maintaining Pipe, Box and Slab Culvert**
MODULE CODE: EIS RCM1 M14 0322
NOMINAL DURATION: 75 Hours
MODULE DESCRIPTION: This module the knowledge, attitude and skills required to install reinforced concrete pipe, box, slab culverts and check dam units that form part of the road drainage system. It includes the minimum criteria for competency assessment. This unit includes the plan and prepare for construction, Laying and maintenance of pipe, box, slab culvert and check dam, setting out of trenches, installing of bedding materials or constructing supporting slabs, lowering and positioning of culvert units legs down, backfilling and compaction.
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Plan and prepare **LO2.** Set out and excavate foundation **LO3.** Construct Pipe, box/slab culvert and check dam **LO4**. Lay pipe **LO5.** Maintain pipe, box, /slab culvert and check dam **LO6.** Clean up
MODULE CONTENTS: **LO1. Plan and prepare.** 1.1 Appling ,interpret and access compliance documentation 1.1.1 Employment and workplace legislation 1.1.2 Ethiopian standards 1.2 Obtaining and confirming safety requirement 1.3 Identifying and implementing traffic management requirement 1.4 Selecting tools and equipment 1.5 Identifying environmental protection requirement 1.6 Applying work instruction and operation 1.7 Identifying construction material 1.8 Check constructing and maintaining of box, slab and culvert

1.9 Culvert unit requirement

LO2. Set out and excavate foundation

2.1 . Determining location and depths of excavation

2.2 . Setting out excavation

2.3 . Advising plant operations

2.4 **.**Checking excavation depths and grades

2.5 . Preparing and compacting foundations base

LO3. Construct Pipe, box/slab culvert and check dam

3.1 .Carrying out clearing and excavation of drainage structure

3.2 Determining Location and depths of excavation

3.3 Setting out Excavation

3.4 checking Excavation depths and grades

3.5 Types of bedding material

3.6 Laying and compacting bedding material

3.7 Compacting and preparing Foundation base

3.8 Setting out and constructing formwork

3.9 Constructing box, pipe and culvert

3.10 Curing Concrete

3.11 Advising Plant operator or laborers

3.12 Constructing *Check dams, Slab culverts,* head and wing walls

LO4. Lay pipe

4.1 **.** Selecting and checking Lifting apparatus

4.2 **.** Preparation of lifting and installation pipe joint

4.3 .Prepare pipe ends

4.4 Aligning Pipe ends and push home

4.5 Checking pipe line and level

4.6 Advising Plant operator

4.7 Finishing pipe, culvert inlets and outlets

LO5. Maintain pipe, box, /slab culvert and check dam

5.1.Applying schedule of maintenance

5.2.Determine location of repairs

5.3.Selecting resources

5.4.Carrying out excavation

5.5.Identifying reporting during maintenance

5.6.Flushing out box, slab, pipe , culvert check dam system

5.7.Provide flow of water

LO6. Clean up

6.1 Clearing of wastage material disposal and recycling

6.2 Maintain and store Tools and equipment

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 equipments/ 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 ❖ (if necessary) ❖ Time extension	❖ 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 ❖ Time extension 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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

Assessment Criteria

LO1. Plan and prepare

- ***Compliance documentation*** relevant to the work activity are accessed, interpreted and applied
- ***Safety requirements are o***btained and confirmed from the ***site*** safety plan and organizational policies and procedures and apply to the allotted task
- ***Signage*** requirements are identified, obtained and implemented from the project ***traffic*** management plan
- ***Tools and equipment*** are selected to carry out tasks consistent with the requirements of the job, check for serviceability and rectified or reported any faults
- ***Environmental protection requirements are i***dentified, confirmed and applied from the project environmental management plan
- Work instructions and operational details relevant to the construction and maintenance of box, slab culvert are checked and tasks are obtained, confirmed and applied to the allotted task
- ***Construction materials*** appropriate to the work application are identified, safely handl and located ready for use
- Culvert units are checked to ensure they conform to the specified requirements.

LO2. Set out and excavate foundation

- Location and depths of excavation are determined from job drawings
- Excavation location is set out and clearly marked
- Plant operator is advised of excavation requirements
- Excavation depths and grades are checked to conform with plans and specifications
- Foundations base are compacted and prepared for testing

LO3. Construct Pipe, box/slab culvert and check dam

- Clearing and excavation to level of the foundation excavation of the drainage structures are carried out according to the design specification.
- Location and depths of excavation are determined from working drawings.
- Excavation location is set out and clearly marked

- Excavation depths and grades are checked to conform to plans and specifications requirements
- ***Bedding material*** type and specification is determined from plans and drawings
- Bedding materials are laid and compacted to specified depths and grades
- Foundation base is compacted and prepared for testing
- Formwork is set out and constructed to required dimensions and specifications
- Box and/or pipe/slab culvert are constructed as per the working drawing and design specification.
- Concrete is cured as per the design specification.
- Plant operator or laborers are advised of compaction and backfill requirements and box, slab culvert are backfilled to specification and required finish level.
- ***Check dams***, ***Slab culverts***, head and wing walls are constructed and properly cured according to the design specification.
- Inlet and outlet of box, pipe/slab culvert are finished to specification

LO4. Lay pipe

- Lifting apparatus are selected, checked and attached to the ***pipe*** in preparation for lifting and ***installation*** for ***pipe joining***
- Pipe ends are prepared and specified
- Pipe ends and push home are aligned
- Pipe is checked for line and level
- Plant operator is advised of backfilling requirements and backfill and compact pipe to required finish level
- Inlets and outlets are finished in accordance with pipe/culvert design specifications

LO5. Maintain pipe, box, /slab culvert and check dam

- Schedule of maintenance repairs/work order or instructions are obtained and applied to specification.
- Location of repairs is determined from works order and confirmed on site.

- Resources are selected in accordance with the task
- Excavation is carried out in accordance with task specification and site safety plan
- Other defects or faults further identified during maintenance are reported in accordance with organizational requirements
- Box/ slab, pipe, culvert and check dam system is flushed out to clear blockages and provide clear flow of water.

LO6. Clean up

- Work area is cleared and materials disposed of or recycled in accordance with project environmental management plan
- Tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices

Annex: Resource Requirements

(EIS RCM2 M14 0322) **Constructing, Laying and Maintaining Pipe, Box and Slab Culvert**				
Item No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Learner)
A.	**Learning Materials**			
1.	TTLM	Prepared by the trainers Module	5pcs	1:5
2.	Textbooks			
2.1	Building construction	Christian Meuli, Karl Wehrie, Heini Muller, Heini Pfiffner	5	1:5
3.	Reference Books			
3.1	Concrete pipe and box culvert	American concrete pipe association	5	1:5
4.	Journals/Publication/Magazines	Electronic journals	1	1:25
B.	**Learning Facilities & Infrastructure**			
1.	Lecture room	8 x 10m	1	1:25
2.	Lap tob	Core i 5/ 7, CPU@ 2.80Gz, RAM 8GB,	1	For trainers
3.	LCD projector	HD	1	For trainers
4.	Printer	ChromaLife100 inks Mono Print Speed Approx.	1	For trainers

		15.0 imp		
5	White board	For White & black board	1	For trainers
6	Screan	64”	1	1:25
D.	**Tools and Equipment**			
1.	Sprit levels	60cm; 120cm	5 pcs	1:5
2.	Leveling instrument with its accessory	Digital/Optical	5 pcs	1:5
3.	Survey pegs/	20 mm to 30 mm. length peg is 150 mm. Wooden pegs	200 pcs	4:1
4.	Plumb bobs	200 g Diameter 32 mm Length 88 mm	5 pcs	1:5
5	Profile board	Steel 2m rural area	25 pcs	1:1
6	Straight edges	2m*5mm*5mm	5 pcs	1:5
7	Hammer	By kg (3, 5,10kg)	5 pcs	1:5
8	Measuring tape	Steel and rolling 5m; 30m	9 Pcs	1:3
9	Ink/chalk	White	1	1:25
10	Line levels	Plastic level 1x180° vail	5 Pcs	1:5
11	Shovels	With handle wooden	5 Pcs	1:5
12	hand saws	Handle with wooden	5 Pcs	1:5

13	cutting knives	Stainless steel	5 Pcs	1:5
14	crow bars	Octagonal crow-bar (ordinary) with chisel and hammer end	5 Pcs	1:5
15	Grinders	Electrical	1 Pc	1:25
16	Scaffolding	Steel/wood	1 Pc	1:25
17	Pick axe	Made of metal and wooden	pcs	1:1
18	Sprit levels	60cm; 120cm	5 pcs	1:5
19	Leveling instrument with its accessory	Digital/Optical	5 pcs	1:5
20	Survey pegs/ Wooden pegs	Steel	200 pcs	4:1
21	Saws	Wooden	5 Pcs	1:5
22	Measuring tape	Steel and rolling 5m; 30m	9 Pcs	1:3
E	**Consumable Materials**			
1	concrete pipe	90cm diameter	As required	25
2	steel pipe	110mm diameter	As required	25
3	masonry block	25cm*12*6	As required	25
4	Gabion	Mashed	As required	25
5	Selected materials	Gereganti	As required	25
6	masonry stone	Granite	As required	25

7	sand	Sea sand	As required	25
8	Aggregate	0.0,0.2,0.4Crushed	As required	25
9	ribbed PVC	Standard 110mm	As required	25
10	rubber ring	Made of rubber	As required	25

LEARNING MODULE 15
TVET-PROGRAMME TITLE: Road Construction and Maintenance Level II
MODULE TITLE: Conducting Road Performance Condition
MODULE CODE: EIS RCM2 15 0322
NOMINAL DURATION: 50 Hours
MODULE DESCRIPTION: This module covers the knowledge, skills and attitudes required to coordinate and monitor road performance condition. It includes the minimum criteria for competence assessment. This unit includes confirming implementation of traffic operation and safety measures, maintenance of gravel road performance measures and report on maintenance.
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1**. Plan and prepare **LO2.** Implement traffic operation and safety measures **LO3.** Conduct, production of selected quarry materials **LO4.** Report on maintenance
MODULE CONTENTS: **LO.1 Plan and prepare** 1.1 Identifying road level requirement 1.2 Identifying Labor based road maintenance requirements 1.3 Identifying quality and quantity requirements 1.4 Identifying Environmental and development factors 1.5 Applying Work instructions 1.6 Applying safety requirements 1.7 Identifying Signage requirements 1.8 Identifying performance levels of road. 1.9 Tools and equipment **LO.2 Implement traffic operation and safety measures** 2.1 Providing warning traffic signs

2.2 Appling work place safety

2.3 Providing Detour roads maintenance

2.4 Indicating stop and slow signs

LO.3 Conduct, production of selected quarry materials

3.1 Identifying road level of service

3.2 Accessing and monitoring road operation

3.3 Identifying maintenance operation

3.4 coordinating and monitoring maintenance operation

LO.4 Report on maintenance

4.1 Coordinating and monitoring *organizational procedures*

4.2 Identifying Current and potential problems

4.3 Reporting investigation results

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	❖ 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	❖ 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

	❖ 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	❖ Present the lecture in video format ❖ Summarize main points		
Demonstration	❖ Conduct close follow up	❖ use Sign language interpreter	❖ Illustrate in clear & short method	❖ Facilitate and support the trainees having

	❖ Use verbal description ❖ Provide special attention in the process of guidance ❖ facilitate the support of peer trainees ❖ Prepare & use simulation	❖ Use video recorded material ❖ Ensure attention of the trainees ❖ Provide structured training ❖ Show clear and short method ❖ Use gesture ❖ Provide tutorial support (if necessary)	❖ Use Video recorded material ❖ Ensure the attention of the trainees ❖ Provide tutorial support (if necessary)	severe upper limbs impairment to operate equipments/ 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	❖ 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	❖ Introduce the trainees with their peers

	other group member ❖ Brief the thematic issues of the work		❖ Inform the group members to speak loudly	
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	❖ Use sign language interpreter ❖ Provide briefing	❖ Provide briefing /orientation on the assignment	

	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	/orientation on the assignment ❖ Provide visual recorded material	❖ 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	❖ 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 ❖ Time extension for trainees having severe upper limb impairment

	reader ❖ (if necessary) ❖ Time extension			
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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO.1 Plan and prepare

- The road level of service requirement is identified.
- Labor based road maintenance requirements to meet the level of service are identified
- Work quality and quantity requirements are identified.
- ***Environmental and development factors*** that impact the roads are identified
- Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied to the allotted task
- Safety requirements are obtained from the site safety plan and organizational policies and procedures, confirmed and applied to the allotted task
- Signage requirements are identified and obtained from the project traffic management plan and observed
- Detail of expected road performance levels is identified ad maid ready as a measurement tools to monitor the performance of the road.
- ***Tools and equipment*** carry out tasks are selected to be consistent with the requirements of the job and checked for serviceability and any faults are rectified or reported.

LO.2 Implement traffic operation and safety measures

- Warning traffic signs are provided as per the design specification
- Work place safety measures are applied as per the design specification and the work place requirement
- Detour roads are provided where the roads are not useable because of maintenance Operation
- Stop and slow signs indicating that the road is under maintenance and laborer are working are shown as per the safe working procedures

LO.3 Identify gravel roads performance measures

- The road level of service requirement is identified.
- The road operation is assessed and monitored against the level service standard to be attained.
- Gaps in maintenance operation is identified
- Instruction to improve maintenance operation coved to the maintenance crew and the implementation operation and process coordinated and is monitored.

LO.4 Report on maintenance

- Coordination and **monitoring** data are analyzed, recorded and reported according to ***organizational procedures and specifications***
- Current and potential problems are identified and investigated.
- Investigation results and recommendations are reported

EIS RCM2 M 15 0322 Conducting Road Performance Condition				
Item No.	Category/Item	Description/ Specifications	Quantity	Recommended Ratio (Item: Learner)
A.	***Learning Materials***			
1.	TTLM	Prepared by Trainers	5	1:5
2	Reference Books		5	1:5
2.1	Construction Annual	2019		
3.	Journals/Publication/Magazines	Construction Annual 2019	5	1:5
B.	***Learning Facilities & Infrastructure***		1	1:25
1.	Lecture Room	8 X 6m	1	1:25
2.	Library		1	1:25
3.	work place			
4.	Internet Room	10X 10m	1	1:25
5	White board	1220mm x 2440mm, double-faced, magnetic, movable with 4 castors. 1 side in white, can be used as a writing ...	1	1:25
6	LCD projector	1220mm x 2440mm, double-faced, magnetic, movable with 4 castors. 1 side in white, can be used as a writing ...	1	1:25
7	Printer	Contrast ratio 3000 to 1 with Auto Iris on and Normal Power Brightness, 4200 Lumens	1	1:25
8	Copy machine	Print Speed: Borderless 10x15cm: Print Resolution: Up to 9600, x 2400 dpi	1	1:25
C.	***Consumable Materials***			
1	Pencil	HB, 2HB, 4H	25 pcs	1:1
2	pen & ink	Red, blue and black	25 pcs	1:1

3	Tape measure	Made of steel ribbon varying in width from 6 mm to 16 mm. It is available in lengths of 1, 2, 10, 30 and 50 meters.	25pcs	1:1
4	String lines	High Tension Steel/Fibre Core Wire *Rope* Hoist 6*K25f 6*K25 22mm 24mm 26mm 28mm 30mm Compacted Strand Cable	5	1:5
D.	***Tools and Equipments***			
1.	Leveling instruments	Telescope magnification Objective aperture Minimum focus Accuracy 1km	5	1:5
2	Losangeles Abrasion machine	steel cylinder of 711 mm inside diameter x 508 mm inside length,	1	1:25
3.	Balance	Digital balance calibration certificate. Sets range from 1 mg - 500 mg ...	1pcs	1:25
4.	Mould	10mm thick steel Diameter 100mm Internal Dia127.3mm Height 1000CC Volume Hammer Weight 3 KG.	5pcs	1:5
5.	Oven	A.C. Motor0.5 H.PCapacity: 100-150 kg.	10pcs	2:5
6.	Arrow boards	LED lamps. The highly visible *arrow board* measures 2400 mm long x 1200 mm high, and .	10pcs	2:5

LEARNING MODULE 16
TVET-PROGRAMME TITLE: Road construction and maintenance Level L2
MODULE TITLE: Performing Minor Road Maintenance Operations
MODULE CODE: EIS RCM2 M16 0322
NOMINAL DURATION: .120... Hours
MODULE DESCRIPTION: This module covers conduct of road maintenance operations including labor based in the civil construction industry. It includes planning and preparing, setting up road maintenance unit, repairing damaged surfaces, and cleaning up.
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Plan and prepare **LO2.**Check pre-maintenance operation **LO3.**Repair damaged surfaces **LO4.**Check equipment performance **LO5.**Carry-out routine maintenance work **LO6.**Carry-out periodic maintenance work **LO7.**Carry-out emergency maintenance **LO8.**Summary of report of the work achieved **LO9.**Clean up
MODULE CONTENTS: **LO1. Plan and prepare** 1.1 accessing, interpreting and applying Compliance documentation 1.2 Safety requirements 1.3 Signage requirements 1.4 Plant, tools and equipment **1.5** Environmental protection requirements **LO2. Check pre-maintenance operation** 2.1 Preparing Road maintenance operations 2.2 Carrying out road maintenance unit

2.3 Operating components of the truck

2.4 Checking Tank for prevention

2.5 Filling Tank for perform repair operations

2.6 Type of asphalt and mix emulsion

LO3. Repair damaged surfaces

3.1 Carrying out Start-up, park and shutdown procedure

3.2 Positioning Truck to damage areas

3.3 Cleaning Area to repair

3.4 Selecting Equipment require for repair

3.5 Preparing Defective area for resurfacing or filling

3.6 Completing Resurfacing or filling

3.7 Finishing Repair surface

3.8 Measuring, calculating and recording Material quantities and additives

3.9 Conducting, controlling and monitoring Repair operations

LO.4 Check equipment performance

4.1 Advising operator

4.2 Inspecting maintain equipment and asphalt storage hopper

4.3 Carry out routine operational servicing and lubrication tasks

4.4 Report and record Equipment condition

LO. 5 Carry-out routine maintenance work

5.1 Side ditches maintenance and bush clearing

5.2 Clearing and maintaining drainage structures or culverts

5.3 Identifying, obtaining, preparing, transporting Materials appropriate to the work

5.4 Spot surfacing and re- surfacing operations

5.5 Maintaining Camber formation

LO. 6 Carry-out periodic maintenance work

6.1 Resurfacing, shoulder and ditch re-shaping

6.2 Clearing and maintaining drainage structures or culverts

6.3 Quarry preparation, loading, unloading and transporting gravel material

6.4 Maintaining Camber formation

LO. 7 Carry-out emergency maintenance

7.1 Reconstruction or repair damage culverts & fords

7.2 Clearing Land slide, tree or rock fall

7.3 Reconstructing Damage road section

7.4 Reconstructing Damage drainage system

7.5 Reconstructing Damage erosion protections

LO. 8 Summary of report of the work achieved

8.1 Preparing. Daily maintenance report

8.2 Preparing Weekly maintenance report

8.3 Identifying and reporting Heavy maintenance needs during work progress

LO. 9 Clean up

9.1 clearing Work area

9.2 cleaning, checking, maintaining and storing Plant, tools and equipment

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	❖ 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	❖ 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

	audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	during lecture time ❖ Present the lecture in video format ❖ Summarize main points		
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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the	❖ Facilitate the integration of trainees with group	❖ Introduce the trainees with their peers

	❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	
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	❖ prepare the assignment questions in large text	❖ Use sign language interpreter	❖ Provide briefing /orientation on the	

assignment	❖ 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	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	assignment ❖ Provide visual recorded material	

ASSESSMENT METHODS:				
Interview		❖ Use sign language interpreter ❖ Ensure or conform whether the proper communication	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having

		was conducted with the trainee through the service of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension		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 ❖ (if necessary) ❖ Time	❖ 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 ❖ Time extension for trainees having severe upper limb impairment

	extension			
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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA

LO1: Plan and prepare

- ***Compliance documentation*** are accessed, interpreted and applied relevant to the work activity
- ***Safety requirements*** are obtained and confirmed from the ***site*** safety plan and organisational policies and procedures, and applied to the allotted task
- ***Signage*** requirements identified, obtained and implemented from the project ***traffic*** management plan
- Plant, ***tools and equipment*** are select to carry out tasks consistent with the requirements of the job, checked for serviceability and rectified or reported any faults
- ***Environmental protection requirements*** are identified from the project environmental management plan, and confirmed and applied to the allotted task

LO2: Check pre-maintenance operation

- ***Road maintenance operations*** are prepared for
- Pre-operational checks are carried out for ***road maintenance unit***
- Operating components of the truck are checked for serviceability
- Tank for prevention is checked of contamination
- Tank is filled with the required ***materials*** to perform repair operations
- Standard mix of emulsion and/or type of asphalt is determined ready for application

LO3: Repair damaged surfaces

- Start-up, park and shutdown procedures are carried out
- Truck is positioned forward of the ***damaged areas*** to be repaired
- Area is cleaned to be repaired free of dust and debris
- Equipment is selected as appropriate to the defective area requiring repair
- Defective area is prepared for resurfacing or filling
- Resurfacing or filling is completed of the damaged area
- Repaired ***surface*** is finished ready for use

- Material quantities and additives are measured, calculated and ***recorded*** for each site
- Repairing operations are conducted, controlled and monitored to ensure that materials are placed to specification

LO4: Check equipment performance

- The operator is advised to conduct fault finding inspections in accordance with manufacturer's specifications and organisational requirements
- The maintain equipment and the asphalt storage hopper are inspected to be in good working order
- The operator is advised to carry out routine operational servicing and lubrication tasks to manufacturer's and organisational requirements
- Equipment condition reports and records are maintained

LO5: Carry-out routine maintenance work

- Side ditches maintenance and bush clearing are conducted according to work order or specification.
- The drainage structures or culverts are cleared and maintained according to work order or specification.
- Materials appropriate to the work application are identified, obtained, prepared, transported safely for use
- Spot surfacing and re- surfacing operations on specified road section are maintained according to work order or specification.
- Camber formation is maintained according to specification.

LO6: Carry-out periodic maintenance work

- Resurfacing, shoulder and ditch re-shaping, are conducted according to the work order or specification.

- The drainage structures or culverts are cleared and maintained according to work order or specification.
- The quarry preparation, loading, unloading and transported gravel material is properly done.
- Camber formation is maintained according to specification.

LO7.Carry-out emergency maintenance

- Reconstruction or repair of damaged culverts & fords are conducted according to the work order.
- Land slide, tree or rock fall is cleared according to the work order.
- Damaged road section resulting from erosion is reconstructed according to the work order or specification.
- Damaged drainage system resulting from erosion is reconstructed according to the work order or specification.
- Damaged erosion protections resulting from serious washout are reconstructed according to the work order or specification.

LO8. Summary of report of the work achieved

- Daily maintenance report is prepared.
- Weekly maintenance report is prepared from the daily report.
- Heavy maintenance needs identified during work progress are reported.

LO9. Clean up

- Work area is cleared and materials are disposed of or recycled in accordance with project environmental management plan
- Plant, tools and equipment are cleaned, checked, maintained and stored

Annex: Resource Requirements

Perform Minor Road Maintenance Operations EIS RCM2 M16 0322					
Item No.	Category/Item	Description/ Specifications		Quantity	Recommended Ratio (Item: Learner)
A.	***Learning Materials***				
1.	TTLM	Prepared by the trainers Module 01	15pcs	1:2	
2.	Textbooks				
3.	Reference Books				
4.	Journals/Publication/Magazines				
B.	*Learning Facilities & Infrastructure*				
1.	Lecture Room	10 X 10m	1	1:30	
2.	Library	15 X 15m	1	1:30	
3.	Workshop or work place	10 X 10m	1	1:30	
C.	*Consumable Materials*				
2.	asphalts	drum	1	1:1	
3.	aggregates	M3	5	1:1	
4.	Cement	bag	5	1:3	
5.	Stone	M3	5	1:1	
6.	Sand	M3	5	1:1	
7.	Reinforcing steel	Dia 8,10 and 12	10	1:1	
8.	water	L			
D.	*Tools and Equipment's*				
1	road maintenance unit (truck) and all of its attachments	Standard	6pcs	1:5	
5	rakes	without handle, 12 teeth	5	1:5	
6	shovels	round point with Y handle, total lenght approx.1m	5	1:5	
7	vibrating plates	Vibration Axle: Uniaxial	1	1:25	

		Monowheel Compaction Depth: 25cm Engine Type:Petrol Engine Travel Speed:25cm/s		
8	jack hammers	WEIGHT27 kg LENGTH 645 mm AIR DRILL STEEL (HEX) 22 x 108 mm	1	1:25
	• wheel barrow	Carrying capacity: 150kg L*H*C: 1380*540*450mm	1	1:25
	• roller	Type: Tire Grind Compaction Depth: 40cm Engine Type:Diesel Engine	1	1:25

LEARNING MODULE 17
TVET-PROGRAMME TITLE: Road Construction And Maintenance Level II
MODULE TITLE: Installing Pre-Cast Bridge Elements
MODULE CODE: EIS RCM2 M17 0322
NOMINAL DURATION: 70 Hours
MODULE DESCRIPTION: This Module covers the installation of pre-cast girders, parapets and concrete bridge decks in the civil construction industry. It includes planning and preparing, installing bearings, installing girders, installing parapets, installing concrete bridge decks, fixing bridge fitting sand cleaning up
LEARNING OUTCOMES At the end of the module the trainee will be able to: **LO1.** Plan and prepared **LO2.** Install bearings **LO3.** Install girders **LO4.** Install pre-cast parapet units **LO5.** Finish parapet **LO6.** Install concrete bridge deck **LO7.** Fix bridge fittings **LO8.** Clean up

MODULE CONTENTS:

LO1. Plan and prepared

1.1 Accessing, interpreting and applying compliance documentation

1.2 Obtaining, confirming and applying work instruction

1.3 Safety Requirements

1.4 Identify Sign Requirements

1.5 Selecting tools and equipment

1.6 Environmental protection requirements

LO2. Install bearings

2.1 Determine bearing types

2..2 Checking bearing material

2.3 Installing Bearings

2.4 Identify and install locating brackets/bolts

LO3. Install girders

3.1 Determine girder location

3.2 Determine fitting sequence and crane

3.3 Checking lifting points and girder

3.4 Place timber packing to support girder load

3.5 Use drift to align holes and insert and tension locating bolts

3.6 Adjust bearings

3.7 Brace girder

3.8 Removing timber packing, roll and store tag lines and epoxy putty or mortar

LO4. Install pre-cast parapet units

4.1 Raise Pre-Cast Parapet

4.2 Maneuver pre-cast parapet unit into the vertical position

4.3 Guide pre-cast parapet unit

4.4 Establish Vertical And Horizontal Alignment Of Precast Parapet

4.5 Install intermediate pre-cast parapet units

4.6 Check Precast Height And Alignment

4.7 Adjust intermediate pre-cast parapet units

4.8 Install Anchor Cable And Specification

LO5. Finish parapet

5.1 Install service and fittings

5.2 Fit joints and grout

5.3 Preparing cast in-situ

5.4 Placing concrete and finish

5.5 Dismantling and removing form work

LO6. Install concrete bridge deck

6.1 Preparing deck components

6.2 Place deck components

6.3 Carry out pre-fabricated concrete deck

6.4 Insert and tension pre-fabricated concrete deck

6.5 Grout transverse stressing bar

6.6 Grout anchor bolts

6.7 Place and specify deck joints

LO7. Fix bridge fittings

7.1 Fit posts and bridge rails

7.2 Assemble and install pre-fabricated stairs

LO8. Clean up

8.1 Clear work area

8.1.1 Disposing maternal

8.1.2 Recycling material

8.2 Clean, check and maintain tools and equipment

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	❖ 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	❖ 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

	audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points	during lecture time ❖ Present the lecture in video format ❖ Summarize main points		
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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the	❖ Facilitate the integration of trainees with group	❖ Introduce the trainees with their peers

	❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	integration of trainees with group members ❖ Conduct close follow up ❖ Introduce the trainees with other group member	members ❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	
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	❖ prepare the assignment questions in large text	❖ Use sign language interpreter	❖ Provide briefing /orientation on the	

assignment	❖ 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	❖ Provide briefing /orientation on the assignment ❖ Provide visual recorded material	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	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having speech challenges

		of the sign language interpreter ❖ Use short and clear questioning ❖ Time extension		
Written test	❖ Prepare the exam in large texts ❖ Use interview as an option if necessary ❖ Prepare the exam in audio format ❖ Assign human reader ❖ (if necessary) ❖ Time extension	❖ 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 ❖ Time extension 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/ practical assessment method ❖ Time extension	❖ Provide activity based assessment ❖ Brief on the instruction of the exam ❖ Use loud voice ❖ Time extension	❖ Provide activity based assessment ❖ Conduct close follow up ❖ Time extension

ASSESSMENT CRITERIA:

LO.1 Plan and prepared

- Access, interpret and apply ***compliance documentation*** relevant to the work activity
- Obtain, confirm and apply work instructions, including plans, specifications, quality requirements and operational

  details to the allotted task
- Obtain and confirm ***safety requirements*** from the ***site*** safety plan and organizational policies and procedures, and apply to the allotted task
- Identify, obtain and implement ***signage requirements*** from the project ***traffic*** management plan
- Select plant, ***tools and equipment*** to carry out tasks consistent with the requirements of the job, check for serviceability and rectify or report any faults
- Identify ***environmental protection requirements*** from the project environmental management plan, and confirm and apply to the allotted task

LO.2 Install bearings

- Determine ***bearing types*** and position from project drawings and specifications
- Check bearing dimensions and materials for quality
- Install bearings as required
- Identify and install locating brackets/bolts in preparation for the placement of ***girders***

LO.3 Install girders

- Determine individual girder location from project drawings and specifications
- Determine fitting sequence to install girders in accordance with engineering instructions and advise the ***crane*** operator
- Check girders for ***conformity*** to design prior to lifting in accordance with standard industry work practices
- Check lifting points on girders for serviceability and attach and use tag lines to guide girder to position
- Place timber packing to support girder load
- Use drift to align holes and insert and tension locating bolts
- Adjust bearings to specification to provide support across the full face of the bearing to the girder
- ***Brace*** girder to prevent lateral movement or rolling
- Remove, roll and store tag lines

- Remove excess epoxy putty or mortar
- Remove timber packing at specified time

LO.4 Install pre-cast parapet units

- Raise pre-cast parapet end unit to allow ***fitting*** of bracket
- Maneuver pre-cast parapet unit into the vertical position in accordance with installation procedures
- Guide pre-cast parapet unit into approximate position and attach locating bolts to cast in brackets
- Correctly establish vertical and horizontal alignment of pre-cast parapet end units and tighten bolts
- Install intermediate pre-cast parapet units in approximate positions
- Check pre-cast end units for correct height and alignment
- Adjust intermediate pre-cast parapet units to design alignment and tighten locating bolts
- Install anchor cable and fix ends to job specifications

LO.5 Finish parapet

- Install ***services*** and fittings to job specifications as required
- Fit joints with foam inserts and grout
- Form up and prepare cast in-situ infills of the pre-cast units
- Place concrete and finish to design
- Dismantle formwork and remove from site

LO6. Install concrete bridge deck

- Install concrete bridge deck Prepare deck components for grouting prior to placement in accordance with deck design and specifications
- Place deck components
- Carry out and complete pre-fabricated concrete decking grouting
- Insert and tension pre-fabricated concrete decking transverse stressing bar as specified
- Grout transverse stressing bar to specifications
- Grout anchor bolts
- Place and specify deck joints of pre-fabricated decking and scuppers

LO7. Fix bridge fittings

- Fit posts and bridge rails as per project drawings and specifications

- Assemble pre-fabricated stairs and install to specifications where required

LO8. Clean up

- Clear work area and dispose of or recycle ***materials*** in accordance with project environmental management plan
- Clean, check, maintain and store plant, tools and equipment

Annex: Resource Requirements

EIS RCM2 M17 0322 Installing Pre-Cast Bridge Elements				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	***Learning Materials***			
1.	TTLM	TTTLM prepared by the trainer	5	1:5
2	Reference Books			
2.1	Design of reinforced concrete	Russel H. Brown Ninth edition	5	1:5
2.2	Bridge engineering hand book	Wlafah Chen and Lian Duan 2nd edition	5	1:5
2.3	Bridge engineering	S ponnuswamy	5	1:5
B.	***Learning Facilities & Infrastructure***			
1.	Class room	8mx6m	1pcs	1:25
2.	White-board/Blackboard	240 x 120 cm	1pcs	1:25
3.	Workshop	10mx10m	1	1:25
4.	Laptop or Computer	32-bit OS; 4 GB RAM; Intel core i5 For trainer	1pcs	1:25
5.	Library	Per section 105 – 180 m2	180 m2	
8.	Internet room	5mx5m	1	1:25
C.	***Consumable Materials***			
1.	Plain rods	Ø12mm	6pcs	1:5
2.	Spacer/spreader	Ø6mm	30	1:1
3.	Wire ties	Roll	1	1:30
4	Pipe sections	½¨	6pcs	1:5

5	scaffolding components	Ø8cm Eq. tree	6pcs	1:5
D.	***Tools and Equipments***			
1.	Tape Measures	Stainless steel measuring tape size 3mx19mm	25	1:1
2	Bolt cutters	RS PRO 460 mm steel bolt cutter	5pcs	1:5
3	Reinforcement benders	14mm new manual rebar bender steel bar bending	5pcs	1:5
4	Wire nippers	MS diagonal wire cutter size 6inch	5pcs	1:5
5	Tie wire reels	Steel fixer tie wire reel	5pcs	1:5

LEARNING MODULE 18

TVET-PROGRAMME TITLE: Road construction and Maintenance Level II

MODULE TITLE: Preventing and Eliminate MUDA

MODULE CODE: EIS RCM2 M18 0322

NOMINAL DURATION: 40 Hours

MODULE DESCRIPTION: This module covers the knowledge, skills and attitude required by a worker to prevent and eliminate MUDA/wastes in his/her workplace by applying scientific problem-solving techniques and tools to enhance quality, productivity and other kaizen elements on continual basis. It covers responsibility for the day-to-day operation of the work and ensures Kaizen Elements are continuously improved and institutionalized.

LEARNING OUTCOMES

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

LO1. Prepare for work.

LO2. Identify MUDA and problem

LO3. Analyze causes of a problem.

LO4. Eliminate MUDA and Assess effectiveness of the solution.

LO5. Prevent occurrence of wastes and sustain operation.

MODULE CONTENTS:

LO1. Prepare for work.

1.1.Determining work instruction

1.2.Interpreting working manual

1.3.OHS requirement

1.4.Selecting Appropriate material

1.5.Identifying and checking safety equipment and tools

LO2. Identify MUDA and problem

2.1 Identification and preparing plan of MUDA

2.2 Discussing Causes and effects of MUDA

2.3 Listing and using statistical tools and techniques

2.4 Identifying and listing possible problems related to kaizen elements

2.5 Analysing and using tools and techniques

2.6 Identifying and measuring Wastes/MUDA

2.7 Identifying and measured waste report

LO3. Analyze causes of a problem.

3.1 Listing all problem

3.2 Analyzing causes of problem and using ***4M1E***

3.3 Identifying causes of problem

3.4 Selecting problem cause

3.5 Listing and using creative idea generation

3.6 Testing and evaluating solution

3.7 Preparing Detail summaries of the action plan

LO4. Eliminate MUDA and Assess effectiveness of the solution.

4.1 preparing and implementing medium KPT

4.2 Improving and adopting ten basic principles of waste MUDA

4.3 Useing tools and techniques eliminate MUDA

4.4 Reducing and eliminated waste/MUDA

4.5 Identifying tangible and intangible results

4.6 Comparing Tangible results

4.7 Reporting Improvements gained by elimination of waste/MUDA

LO5. Prevent occurrence of wastes and sustain operation.

5.1 Preparing and implementing plan of MUDA

5.2 Defining and preparing machines operation

5.3 Using visual and auditioning control methods

5.4 creating Waste-free workplace by Using 5W and 1H

5.5 operating and Practicing standard procedures

5.6 facilitating standard procedures and practices

5.7 standard operating procedures(SOPs)

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	❖ 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

	❖ Encourage trainees to record the lecture in audio format ❖ Provide Orientation on the physical feature of the work shop ❖ Summarize main points			
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 equipments/ 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	❖ Use sign language interpreters ❖ Facilitate the integration of trainees with group members	❖ Facilitate the integration of trainees with group members	❖ Introduce the trainees with their peers

	❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Brief the thematic issues of the work	❖ Conduct close follow up ❖ Introduce the trainees with other group member	❖ Conduct close follow up ❖ Introduce the trainees with other group member ❖ Inform the group members to speak loudly	
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	❖ Speak loudly ❖ Using sign language interpreter if necessary	❖ Use written response as an option for the trainees having speech challenges

		❖ Time extension		
Written test	❖ Prepare the exam in large texts ❖ Use interview as an option if necessary ❖ Prepare the exam in audio format ❖ Assign human reader ❖ (if necessary) ❖ Time extension	❖ 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 ❖ Time extension for trainees having severe upper limb impairment

ASSESSMENT CRITERIA:

LO.1. Prepare for work.

- Work instructions are used to determine job requirements, including method, material and equipment.
- Job specifications are read and interpreted following working manual.
- ***OHS requirements***, including dust and fume collection, breathing apparatus and eye and ear personal protection needs are observed throughout the work.
- Appropriate material is selected for work.
- ***Safety equipment and tools*** are identified and checked for safe and effective operation.

LO.2. Identify MUDA and problem

- Plan of MUDA and problem identification is prepared and implemented.
- Causes and effects of MUDA are discussed.
- All possible problems related to the process /Kaizen elements are listed using ***statistical tools and techniques***.
- All possible problems related to kaizen elements are identified and listed on Visual Management Board/Kaizen Board.
- ***Tools and techniques*** are used to draw and analyze current situation of the work place.
- Wastes/MUDA are identified and measured based on ***relevant procedures***.
- Identified and measured wastes are reported to relevant personnel.

LO.3. Analyze causes of a problem.

- All possible causes of a problem are listed.
- Cause relationships are analyzed using***4M1E***.
- Causes of the problems are identified.
- The root cause which is most directly related to the problem is selected.
- All possible ways are listed using ***creative idea generation*** to eliminate the most critical root cause.
- The suggested solutions are carefully tested and evaluated for potential complications.
- Detailed summaries of the action plan are prepared to implement the suggested solution.

LO.4 . Eliminate MUDA and Assess effectiveness of the solution.

- Plan of MUDA elimination is prepared and implemented by ***medium KPT*** members.
- Necessary attitude and the ***ten basic principles*** for improvement are adopted to eliminate waste/MUDA.
- Tools and techniques are used to eliminate wastes/MUDA based on the procedures and OHS.
- Wastes/MUDA are reduced and eliminated in accordance with OHS and organizational requirements.
- ***Tangible and intangible results*** are identified.
- Tangible results are compared with targets using ***various types of diagrams***.
- Improvements gained by elimination of waste/MUDA are reported to relevant bodies.

LO.5 Prevent occurrence of wastes and sustain operation.

- Plan of MUDA prevention is prepared and implemented.
- Standards required for machines, operations, defining normal and abnormal conditions, clerical procedures and procurement are discussed and prepared.
- Occurrences of wastes/MUDA are prevented by using ***visual and auditory control methods***.
- Waste-free workplace is created using ***5W and 1H***sheet.
- The completion of required operation is done in accordance with standard procedures and practices.
- The updating of standard procedures and practices is facilitated.

  The capability of the work team that aligns with the requirements of the procedure is ensured and trained on the new ***Standard Operating Procedures (SOPs)***.

Annex: Resource Requirements

EIS_RCM2 18_0322 Preventing and Eliminate MUDA				
Item No.	**Category/Item**	**Description/ Specifications**	**Quantity**	**Recommended Ratio (Item: Trainee)**
A.	***Learning Materials***			
1.	TTLM	TTTLM prepared by the trainer		
2.	Reference Books			
2.1	http://213.55.95.56/bitstream/handle/123456789/15195/Wubshet%20Mulatu.pdf?sequence=1&isAllowed=y			
2.2	Abbas Toloei Eshlaghy, Hydeh Mottaghi and Rasool Shafieyoun Effective factors on sustainability of manufacturing processes, overcoming shrinkage in improved processes[Journal] // African Journal of Business Management. - Tehran, Iran. : Academic Journals, April4, 2011. - 7 : Vol. 5. - pp.2700-2707			
4.	Journals/Publication/Magazines			
B.	***Learning Facilities & Infrastructure***			
1.				
2.				
3.				
C.	***Consumable Materials***			
1.				
2				

Acknowledgement

The **Ministry of Labor and Skills** wishes to thank and appreciation for the trainers who donated their effort and time to develop this outcome based curriculum for the TVET program Road construction and maintenance Level- II. We also thank all regional TVET College, coordinator, OXFAM office programmers for active facilitation of their trainers for the development of this curriculum.

The trainers who developed the curriculum

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