Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

PWOFE301

FIELD EXCAVATION WORKS

CONDUCT FIELD EXCAVATION WORKS

Competence

RQF Level: 3

Learning Hours
30

Credits: 3

Sector: Construction and Building Services

Trade: Public works

Module Type: Specific

Curriculum: CBSPWO3001- TVET Certificate III in Public Works

Issue Date: May 2022

<table>
<tr><td>Purpose statement</td><td colspan="5">This module describes the skills, knowledge and attitude required to conduct field excavation works. It is intended for learners who have successfully completed the ordinary level and pursuing level III in Public works or applying for recognition of prior learning or other related qualifications. At the end of this module, learners will be able to Select materials, tools and equipment, Prepare site for excavation, Carry out excavation works and Clean up construction work place. Qualified learners deemed competent to this competency shall have ability to take responsibility for the carrying out of a range of defined activities in field excavation works under non- directive supervision.</td></tr>
<tr><td>Leaning assumed to be in place</td><td colspan="5">Safety, Health and environment at workplace; Basic technical drawing; Public works resources; Set out road alignment</td></tr>
<tr><td rowspan="6">Delivery modality</td><td colspan="2">Training delivery</td><td>`</td><td colspan="2">Assessment</td><td>Total 100%</td></tr>
<tr><td colspan="2">Theoretical content</td><td>30%</td><td rowspan="4">Formative assessment</td><td>30%</td><td rowspan="4">50%</td></tr>
<tr><td colspan="2">Practical work:</td><td rowspan="3">70%</td><td rowspan="3">70%</td></tr>
<tr><td>• Group project and presentation</td><td>20%</td></tr>
<tr><td>• Individual project /Work</td><td>50%</td></tr>
<tr><td colspan="3"></td><td colspan="2">Summative Assessment</td><td>50%</td></tr>
</table>

Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
1. **Select materials, tools and equipment**	1.1. Materials are properly selected based on the nature of work.
	1.2. Tools are properly selected according to the nature of work
	1.3. Equipment are properly selected according to the nature of work
2. Prepare site for excavation	2.1. The site is properly demarcated according to the site boundaries
	2.2. Site conditions are properly identified in relation with the work to be implemented
	2.3. Surface obstacles are adequately removed according to their types.
3. Carry out excavation works	3.1. Soil is carefully cut based on surveying data
	3.2. Underground obstacles are carefully removed according to their type.
	3.3. Site is properly dumped off based on environmental aspect
4. Clean up the	4.1. The work area is carefully cleared in accordance with environmental management

work place		plan
	4.2.	Materials are carefully removed as per environmental impact assessment plan
	4.3.	Tools and equipment are properly maintained in accordance with manufacturer recommendations and standards work practices.
	4.4.	Equipment are properly maintained in accordance with manufacturer's recommendations and standards work practices.

Course content

Learning outcomes	**At the end of the module the learner will be able to:** 1. **Select materials, tools and equipment** 2. **Prepare site for excavation** 3. **Carry out excavation works** 4. **Clean up the work place**
Learning outcome 1: Select materials, tools and equipment	**Learning hours: 5**

Indicative content

(Based on the performance criteria and the extent of the learning outcome: What, How, Up to)

- **Selection of materials used in excavation works**
  - ✓ Liquid materials
  - ✓ Solid materials
  - ✓ Explosive materials

- **Selection of tools used in excavation works** (Refer to RS ISO 45001; RS 175; RS EAS 188; RS EAS 1020; RS ISO 20347; RS EAS 914; RS EAS 132)
  - ✓ Cutting tools
  - ✓ Digging tools
  - ✓ Transporting tools
  - ✓ Compacting tools
  - ✓ Measuring tools

- **Selection of equipment used in excavation work**
  - ✓ Cutting equipment
  - ✓ Digging equipment
  - ✓ Transporting equipment
  - ✓ Levelling equipment
  - ✓ Compacting equipment

Resources required for the learning outcome	
Equipment	- Excavators (with hydraulic hummer), Bulldozer, Compressor, Wheel loader, Compactors, Grader, Trucks.
Materials	Fuel, Lubricants, Wood, Nails, Warning tape, explosives, Rigid cartridges, Soft-packages, fuse Detonating, relays, Books, Pen, Notebook, Whiteboard/Blackboard, Marker pen, Chalks, Slurries Emulsions
Tools	Pick, axes, Hoe, Forked hoe, Hummer, Spade, Shovel, Mattock, Forked, hoe, wheelbarrow
Facilitation techniques	• Presentation, demonstration and simulation, individual and group work, practical exercise, individualized, trainer guided, group discussion
Formative assessment methods	• Written assessment, oral presentation, performance assessment

Learning outcome 2: Prepare site for excavation	**Learning hours: 5**

Indicative content

(Based on the performance criteria and the extent of the learning outcome: What, How, Up to)

- **Demarcation of the site** (Refer to RS EAS 914; RS EAS 132; RS 409; RS 175; RS EAS 188)
  - ➢ Procedures of site demarcation
  - ➢ Requirements of site installation
- **Identification of site conditions**
  - ➢ Types of soil

➢ Accessibility of the site • **Removal of surface obstacles** ➢ **Types of surface obstacles** ➢ **Communication for public infrastructure obstacles**

Resources required for the indicative content	
Equipment	- Excavators (with hydraulic hummer), Bulldozer, Compressor, Wheel loader, Compactors, Grader, Trucks.
Materials	Fuel, Lubricants, Wood, Nails, Warning tape, explosives, Rigid cartridges, Soft-packages ,fuse Detonating , relays, Books, Pen, Notebook, Whiteboard/Blackboard, Marker pen, Chalks, Slurries Emulsions
Tools	Pick, axes, Hoe, Forked hoe, Hummer, Spade, Shovel, Mattock, Forked, hoe, wheelbarrow
Facilitation techniques	Presentations, demonstration and simulation, individual and group work, practical exercise, individualized, trainer guided, group discussion
Formative assessment methods	Written assessment, oral presentation, performance assessment

Learning outcome 3: Carry out excavation works	**Learning hours: 15**
Indicative content	
(Based on the performance criteria and the extent of the learning outcome: What, How, Up to) • **Cutting of firm soil** ✓ soil cutting procedures ✓ Rock excavation methods • **Removal of ground obstacles** (Refer to RS ISO 45001; RS 175; RS EAS 188; RS EAS 1020; RS ISO 20347; RS 177) ✓ Types of underground obstacles ✓ Communication for public infrastructure obstacles	

- **Dumping off the site**
    - ✓ Conduction of loading excavated soil
    - ✓ Gather information of dumping site

Resources required for the indicative content	
Equipment	Excavators (with hydraulic hummer), Bulldozer, Compressor, Wheel loader, Compactors, Grader, Trucks.
Materials	Fuel, Lubricants, Wood, Nails, Warning tape, explosives, Rigid cartridges, Soft-packages ,fuse Detonating , relays, Books, Pen, Notebook, Whiteboard/Blackboard, Marker pen, Chalks, Slurries Emulsions
Tools	Pick, axes,Hoe,Forkedhoe,Hummer,Spade,Shovel,Mattock,Forked,hoe,wheelbarrow
Facilitation techniques	Presentation, demonstration and simulation, individual and group work, practical exercise, individualized, trainer guided, group discussion
Formative assessment methods	Written assessment, oral presentation, performance assessment

Learning outcome 4: **Clean up construction work place**	**Learning hours: 5**

Indicative content

(Based on the performance criteria and the extent of the learning outcome: What, How, Up to)

- **Clearing the work area** (Refer to RS ISO 45001; RS 175; RS EAS 188; RS EAS 1020; RS ISO 20347; RS 177)
    - ✓ Description of environmental impact assessment
    - ✓ Description of general safety rules
    - ✓ Types of wastes to be removed
    - ✓ Clearing methods
- **Removal of materials** (Refer to RS ISO 14001)
    - ✓ Type of waste
    - ✓ Removing methods
- **Maintenance of tools**
    - ✓ Interpretation of manufacturer recommendation

- ✓ Clearing methods
- ✓ Requirements of handling and storing tools

- **Maintenance of equipment**
  - ✓ Interpretation of manufacturer recommendation
  - ✓ Cleaning methods
  - ✓ Types of maintenance

Resources required for the indicative content	
Equipment	Excavators (with hydraulic hummer), Bulldozer, Compressor, Wheel loader, Compactors, Grader, Trucks.
Materials	Fuel, Lubricants, Wood, Nails, Warning tape, Pourable/pump able explosives, Rigid cartridges, Soft-packages ,explosives, fuse Detonating, relays, Books, Pen, Notebook, Whiteboard/Blackboard, Marker pen, Chalks, Slurries emulsions
Tools	Pick, axes, Hoe, Forked hoe, Hummer, Spade, Shovel, Mattock, Forked, hoe, wheelbarrow
Facilitation techniques	Presentation, demonstration and simulation, individual and group work, practical exercise, individualized, trainer guided, group discussion
Formative assessment methods	Written assessment, oral presentation, performance assessment

Integrated/Summative assessment (For specific module)

Integrated situation

The management of Kigali city has gotten a problem of road deterioration with potholes, which tends to cause traffic jam. Therefore, the City of Kigali has signed a contract with NTBD Ltd for maintenance of roads in Kicukiro, Gasabo and Nyarugenge districts. During phase one, the client requests the contractor to construct an asphalt road from Free zone - Techno pole. As a technician from the foresaid company, you are requested to perform excavation of 3m length by 1.5m width and 0.5m depth, within 6 hours, given that:

i. All surveying data are clear
ii. All materials, tools and equipment with operators are available on site
iii. All Contact facilities for public infrastructures are available

Resources

Tools	Pick,axes,Hoe,Forkedhoe,Hummer,Spade,Shovel,Mattock,Forked,hoe,wheelbarrow
Equipment	Excavators (with hydraulic hummer), Bulldozer, Compressor, Wheel loader, Compactors, Grader, Truck, Machine rammers, Vibrating plate compactors, wheel rollers
Materials/ Consumables	Fuel, Lubricants, Wood, Nails, Warning tape, ,Books, Pen, Notebook, Marker pen, Chalks, Slurries Emulsions

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
Learning outcome1: **Select materials, tools and equipment (20%)**	1.1. Materials are properly selected based on the nature of work.	Indi.1. Materials are adequately selected			8
	1.2. Tools are properly selected according to the nature of work	Indi.1. Tools are adequately selected			5
	1.3. Equipment are properly selected according to the nature of work	Indi.1. Equipment are adequately selected			7
Learning outcome 2: **Prepare site for excavation (30%)**	2.1. The site is properly demarcated according to the site boundaries	Ind.1: Site demarcation is well done			8
		Ind.2. Site installation is well done			5
	2.2. Site conditions are properly identified in relation to the work to be implemented	Ind.1.Types of soil are well mentioned			4
		Ind.2. Accessibility of the site is clearly demonstrated			7
	2.3. Surface obstacles are adequately removed according to their types.	Ind.1. Types of surface obstacles are well identified			3
		Ind.2. Types of surface obstacles are well removed			3

Learning outcome 3: **Carry out excavation works** **(40%)**	3.1. Firm soil are careful cut based on surveying data	Ind.1. Firm soil are well cut			10
		Ind.2. Rock excavation methods are well mentioned			5
	3.2. Underground obstacles are carefully removed according to their type	Ind.1. Types of underground obstacles are well mentioned			8
		Ind.2. Underground obstacles are well removed			7
	3.3. Site is properly dumped off based on environmental aspect	Ind.1. Excavated soil is well dumped off the site			10
Learning outcome 4: **Clean up construction work place (10%)**	4.1. The work area is carefully cleared in accordance to environmental management plan	Ind.1. work area are carefully cleared			3
	4.2. Materials are carefully removed as per environmental impact assessment	Ind.1. Materials are carefully removed			2
	4.3. Tools are properly maintained in accordance with manufacturer recommendations and standards work practices	Ind.1. Tools are properly maintained			2
	4.4. Equipment are properly maintained in accordance with manufacturer recommendations and standards work practices.	Ind.1. Equipment are properly maintained			2
		Indi.2. Time is well respected			1
Total marks					**100**
Percentage Weightage					**100%**
Minimum Passing line % (Aggregate): 70%					

References:

1. Bing Wen SHAN BIAN ZHU, *Cement Concrete Pavement Construction*,1990, Abebooks
2. De Vekey RC (2001). *Bricks blocks and masonry made from aggregate concrete: Part 2 – APPEarance and environmental aspects*, BRE Digest 460, Part 2.
3. M.Rashad Islam & Rafiqul A Tarelder, Pavement Design: Materials, Analysis,2016, McGraw-Hill Education
4. Norbert J. Delatte, *Concrete Pavement Design, Construction, and Performance Second Edition*,2016 Routledge
5. William & Radford, *Cement Houses and How to Build Them ,1996*, McGraw-Hill Education
6. RS ISO 45001: Occupational Health and Safety Management system— Requirements;
7. RS 175: Wheelbarrow specifications;
8. RS EAS 188: Machete — Specification;
9. RS EAS 1020: Shovels and spades — Specification;
10. RS ISO 20347: Personal protective equipment — Occupational footwear;
11. RS EAS 914: Mild steel nails — Specification;
12. RS EAS 132: Hoe — Specification
13. RS 409: School chalks — Specification;
14. RS 177: Picks, beater picks and mattocks — Specification