Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

BDCWC001

WOODEN ROOF CONSTRUCTION

Competence: CONSTRUCT WOODEN ROOF

RQF Level: N/A

Learning Hours 80

Credits: 8

Sector: CONSTRUCTION AND BUILDING SERVICES

Program: MASONRY

Module Type: SPECIFIC

Curriculum: DUAL TRAINING SHORT COURSE IN MASONRY

Issue Date: February 2023

<table>
<tr><td>Purpose statement</td><td colspan="5">This module describes employable and practicable skills, knowledge and right attitudes required by the trainee to perform roof setting out, prepare materials for roof construction assemble roof trusses, join and secure the roof frame and finally perform finishing activities for the roof. The contents provided in this course are packages reserved for a trainee pursuing TVET certificate program in Masonry. Graduates in this program will have knowledge and skills to perform roof structures under minimum supervision.</td></tr>
<tr><td>Learning assumed to be in place</td><td colspan="5">Maintain SHE at workplace, Construction basic technical drawing, Building set out, Scaffolding operations, Bricks and blocks masonry wall elevation</td></tr>
<tr><td rowspan="6">Delivery modality</td><td>Training delivery</td><td>100%</td><td colspan="2">Assessment</td><td>Total 100%</td></tr>
<tr><td>Delivered in school</td><td>25%</td><td colspan="2">Formative assessment in school 30%</td><td rowspan="3">50%</td></tr>
<tr><td colspan="2">Delivered in company</td><td rowspan="3">65%</td><td colspan="2" rowspan="3">Workplace comprehensive assessment in company 70%</td></tr>
<tr><td>• Demonstration and practice</td><td>15%</td></tr>
<tr><td>• Individual project /Independent Work</td><td>50</td></tr>
<tr><td></td><td colspan="3">Summative Assessment</td><td>50%</td></tr>
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Elements of Competency and Performance Criteria		
Elements of competence	**Performance criteria**	**Learning site**
1. Perform setting out of the roof	1.1 Drawing of roof is well interpreted in accordance with drawing standards.	School& Company
	1.2 Top of the wall is correctly checked according to the work to be done	School& Company
	1.3 Measurements of the trusses are accurately recorded according to the drawing.	School& Company
	1.4 Pegs for trusses are precisely fixed in their respective position.	School& Company
	1.5 Setting out ropes are well levelled and fixed according to their functions	School& Company
2. Prepare materials to	2.1 Tools and equipment are properly selected referring to their uses.	School& Company

the required sizes	2.2 Roof types and their components are properly identified in accordance with the standard.	School& Company
	2.3 Roof materials are well selected according to their use	School& Company
	2.4 Truss elements are accurately marked out before being taken to the machine	School& Company
	2.5 Truss elements are properly cut according to the measurements provided	School& Company
3. Assemble trusses in accordance with the standard	3.1. Truss elements are properly laid according to the designed drawing.	School& Company
	3.2. Truss elements are correctly assembled according to the designed drawing.	School& Company
	3.3. Truss elements are tightly fixed according to the designed drawing.	School& Company
	3.4. Roof structure elements are tightly connected according to the designed drawing.	School& Company
4. Join and secure all trusses together	4.1. Trusses elements are properly lifted according to their positions.	Company
	4.2. Trusses elements are correctly kept in the right position according to the roof standards.	Company
	4.3. Trusses are correctly connected to the wall plate/pillars according to the designed drawing.	Company
	4.4. Trusses are strongly connected together by braces according to the designed drawing	Company
	4.5. Purlins are properly attached to rafters according to the designed drawing.	Company
5. Perform roof finishing	5.1. Gutters are correctly fixed by respecting the required slope for draining water.	Company
	5.2. Fascia boards and soffit are tightly fixed to the roof edges according to the designed drawing.	Company
	5.3. Wood preservation is well applied for protecting the roof members from parasites according to their uses	Company
	5.4. Roof sheathing materials are accurately applied according to the roof frame.	School& Company

Course content

Learning outcomes	At the end of the module the trainee will be able to:
	1. Perform setting out of the roof 2. Prepare materials to the required sizes 3. Assemble trusses in accordance with the standard 4. Join and secure all trusses together 5. Perform roof finishing

Tools, equipment and materials

Learning outcomes	Indicative content	Learning Hours: 10	
		School	Company
1.Perform setting out of the roof	• **Roof drawing interpretation** ✓ The types of drawing materials ✓ Drawing techniques ✓ Drawing presentation ✓ Drawing scales	1	1
	• **Top wall Checking for setting the wall plate** ✓ Methods used to check the levels ✓ Equipment used in levelling ✓ Tools used for levelling • **Recording measurements of the trusses** ✓ Element to be measured Length of truss Width truss Rise truss ✓ Measurement instruments ✓ Use of measurement instruments ✓ Process of recording measurements of the truss	4	

	• **Fixing pegs for trusses** ✓ Methods of fixing pegs ✓ Roof layout ✓ 3,4,5 method ✓ Rafter calculation ✓ Square setting • **Levelling and fixing setting out ropes** ✓ Levelling instruments ✓ Methods of levelling ✓ Methods of setting out ✓ Use of ropes/strings		4
Resources required for the learning outcome		School	Company
Equipment	✓ **PPEs** ✓ **Wheelbarrow**		
	Levelling equipment: ✓ **Dumpy level** ✓ **Theodolite** ✓ **Total station** ✓ **PPE** ✓ **Wheelbarrow**		
Materials	✓ Pegs ✓ nails ✓ Strings/ropes ✓ Drawing papers ✓ Timber		
	✓ Pegs ✓ Nails ✓ Strings/ropes ✓ Drawing papers ✓ Timber		
Tools	Hammer, Pencil, Spirit level, Tape measure, marking tools Calculator, Drawing board		
	✓ **Hammer Pencil** ✓ **Spirit level** ✓ **Tape measure** ✓ **Marking tools**		

Facilitation techniques / learning activities	• Group discussion, Practical exercises (individual and group work) • Trainer guided • Demonstration and simulation		
	• Demonstration • Practical work		
Formative assessment methods	• Written assessment • Oral based assessment		
	• Product assessment • Performance assessment		

Sizes of roof materials

Learning outcomes	**Indicative content**	**Learning Hours: 10**	
		School	Company

2.Prepare materials to the required sizes	• **Classification of Tools and equipment for roof construction:** ✓ Holding tools ✓ setting out tools ✓ Cutting and ✓ shaving tools ✓ boring tools ✓ Fixing tools ✓ Portable machines ✓ Heavy duty machine ✓ Tools and equipment serviceability and safety requirements • **Identification of roof types and their components** ✓ Pitched roofs ✓ Flat roofs ✓ Curved roofs ✓ Hipped roof • **Selection of roof materials** ✓ Roof materials ✓ Metal ✓ Wood ✓ Nails Screws • **Various components(elememts) of Roof trusses** ✓ Principal rafter ✓ Bottom chord or main tie ✓ Ties ✓ Sag tie ✓ Purlins ✓ Rafters ✓ Ridges lines ✓ Roof covering ✓ Bolts	5	
	• **Procedures of cutting truss elements** ✓ Measuring ✓ Marking ✓ Cutting		5
Resources required for the learning outcome		School	Company

Equipment	✓ PPE ✓ Wheelbarrow		
	Levelling equipment: ✓ Dumpy level ✓ Theodolite ✓ Total station ✓ PPE ✓ Wheelbarrow		
Materials	Pegs, Nails, Strings/ropes, Drawing papers, Timber, Strings/ropes		
	Roof coverings, bolts, tubes, Nails , Drawing papers, Timber		
Tools	Hammer, Pencil, Spirit level, Tape measure, marking tools, Calculator, Drawing board		
	✓ Hammer ✓ Pencil ✓ Spirit level ✓ Tape measure ✓ Marking tools		
Facilitation techniques and learning activities	• Group discussion • Practical exercises (individual and group work) • Trainer guided • Demonstration and simulation		
	• Demonstration • Practical work		
Formative assessment methods	• Written assessment • Oral based assessment		
	• Product assessment • Performance assessment		

Assembling the trusses

Learning outcomes	Indicative content	Learning Hours: 25	
		School	Company
3.Assemble trusses in accordance with the standard	• **Truss elements laying out:** ✓ Layout techniques/methods ✓ Rafter calculation ✓ Roof trusses types	10	
	• **Truss elements assembling:** ✓ Assembling techniques and methods • **Truss elements fixing:** ✓ Fixing materials of roof structure elements: ✓ Nails ✓ Bolt and nut ✓ Screw • **Connecting roof structure elements:** ✓ Braces ✓ Purlins ✓ Ridge boards • **Types of roof connectors:** ✓ Iron galvanised ✓ Metal gussets ✓ Brackets		15
Resources required for the learning outcome		**School**	**Company**
Equipment	✓ PPE ✓ Wheelbarrow ✓ Theodolite ✓ Dumpy ✓ Wheelbarrow		
Materials	Nails, Timber, Nails, Bolt and nut, Screw, Braces, Purlin, Ridge boards, Iron galvanized, Metal gussets,		
Tools	Claw hammer, Spirit level, Tape measure, Claw hammer, Spanners, Screw drivers, Spirit level , Tape measure		
Facilitation techniques and learning activities	• Group discussion • Practical exercises (individual and group work) • Trainer guided • Demonstration and simulation		
	• Practical work • Demonstration		

Formative assessment methods	• Written assessment • Oral based assessment		
	• Product assessment • Performance assessment		

Joining and securing the trusses

Learning outcomes	**Indicative content**	**Learning Hours: 20**	
		School	Company
4.Join and secure all trusses together	• **Lifting trusses to their positions** ✓ Methods of lifting ✓ Method of equilibrium • **Keeping trusses in the plumb position** ✓ Use of a plumb bob ✓ Vertical/horizontal position • **Connecting trusses to the wall plate/pillars** ✓ Bird's mouth creation ✓ Rod anchors ✓ Methods of connecting wall plates with rafters • **Connecting trusses together by braces** ✓ Diagonal checking ✓ Lateral braces ✓ Bracing methods • **Attaching purlins to rafters** ✓ Spacing of purlins ✓ Methods for connecting purlins to rafters.		20
Resources required for the learning outcome		**School**	**Company**
Equipment	✓ Lifting equipment ✓ PPE		
Materials	✓ Braces ✓ Anchors		
Tools	✓ Plumb bob ✓ Spirit level		
Facilitation techniques and learning activities	• Demonstration • Practical work		

Formative assessment methods	• Performance assessment • Product assessment		

Perform roof finishing

Learning outcomes	**Indicative content**	**Learning Hours: 15**	
		School	Company
5.Perform roof finishing	• **Fixing gutters** ✓ Silicone sealant ✓ Mastic Methods of gutter fixing • **Fixing fascia boards and soffit to the roof edges** ✓ Fixing techniques • **Wood preservation** ✓ Application of wood preservatives ✓ Methods of application: brushing, spray gun, rolling		5
	• **Application of roof sheeting materials** ✓ Characteristics of roof materials. ✓ Laying techniques and principles ✓ Techniques of fixing: ✓ Using nails ✓ Screws ✓ Bolt and nuts	5	
	• **Application of roof sheeting materials** ✓ Applying laying techniques and principles ✓ Using nails ✓ Screws ✓ Using Bolt and nuts		5
Resources required for the learning outcome		**School**	**Company**
Equipment	✓ Welding machine		
Materials	Paraffin, thinner, Bolt and nuts; Nails; Glasses; Roof Tiles; roof sheets		

Tools	✓ Scraper ✓ broom ✓ silicone gun		
Facilitation techniques and learning activities	• Demonstration • Simulation • Individual and group work • Practical exercise • Trainer guided Group discussion		
	• Demonstration • Practical work		
Formative assessment methods	• Written assessment • Oral presentation		
	• Performance assessment • Product assessment		

Integrated/Summative assessment

Integrated situation

S.G.G. contractors located at Kicukiro District wants to construct gable roof on the carpentry workshop but does not have staff to construct that roof. The roof will have the following dimensions: 15m length x 10m width, the riser (king post) of 2.5m and overhang 0.80m at each side; the covering materials are iron sheets, the timber to be used for trusses is in eucalyptus. As the competent mason you are requested to perform the following tasks:

✓ Perform setting out of the roof

✓ Prepare materials to the required sizes

✓ Assemble trusses in accordance with the standard

✓ Join and secure all trusses together

✓ Perform roof finishing

Instructions:

- The tasks will be done in the group of 6 (six) trainees
- The foundation, Elevation is pre-erected, and All materials, tools, equipment are available on the site
- The proofing work should be done within 16 hours.

Resources

Tools	✓ **Fixing tools**
Equipment	✓ **Portable machines,** ✓ **Heavy duty machines**
Materials/ Consumables	Nails; Bolt and nut; Screw; Braces; Purlins; Ridge boards;, Rafters, Wall plates, varnish

Assessable outcomes	Assessment criteria (Based on performance criteria)	Indicator	Observation		Marks allocation
			Yes	No	
Learning outcome 1: Perform setting out of the roof (30%)	1.1. Drawing of roof is well interpreted in accordance with drawing standards.	Shape of roof is interpreted			10
		Dimension of roof is interpreted			
		Symbol of roof is interpreted			
		Material of roof is interpreted			
	1.2. Top of the wall is correctly checked according to the work to be done	Levels of top wall is checked			4
		Strength of the top wall is checked			
	1.3. Measurements of the trusses are accurately recorded according to the drawing.	Length of truss is recorded			8
		Width of truss is recorded			
		Rise of truss is recorded			
	1.4. Setting out ropes are well levelled and fixed according to their functions.	Ropes are set			8
		Ropes are levelled			
		Ropes are fixed			
Learning outcome 2: Prepare materials to the required sizes (20%)	2.1. Tools and equipment are properly selected referring to their uses.	Holding tools are selected			5
		Setting out tools is selected			
		Cutting tools is selected			
		Fixing tools is selected			
		shaving tools is selected			
		Portable machine is selected			
		Boring tools is selected			

	2.2. Roof types and their components are properly identified in accordance with the standard.	Gable roof is identified			6
		Eave is identified			
		Hip is identified			
		Ridge is identified			
		Purlins is identified			
		Fascia boards is identified			
		Pitch is identified			
		Battens is identified			
		Hip rafter is identified			
		Common rafter is identified			
	2.3. Roof materials are well selected according to their use	Woods are selected			3
		Nails are selected			
		Screws are selected			
		Adhesive material is selected			
		Preservative material is selected			
	2.4. Truss elements are accurately marked out before being taken to the machine	Webbing/posts are marked			3
		Joists are marked			
		Rafters are marked			
		Purlins are marked			
		Struts are marked			
		Bottom chords are marked			
		Ridges boards are marked			
		King post truss is marked			
	2.5. Truss elements are properly cut according to the measurements provided.	Webbing/posts are cut			3
		Rafters are cut			
		Purlins are cut			
		Struts are cut			
		Bottom chords are cut			
		Joists are connected			
		Ridges boards are cut			

		King post truss is cut			
Learning outcome 3: Assemble trusses in accordance with the standard (30%)	3.1. Truss elements are properly laid according to the designed drawing.	Webbing/posts are laid			10
		Joists are laid			
		Rafters are laid			
		Purlins are laid			
		Struts are laid			
		Bottom chords are laid			
		Ridges boards are laid			
		King post truss is laid			
	3.2. Truss elements are correctly assembled according to the designed drawing.	Webbing/posts are assembled			10
		Joists are assembled			
		Rafters are assembled			
		Purlins are assembled			
		Struts are assembled			
		Bottom chords are assembled			
		Ridges boards are assembled			
		King post truss is assembled			
	3.3. Truss elements are tightly fixed according to the designed drawing.	Webbing/posts are fixed			5
		Joists are fixed			
		Rafters are fixed			
		Purlins are fixed			
		Struts are fixed			
		Bottom chords are fixed			
		Ridges boards are fixed			
		King post truss is fixed			

	3.4. Roof structure elements are tightly connected according to the designed drawing.	Webbing/posts are connected			5
		Joists are connected			
		Rafters are connected			
		Purlins are connected			
		Struts are connected			
		Bottom chords are connected			
		Ridges boards are connected			
		King post truss is connected			
Learning outcome 4: Join and secure all trusses together (15%)	4..1Trusses are strongly connected together by braces by respecting the roof skeleton standards	Diagonals are connected			10
		Lateral braces are connected			
		Cross braces are connected			
	4.5 Purlins are properly attached to rafters by respecting the length of covering materials	Spacing of purlins to the rafter are respected			5
		Nailing purlins to rafters are observed			
Learning outcome 5: Perform roof finishing (5%)	5.1 Wood preservation is well applied for protecting the roof members from parasites according to their uses	Liquid material(varnish) is prepared			5
		First layer of lliquid materials(varnish) is applied			
		Finishing layer of lliquid materials(varnish) is applied			
Total marks					**100**
Percentage Weightage					**100%**
Minimum Passing line % (Aggregate): 70%					

Reference

3. J.M WAITHAKA. (1990). *BUILDING CONSTRUCTION.* NAIROBI: KENYA INSTITUTE OF EDUCATION.

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Kuwoba, 2. A. (2010). *BUILDING CONSTRUCTION 2ND EDITION.* MUMBAI: ADV. WORKS.