Republic of Rwanda
Ministry of Education

RTB | RWANDA TVET BOARD

FUNDAMENTALS OF BUILDING MATERIALS

BDCCM301

DEMONSTRATE FUNDAMENTALS OF BUILDING MATERIALS

Competence

RQF Level: 3

Learning Hours 40

Credits: 4

Sector: Construction and Building Services

Trade: Building construction

Module Type: Specific

Curriculum: CBSBDC3001- TVET Certificate 3 in Building Construction

Copyright: © Rwanda TVET Board, 2022

Issue Date: October ,2021

Purpose statement	This module describes the skills, knowledge and attitudes to demonstrate fundamentals of building materials. It is intended to be pursued by the learner at TVET level III for TVET Certificate III in Building construction. At the end of this module, the learner will be able to identify natural building construction materials, industrial building construction materials and pre-fabricated building construction materials.

Delivery modality	**Training delivery**		**100%**	**Assessment**		**Total 100%**
	Theoretical content		30%	Formative assessment	30%	100%
	Practical work:		70%		70%	
	• Group project and presentation	20%				
	• Individual project /Work	50%				
				Summative Assessment		N/A

Elements of Competency and Performance Criteria

Elements of competency	Performance criteria
1. Identify natural building construction materials	1.1. Appropriate building stone is described according to the standards.
	1.2. Appropriate building aggregates are described according to the standards.
	1.3. Adequate water for construction works is described according to the standards.
	1.4. Adequate construction timber is described according to the use.
2. Identify industrial building construction materials	2.1. Proper building construction cement is described according to the standards.
	2.2. Adequate building construction metal is described according to the use.
	2.3. Convenient building construction paint and varnish are described according to the standards.
	2.4. Adequate construction plastics materials are described according to the standards.
	2.5. Proper building construction glass is described according to the place of use.

3. Identify pre-fabricated building construction materials	3.1.	Adequate soil-based building construction products are described according to the standards.
	3.2.	Convenient building construction cement based products are described according to the standards
	3.3.	Adequate pre-fabricated building structure elements are described according to the standards

Course content	
Learning outcomes	**At the end of the module the learner will be able to:** **1. Identify natural building construction materials** **2. Identify industrial building construction materials** **3. Identify pre-fabricated building construction materials.**
Learning outcome 1: **Identify natural building construction materials**	**Learning hours: 5**
Indicative content	

- Definition of stone
- Classification of stones:
- Based on geological formation:
  - ✓ Igneous rocks
  - ✓ Sedimentary rocks
  - ✓ Metamorphic rocks
- Based on physical characteristics:
  - ✓ Stratified rocks
  - ✓ Unstratified rocks
  - ✓ Foliated rocks
- Based on chemical characteristics:
  - ✓ Argillaceous
  - ✓ Silicious rocks
  - ✓ Calcarious
- Characteristics of good building stone
- Defects of building stone
- Definition of aggregates
- Classification of aggregates:
  - ✓ Fine aggregates
  - ✓ Coarse aggregates
- Sources of aggregates
- Qualities of good aggregates
- Introduction to water:
  - ✓ Definition
  - ✓ Composition
- Qualities of good water for construction purposes
- Uses of water in building construction works
- Introduction to timber:
  - ✓ Definition of timber
  - ✓ Classification of trees:
    - Endogenous

- Exogenous • Structure of timber • Characteristics of good timber that is used in building construction • Seasoning of timber • Defects in timber • Uses of timber in building construction
Resources required for the learning outcome

Equipment	Concrete mixer
Materials	Handouts, Books, Computer, White board, Markers, Flipchart, Pieces of paper, Projector, Internet, RS 435: Timber in joinery — General requirements RS 427: Round and sawn timber — Nomenclature of timbers used in Rwanda RS EAS 23: Timber — Dimensions for coniferous sawn timber (cypress and pine) — Sizes of sawn and planed timber — Specification
Tools	Books, Internet, Handouts, Ink-pen
`	• Group discussion • Trainer guided • Matching questions • Multiple choice • Sentence completion • Short questions • Essay • Open ended questions
Formative assessment methods	• Written assessment • Performance assessment

Learning outcome 2: **Identify industrial building construction materials**	**Learning hours: 18**
Indicative content	
• **Introduction to cement** ➢ Definition ➢ Function ➢ Types • **Properties of cement** ➢ Physical properties ➢ Chemical properties ➢ Mechanical properties • **Manufacturing process of cement**	

- **Qualities of good cement**
- **Fild tests of cement**
- **Proper storage of cement**
- **Definition of metal**
- **Classification of metal:**
  - Ferrous metals
  - Non-ferrous metals
- Properties of metals:
  - Physical
  - Chemical
  - Mechanical
- Identification of metals for building construction:
  - Sheet metals
  - Steel sections
  - Steel bars
- **Binding wires**
- **Definition of terms**
  - Paint
  - Varnish
- **Composition of paint and varnish**
  - Base
  - Vehicle
  - Pigments
  - Solvents
  - Driers
  - Adulterants
- **Properties of paint and varnish**
  - Physical
  - Chemical
- **Types of paints and varnishes**
- **Characteristics of good paint and varnish**
- **Uses of paint and varnish**
- **Definition of plastic**
- **Properties of plastics**
  - Phyisical
  - Chemical
  - Mechanical
- **Classifications of plastics**
  - Thermoplastic
  - Thermosetting
- **Applications of plastics in building construction**
- **Definition of glass**
- **Properties of glass:**
  - Phyisical

➢ Mechanical • **Types of glass for building construction** • **Applications of glass in building construction**

Resources required for the indicative content	
Equipment	Concrete mixer
Materials	Handouts, Books, Computer, White board, Markers, Flipchart, Pieces of paper, Projector, Internet, RS 435: Timber in joinery — General requirements RS 427: Round and sawn timber — Nomenclature of timbers used in Rwanda RS EAS 23: Timber — Dimensions for coniferous sawn timber (cypress and pine) — Sizes of sawn and planed timber — Specification
Tools	Books, Internet, Handouts, Ink-pen
Facilitation techniques	• Group discussion • Trainer guided • Matching questions • Multiple choice • Sentence completion • Short questions • Essay • Open ended questions
Formative assessment methods	• Written assessment • Performance assessment • Product based assessment

Learning outcome 3: Identify pre-fabricated building construction materials.	**Learning hours: 17**
Indicative content	
• **Classification of soil-based building construction products** • **Classification of bricks/ blocks** • **Manufacturing process of burnt soil-based building construction materials** • **Manufacturing process of unburnt soil-based building construction materials** • **Qualities of good bricks/ blocks** • **Defects of bricks/ blocks** • **Identification of cement based building construction products** ➢ Cement based bricks ➢ Cement based blocks ➢ Cement based pavers ➢ Ventilation blocks • **Manufacturing process of cement based products** • **Qualities of cement based products complying with Rwandan standards**	

- **Defects in cement based products**
- **Identification of pre-fabricated building structure elements**
  - Walls
  - Columns
  - Beams
  - Slabs
- **Manufacturing process of pre-fabricated building structure elements**

Resources required for the indicative content	
Equipment	Concrete mixer
Materials	Handouts, Books, Computer, White board, Markers, Flipchart, Pieces of paper, Projector, Internet, RS 435: Timber in joinery — General requirements RS 427: Round and sawn timber — Nomenclature of timbers used in Rwanda RS EAS 23: Timber — Dimensions for coniferous sawn timber (cypress and pine) — Sizes of sawn and planed timber — Specification
Tools	Books, Internet, Handouts, Ink-pen
Facilitation techniques	• Lectures • Demonstration and simulation • Individual and group work • Practical exercise • Individualized • Trainer guided • Group discussion
Formative assessment methods	• Written assessment • Performance assessment • Product based assessment • Project based assessment

Resources required for the indicative content	
Equipment	Drawing pins and clips, Compass, Drawing pencil , Drawing board, Drawing tables
Materials	Construction drawing handout, A3 Papers, A2 Papers, A1 Papers, A0 Papers, Inks, Eraser, Pencil lead, Lead
Tools	Books, Internet, Handouts, Ink-pen, Pencils, set squares, Protractor, Compass, French curves, Template, Pantograph, Proportion divider, Scale rule, Pencil, sharpener, making tape, Drawing board, Knife, Scissors
Facilitation techniques	• Lectures • Demonstration and simulation • Individual and group work • Practical exercise • Individualized

	• Trainer guided • Group discussion
Formative assessment methods	• Written assessment • Performance assessment • Product based assessment • Project based assessment

References:

1. Duggal, S.K. (2008). Building materials (Third revised edition), New age international (P) Limited publishers, New Delhi.
2. Saiful I. (2010). Building Material and Construction, King Khalid University.
3. Bhavikatti , S. S. (2014). Building Materials and Construction, Vikas Publishing.
4. Allen, E. (2019). Fundamentals of Building Construction : Materials and Methods (7th Edition). John Wiley & Sons Inc.
5. Bibhuti, B. D. (2018). Sustainable Construction and Building Materials. Springer