



ZIMBABWE

MINISTRY OF PRIMARY AND SECONDARY EDUCATION

# BUILDING TECHNOLOGY AND DESIGN SYLLABUS

FORMS 5 - 6

2015 - 2022

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Harare

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## 1.0 PREAMBLE

### 1.1 Introduction

This Building Technology and Design Syllabus is designed for Forms 5 - 6 learners who have done Building Technology and Design from Form 1 - 4. It seeks to promote the realisation and utilization of Zimbabwe Architecture through research in order to generate designs based on indigenous knowledge systems. It borrows from unique heritage sites such as The Great Zimbabwe monument and other indigenous designs within Southern Africa.

The syllabus embraces inclusivity in the learning and teaching of Building Technology and Design. Practical, Theoretical, Research and Problem-solving approaches will be used in the acquisition of competency based skills, knowledge and attitudes which are relevant to the requirements of construction industry, commerce, further studies and enterprise.

### 1.2 Rationale

The syllabus is concerned with the development of competency-based skills, moral and ethical attributes to promote Unhu/Ubuntu/Vumunhu as a philosophy. It emphasizes the learner's role in making and shaping the environment whilst adding value to it. This encourages the learner to employ problem solving skills to produce value added products that are useful in the community, nation and global markets. The syllabus sets out to promote desirable enterprise and life-long learning skills relevant to contemporary society. The syllabus enables the learner to explore numerous Building Technology and Design materials, Science, Mathematics, ICTs and other related learning areas in a sustainable manner.

The Building Technology and Design syllabus enables learners to develop skills in:

- Innovativeness
- Invention
- Creativity and problem solving
- Project management
- Value addition and beneficitation

### 1.3 Summary of Content

This syllabus covers theory, practical and problem solving activities in areas such as:

- Health and Safety
- Science of materials
- Site surveying
- Quantity surveying and estimating
- Structural analysis
- Architecture
- Management of construction projects
- Maintenance and renovation
- Building control and development
- Renewable energy
- Intellectual Property Rights

### 1.4 Assumptions

The syllabus assumes that learners have knowledge of:

- Health and Safety
- Building drawing and design
- Material science
- Methods of work
- Engineering science
- Intellectual property rights
- Use and maintenance of tools and equipment
- Enterprise skills
- Estimations

### 1.5 Cross - cutting themes

Building Technology and Design as a learning area has a universal thrust which encompasses the following cross-cutting themes:

- Gender equity
- Inclusivity
- Teamwork
- Health and safety
- Technology and innovation
- Environmental management
- ICT
- Children's Rights and Responsibilities
- Disaster Risk Management
- Heritage studies

## 2.0 PRESENTATION OF SYLLABUS

The Building Technology and Design Syllabus is a single document covering Forms 5 to 6. It contains the Preamble, Presentation of syllabus, Aims, Objectives, Methodology, Topics, Scope and Sequence, Competency Matrix and Assessment.

### 3.0 AIMS

The syllabus aims to help learners to:

- 3.1 appreciate the importance of health and safety in the environment.
- 3.2 apply scientific concepts and principles of building engineering.
- 3.3 develop skills to carry out site surveying.
- 3.4 develop the ability to calculate building material quantities and estimations.
- 3.5 promote appreciation of architecture in building design and construction.
- 3.6 appreciate the need for legislation and proper management of building projects.
- 3.7 develop a maintenance, value addition and beneficiation culture.
- 3.8 value and utilize renewable sources of energy.

### 4.0 SYLLABUS OBJECTIVES

Learners should be able to:

- 4.1 observe health and safety regulations.
- 4.2 select appropriate materials to use during construction processes.
- 4.3 apply knowledge of science of materials to building construction.
- 4.4 demonstrate the correct use of tools and equipment.
- 4.5 calculate building material quantities.
- 4.6 apply knowledge of architectural concepts, principles and skills in order to solve construction related challenges in their communities.
- 4.7 budget resources for the construction of a building project.
- 4.8 analyze forces that act on building structures.
- 4.9 demonstrate understanding of principles of maintenance, value addition and beneficiation in their communities.
- 4.10 demonstrate understanding of legislation governing construction projects.
- 4.11 justify the significance of renewable sources of energy as alternatives in buildings.
- 4.12 demonstrate desirable interpersonal dimensions, attitudes, moral and ethical values underlying Unhu/Ubuntu/Vumunhu philosophy.
- 4.13 demonstrate enterprise skills through planning, development, implementation and evaluation of projects.

### 5.0 METHODOLOGY AND TIME ALLOCATION

#### 5.1 Methodology

The syllabus is based upon interactive, learner centred, multi -sensory and hands-on approaches. Principles of individualization, team work and research should influence the use of the suggested methods. Methods and principles used encourage curiosity and promote practical orientated learning whereby learners apply their experiences, knowledge, skills and positive attitudes. The approaches should also create awareness of the issues of sustainability by involving learners in environmental and waste management. The use of ICT (CAD/CAM) is mandatory.

#### 5.2 Suggested Methods

- Case study
- Discussion
- Project based learning
- Educational tour
- E-learning
- Experimentation
- Individualization
- Problem solving
- Research
- Demonstration
- Survey
- Visual tactile
- Gallery walk
- Resource person(s)
- School on the shop floor
- Group work
- Shadowing

#### 5.3 Time Allocation

Fourteen periods of 40 minutes per week should be allocated to adequately cover the syllabus. Two double theory and two blocks of 5 periods for practical/experiments should be allocated. Learners should be engaged in at least two educational tours per year, one exhibition per year, one seminar per term and attachment of two weeks of April/May of Form six (6) school vacation.

### 6.0 TOPICS

- 6.1 Health and Safety
- 6.2 Science of materials

- 6.3 Site surveying
- 6.4 Quantity surveying and estimating
- 6.5 Structural analysis
- 6.6 Architecture
- 6.7 Management of construction projects
- 6.8 Maintenance and renovation
- 6.9 Building control and development
- 6.10 Renewable energy
- 6.11 Intellectual Property Rights

## 7.0 SCOPE AND SEQUENCE CHART

TOPIC	FORM 5	FORM 6
7.1 Health and Safety	<ul style="list-style-type: none"> <li>Disaster management</li> <li>Work site management</li> <li>Occupational Health and safety</li> </ul>	<ul style="list-style-type: none"> <li>Waste management</li> <li>Environmental impact assessment</li> </ul>
7.2 Science of materials	<ul style="list-style-type: none"> <li>Properties and characteristics of materials</li> </ul>	<ul style="list-style-type: none"> <li>Material tests</li> </ul>
7.3 Site surveying	<ul style="list-style-type: none"> <li>Land surveying</li> </ul>	
7.4 Quantity surveying and estimating	<ul style="list-style-type: none"> <li>Quantity surveying</li> </ul>	<ul style="list-style-type: none"> <li>Tendering and Estimating</li> </ul>
7.5 Structural analysis	<ul style="list-style-type: none"> <li>Forces on building structures</li> </ul>	<ul style="list-style-type: none"> <li>Design of structures</li> </ul>
7.6 Architecture	<ul style="list-style-type: none"> <li>Zimbabwe Architecture</li> <li>African Architecture (Southern Africa)</li> <li>Exotic Architecture (Roman and Greek)</li> <li>Design and Drawing</li> </ul>	<ul style="list-style-type: none"> <li>Design, drawing and modeling</li> </ul>
7.7 Management of construction projects	<ul style="list-style-type: none"> <li>Building Contracts</li> <li>Management of construction projects</li> </ul>	<ul style="list-style-type: none"> <li>Business enterprises</li> </ul>
7.8 Maintenance and renovation	<ul style="list-style-type: none"> <li>Rehabilitation and maintenance of infrastructure</li> <li>Adaptation of buildings</li> </ul>	
	<ul style="list-style-type: none"> <li>Building constructional processes</li> </ul>	<ul style="list-style-type: none"> <li>Building Model By-laws</li> </ul>



TOPIC	FORM 5	FORM 6
7.9 Building control and development		
7.10 Renewable energy		<ul style="list-style-type: none"> <li>• Renewable energy systems</li> </ul>
7.11 Intellectual property rights		<ul style="list-style-type: none"> <li>• Patenting</li> </ul>

## 8.0 COMPETENCY MATRIX

### FORM 5

#### 8.1 TOPIC 1: HEALTH AND SAFETY

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
<b>8.1.1 Disaster Management</b>	<ul style="list-style-type: none"> <li>demonstrate fire drill procedures</li> <li>identify safety outlets</li> <li>identify equipment for use in cases of fire outbreak</li> <li>support the affected</li> </ul>	<ul style="list-style-type: none"> <li>Fire drill procedures</li> <li>Equipment</li> <li>International organisation for standards (ISO) certification</li> <li>First Aid procedures</li> </ul>	<ul style="list-style-type: none"> <li>Demonstrating fire drill procedures</li> <li>Reacting to fire outbreaks</li> <li>Selecting the right equipment/procedures</li> <li>practicing First Aid</li> </ul>	<ul style="list-style-type: none"> <li>Procedure manual</li> <li>Assembly points</li> <li>Resource persons</li> <li>Firefighting equipment</li> <li>ICT tools</li> <li>Regulatory Acts</li> <li>Standards Association of Zimbabwe(SAZ)</li> <li>First Aid kit and equipment</li> </ul>
<b>8.1.2 Work Site Management</b>	<ul style="list-style-type: none"> <li>plan the layout design</li> <li>demonstrate organizational structure of a work site</li> <li>demonstrate a maintenance culture</li> </ul>	<ul style="list-style-type: none"> <li>Site layout</li> <li>Organizational structure of a work site</li> <li>Maintenance of buildings</li> </ul>	<ul style="list-style-type: none"> <li>Planning and designing site layouts</li> <li>Organizing work sites</li> <li>Monitoring and repairing within the school and community</li> </ul>	<ul style="list-style-type: none"> <li>Print media</li> <li>ICT tools</li> <li>Work site plans</li> </ul>
<b>8.1.3 Occupational Health and Safety</b>	<ul style="list-style-type: none"> <li>determine the level of health and safety in various work environments</li> </ul>	<ul style="list-style-type: none"> <li>Work environment</li> <li>Work procedures - rules - regulations</li> </ul>	<ul style="list-style-type: none"> <li>Determining the level of health and safety in various work environments (research)</li> </ul>	<ul style="list-style-type: none"> <li>Educational tours</li> <li>ICT tools</li> <li>Health and Safety Act</li> </ul>

## 8.2 TOPIC 2: SCIENCE OF MATERIALS

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
8.2.1 Properties and characteristics	<ul style="list-style-type: none"> <li>• describe properties of materials</li> <li>• explain the working properties of materials</li> </ul>	<ul style="list-style-type: none"> <li>• Physical and chemical properties of materials</li> <li>• Working properties of materials</li> </ul>	<ul style="list-style-type: none"> <li>• Describing properties of materials</li> <li>• Explaining the working properties of materials</li> </ul>	<ul style="list-style-type: none"> <li>• Print media</li> <li>• ICT tools</li> <li>• Materials</li> </ul>

### 8.3 TOPIC 3: SITE SURVEYING

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
8.3.1 Land Surveying	<ul style="list-style-type: none"> <li>• discuss land surveying procedures</li> <li>• describe principles and techniques</li> <li>• identify surveying tools and equipment</li> <li>• describe use and care of tools and equipment</li> <li>• describe surveying methods</li> <li>• demonstrate surveying methods</li> </ul>	<ul style="list-style-type: none"> <li>• Land survey procedures</li> <li>• Concepts, principles and techniques</li> <li>• Tools and equipment</li> <li>• Land survey methods</li> </ul>	<ul style="list-style-type: none"> <li>• Discussing land surveying procedures</li> <li>• Describing principles and techniques</li> <li>• Identifying surveying tools and equipment</li> <li>• Describing use and care of surveying tools and equipment</li> <li>• Describing methods of surveying</li> <li>• Demonstrating procedures of surveying</li> </ul>	<ul style="list-style-type: none"> <li>• Resource persons</li> <li>• Surveying tools and equipment</li> <li>• ICT tools</li> <li>• Educational tours</li> <li>• Print media</li> </ul>

## 8.4 TOPIC 4: QUANTITY SURVEYING AND ESTIMATING

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
8.4.1 Quantity Surveying	<ul style="list-style-type: none"> <li>• discuss the principles of quantity surveying</li> <li>• explain the role of a quantity surveyor</li> <li>• demonstrate procedures of calculating building quantities</li> </ul>	<ul style="list-style-type: none"> <li>• Theory of quantity surveying</li> <li>• Role of a quantity surveyor</li> <li>• Procedure of calculating building quantities:               <ul style="list-style-type: none"> <li>- taking off</li> <li>- waking up</li> <li>- abstracting</li> <li>- bill of quantities</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Outlining of principles of quantity surveying</li> <li>• Explaining the role of a quantity surveyor</li> <li>• Demonstrating procedures of calculating building quantities</li> </ul>	<ul style="list-style-type: none"> <li>• Resource persons</li> <li>• ICT tools</li> <li>• Site visits</li> <li>• Educational tour</li> </ul>

### 8.5 TOPIC 5: STRUCTURAL ANALYSIS

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
<p><b>8.5.1 Forces on building structures</b></p>	<ul style="list-style-type: none"> <li>• describe types of forces</li>   <li>• discuss effects of forces</li>   <li>• calculate slenderness ratio of walls and columns</li> </ul>	<ul style="list-style-type: none"> <li>• Forces acting on structures:               <ul style="list-style-type: none"> <li>- compression</li> <li>- tension</li> <li>- shear</li> <li>- torsion</li> <li>- strain</li> <li>- stress</li> </ul> </li> <li>• Effects of forces on structures               <ul style="list-style-type: none"> <li>- foundations</li> <li>- walls</li> <li>- columns</li> <li>- beams</li> <li>- trusses</li> </ul> </li> <li>• Slenderness ratio</li> </ul>	<ul style="list-style-type: none"> <li>• Describing types of forces</li>   <li>• Discussing the effects of forces on buildings</li>   <li>• Calculating slenderness ratio of walls and columns</li> </ul>	<ul style="list-style-type: none"> <li>• Resource person</li> <li>• Print media</li> <li>• ICT tools</li> </ul>

## 8.6 TOPIC 6: ARCHITECTURE

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
<b>8.6.1 Zimbabwe Architecture</b>	<ul style="list-style-type: none"> <li>identify indigenous designs</li> <li>analyze structures of indigenous designs</li> <li>analyze architectural significance of heritage sites</li> </ul>	<ul style="list-style-type: none"> <li>Indigenous designs (cultural perspective)</li> <li>Heritage sites eg: Great Zimbabwe</li> </ul>	<ul style="list-style-type: none"> <li>Identifying indigenous designs</li> <li>Analyzing structures of indigenous designs</li> <li>Analyzing architectural significance of heritage sites</li> </ul>	<ul style="list-style-type: none"> <li>Print /embossed media</li> <li>ICT tools</li> <li>Resource person</li> <li>Heritage sites</li> <li>Braille material and equipment</li> <li>Talking books</li> </ul>
<b>8.6.2 African Architecture (Southern African)</b>	<ul style="list-style-type: none"> <li>identify relationships of the designs and patterns used</li> </ul>	<ul style="list-style-type: none"> <li>Designs and patterns</li> </ul>	<ul style="list-style-type: none"> <li>Identifying relationships of the designs and patterns used</li> </ul>	<ul style="list-style-type: none"> <li>Print /embossed media</li> <li>ICT tools</li> <li>Resource person</li> <li>Heritage sites</li> <li>Braille material and equipment</li> <li>Talking books</li> </ul>
<b>8.6.3 Exotic Architecture</b>	<ul style="list-style-type: none"> <li>analyze the Roman and Greek architectural designs</li> </ul>	<ul style="list-style-type: none"> <li>Roman architecture</li> <li>Greek architecture</li> </ul>	<ul style="list-style-type: none"> <li>Analyzing the Roman and Greek architectural designs</li> </ul>	<ul style="list-style-type: none"> <li>Print /embossed media</li> <li>ICT tools</li> <li>Resource person</li> <li>Heritage sites</li> <li>Braille material and equipment</li> <li>Talking books</li> </ul>
<b>8.6.4 Design and Drawing</b>	<ul style="list-style-type: none"> <li>generate design ideas</li> <li>produce working</li> </ul>	<ul style="list-style-type: none"> <li>Working drawings of single storey buildings.</li> </ul>	<ul style="list-style-type: none"> <li>Generating design ideas</li> </ul>	<ul style="list-style-type: none"> <li>ICT tools</li> <li>Print media</li> </ul>

	<p>drawings of single storey buildings.</p> <ul style="list-style-type: none"><li>• apply architectural concepts to design buildings</li></ul>	<ul style="list-style-type: none"><li>• Architectural design concepts</li></ul>	<ul style="list-style-type: none"><li>• Producing working drawings of single storey buildings.</li><li>• Applying architectural concepts to design buildings.</li></ul>	
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## 8.7 TOPIC 7: MANAGEMENT OF CONSTRUCTION PROJECTS

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
<b>8.7.1 Building Contracts</b>	<ul style="list-style-type: none"> <li>• identify types of contracts</li> <li>• distinguish contract documents</li> <li>• evaluate legal provisions in contracts</li> </ul>	<ul style="list-style-type: none"> <li>• Types of contract agreements</li> <li>• Contract documents</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying types of contracts</li> <li>• Distinguishing contract documents</li> <li>• Evaluating legal provisions in contracts</li> </ul>	<ul style="list-style-type: none"> <li>• Resource persons</li> <li>• Sample contract documents</li> </ul>
<b>8.7.2 Management of Construction Projects</b>	<ul style="list-style-type: none"> <li>• discuss construction project management concepts</li> <li>• distinguish project team roles</li> <li>• construct schedules of work</li> <li>• examine sequence of operation for economic production</li> </ul>	<ul style="list-style-type: none"> <li>• Project as a concept</li> <li>• Management concepts:                             <ul style="list-style-type: none"> <li>- planning</li> <li>- organizing</li> <li>- directing /controlling</li> <li>- leading</li> </ul> </li> <li>• Project team roles</li> <li>• Scheduling techniques                             <ul style="list-style-type: none"> <li>- Gantt chart</li> </ul> </li> <li>• Cost benefit analysis</li> </ul>	<ul style="list-style-type: none"> <li>• Discussing construction project management concepts</li> <li>• Distinguishing project team roles</li> <li>• Constructing schedules of work</li> <li>• Examining sequence of operation for economic production</li> </ul>	<ul style="list-style-type: none"> <li>• ICT tools</li> <li>• Resource persons</li> <li>• Educational tours</li> </ul>

## 8.8 TOPIC 8: MAINTENANCE AND RENOVATION

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES,SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
<b>8.8.1 Rehabilitation and Maintenance of Infrastructure</b>	<ul style="list-style-type: none"> <li>• develop a maintenance culture.</li> <li>• distinguish between planned and unplanned maintenance.</li> <li>• justify rehabilitation, value addition and beneficiation.</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance culture</li> <li>• Planned and unplanned maintenance</li> <li>• Rehabilitation, value addition and beneficiation</li> </ul>	<ul style="list-style-type: none"> <li>• Developing a maintenance culture.</li> <li>• Distinguishing between planned and unplanned maintenance.</li> <li>• Justifying rehabilitation, value addition and beneficiation.</li> </ul>	<ul style="list-style-type: none"> <li>• ICT tools</li> <li>• Resource persons</li> <li>• Talking books</li> </ul>
<b>8.8.2 Adaptation of Buildings</b>	<ul style="list-style-type: none"> <li>• discuss requirements for change of building use</li> <li>• observe steps followed when adapting buildings</li> <li>• identify effects of building adaptations</li> </ul>	<ul style="list-style-type: none"> <li>• Change of building use (adaptation)</li> <li>• Procedure for changing building use</li> <li>• Effects of change in building use</li> </ul>	<ul style="list-style-type: none"> <li>• Discussing requirements for change of structure use</li> <li>• Observing steps followed when adapting buildings</li> <li>• Identifying effects of building adaptations</li> </ul>	<ul style="list-style-type: none"> <li>• Resource persons</li> <li>• Educational tours</li> <li>• Building By-laws</li> </ul>

## 8.9 TOPIC 9: BUILDING CONTROL AND DEVELOPMENT

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
<b>8.9.1 Building Constructional Processes</b>	<ul style="list-style-type: none"> <li>• describe stages involved in building constructional processes</li> </ul>	<ul style="list-style-type: none"> <li>• Stages in building construction processes:                             <ul style="list-style-type: none"> <li>- preliminary site work</li> <li>- sub-structure work</li> <li>- super structure work</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Describing stages involved in building constructional processes</li> </ul>	<ul style="list-style-type: none"> <li>• ICT tools</li> <li>• Site visits</li> <li>• Electronic media</li> <li>• Print media</li> </ul>

## FORM 6: COMPETENCY MATRIX

### 8.1 TOPIC 1: HEALTH AND SAFETY

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
<b>8.1.1 Waste Management</b>	<ul style="list-style-type: none"> <li>identify methods of waste management</li> <li>observe relevant by-laws</li> <li>examine alternative strategies for managing waste</li> </ul>	<ul style="list-style-type: none"> <li>Waste disposal methods</li> <li>By-laws</li> <li>Waste management methods</li> </ul>	<ul style="list-style-type: none"> <li>Identifying methods of waste disposal</li> <li>Observing relevant by-laws</li> <li>Examining alternative strategies for managing waste</li> </ul>	<ul style="list-style-type: none"> <li>ICT tools</li> <li>Print media</li> <li>Resource persons</li> <li>Site visits</li> <li>Waste matter</li> <li>By-laws</li> </ul>
<b>8.1.2 Environmental Impact Assessment</b>	<ul style="list-style-type: none"> <li>assess the construction environment</li> </ul>	<ul style="list-style-type: none"> <li>Environmental control</li> </ul>	<ul style="list-style-type: none"> <li>Implementing environmental impact assessment</li> <li>Reducing, reusing, recycling</li> </ul>	<ul style="list-style-type: none"> <li>ICT tools</li> <li>Print media</li> <li>Resource persons</li> <li>Site visits</li> <li>Waste matter</li> <li>By-laws</li> </ul>

## 8.2 TOPIC 2: SCIENCE OF MATERIALS

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES,SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
8.2.1 <b>Material tests</b>	<ul style="list-style-type: none"> <li>• demonstrate different material tests</li> </ul>	<ul style="list-style-type: none"> <li>• Soil tests</li> <li>• Concrete tests</li> <li>• Brick tests</li> <li>• Timber tests</li> <li>• Steel tests</li> <li>• Cement tests</li> <li>• Aggregate tests</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrating different material tests</li> </ul>	<ul style="list-style-type: none"> <li>• Educational tours</li> <li>• Real materials</li> <li>• Testing equipment</li> <li>• ICT tools</li> <li>• Resource persons</li> <li>• Print media</li> </ul>

### 8.4 TOPIC 4: QUANTITY SURVEYING AND ESTIMATION

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES,SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
8.4.1 Tendering and Estimating	<ul style="list-style-type: none"> <li>• identify types of tender</li> <li>• describe the process of tendering</li> <li>• explain the importance of estimation</li> </ul>	<ul style="list-style-type: none"> <li>• Tendering documents</li> <li>• Tender process and procedures</li> <li>• Types of tender</li> <li>• Estimation</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying types of tender</li> <li>• Describing the process of tendering</li> <li>• Explaining the importance of estimation</li> </ul>	<ul style="list-style-type: none"> <li>• ICT tools</li> <li>• Resource persons</li> <li>• Educational tours</li> <li>• Braille</li> <li>• Talking books</li> </ul>

### 8.5 TOPIC 5: STRUCTURAL ANALYSIS

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES,SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
8.5.1 Design of structures	<ul style="list-style-type: none"> <li>• illustrate knowledge of forces by designing and modeling structures</li> </ul>	<ul style="list-style-type: none"> <li>• Design of structures such as:                             <ul style="list-style-type: none"> <li>- Roofs</li> <li>- Beams</li> <li>- Columns</li> <li>- Foundations</li> <li>- Stair cases</li> <li>- Decks</li> <li>- Water reservoirs</li> <li>- Bridges</li> <li>- Arches</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Illustrating knowledge of forces by designing structures</li> <li>• Model making</li> </ul>	<ul style="list-style-type: none"> <li>• ICT tools</li> <li>• Resource persons</li> <li>• Educational tours</li> <li>• Models</li> </ul>

## 8.6 TOPIC 6: ARCHITECTURE

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
8.6.1 Design, Drawing and Modeling	<ul style="list-style-type: none"> <li>• design to meet client's brief</li> <li>• apply CAD skills to solve practical problems in their communities</li> <li>• evaluate own work basing on the design</li> <li>• produce realistic artefacts</li> </ul>	<ul style="list-style-type: none"> <li>• Design process</li> <li>• Computer Aided Design (CAD) applications</li> <li>• Computer Aided Modeling(CAM) applications</li> <li>• Design realisation</li> </ul>	<ul style="list-style-type: none"> <li>• Designing to meet client's brief (school and community)</li> <li>• Applying CAD skills to solve practical problems in their communities</li> <li>• Manufacturing artifacts using CAM applications</li> <li>• Evaluating own work basing on the design</li> <li>• Producing realistic artefacts</li> </ul>	<ul style="list-style-type: none"> <li>• ICT tools</li> <li>• Print media</li> <li>• Suitable model making material</li> <li>• Sample designs</li> <li>• Videos</li> </ul>

## 8.7 TOPIC 7: MANAGEMENT OF CONSTRUCTION PROJECTS

SUB-TOPIC	OBJECTIVES Learners should be able to:	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
<b>8.7.1 Business Enterprises</b>	<ul style="list-style-type: none"> <li>identify business models</li> <li>discuss enterprise skills</li> <li>develop project proposals</li> <li>calculate production costs</li> </ul>	<ul style="list-style-type: none"> <li>Business models</li> <li>Enterprise skills</li> <li>Project proposals</li> <li>Budgets and production costs</li> </ul>	<ul style="list-style-type: none"> <li>Identifying business models</li> <li>Discussing enterprise skills</li> <li>Developing project proposals</li> <li>Calculating production costs</li> </ul>	<ul style="list-style-type: none"> <li>ICT tools</li> <li>Resource persons</li> <li>Print media</li> <li>Educational tours</li> </ul>

## 8.9 TOPIC 9: BUILDING CONTROL AND DEVELOPMENT

SUB-TOPIC	OBJECTIVES Learners should be able to	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
<b>8.9.1 Building Model By-laws</b>	<ul style="list-style-type: none"> <li>identify relevant by-laws for planning and construction purposes</li> <li>describe building regulations governing stages of development</li> </ul>	<ul style="list-style-type: none"> <li>Building model by-laws</li> <li>Building regulations</li> </ul>	<ul style="list-style-type: none"> <li>Discussing relevant by-laws for planning and construction purposes</li> <li>Describing building regulations governing stages of development</li> </ul>	<ul style="list-style-type: none"> <li>Resource persons</li> <li>Local authorities</li> <li>Model Building By-laws</li> <li>ICT tools</li> <li>Talking books</li> </ul>



## 8.10 TOPIC 10: RENEWABLE ENERGY

SUB-TOPIC	OBJECTIVES Learners should be able to	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
8.10.1 Renewable Energy Systems	<ul style="list-style-type: none"> <li>• identify types of renewable energy systems</li> <li>• identify equipment for solar energy systems</li> <li>• explain the importance of renewable energy systems in buildings</li> <li>• design and construct a biogas digester</li> <li>• observe safety considerations in the construction of renewable energy systems</li> </ul>	<ul style="list-style-type: none"> <li>• Types of renewable energy systems:               <ul style="list-style-type: none"> <li>- photo voltaic system(PV)</li> <li>- hot water system</li> <li>- biogas digester</li> </ul> </li> <li>• Equipment for solar energy systems</li> <li>• Importance of renewable energy systems</li> <li>• Biogas digester</li> <li>• Safety considerations</li> </ul>	<ul style="list-style-type: none"> <li>• Identifying renewable energy systems</li> <li>• Identifying equipment for solar energy systems</li> <li>• Explaining the importance of renewable energy systems in buildings</li> <li>• Designing and constructing a biogas digester for a school or community.</li> <li>• Observing safety considerations in the construction of renewable energy systems</li> </ul>	<ul style="list-style-type: none"> <li>• Educational tours</li> <li>• Resource persons</li> <li>• ICT tools</li> <li>• Safety Regulations Act</li> </ul>

## 8.11 TOPIC 11: INTELLECTUAL PROPERTY RIGHTS

SUB-TOPIC	OBJECTIVES Learners should be able to	CONTENT (ATTITUDES, SKILLS AND KNOWLEDGE)	SUGGESTED NOTES AND ACTIVITIES	SUGGESTED RESOURCES
8.11.1 Patenting	<ul style="list-style-type: none"> <li>• describe the patenting process</li> <li>• carry out patenting procedures to protect innovations and inventions</li> </ul>	<ul style="list-style-type: none"> <li>• Patenting process</li> <li>• Copyrights and claims</li> </ul>	<ul style="list-style-type: none"> <li>• Describing the patenting process</li> <li>• Carrying out patenting procedures to protect innovation and inventions</li> </ul>	<ul style="list-style-type: none"> <li>• Resource persons</li> <li>• ICT tools</li> <li>• Print media</li> <li>• Patents Act</li> </ul>

## 9.0 ASSESSMENT

Forms 5-6 Building Technology and Design is assessed through continuous and summative assessment methods. The syllabus scheme of assessment is based on the principle of inclusivity. Arrangements, modifications and provisions for the assessment of candidates with special needs will be made to allow equal opportunities in accurate performance and measurement of abilities.

Learners are required to design and realize a community based project as continuous assessment by October of Form 6. They are also required to write 2 exercises based on Building Technology and Design Theory, 2 exercises based on Design and Drawing and 2 practical exercises that should be submitted as continuous assessment at the end of each year. The subject teacher will set and mark the exercises, as well as record the marks using ZIMSEC guidelines.

ZIMSEC will provide a template for the assessment of soft skills. Subject teachers will be required to provide a file for each learner where each of the exercises and marked scripts will be kept. In addition, subject teachers will also be required to create a file where exercises / question papers and marking guides for each exercise administered as well as recorded marks will be kept. ZIMSEC and Ministry of Primary and Secondary Education personnel will monitor the programme.

School heads will submit continuous assessment marks for design projects at the end of the year in Form 6 as provided for by ZIMSEC.

### 9.1 ASSESSMENT OBJECTIVES

By the end of the learning phase, learners will be assessed on the ability to:

- 9.1.1 observe health and safety regulations.
- 9.1.2 select appropriate materials to use during construction processes.
- 9.1.3 apply knowledge of science of materials to building construction.
- 9.1.4 demonstrate the correct use of tools and equipment.
- 9.1.5 calculate building material quantities.
- 9.1.6 apply knowledge of architectural concepts, principles and skills in order to solve construction related challenges in their communities.
- 9.1.7 budget resources for the construction of a building project.
- 9.1.8 analyze forces that act on building structures.
- 9.1.9 demonstrate understanding of principles of maintenance, value addition and beneficiation in their communities.
- 9.1.10 demonstrate understanding of legislation governing construction projects.
- 9.1.11 justify the significance of renewable sources of energy as alternatives in buildings.
- 9.1.12 demonstrate desirable interpersonal dimensions, attitudes, moral and ethical values underlying Unhu/Ubuntu/Vumunhu philosophy.
- 9.1.13 demonstrate enterprise skills through planning, development, implementation and evaluation of projects.

#### CONTINUOUS AND SUMMATIVE ASSESSMENT

Continuous and summative assessment will be carried out in the Building Technology and Design Theory, Design and Drawing, Practical Work and Design Project. The weighting of the components are as follows:

Summative Assessment	60%
Continuous Assessment	40%

Assessment Mode	Paper 1 Building Technology and Design Theory	Paper 2 Design and Drawing	Paper 3 Practical	Design Project	TOTALS
Summative	20%	20%	20%		60%
Continuous	5%	5%	10%	20%	40%

### SCHEME OF ASSESSMENT

There are three papers: Paper 1- Building Technology and Design Theory, 3 hrs; Paper 2- Design and Drawing, 15 hrs and Paper 3 Practical, 6hrs

Paper 1 – Building Technology and Design Theory (3hrs). Three sections will be offered:

Section A – Ten compulsory questions based on all sections of the syllabus.

Section B – Five questions will be offered from Science of Materials, Management of Construction Projects, Architecture, Structural Analysis and Renewable Energy. Candidates to answer any two.

Section C – A problem solving question based on Design and Drawing principles. It tests design thinking.

Paper 2 – Design, Drawing and modeling (15 hrs)

Three questions will be set based on CAD applications from the following areas – Architecture, Renewable Energy and Structural Analysis. Candidates to answer one question.

Paper 3 – Practical (6hrs)

Practical question will be set on the following areas: Quantity Surveying, Land Surveying, Building Constructional processes..

Design Project (Continuous Assessment)

Guidelines for the project will be sent to Centres by November of Form 5. The project will be done during the course of the year beginning January to October of Form 6.

### SPECIFICATION GRID

Assessment Objectives	Paper 1 Building Technology and Design	Paper 2 Design and Drawing	Paper 3 Practical
1.	X	X	X
2.	X	X	X
3.	X	X	X
4.	X	X	X
5.	X	X	X
6.	X	X	X
7.	X	X	X
8.	X	X	
9.	X	X	X
10.	X	X	X
11	X	X	X
12			X
13	X	X	X
<b>Weighting</b>	<b>20%</b>	<b>20%</b>	<b>20%</b>

Objectives	Paper 1	Paper 2	Paper 3
Knowledge with understanding	50%	20%	30%
Practical skills and their application	20%	50%	50%
Decision making and judgment	30%	30%	20%
TOTAL	100%	100%	100%

## 10.0 BUILDING TECHNOLOGY AND DESIGN ASSESSMENT MODEL



