26.2.0 # ESTIMATING AND COSTING I

Introduction

26.2.1 This module unit involves equipping trainees with knowledge, skills and attitudes in categories, evaluating building units and components. Upon completion of the module, one can work as an Assistant Quantity Surveyor among other fields of work.

The module unit is designed to equip the trainees with knowledge, skills and attitude necessary for carrying out cost evaluation and price analysis in various building structures. The trainee should have basic knowledge of Mathematics and General Building and Construction from Module I work to proceed with this module.

General Objectives

26.2.2 By the end of this module unit, the trainee should be able to:

a) understand working principles of estimating and costing
b) carry out research work to provide data for planning, design, in order to plan, analyse the cost target of a building
c) apply the evaluation skills to cost control construction works

Module Unit Summary and Time Allocation – (77 Hours)

26.2.3

Code	Sub-Module Units	Content	Total Hours
26.2.01	Site and Office Procedure	• Role of Quantity Surveyor • Role of Contractors, Sub-Contractors and Suppliers • Sums I Bills of Quantities • Payment Certificate • Valuation of Variations • Contract Documents -Types of Contracts -Tendering Systems	20
26.2.02	Introduction to Estimating	• Roles of Estimation • Sources of Cost Information • Terms used in	6

26.2.03	Approximate Estimating	Estimation • Cubic Method • Functional Unit Method • Superficial Area Method • Storey Enclosure Method • Approximate Quantities Method	18
Total			**44**

26.2.0 **ESTIMATING AND COSTING**

26.2.01 **SITE AND OFFICE PROCEDURE**

26.2.01T0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

a) explain the role of a quantity surveyor
b) explain the role of contractors, sub-contractors, nominate sub-contactors
c) explain sums included in the bills of quantities
d) explain types of payment certificates
e) explain variations and valuation of variations
f) explain the importance of contract document

25.2.01C *Competence*

The trainee should have the ability to:

i) prepare tender documents
ii) tender for construction works

Content

26.2.01T1 Role of quantity surveyor at:
- pre-contract stage
- construction stage
- post construction stage

26.2.01T2 Role of contractors, sub-contractors and suppliers

26.2.01T3 Sums in bills of quantities
- prime cost sum
- provisional sum
- contingency sum

26.2.01T4 Payment certificates
- interim certificates
- penultimate certificate
- final certificate

26.2.01T5 Variations
- valuation of variations

26.2.01T6 Contract documents

26.2.02 **INTRODUCTION TO ESTIMATING**

26.2.02T0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

a) explain the role of an estimator during pre-tender
b) explain sources of cost information
c) explain terms used in estimating and costing

25.2.02C *Competence*

Ability to gather cost information and use it in estimating for a given project

26.2.02T1 *Content*

Role of estimator
- build up rates
- re-measurements
- prepare claims

26.2.02T2 Sources of cost information
- priced bills of quantities
- trade journals/ magazines
- Ministry of Public Works price books
- schedule of rates
- quotations
- build up of rates
- JBC schedule of rates

26.2.02T3 Terms
- unit rate
- profit
- overheads
- all-in labour rates
- all in mechanical rate
- man-hour

27.2.03 APPROXIMATE ESTIMATING

26.2.03T0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to explain:
a) cubic method
b) functional unit method
c) superficial area method
d) superficial enclosure method
e) approximate quantities method

25.2.03C *Competence*

The trainee should have the ability to:
i) estimate cost of project
ii) use historical information from completed project
iii) estimate for proposed project
iv) use approximate quantities method to compute estimates

26.2.03T1 *Content*

Explain cubic method
- cube unit
- cubic capacity
- cubic rate
- extension
- merits and drawbacks

26.2.03T2 Functional unit method

26.2.03T3 Superficial area method
- unit floor area cost
- total area cost
- merits and demerits

26.2.03T4 Superficial enclosure method
- unit storey area
- cost
- total storey cost
- merits and drawbacks

6.2.03T5 Approximate quantities method

- rules
- methods

- Priced bills of quantities
- Practicing quantity surveyor

Suggested Teaching/Learning Methods

- Discussion
- Calculations
- Field visits

Suggested Assessment Methods

- Oral
- Written exercise
- Assignment
- Project

Suggested Teaching/Learning Resources

- Text books

Tools and Equipment

- Scientific calculator
- Dimension paper
- SMM and CESMM
- Working drawing

27.2.0 BUILDING DRAWING AND CAD I

27.2.1 Introduction

This module unit deals with the study of the principles and processes in design of building.

Purpose

The purpose of this module unit is to equip the trainee with knowledge, skills and attitudes necessary to understand the principles and processes used in the design of building.

27.2.2 General Objectives

By the end of the module unit, the trainee should be able to:

a) Understand the role of the parties involved in the design process
b) Understand the working relationships of the parties involved in the design process
c) Understand the methods used in the design process
d) Understand the stages of architectural design process

27.2.3 Module Summary and Time Allocation

CODE	SUB-MODULE UNIT	CONTENT	TIME ALLOCATION		
			T	P	TOTAL
27.2.01	Architectural Practice	• Parties involved • Working relationship • Functions • Design process • Stages in design • Architectural elements • Working drawings	10	19	29
27.2.02	Design	• Specifications	16	16	32

	Development	• Local authorities approval • Alterations and additions • Scheme design • Building regulations • Working drawings			
27.2.03	Structural and Services Drawings	• Functions • Interpretation • Schematic designs	12	26	38
					99

27.2.01 ARCHITECTURAL PRACTICE

Theory

27.2.01T0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

a) identify parties involved in the design of a project

b) define working relationship of a parties involved in the design process

c) state functions of various project-team members

d) define methods of design process

e) describe stages in architectural design process

27.2.01T1 *Content*

- Parties in design process
  - o developer
  - o financier
  - o technologist
  - o architect
  - o planners
  - o engineers
  - o surveyors
  - o social researchers
  - o environmentalists
  - o contractors
  - o lawyers
  - o economists
- Formal engagement of role players
  - o responsibilities
  - o significance
  - o scope
- Methods
  - o algorithm
  - o heuristic
  - o social science
  - o research
  - o applied research
- Stages in design process
- Building categories
  - o public
  - o commercial
  - o industrial
  - o domestic
- Examples in each category
- Developers needs and requirements
  - o internal and external treatment
  - o shades
  - o colours
  - o materials
  - o spatial relationships
  - o satisfactory requirement
  - o neighbourhood
- Developers financial limits

- service
- limitations
- Ownership documents
- title deeds
- certificate of deed
- certificate of land transfer
- survey plan
- rates payment note

-Working drawing
- location of site
- preparation of detailed site plan
- survey data
- planning regulations

-Floor, foundations, roof plans
- Elevations
- front elevation
- rear elevation
- Sections
- longitudinal
- vertical
- Components / details
- foundation
- slabs
- walls
- beam / columns
- stairs
- chimneys
- cabinets and accessories
- windows
- doors
- stairs

Practice

27.2.01P0 *Specific Objectives*

By the end of the sub-module unit, the trainee should be able to:

a) design architectural elements for different building categories

b) prepare working drawings that meets the statutory and customer requirements

27.2.01P1 *Content*

- Design brief
  - problem statement
  - justification
  - possible solutions by clients
- Working drawings
  - foundations
  - slabs
  - walls
  - beam/columns
  - stairs
  - chimneys
  - cabinets and accessories
  - windows and door schedules

27.2.01C **Competence**

The trainee should have the ability to:

i) Appreciate the role of team players in the

			Suggested Learning Resources
			- Free hand sketches - Camera/photographs - Report writing - Handouts - Pictures - Site / visits - Discussion - Title deed - Certificate of land transfer - Rates demand note - Deed plan - Specification of building materials - Drawing equipment - Blue print material
		27.2.02	**DESIGN DEVELOPMENT**
			Theory
		27.2.02T0	*Specific Objectives* By the end of the module unit, the trainee should be able to:
			a) state specifications of materials for various elements in a building design

under material and artificial features in preparation of given design

iii) Isolate unique features and requirements in each category

iv) Take into consideration the climatic requirements

- Verify:legal documents
- Interpret local authorities by-laws and requirements

v) Apply architectural graphic techniques to prepare detailed site plan

- Scale draw foundation plan floor plan
- roof plan

vi) Design, draw and detail one storey building from substructure to superstructure

vii) Prepare schedule of materials and components

viii) Table relevant documents for approval

ix) Verify appropriateness of submitted documents

b) outline procedure of approval of drawings by local authority

c) describe the nature of alterations and additions on existing buildings

d) explain the effects of alternation and addition

2.02T1 *Content*

- Process of developing scheme design ideas
  - o extracting relevant information from codes and by laws
  - o guides on zoning and planning requirements
  - o implementation of zoning regulation and planning requirements
- Specifications of materials
  - o substructures
  - o superstructures
  - o external works
  - o services / water sanitary and electrical
- Refinement of preliminary design
  - o presentation
  - o models
- Working drawings
  - o neighbourhood planning
- Location of site on presentation drawing location plan, primary access road, key architectural points
- Site plan
  - o access to and from site
  - o profile of surrounding architectural points
  - o proposed structure
  - o floor plans
  - o reference points
  - o relative levels
- Roof plan / foundation plan
- Detailed elevations
  - o material finish
  - o reference points
  - o number of elevations
- Detailed sections
  - o specifications
  - o primary elements
- Details
  - o major and minor
  - o preamble
  - o special instruction
- Schedules
  - o materials
  - o building elements
- Procedure of approval
  - o submission of drawings
  - o circulation of drawing
  - o approval by appropriate committees
- Documents
  - o certificate of land ownership
  - o deed plans
  - o survey plan
  - o demand notes
  - o working drawings
  - o receipt of payment for approval

Practice

27.2.02P0 *Specific Objectives*

By the end of the sub-module unit,

the trainee should be able to:

a) develop preliminary scheme design ideas for a given architectural solution
b) apply relevant building regulation at appropriate stage
c) prepare final preliminary design
d) produce final working drawings

27.2.02P1 *Content*

- Scheme design
- Building regulations
- Working drawings
- Schedules

27.2.02C **Competence**

The trainee should have the ability to:

i) Develop sketch briefs
ii) Establish and source for relevant information
iii) Initiate and manage, obtain concesors from client
iv) Use developed preliminary sketches / ideas
v) Design ideas to produce
   - final detailed drawings
   - specifications
   - schedules of components
vi) Specify materials through the use of symbols and specifications
vii) Master relevant skills in drawing office practice
viii) Compile and table documents for approval
ix) Present drawings for approval
x) Use relevant guidelines to carry out effective alterations on existing structure

Mandatory Learning Resources

- Building code
- Local authority by-laws
- Public works specifications
- EE regulations

- Manuals
- Specifications from manufactures

27.2.03 **STRUCTURAL AND SERVICES DRAWINGS**

Theory

27.2.03T0 *Specific Objectives*

By the end of the module unit, the trainee should be able to:

a) outline the functions of structural drawings
b) outline the functions of electrical drawings
c) interpret electrical details
d) outline the functions of water distribution systems
e) detail the schematic layout of waste water and sanitary system
f) explain the function of gas supply system
g) outline the functions of mechanical drawings
h) interpret mechanical services drawings

27.2.03T1 *Content*

- Structural elements
  - foundations
  - slabs
  - beams
  - columns
  - roofs
- Reinforcements
  - main and distribution
  - symbols and notations
  - reinforcement schedule
- Steel concrete and timber structural elements
  - detailed drawings
  - specifications
  - notes
- Electrical drawings
  - layout (electrical)
  - layout alarm systems
  - auxiliary systems

- telephone
- net works
- solar systems
- Distribution system
  - hot and cold water system
  - pressurised system
  - symbols and notations
  - specifications
  - pipe sizing
  - auxiliary systems fire sprinkle and hydrants
  - waste water system
  - drainage
  - disposal point
  - treatment septic tank
- Gas supply system
  - gas points
  - pressure control
  - distribution
  - pipe sizing
- Mechanical service system
  - air conditioning
  - ducts, electrical and air exchange systems
  - appliances rating and capacities
  - symbols and notations
- Lifts and escalators system layout and anchorage
  - specifications
    - capacity ratings and speed

Practice

27.2.03P0 *Specific Objectives*

By the end of the module unit, the trainee should be able to:

a) detail structural elements
b) detail basic elements of electrical layouts
c) detail schematic layout of electrical system
d) detail the layout of water supply system
e) detail the schematic layout of gas supply system
f) detail basic elements of mechanical services drawings

27.2.03P1 *Content*

- Structural elements
- structural drawings
- electrical elements
- schematic electrical system layout
- water supply / distribution layout
- elements of mechanical services
- Schematic drawings of mechanical services

27.2.03C

Competence

The trainee should have the ability to:

i) Prepare structural drawings for building up to 3 story buildings

ii) Prepare electrical drawings for up to 3 storeys

iii) Prepare water supply and waste systems for buildings up 3 storeys

iv) Prepare detail drawings for waste treatment system for :

- residential housing capacity of 30 persons
- institutional building capacity of 250 persons

v) Prepare drawings for gas supply systems for residential household and school laboratory

vi) Prepare drawing for lift / escalator systems for three story office blocks

Suggested Learning Resources

- Steel structural detailing specifications for design
- Manuals specifications BS 870
- EUROPEAN UNION OFFICE PRACICE 2 (EC 2)