WOLAITA SODO UNIVERSITY

COLLEGE OF ENGINEERING

DEP`t OF CoTM

Cotm student association

COST ENGINEERING

HOW MUCH IT MAY COST?



PREPARED BY WONDE (AGU)

PROJECT COST ESTIMATION

- Project Cost estimation is the process of valuing on monetary expression, including the cost of all possible entrants necessary for the planning, implementing and monitoring stages of the proposed project under consideration.
- Cost estimation is the determination of the probable cost of a project.

Knowledge and Managerial Skill for Cost Estimation

The following knowledge, managerial talents, and degree of construction experience make a good estimator.

- Ability to read and understand contract documents, with special skills in reading construction drawings for all specialties and related specifications.
- Ability to accurately take off the quantities of construction work for which he or she is preparing the detail estimate.
- Ability to visualize the future building from drawings, which usually requires some years of construction site experience.
- Knowledge of arithmetic, basic geometry, and statistics.

Knowledge and Managerial Skill for Cost Estimation cont..

- Familiarity with estimating software in depth and with available building cost databases.
- Knowledge of building construction methods.
- Knowledge of labor productivity, crew composition, and impacts of various forecasted site conditions on crew output.
- Possession of office managerial skills in organizing project-related cost information.
- Ability to work under pressure and to meet all bid requirements and deadlines.

Basic Cost Components of Construction Project

Basically the cost of any construction project comprises

-*Direct costs,* which include the direct cost of materials, labor as well as equipment and sub contract cost.

-*Indirect costs,* which include but not limited to head office and site overhead costs.

-*Risk allowance*

-*Profit and income tax*

Direct Construction Cost

- The direct costs mainly include material, labor, equipment and subcontract costs as described below.
- Direct Material costs: These costs referring to the cost of materials, consumables and components used for executing an activity including the allowances for scrap and wastages.
- Direct Labor costs: All costs related to the workers working on a specific activity such as carpenters, masons, erectors, painters, plumbers and so on.
- Direct Equipment costs: These costs referring to the costs of machineries and plants used in executing a specific activity.
- Subcontract costs: In case some specific activities are subcontracted, the subcontract price will be considered as the direct cost of the activities to be executed by the subcontractor.

Indirect Construction Cost

- Indirect construction costs are all costs, which can not be directly booked under a specific activity in a construction project but required to keep the whole project operational.
- These costs are also called overhead costs, which mainly include the head office and site overhead costs.

- **A. Head office overhead costs**
- Head office overhead costs are all costs required to run the whole operation of the construction company, which usually administers different projects at a time.
- These costs are not usually associated with specific project but rather shared proportionally by all projects under the company.

Example MODCON ENGINEERING PLC HEAD OFFICE IN ADDIS ABEBA

Head office overhead cost = k2 * Direct cost

K2 = percent payment to head office over head cost (7-10%)

B. Site overhead costs

- Site overhead costs are all costs required to run the whole operation of a specific construction project at site level.
- These costs are not associated with specific activity in a project but rather shared proportionally by all activities within the project. Some of the site overhead costs are listed below with further clarifications.
- Site management costs: These costs refer to costs related with salaries and benefit packages of the site management members in the project site.
- Indirect labor costs: salaries and benefits of staffs other than the site management members working at the project site such as site engineers, office engineers, administrative and finance staffs, data collectors and so on.

site overhead cost = k1 * Direct cost

k1= percent payment to site over head cost (10-14%)

Risk Allowance

- Usually contractors incorporate risk allowances in their tender prices to compensate the negative impacts of different risks such as contractual, technical, political and economic risks.

Political and economic risks reflect the impact of political situations, stability of economic policies, inflation and price escalation on the execution of the intended construction project.

Risk Allowance con`d

- Let’s assume the following factors represent the percentage cost increment of each cost component and the risk allowance will be calculated as follows:
- R1 => increment on direct material cost (6-9%)
- R2 => increment on direct labor cost (9.5-13%)
- R3 => increment on direct equipment cost (5.57-7.83%)
- R4 => increment on site over head cost (1.2-3.58)
- R5 => increment on head office over head cost (1.21-2.68)
- Therefore risk allowance = **R1DMC+R2DLC+R3DEC+R4SOC+R5HOC**

Profit and Income Tax

- Construction projects are executed by contractors whereby these contractors will commit to invest their capital to get maximum possible profit from the contracts to be performed.
- A profit margin entirely depends on the market competitiveness and company strategies.
- Any construction company operating a profitable business in Ethiopia shall pay 30% of its gross profit as an income tax as per the income tax proclamation No. 286/2002 = Amended **PROCLAMATION NO. 608/2008**.

UNIT RATE (PRICE) ANALYSIS

ANALYSIS SHEET FOR DIRECT & INDIRECT UNIT COSTS

ROJECT: **Excavation and earth**
ork
/ORK ITEM: Site clearance of 20 cm
epth
OTAL QANTITY OF WORK ITEM: 1m²

LABOUR HOURLY OUTPUT: 0.6 m²/hr.
EQUIPEMENT HOURLY OUTPUT
RESULT: 44.30 Birr/m²

Material Cost (1:01)						Labour (1:02)					Equipment Cost (1:03)			
Type of Material	Unit	unit	Qty *	Rate	Cost per Unit	Labour by Grade	No.	UF	** Indexed Hourly Cost	Hourly Cost	Type of Equipment	No.	Hourly Rental	Hourly Cost
						G.Chief	1	0.2	15.4512	3.09	Tool	1	4	4
						D/L	1	1	8.6913	8.69				0
	Total (1:-01)				0		Total (1:02)			11.78		Total (1:03)		4

A= Materials Unit Cost 0.00 0.00 Birr/m²

B=Manpower Unit Cost B = labour unit cost 19.64Birr/m²

Total of (1:02)
Hourly Output:

C=Equipment Unit Cost 6.67 Birr/m²

Total of (1:03)
Hourly output:

Direct Cost of Work Item = A+B+C = 26.30 Birr/m²

Site Overhead cost:	11.49%	3.02 Birr/m²
Head office overhead cost:	8.63%	2.27 Birr/m²
Over head cost :		5.29 Birr/m²
Profit Cost:		4.82 Birr/m²
Risk allowance		2.12 Birr/m²
Total Unit Price :		38.53 Birr/m²
VAT:	15%	5.78 Birr/m²

- **1. Excavation and earth work**
- **1.1 Site clearance**
- **Description**:-this work shall consist of the removal, whole or in part and satisfactory disposal of all the building, fence, structure, abandoned pipelines and any other obstruction which are not designated.
- **Purpose**:-the main purpose of site clearance are to remove or clear all tree,stumps,roots, bushes,vegetation,debris,material and other obstruction.
- **Material cost=0**
- **Labor cost, assume the soil is ordinary**
- - Crew designation ex.A2 by machine incentives(**operator, operator helper)**
- **Operator helper**
- Hourly cost of **operator helper**= **90birr/day/8hrs/day=11.25birr/hr.**
- There will be **10%** employee benefit.
- **25%** extra pay for all employees working 48weekly working hour and over time 4hours.
- Hourly employee benefit= **10%*11.25birr/hr.=1.12birr/hr.**
- Hourly overtime cost= **25%*4/48*11.25=0.234birr/hr.**
- Extra pay (for long continuity of service) = 1birr/hr. for 65% of daily labor
- Extra pay= **0.65 * 1= 0.65birr/hr**
- **Operator helper 11.25+ 1.12+ 0.23 +0.65 = 13.4birr/hr**

Item	Type of Work	Material Required to Produce 1m³ concrete
1	Concrete C- 7 Mechanical Mix Mix ratio 1:4:8	Cement = 150 kgs (3 bags) Sand = 773 kgs (0.42 m³) Gravel = 1890 kgs (0.84 m³) Water = 60 liters
2	Concrete C-15 Mechanical mix Mix ratio 1:3:6	Cement = 200 kgs (4 bags) Sand = 754 kgs (0.41 m³) Gravel = 1843 kgs (0.82 m³) Water = 80 liters
3	Concrete C- 20 Mechanical mix Mix ratio 1:2:4	Cement = 275 kgs (5.5 bags) Sand = 718 kgs (0.39 m³) Gravel = 1755 kgs (0.78m³) Water = 110 liters
4	Concrete C- 30 Mechanical mix Mix ratio 1:2:3	Cement = 325 kgs (6.5 bags) Sand = 837 kgs (0.45 m³) Gravel = 1536 kgs (0.68m³) Water = 130 liters
5	Concrete C- 7 Hand mix Mix ratio 1:3.5:8	Cement = 153 kgs (3.06bags) Sand = 704 kgs (0.38 m³) Gravel = 1966 kgs (0.87 m³) Water = 92 liters
6	Concrete C- 15 Hand mix Mix ratio 1:2:5:6	Cement = 202 kgs (4.04 bags) Sand = 661 kgs (0.36 m³) Gravel = 1940 kgs (0.868 m³) Water = 121 liters

WEL COME TO CALCULATION PART

