**FINANCIAL AND BUSINESS MANAGEMENT TRAINING FOR ROAD CONTRACTORS**

**MODULE SIX SESSION FiVE**

**COSTING AND PRICING OF ROAD WORKS**

**Determining costs and pricing for the rehabilitation of KANUSHU-MAGEGE ROAD Km: 04+000.**

**Objectives of the Session**

1. Interpret the bills of quantities for appropriate costing and pricing of road works (based on the Magege case)
2. Identify factors to consider during pre-tender site visits and meetings that affect costs of road works
3. Use scenarios to determine costs and pricing of a contract.

**Costing and Pricing Road Works**

Pricing of road works involves the accumulation of expenses to determine the cost of a contract or a unit of output. The expenses are many hence accumulating them gives a total of all costs involved. In summary, costing of road works means the determination of what it takes for the contractor to deliver the works. On the other hand pricing of road works involves selection of an appropriate mark-up to determine a bid price. This is usually pre-determined by the industry; however there are scenarios where the market forces of demand and supply are left to be benchmarked by the industry players. Pricing of road works simply means the determination of the bid price at which the contractor will bill the employer. The bid price should cover the cost of works and a reasonable profit margin.

For both costing and pricing, a suitable unit cost easy to measure is chosen. The unit of output could be a standard unit like a length like a kilometre, an area such as a m2 or a volume such as a m3 or feet of a chainage. This can be either on alignment, shoulders or the drainage lines. Such units could be:

1. A segment of the contract such as the construction of drainage or access road to a quarry.
2. An activity of the contract e.g. watering the Chainages during compaction and at dust control.

**Why contractors need to cost and price road works:**

1. To control resources used in road construction since they are many. The estimated unit cost serves as a control budget against which actual cost could be compared as the works progress.
2. To determine an appropriate price to charge for works done
	* Avoid being uncompetitive, since we are not the only ones in the market. On one hand we have to avoid overcharging since if we do so we shall not be able to win jobs. Works are costed bearing in mind the competition thereby adopting techniques that will improve speed of delivery and reduce costs.
	* On the other hand we should not undercharge since if we do so we stand the risk of loosing money on the job and even failing to complete the works.
3. To compare costs and profitability of different road components or sections. This helps us to determine early the capital and other resources injection.
4. To benchmark with budgets or competitors

**Approach to pricing works**

Many contractors lobby for and use standard rates (price) predetermined by MOWT or budget estimates by LGs. Such rates are budget estimates only. Where available they are internal to the employer and may be outdated, uncompetitive or not suitable for the environment in which the works are to be undertaken.

Pricing rates should be built up from cost elements based on the zero budget/cost approach plus a competitive mark-up. A contractor from many years of experience should build up their cost rates for common woks activities. For a specified tender such rates should be reviewed for each job activity after receiving the geotechnical survey reports, visiting the site of the works and examination of the project plans.

**What to watch out for on a pre-bid site visit**

1. The terrain whether it’s hilly, gentle sloping or flat land. This also helps you to know what machinery you have to have/hire.
2. The nature of soils, depending on the materials in the area the contractor can figure out where to get the materials like gravel, sand and water etc.
3. Source of major raw materials, hardware; are there trading centres where they can buy materials in the nearby areas.
4. Availability of basic amenities for staff such as: accommodation, food and water, so that the contractor understands the costs on human and resources.
5. Source and cost of labour as in some sorroundings it could be expensive to obtain casual labour while in others it is abundant and cheap.
6. Security of person and assets

**Issues to consider during pre-bid conference**

This is important to critically analyse the following issues because they have a bearing on the cost price of a unit output. They include;

1. Source of raw materials
2. Compensation of the road area (if it is supposed to be done by the contractor)
3. Access/diversion road compensation as above
4. Environmental Impact Cost Implications
5. Consensus for the LG to hire out its machinery to contractors
6. Any clarifications on the Bid Documents
7. Presentation of addendum if any

**Types of Costs for Roads**

1. Types of Direct costs are traced directly to the road works e.g
	* Labour, materials and direct expenses.
	* Equipment and consumables
2. Indirect costs (overheads) e.g
	1. Contingency costs
	2. Administrative expenses
	3. Management emoluments
	4. Rent of premises
	5. Power
	6. Software

**Site preparatory works**

Pricing this activity involve identifying the elements of cost such as labour, materials , machine hire and indirect costs for the following;

1. Establishment of camps and their maintenance. This is the planning ground for operations. Most resources are organised and kept here at the beginning and depending on the size of the project other stores and stockpiles can be created.
2. Construction of access road to quarry sites and its maintenance. This is because the material has to be delivered to the stockpile or on the alignment.
3. Construction of deviations and their maintenance. As the carriageway is being worked on operations of the users have to continue, hence create a diversion for them where they will pass with their merchandise. These are essential to administer, access materials for road construction and to also allow traffic to flow during works. Example of a cost accumulation is given below:

|  |  |  |
| --- | --- | --- |
| Pricing construction of access roads to quarry sites |  |  |
| One kms from site (LS) | Quantity | Cost/unit | Total Cost (shs)  |  |
| (De)Mobilization  | 1 |   | 2,000,000 |  |
| Grader hire (days) |  1  |  1,000,000  |  1,000,000  |  |
| Fuel |  50  |  3,300  |  165,000  |  |
| Machine operator |  1  |  10,000  |  10,000  |  |
| Technician |  1  |  5,000  |  5,000  |  |
| Admnistrative overhead |   |  7.5%  |  238,500  |  |
| Cost per kms  |   |   |  3,418,500  |  |
| Margin 20% |  1 |  3,418,500  |  683,700  |  |
| **Rate per kms**  |  |  |  **4,102,200**  |  |

**Setting Out and Site Clearing Works**

It includes the following key items;

1. Establishment or re-establishment of road alignment and setting out road works. The surveyor will help us to re-establish the alignment and where we reduce on the corners and if the place is hilly we put up gabions to protect landslides into the road.
2. Clearing site of all grass, bushes and boulders; grub all roots including excavation of top soil from road formation. This is done incase the alignment is new.
3. Extra for boulders over 1.5m maximum girth. If these exist they will be removed and fill material brought in to fill.
4. Cutting and removal of site trees up to 1m girth including roots and stumps
5. Extra cost is allowed for trees above 1m.

Below is an example of costing and pricing of a site clearing works activity:

|  |
| --- |
| Clear site of all grass, bushes and boulders (up to 1.5m maximum girth) and Grub all roots of grass and bushes including excavation of top soil from road formation   |
| Machine hire |  Unit  |  Cost per unit  |  Total cost |
| (De)Mobilisation  |  1  |  2,000,000  |  2,000,000  |
| Grader hire | 1  | 1,000,000  |  1,000,000  |
| Fuel | 50  | 3,300  |  165,000  |
| Operator | 1  | 10,000  |  10,000  |
| Labour |   |   |   |
| Site Engineer (days)  | 1  | 500,000  |  250,000  |
| Surveyor (days)  | 1  | 550,000  |  550,000  |
| Lab Technician |  1  | 100,000  |  100,000  |
| Technician | 1  | 10,000  |  10,000  |
| Administrative overheads |   | 7.5  |  306,375  |
| Cost |   |   |  4,391,375  |
| Margin -20% |  1  | 4,391,375  |  878,275  |
| **Rate (price) per kms**  |  |  |  **5,269,650**  |
|  |  |  |  |

**Earth Works Activity**

1. Rehabilitation of existing formation include:
	* Reshaping of existing road formation, watering and compaction.
	* Opening of chocked culverts, desilting these culverts costs have to be factored in.
	* Opening or re-excavation of side and drains

 2. Construction of road formation include:

* + Excavation to level
	+ Excavation in side, mitre, catch water and other specified drains
	+ Form, water and compact road bed.

Earth Works Activity

 Provision of fill materials:

* + Preparation of Quarry Site consisting of clearing vegetation and removing topsoil. Because these are highly silt. There CBR, PI and Sieve Analysis are so poor, hence can be thrown away unless material is less and the top soils has some components the contractor needs. Then this can be improved with cement or lime.
	+ Excavation, hauling, placing, watering and compaction of approved fill material to create a level road bench.
	+ Excavation of rock

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**Drainage Works**

1. Provide and install scour checks
	* Using stone or using sticks. If the contractor uses stone pitching or others.
2. Excavation of foundation for structures:
	* In soil not more than 1m deep
	* In soil more than 1m deep
3. Supply and install concrete culvert pipe rings reinforced with BRC A 142:
	* Supply and install concrete culvert pipe rings of 600mm diameter, 900mm diameter or 1200mm diameter or 450mm diameter.

Supply and install steel culvert pipe rings:

* + Of 600mm diameter or 900mm diameter or 1200mm diameter

5. Demolish existing structures and cart away debris

6. Provide material and build cement bound masonry work in:

* + Stones or in Concrete Blocks

7. Provide select material and backfill structures

8. Excavate water diversions and/or construct barriers (Provisional)

9. Other drainage erosion protection works as directed by the Engineer - Provisional Item

Example of costing and pricing of drainage works:

|  |
| --- |
| **Costing and Pricing to Supply and install concrete culvert pipe rings of 600mm diameter )**   |
|  One km  | Quantity  |  Rate  |  Cost  |
|  **Direct expenses -Equipment**  |   |   |   |
|  (De)Mobilisation  |  1  | 2,000,000  |  2,000,000  |
|  Backhoe Hire  |  1  | 1,000,000  |  1,000,000  |
|  Fuel  |  50  |  3,300  |  165,000  |
|  Operator  |  1  |  10,000  |  10,000  |
|  **Labour**  |   |   |   |
|  Site Engineer  |  1  |  500,000  |  500,000  |
|  Surveyor  |  1  | 550,000  |  550,000  |
|  Inspector  |  1  | 100,000  |  100,000  |
|  Technician  |  4  | 10,000  |  40,000  |
|  **Materials**  |   |   |   |
|  Culverts  |  6  | 79,560  |  477,360  |
|  Cement(bags)  |  20  | 29,000  |  580,000  |
|  Rolled iron bars(pcs)  |  4  | 20,000  |  80,000  |
|  Weld mash  |  4  |  15,000  |  60,000  |
|  Sand(Tonnage)  |  15  |  10,000  |  150,000  |
|  **Administrative overheads**  |   | 7.5%  |  428,427  |
|  **Cost**  |   |   |  6,140,787  |
|  **Margin**  |  20% | 6,140,787  |  1,228,157  |
|  |   |   |  **7,368,944**  |
| **Rate (Price)/culvert**  |  |  |  **1,228,157**  |

 **Gravelling and Completion Works**

1. Preparation of quarry site consisting of clearing vegetation and removing top soil.
2. Excavate gravel, remove boulders, stockpile, load, haul, offload, spread, water and compact in place
3. Restoration of site(s), quarries and borrow pits.

 **Preliminary and General Items**

* Mobilisation and Demobilisation
* Insurances and Bonds
* Traffic Accommodation
* Bill Boards
* Maintenance of the whole of the Works
* Supervision of the Project by the Employer
* Site meetings and with local communities
* Allow for sign posts
* PROVISIONAL 5% FOR CONTINGENCIES

**Example of adopting pre determined work measurement data for labour based contractors:**

The table below is an adoption of data from the Ministry of Works and Transport. It uses the average output for labour based unskilled workers (column 3) per day to determine pricing of labour based works. By applying the contractor’s current piece rate per day (column4), we have established the likely unit cost (column 4) and then applied a selected margin to determine the charge rate on to the employer (column 7) per unit of work performed.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Activity** | **Unit**  | **Expected Daily Task Range** | Rate per day (shs) | Cost /unit (shs) | Margin | Pricing Rates (shs) |
| Setting out  | METRE | 100 | 24,000 | 240 | 50% | 360 |
| Bush clearing – light  | M2 | 350 | 15,000 | 43 | 50% | 64 |
| Bush clearing - medium  | M2 | 200 | 15,000 | 75 | 50% | 113 |
| Bush clearing – heavy  | M2 | 100 | 15,000 | 150 | 50% | 225 |
| Stripping and grubbing  | M3 | 175 | 15,000 | 86 | 50% | 129 |
| Tree cutting No. - | EACH | 5 | 15,000 | 3,000 | 50% | 4,500 |
| Stump removal No. - | EACH | 2 | 15,000 | 7,500 | 50% | 11,250 |
| Boulder removal - Day work |   | 3 | 15,000 | 5,000 | 50% | 7,500 |
| Excavate ordinary soft soil  | M3 | 5 | 15,000 | 3,000 | 50% | 4,500 |
| Excavate ordinary medium soil  | M3 | 3.5 | 15,000 | 4,286 | 50% | 6,429 |
| Excavate hard soil | M3  | 3 | 15,000 | 5,000 | 50% | 7,500 |
| Excavate very hard soil  | M3  | 2 | 15,000 | 7,500 | 50% | 11,250 |
| Excavate rock  | M3  | 0.8 | 15,000 | 18,750 | 50% | 28,125 |
| *The expected daily task range is per MoWT Vol2 Manual A2.*  |  |  |  |  |

Competitiveness and profitability can be changed by varying the piece rate to suit the environment and also varying the profit margin.

**Example of adopting pre determined equipment (dry) costs:**

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These rates can be obtained from the MoWT. For purposes of bidding a profit margin of say 25% is added to arrive at possible charge out rates for bidding. The appropriate margin is a policy decision for each company. After determining the rates for bidding evaluate them against personal knowledge of what is on the market and review them appropriately.

**Cost, Revenue and Profitability scenarios:**

Using Microsoft Excel worksheets of a BOQ with the work costs, margins and rates, it is possible prior to bidding to ascertain the cost of works, the revenues to be generated and the likely profits to be earned on the job. Scenarios could be tested with varying margins while determining the appropriate bid price. This will be demonstrated in session six. (Two scenarios are availed to you in Excel worksheets on a cd.)