

ANNEX 4.5 CONSTRUCTION COST MODULE

1 EXECUTIVE SUMMARY

1.1 General

Unit rates development is based on the Bill items as listed in the respective sections of the Standard Specification for Road and Bridge Construction (1986) of the Ministry of Transport and Communication.

1.2 Rates

The unit rates have been derived by considering each item in the Bill of items as an individual activity, specifically or broadly covered in the contract specifications, and costing inputs required for completing the activity. The cost components are plant, labour and materials including associated on- and off- site overheads.

Unit rates adopted for dayworks Bill of items is a reflection of the estimated hire rates for construction plant/equipment and direct costs of various materials and labour categories. These are normally utilised, for varied works at short notice, for short durations, which the contractor may not have mobilized at the start or convenience of a contract.

The methodology used in the derivation of rates is covered in section 3 of this report. While reasonable efforts have been made in the unit rates derivation, the limitation of this method in realizing the unit rate has to be appreciated.

1.3 Plant and Equipment

The cost of plant and equipment input for each activity is based on evaluated owning, operating and running costs. It is assumed that all the plant and equipment are to be imported into the country for the project.

1.4 Materials

The materials normally required for a project, with the exception of a few selected items not manufactured in the country are sourced locally. The cost of locally manufactured material and processed materials such as cement and bitumen, have been determined on the basis of finished product cost, as per quotes from vendors including transport, other handling expenses at the site and wastage together with an additional expense to cover for overhead charges and profit. In the case of the large volume materials that can be produced on site, such as surface dressing chippings for aggregates and concrete works the cost of production and associated handling charges has also been taken into account.

1.5 Labour

The labour costs including for the works supervisors and management are assumed to be local. The cost of labour employed on dayworks basis is based on the expected wage rates, transportation and other costs the contractor might incur in the employment of labour as well as overheads and profits.

2 INTRODUCTION

2.1 Background

Unit rates have been determined using basic cost elements, i.e. labour, materials, plant and equipment, tools, overheads, on-site costs, profits, etc. for each work item. The unit rates derived have been compared with rates from recently tendered projects of similar nature in Kenya, and adjustments have consequently been made to some of the derived rates as necessary.

2.2 Source of Information

2.2.1 Labour Rates

These have been obtained from the Memorandum of Agreement between Kenya Association of Building and Civil Engineering Contractors and Kenya Building, Construction, Timber, Furniture and Allied Industries Employees Union which have to be in conformity with the stipulations of the Employment Act (Cap 226).

However, the contractor is not obliged to go by these minimum rates and, for the sake of motivating his labour, may opt to pay higher wages. These unit rates, however, have been based on the minimum labour rates on the premise that, to achieve a competitive bid, the successful bidder cannot afford to inflate the direct costs for which labour is one.

2.2.2 Plant and Equipment

Details regarding plant cost and productivity have been obtained from M/s Mantrac Kenya Ltd, the local franchise holder for Caterpillar machinery. Information on Aggregate Crusher and Bitumen Distributors has been obtained from the respective manufacturers in Britain. For other items of plant, the relevant information was obtained from dealers/agents based in Nairobi.

Prices of Engineer's office equipment and furniture, survey and laboratory equipment, and furniture and accessories for staff houses as well as factory-processed construction materials have been obtained directly from suppliers based in Nairobi.

2.2.3 Taxes and Duties

The applicable rates of Customs Duty and Value Added Tax for the respective items have been obtained from The Customs and Excise Act Chapter 472 as published by the Government Printer, Nairobi. For items of plant whose ex-factory cost was obtained from the manufacturers overseas, the cost, insurance and freight(CIF) was obtained by adding the freight and insurance cost from reputable shipping agents.

3 METHODOLOGY

3.1 General

The assignment covers the derivation of unit rates of various road construction activities from the first principles. Description of the various bill items is based on the methods of measurements used in standard specifications for Roads and Bridges (1986)

3.2 Methodology

3.2.1 Background

The methodology adopted in deriving these rates involves the summing up of the basic inputs required for each work item. Each item in the Bill of Quantities is taken as an activity that utilizes one or a combination of resources namely: equipment, materials and manpower. The derived basic unit cost for each activity or work item is then factored to include fixed and variable overheads, on-site expenses, general tools and profits.

3.2.2 Plant Owning and Operating Cost

The cost estimate for the construction equipment is based on rental charges per hour. Two independent aspects which make up the cost: owning cost and operating cost have been considered. Labour and material costs have been added to obtain a unit rate for an item of work.

3.2.2.1 Owning Cost

A) Cost of Capital

It is assumed that the contractor is hiring new/existing company owned plant or hiring plant from external sources. An interest rate of 13.5 % the expected opportunity cost has been used to determine equipment owning cost. This rate is considered reasonable because, the 91-day Treasury bill rates normally used as the lending benchmark were on upward trend for the most of year (2008) averaging 9%.

B) Insurance Cost

The plant owning cost build up has included 6 % insurance and License cost based on the market value of the equipment.

Private vehicles (similar to those proposed by Engineer's supervision team) comprehensive insurance varies between 6 - 10 % of their market value and if a fleet is insured there is a discount. In our case, this view is taken into account and as such a rate of 7.5 % has been adopted covering vehicle damage, third party property damage, third party injuries, among others.

C) Residual Value

The resale value is undoubtedly a crucial factor in determining the plant owning cost. It goes without saying that the higher the resale value, assuming no inordinate capital expenditure during the machine's useful life, the better it is for the contractor since this directly translates to low hourly depreciation charges and low hourly owning costs. This is significant as it improves the competitive position of the contractor.

The depreciation cost has been included in the machine owning cost and the hourly rate derived is based on simple straight-line analysis for the number of years or hours the contractor is expected to use the machine gainfully.

3.2.3 Operating Cost

3.2.3.1 General

The operating costs incorporated in the applicable rates include Maintenance costs, fuel/lubricant costs, and costs for minor spare parts as well as operators/drivers wages. Costs for major replacement such as machine overhauls have not been considered, as they are capital costs.

Maintenance costs, fuel and lubricant consumption rates have been obtained from operating manuals of respective plant and equipment and vendors as well as past site data.

A) Tyre Cost

Tyre costs are an important part of the hourly cost of any wheeled machine. Since the best estimate of this item is actually obtained through actual experiences with machine operations at the site, and depends on uniqueness and the severity of the site in question, the length of tyre life (in hours) used are estimates from manufacturers and tyre dealers. The estimates range between 3000 to 6000 hours with 5000 hours being adopted. The main assumption in this case is that tyres shall wear normally at the treads through abrasion; the possibility of premature failures - through rock cuts, rips, and irreparable tears caused by jagged stumps - has been ignored.

B) Labour to Operate Plant and Equipment

Labour that is required to operate the item of plant or equipment is work input and has been included in the plant operating cost. Supporting labour to assist in the operation of plant/equipment and manning workshops/stores has been covered under overheads.

3.2.4 Materials

The cost of materials (tax/duty exempt as well as inclusive) has been obtained directly from vendors and manufacturers. The cost of some materials produced on-site such as aggregates and chippings have been determined using basic cost parameters conjunctive to the production plant and/or equipment (e.g., jaw crusher). Significantly, the cost of manufactured or factory-processed materials has been taken to be the bulk cost that any contractor would opt for in order to reap the benefits of the economies of scale in production.

3.2.5 Overheads

Overheads for the project have been estimated to be 13 %

3.2.6 Profit

A profit margin of 13.5% has been allowed based on the opportunity cost of capital in Kenya.

3.2.6.1 Variable Overheads

The general site overheads costs comprising of wastage and efficiency have been built into the applicable unit rate as follows.

3.2.6.2 Wastage

All construction projects have an element of wastage, which include losses of construction materials as a result of damage or spoilage during Transportation, storage, handling and application. Therefore an index for wastage will be included to hedge against anticipated wastage. Wastage of 2.5 % has been used selectively on items which are considered to have high proportion of material content.

3.2.6.3 Efficiency

Individual sections of construction can achieve high levels of efficiency .However; the capacity to translate this aspect to all sections simultaneously is another matter. The overall efficiency of the

site at any instance can and will affect the productivity. It is anticipated that an experienced firm can achieve and maintain an overall site efficiency of 85% at any time during the construction period.

3.3 Dayworks Rates

3.3.1 General

During project implementation the Engineer has discretion to order in writing that additional or substituted work be carried out on a daywork basis for reimbursement of costs, if in his opinion it is necessary or desirable.

Generally, the additional or substituted work by its nature or amount relative to the original work may be small, thus the day work rates may not have direct relationship with work items BOQ (Bill of Quantities) rates.

3.3.2 Construction Equipment

The dayworks rates for plant and equipment have been derived from first principles putting into consideration the Owning and Operational costs of the construction equipment. The derived rates have been adjusted to allow for the additional costs for transport of the plant to site, local cost for fuel, lubricants and contractors Profits and overhead costs.

3.3.3 Materials

The rates for materials have been calculated on the basis of the invoiced prices, transport, other handling expenses at the site, and wastage together with an additional expense to cover for overhead charges and profit.

3.3.4 Labour

The cost for labour employed on dayworks basis has been obtained on the basis of the amount of wages paid, transportation and subsistence allowance plus costs of inconvenience the contractor can be expected to incur in the employment of labour as well as overhead and profit.

4 CONCLUSION

Civil Engineering works are procured and compared effectively through tendering process. The variations in tender offers are caused by different perceptions of the works, the abilities of the tenderers to mobilize and utilize resources and the terms and conditions under which the payments are to be made.

In general, the factors considered by tenderers will include (but are not restricted to) the level of construction activities, investment risk, the company's workload and the location of the project. Others are availability of the construction equipment, human and capital resources of the firm, availability of the construction materials, and the flexibility in financing the project whilst awaiting payments.

Every bidder will consider these factors and many others in the preparation of their tender .It should be noted that, the eventual contract rates will depend on many variables, and attention is to be given to the conditions prevailing on each project and the levels of incentives operated to achieve the particular Specifications of the respective project roads.

Moreover, Contractors would tend to make bids that hedge against inflation trends, delayed payment and overall financial/cost instability of the company hence it is necessary to take great caution in the assessment and comparing of rates published in different tender documents.

The derived rates are based on optimal use of resources without speculation. These are subject to change depending on whether the equipment is owned by the tenderer or it is hired and the vibrancy of the equipment hire market.

5 MODEL

A comprehensive unit rates spreadsheet model is available from the Consultants.