

## 1.1 Contract documentation for labour-based road construction

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### 1. INTRODUCTION

When building engineering projects, two methods of construction are possible, viz, using technology dominated by mechanical equipment or that dominated by mechanical labour.

The items of plant now available to the construction industry are very intensive.

Construction equipment now ranges from simple hand tools to very expensive and sophisticated equipment capable of executing tasks beyond the capabilities of manual labour.

Many construction industries normally opt for plant-intensive methods of construction.

The main reasons given for selecting this method of construction are that:-

- Plant-intensive methods of construction tend to increase the rate of output so that project construction duration can be considerably reduced.
- The use of construction equipment can help maintain high quality standards required by present-day designs and specifications.
- It is difficult to control workers. Only experienced supervisors can induce workers to produce acceptable labour outputs. The rated output of basic construction equipment can be obtained from the plant manufacturers. In the case of labour-intensive activities the expected outputs are normally negotiated with the help of gang leaders before the actual implementation, which may still require very tactful handling.

Although the use of plant-intensive methods for the construction of rural roads can be very effective, the procedures usually have two major drawbacks for developing countries. Firstly, the construction equipment (including spare parts and, in some cases, the personnel to operate and maintain the equipment) are paid for in foreign exchange. Secondly, equipment-based methods of construction offer very few employment opportunities for the rural people. Over 75% of the total population in a typical developing country lives in the rural areas where employment generation is always needed.

Most developing countries face severe shortages of foreign exchange which is needed for the importation of construction equipment. In addition, the economic structural adjustment programmes (ESAP's) being pursued by most of these developing countries have resulted in market reforms leading to keen competition in the industrial sector. A number of industries in the informal sector which have not survived this competition have been forced to wind up thereby increasing the level of unemployment which has already witnessed steady increase resulting from the trimming down of the size of the formal sector.

Part of the solution to the current unemployment crisis facing most developing countries would be to embark on a serious employment creation programme for the rural areas. A

programme of rural road construction and maintenance using labour-based methods can serve the dual purpose of creating employment opportunities for rural people while at the same time conserving the scarce foreign exchange needed for importing the construction equipment.

## **1.2 Conditions which favour labour-based methods**

Before a final decision is taken to implement labour-based methods, the following important factors must be considered.

### *1.2.1 Minimum wage of available unskilled labour*

Labour-based methods of construction have been found to be competitive with plant-intensive methods when the average unskilled wage rate is equivalent to about US \$4.00 per day (1995) or less. This 'break-even rate' or the wage beyond which workers cease to be economic compared to machines has been found to vary from one project to the other. It also depends very much upon the employment climate in the country. The break-even wage has been found to be only US \$3.00 in Zimbabwe; it is as high as US \$10.00 in Lesotho, probably because workers in Lesotho have access to employment opportunities in rich South African mines.

### *1.2.2 Availability of labour*

The project manager must determine in advance how many workers will be needed and for how long. A detailed programme of work must be drawn up. Copies of the programme of work must be distributed to sub-contractors, suppliers etc. Rural roads (e.g. feeder roads) generally link villages (and other major agricultural centres) to cities and towns. Local chiefs have been found to be very helpful in arranging casual labour at short notice. It is always advisable to take into consideration planting and harvesting seasons which are always devoted to serious work on farms.

### *1.2.3 Experience with labour-based methods will ensure good results*

Experience with labour-based methods of construction will ensure good results. Correct management techniques must be enforced so that large numbers of people may be effectively employed. The supervisory staff must be conversant with the basic techniques of task setting. These consist essentially in establishing gangs for the project in hand and defining the pre-measured activities to be performed by each gang in a measured time interval. The allocation of resource for example, manpower to a construction activity on a daily basis so that each worker in the gang would have contributed his daily output, is the most important aspect of labour management control.

### *1.2.4 Designs must be 'neutralised'*

Designs must be modified to suit labour-based methods. In the industrialised countries, the use of advanced technology, availability of capital and high cost of labour have led to designs, specifications, conditions of contract and other methods of construction which favour equipment-based method of construction. Engineering and other training institutions in the industrialised countries expose students from developing countries exclusively to equipment-based construction concepts. When projects are being formulated, those aspects of design, specification and contractual procedures must be

defined in such a way that any bias is removed and alternative methods can be considered on a comparative basis. This process is known as 'neutralisation'.

Under normal circumstances field engineers seldom participate in decision making. Therefore they cannot influence any decision taken at the project implementation stage when the design may influence one specified basic method of construction. Opportunity must therefore be given to field engineers to participate in the 'neutralisation' process.

### *1.2.5 Nutrition and health of workers*

The nutrition and health of the workers on the project must be given serious consideration. Experience has shown that the following measures will help improve productivity on the site.

#### *1.2.5.1 Subsidised meals*

Subsidised meals for the workers may mean extra expenditure for the employer, yet in the end, workers may return from break on time. Some employers supply meals to the workers on credit, payable at the end of the month. This ensures that workers are well fed during the critical days of the month when most workers do not have money to buy food. If meals are not to be subsidised then the alternative is to provide canteen facilities for workers to buy their food at break times.

#### *1.2.5.2 Transportation facilities*

Lateness and absenteeism can be substantially reduced by providing transport for workers to and from the site. The collection points and times when each group of workers are to be picked up should be communicated to the workers or their gang leaders.

#### *1.2.5.3 First-aid kit on site*

First-aid kit on site may save very serious situations. Such facilities which tend to improve the welfare of workers help to improve productivity.

## **2. DIRECT LABOUR OR CONTRACT?**

The current economic structural adjustment programme has intensified the call for the reduction of the formal sector. Hitherto the size of each ministry has been allowed to grow large enough to allow the ministry to execute projects by 'direct labour'. In using this strategy the ministry can execute projects using its own group of professional and technical staff, and other gangs of skilled and unskilled workers. The major advantage of this approach is that the ministry will retain a group of workers who may have gained several years of construction experience. The problem of having to look for casual workers on monthly or daily basis does not arise and therefore the expected output which has been developed over the years can be sustained.

### **2.1 Labour-based contracting**

A typical labour-based construction may consist of about 600 casual labourers excluding senior site supervisors, site supervisors, field assistants etc. Assuming that during the final phase of the programme, four units are to be established in each of the eight provinces, then about 20,000 casual workers will be employed. The ministry will need a substantial financial injection in order to establish site offices in addition to the staff needed to supervise such a large labour force.

If construction and maintenance works are given out on contract to local contractors who have experience in labour-based methods, then the ministry can afford to reduce staff and retain a few of the highly experienced supervisors who will then check and approve items of work being executed by contractors. Most of the labour-based roadworks are still being executed by direct labour in Zimbabwe. The next phase (which will follow soon) will be to involve some local contractors.

## **2.2 *Some possible advantages of contracting***

If workers are adequately and promptly motivated, productivity can be considerably increased. The bureaucratic system in the Civil Service does not give room to field supervisory staff to use their initiative to explore ways of motivating workers to offer increased outputs. Contractors normally have smaller outfits (and hence overhead costs are much smaller). If intensive training programmes are started now then there will be a great future for labour-based contract works.

## **3. DEVELOPING DOMESTIC CONTRACTORS**

### ***Background***

In the past two decades, domestic contractors in Ethiopia, Ghana and Kenya have been gradually developed. Domestic contractors in these countries were selected, provided with works and site management assistance, and finally licensed as road contractors. A reasonable measure of success was attained, but, in Ghana, a third of the contractors previously trained have been put out of business as a result of long delayed payments, and also by the massive devaluation of the cede.

Domestic contractors have a competitive advantage over large international firms especially in the case of rural road construction and maintenance. Rural road networks are small and scattered. Besides, a large percentage of the rural road construction and maintenance may be carried out using labour-based techniques which again tend to favour small domestic contractors. Therefore if rural road construction and maintenance programmes are planned on a regular basis, there will be a steady demand to sustain domestic contractors.

Small and medium-sized contractors may be suitably prepared for rural roadworks such as labour-based road construction, regrading and regravelling, through seminars, training, technical manuals and specially prepared contract formats.

## **4. TRAINING OF DOMESTIC CONTRACTORS**

Opportunities are provided for various categories of the contractors' staff (viz managers, administrative managers and staff, project managers, engineers and technicians) to attend seminars on site management techniques, and labour-based road construction/maintenance methods. Sample works are organised with and are carried out by selected contractors while other contractors in the area are invited to visit and watch demonstrations.

Technical assistance to contractors should focus on works preparation, programming, allocation of resources, site management, cost and quality controls. Promoting labour-based methods of road construction/maintenance is another way to develop small contractors. Labour-based methods require low capital investment; however, good

organisation and site management are the recognised keys to successful project implementation - these techniques must be taught to contractors. If the role of domestic contractors should continue to be dynamic, the need for reforms in the following areas will be required:

- Payment procedures for public contracts must be overhauled so that contractors are paid promptly for work executed.
- Conditions of contract including escalation formulas based on reliable statistics, contract administration procedures etc. must be constantly reviewed.
- Employment regulations, restrictions on hiring and firing of labour, minimum wages, contractors' access to foreign currency etc.

## 5. CONTRACTS FOR ROAD CONSTRUCTION

### ***Modes of measurement for payments***

The three modes of measurement for payments are associated with three options for setting up contractors for works as follows:

#### *a) Cost-plus-fee type of contract*

This appears to be the weakest with regard to cost efficiency. However, in very specific and emergency cases a cost-plus-fee contract may be used because it gives the site manager wider flexibility to address needs. To prevent possible abuse, it may be desirable to include a small cost-plus-fee component in a unit-price contract in order to give some flexibility. Also a ceiling amount on the cost-plus-fee component will limit the risk of abuse.

#### *b) Paying for actual works under a unit-price contract*

The contract consists of unit prices for the itemised kinds of works and bill of quantities (BOQ). Payments are made in accordance with actual works executed. Labour-based routine road maintenance, drainage maintenance and repairs, regrading and regravelling works may be given out on such contracts.

#### *c) Paying for services under lump-sum contract*

Under this contract scheme, the road standards to be reached are specified: contractors are free to select and carry out appropriate works to meet these standards. Contractors may be paid for road maintenance work on lump-sum basis per year.

#### *d) Quality specification*

A simple, realistic and verifiable target should be set. Tough technical specifications that contractors cannot meet and that supervisors do not enforce demoralise both parties and lead to abuse.

#### *e) Working conditions*

Adverse climatic conditions create an important risk, especially on earth and gravel roads. A storm can seriously damage the road just after the contractor has completed the

section but before the supervisor's visit. A heavy truck can destroy several kilometres of earth roads. Who pays for this damage? Contract documents must give a clear definition of the risk to be borne by the contractor.

f) *Contract award*

Procedures for contract awards should be streamlined and timed so as to enable contractors to take advantage of the dry season.

## 6. CONCLUSION

Contract documentation for labour-based road projects must be simplified since most contractors may not understand voluminous contract documents.

Some simple schedule of rates contracts may be quite ideal for labour-based road construction and maintenance.

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