An Estimator's lack of knowledge regarding the use of resources to calculate a rate

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An Estimator's lack of knowledge regarding the use of resources to calculate a rate

(Specifically focusing on Civil Engineering Construction Procedures)

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Declaration by student

I, the undersigned, hereby confirm that the attached treatise is my own work and that any sources are adequately acknowledged in the text and listed in the bibliography

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Signature of acceptance and confirmation by student

ABSTRACT

Title of treatise:	An Estimator's lack of knowledge regarding the use of resources to calculate a rate (Specifically focusing on Civil Engineering Construction Procedures)
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The objective of this treatise is to identify why estimators make certain common mistakes when compiling estimates.

Estimators should educate themselves on what resources are available and how to use the available resources before they undertake the responsibility of compiling estimates for companies operating in the construction industry.

Resources like plant, labour, materials and applied markup form the basis of a rate. Estimators should have enough knowledge on how to use these resources before an estimate is compiled.

Estimators that lack experience and knowledge regarding the usage of resources are dangerous estimators. Companies rely on their estimators to not just win tender bids, but to also provide a price that the project can actually be constructed for.

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CHAPTER 1 – INTRODUCTION

1.1 INTRODUCTION

ESTIMATING? This concept is defined as “a calculation or guess about amount or value” according to The South African Oxford School Dictionary (1996).

Being a qualified Quantity Surveyor and a second year Honours student at the University of Pretoria, it would be expected of you to know how estimating works. During the B. Sc (QS) course students get taught what estimating is and how to use it, but the course only touch slightly on the principle of how it actually works. By multiplying a quantity with a rate you calculate an amount. Adding up all the amounts of all the items in a Bill of Quantities will give you a construction value, which therefore will give you an estimate of what a project is going to cost. The B. Sc (QS) course focuses a lot on actual measuring of quantities for different projects. The rates used for an estimate is only discussed briefly.

How do rates actually get calculated? Recourses like materials, plant and labour is used to calculate rates. Knowing the resources used to calculate each rate is probably a good start, but then the question of how much of each resource is required pops up. Focusing on the civil engineering industry there are four main points of interest; plant, labour, material and applied markup.

Materials will be easier to calculate than plant and labour, because you can measure the quantities needed. Plant and labour however have certain production factors. PRODUCTION FACTORS (for example) – how many cubic meters will an x sized Excavator do per day while excavating for open drains? How many cubic meters will a labourer do per day while excavating trenches? What factors will influence their productivity? Using wrong production factors could cause an estimate to be totally wrong.

The costs of materials are often calculated by using an old tender amount and multiplying it with an escalation factor. Will this escalated rate be a market related price? Will the contractor find a supplier to supply materials at the newly escalated price? When considering the time factor through the duration of the project, does escalation cover the additional costs a contractor could occur on material? Can the contractor bargain on escalation to cover a keen tender price? These are all dangerous assumptions that estimators make that could possibly lead to great losses.

After the estimator has combined all the recourses to calculate a rate a markup needs to be added to the rate to cover the contractor's overhead costs and profit. What percentage must be used for different sized companies? What are overheads? How much profit can the contractor add to still be competitive at tender stage? For an estimator to under estimate a company's overhead costs could cause a loss to the project even though your "construction items" were estimated correct.

In summary: there are lots of study material available stating what different plant items can do, what labourers should do, what materials should cost and what a certain sized company's overhead cost should be.

BUT WHAT ACTUALLY HAPPENS IN THE CONSTRUCTION INDUSTRY?

1.2 STATING THE PROBLEM

Estimators do not have the background, experience and therefore knowledge regarding the setup of a rate.

1.3 THE SUB PROBLEMS

1.3.1 PLANT

- What production factors can safely be used for different plant items?
- What factors influence the productivity of plant on site?

1.3.2 LABOUR

- What production factors can safely be used for labour?
- What factors influence the productivity of labour?

1.3.3 MATERIAL

- Can one material price be used on a number of different projects?
- Does an escalated material price resemble current market related prices?
- Does escalation cover additional costs for material throughout the duration of the project?

1.3.4 APPLIED MARKUP

- Does the estimator know what his company overhead costs are?
- What percentage markup will ensure the contractor to still be competitive at tender stage, but also ensure him to make a profit on the project?

1.4 THE HYPOTHESIS

1.4.1 PLANT

Estimators do not have enough knowledge of the physical site conditions. Site conditions will directly influence the productivity of plant. Estimating the cost of plant will be unique for each project, therefore a general production factor for each item in the Bills of Quantities cannot be used.

1.4.2 LABOUR

Estimators do not have enough knowledge of the physical site conditions and the factors that would influence the productivity of labour. There are lots of factors that will influence the productivity of labour and therefore we can again not use a general production factor for all projects.

1.4.3 MATERIAL

It is dangerous to use escalated old prices for current required prices. It does not take a lot to ask suppliers for a quote on specific materials required. Escalation should also not be bargained on as fixed revenue that will be received. For example, considering the current fluctuation in the diesel price, the prices of materials also fluctuated, causing a positive and negative escalation.

1.4.4 APPLIED MARKUP

Considering the current financial situation in South Africa, work is not something that is served to anybody on a silver plate. Contractors therefore tender extremely keen. A big mistake some estimators can make is to reduce their markup added to each rate, without knowing what the company's overhead costs are. The markup added includes company - and site overhead costs and profit. When considering the fight for work it makes sense to reduce your estimate by first cutting on your markup. This is a dangerous exercise, because if you do not have all your facts straight you can cause you company to run a loss on the entire project.

1.5 DELIMITATIONS

The research would be limited to the Civil Engineering Industry, specifically focusing on road construction and storm water installation practices. The research will be performed in Gauteng, South Africa.

1.6 IMPORTANCE OF THE STUDY

It is imperative for the estimator to understand where rates come from before undertaking the huge responsibility of giving his employer (contractor or client) advise, based on his "knowledge", on what a construction project will cost.

1.7 RESEARCH METHODOLGY

- Work on different construction sites
- Monitor the production of plant and labour on site
- Evaluate the influences of site conditions, weather etc. on the production of plant and labour
- Compare escalated old prices for materials with current market related prices
- Evaluate the principle of escalation
- Establish what overhead costs include

CHAPTER 2 - PLANT AND EQUIPMENT COSTS

2.1 INTRODUCTION

Construction equipment and plant are all the tools, instruments, machinery and other mechanical elements that are required to carry out construction procedures. Construction plant is defined as processing plants that are placed on site and is essentially stationary and fixed, for example cranes, etc. Equipment is defined as movable items, for example small hand tools, tractors, trucks, etc. Plant and equipment are grouped together for estimating purposes. (In this chapter equipment and plant will be collectively referred to as plant)

(Mayo, 2003; Schexnayder, 2003)

The following sub-problems were identified and will be solved in this chapter:

- What production factors can safely be used for different plant items?
- What factors influence the productivity of plant on site?

2.2 SELECTION OF PLANT

In order to increase job-site productivity it is important to select plant with proper characteristics and a size most suitable for the work conditions on the construction site.

The cost of plant makes up a great deal of the overall construction cost in Civil Engineering practices. Incorrect plant included for in the estimate can either cause a tender to be over priced or it can lead to severe financial losses if the work cannot be carried out by the plant estimated for. Some factors that have to be considered when selecting plant at tender stage are:

- Plant production rates
- Size of the job*:* For example larger volumes of excavation will require larger excavators, or smaller excavators in greater number
- Activity time constraints*:* For example shortage of time for excavation may force contractors to increase the size or numbers of equipment for activities related to excavation.
- Availability of plant
- The availability of space and mobility of plant on site
- Soil characteristics*:* The type and condition of the soil is important when choosing the most adequate plant since each piece of plant has different outputs for different soils.
- Plant capabilities
- Distances material must be moved
- Steepness and direction of grades on site
- Weather and temperature conditions
- Hauling restrictions
- Mobilization and demobilization costs

(Mayo, 2003; Schexnayder, 2003)

2.3 THE COST OF PLANT

Plant has two types of costs:

2.3.1 ANNUAL COST OF PLANT

Annual costs occur by just owning a piece of plant, whether it is used or not. Annual costs include the following expenses:

2.3.1.1 Annual depreciation

Plant starts to depreciate in value the moment you buy it. This is because the plant will eventually be "used up" and will have to be replaced with new plant sometime in the future. Provision must be made for this in order to recover the cost of using the plant over its working life, through income from contracts. (Social Housing Foundation, 2006)

2.3.1.2 Finance costs

If the plant is financed by a bank or other financial means other than the company's own, there are annual interest costs. If the plant is bought with the companies own funds, the money is not available for other investment opportunities where it could have earned interest or other income. This loss of interest or income is a cost to the company. (Social Housing Foundation, 2006)

2.3.1.3 Licensing

Bigger plant often has its own road wheels for transportation and would have to be licensed with the traffic authorities. All the other plant also requires a new license every year. (Social Housing Foundation, 2006)

2.3.1.4 Insurances

Plant must be insured against loss of or damage to the asset, as well as for third-party liability. (Social Housing Foundation, 2006)

2.3.1.5 Maintenance and servicing

In order to get the best use out of plant it must be maintained to ensure good working condition. This involves having to service the plant at regular intervals. (Social Housing Foundation, 2006)

2.3.2 HOURLY COST OF PLANT

Hourly costs refer to the direct operational costs. Hourly costs include the following expenses:

2.3.2.1 Fuel/energy

The contractor will have past records that will indicate the hourly consumption of petrol, diesoline and electricity used in plant (Some manufacturers will also have estimates on what the usage on the plant should be). (Social Housing Foundation, 2006)

2.3.2.2 Lubricants

Plant must be oiled and greased on a regular basis. The costs of such lubricants can sometimes be up to 20% of the energy cost. (Social Housing Foundation, 2006)

2.3.2.3 Operating wages

When costing plant the cost of the operator to operate the plant should not be kept separate, therefore the total cost of operators must also be included in the hourly cost of plant. (Social Housing Foundation, 2006)

2.4 PLANT PRODUCTIVITY RATES

The productivity rates of plant on site influence the hourly cost of plant. The estimator should have sufficient knowledge of the different types of plant available as well as the conditions on site to be able to use correct production rates when compiling the estimate. Incorrect production rates can lead to serious financial losses. The productivity of plant on site can be influenced by the following:

- Weight to horsepower ratio
- Capacity
- Type of transmission
- Speeds
- Operating costs

- Weather
- Access to the site
- Space available on site (restricted or unrestricted)
- The quantity of material to be moved
- Traffic accommodation
- Trees
- Surrounding houses
- Number of plant teams per activity

(Mayo, 2003; Schexnayder, 2003)

2.5 EXAMPLE: ESTIMATING PLANT COSTS

Plant has production rates. For example, a concrete mixer can yield 12 batches of 250 liters each per hour, or an excavator can excavate 20m³ of soft material to a depth of 1.5m, etc. There are multipliers for work of a similar nature, but with different degrees of difficulty. The cost of the concrete mixer in this example is to be priced into the item rates for each measured item of concrete work. (Social Housing Foundation 2006)

Table 1: 250 Litre petrol-driven concrete mixer:

1. Information	
1.1 Purchase price	R 30,000
1.2 Salvage value (2nd hand release value at end of life)	R 6,000

1.3 Interest rate for financing			20% p.a.
1.4 Anticipated working life			11 520 hours
1.5 Occupation factor hours/day (The other two hours used for cleaning, maintenance, etc.)			6 h
1.6 Production weeks (4-week construction industry holiday per year)			48 x 5 days/year
1.7 Deprecation method			straight-line
1.8 Fuel consumption litres/h			2.5 litre/hour
1.9 Lubricating oils, etc.			20% of fuel cost
1.10 Repair and maintenance			10% of purchase price p.a.
1.11 Insurance			R0.10/R10.00 p.a.
1.12 Life in years: (11520/6 = 1920 days/5 = 384 weeks/48 = 8 years)			8 years
1.13 Yield			250 litre/batch
1.14 Production/ work rate (5 minute cycle)			12 batches per hour
2. Annual cost			
2.1 Depreciation: (R30 000 - R6 000)/8			R 3,000
2.2 Interest: 20% x R30 000 x 0.5			R 3,000
2.3 Repair and maintenance: 10% x R30 000			R 3,000
2.4 Insurance: R0.50/R10 x R30 000 x 0.5			R 750
2.5 License fees			R 150
			R9,900.00/1440* = R6.88/h
*(11520/8 = 1440 working hours per year)			
3. Hourly cost:			
3.1 Fuel:2.5 litre @ R4.00	R10.00		
3.2 Lubricants: 20% x R10.00	R 2.00		
3.3 Operator: 8/6 x R12.00/h	R16.00	R28.00	
Total cost per hour		**R34.88**	
Total cost per m^3: $3m^3$/hour (12 x 250 litre/h) = R34.88/2			**R11.63/m^3**

(Social Housing Foundation 2006)

The total cost of using the concrete mixer is R11.63/m^3. This cost will be included in the unit rate for each measured item of concrete work in the bill. The cost of transporting

the mixer to and from site is calculated separately (it will vary for each contract) and priced in the preliminaries section of the bill.

2.6 SUMMARY

Plant rates should be carefully compiled to ensure that the true cost of the plant is covered in an estimate. The Annual and hourly cost of plant are easy to calculate, the difficult part is to determine the correct production factor. It is imperative for estimators to know all the technical aspects of plant, go out to site and monitor the production and performance of plant on a regular basis and to continuously compare the actual production of plant to the allowable in the estimate. By doing the above estimators would be able to safely estimate what the production of plant would be on different projects.

2.7 TESTING OF HYPOTHESIS

With the approval and consent from the Contractor Moseme Road Construction, a Civil Engineering Contracting firm based in Benoni, Johannesburg, a test was done to evaluate the productivity of plant on two specific projects, namely Emergency Road Patchwork, Pothole Repairs and Maintenance: Phokeng - Sun City and the Widening and Upgrading of Pretorius Street: Hatfield. Three different processes were monitored: cut to fill, cut to spoil and processing of the sub base. In general the following plant was used for each process on both projects:

2.7.1 TABLE 2: CUT TO FILL

LOAD	Excavator (Sun City)/ TLB (Hatfield)
CART	10 m³ Truck
PROCESS	Grader Roller Water Bowser

2.7.2 TABLE 3: CUT TO SPOIL

LOAD	Excavator (Sun City)/ TLB (Hatfield)
CART	10 m³ Truck
SPREAD	Loader

2.7.3 TABLE 4: SUB BASE (Commercial Source material)

PROCESS	Grader Roller Water Bowser

After monitoring each site for one week the following results could be compiled:

Table 5: Emergency Road Patchwork, Pothole Repairs and Maintenance: Phokeng - Sun City

DATE	FILL/ M3	SPOIL/ M3	SUB BASE/ M3
03/08/2009	336.00	70.00	1,106.00
04/08/2009	1,302.00	0.00	703.50
05/08/2009	924.00	441.00	903.00
06/08/2009	980.00	241.50	878.50
07/08/2009	462.00	703.50	595.00
08/08/2009	598.50	329.00	511.00
09/08/2009	378.00	357.00	483.00
TOTAL	**4,980.50**	**2,142.00**	**5,180.00**
AVERAGE/ DAY	**711.50**	**306.00**	**740.00**

Table 6: Widening and Upgrading of Pretorius Street: Hatfield

DATE	FILL/ M3	SPOIL/ M3	SUB BASE/ M3
24/08/2009	48.00	83.00	195.00
25/08/2009	27.00	17.00	118.00
26/08/2009	71.00	22.00	146.00
27/08/2009	92.00	45.00	97.00
28/08/2009	32.00	19.00	169.00
29/08/2009	37.00	29.00	163.00
TOTAL	**307.00**	**215.00**	**888.00**
AVERAGE/ DAY	**51.17**	**35.83**	**148.00**

The above results show that the project in Sun City is doing an average of 740 m³ Sub Base per day, while the project in Hatfield is only doing an average of 148 m³ Sub Base per day. The difference between the two projects is on average 592 m³ per day. The reasons for this big difference are the following:

- Sun City is a much bigger project than the Hatfield project
- Hatfield's work is restricted (traffic, trees, access to houses, services, etc.) while the work in Sun City is unrestricted (no traffic, trees, houses, etc.)
- Sun City have enough space to use more than one team per activity (for example two processing teams) while Hatfield only can only use one team per activity because the space is limited

2.8 CONCLUSION

The initial hypothesis is correct. Estimators do not have enough knowledge of the physical site conditions. Site conditions will directly influence the productivity of plant. Estimating the cost of plant will be unique for each project, therefore a general production factor for each item in the Bills of Quantities cannot be used.

CHAPTER 3 - LABOUR COSTS

3.1 INTRODUCTION

Productivity in construction is often broadly defined as output per labour hour. (Hendrickson, 1998) The cost of labour is probably the most variable and difficult resource cost to estimate. The local market conditions should be thoroughly investigated to determine the availability and competency of labour available for construction purposes.

The following sub-problems were identified and will be solved in this chapter:

- What production factors can safely be used for labour?
- What factors influence the productivity of labour?

3.2 LABOUR COST

Labour costs can be divided into two groups:

3.2.1 DIRECT LABOUR

Direct labour is the base wages and additional benefits payable to a labourer who is performing a specific activity. These wage rates for different labour sectors and working conditions are determined by various unions in the construction industry;

in this case they are determined by SAFCEC (South African Federation of Civil Engineering Contractors). Direct labour costs include:

- Basic wage per hour
- Compulsory contributions by the employer (medical aid, bonus, etc.)
- Statutory contributions by the employer with regard to skills development Levies, accident insurance, Unemployment Insurance (UIF)
- Agreed travel and/ or accommodation allowances

(Social Housing Foundation, 2006)

3.2.2 INDIRECT LABOUR

These are wages and company contributions paid to personnel whose efforts cannot be allocated to specific activities. These personnel usually include for engineers, site clerks, tea lady, etc. Indirect labour costs are included in the site overhead costs.

3.3 THE LABOUR CONSTANT

The labour constant is the term given to the average time it takes a healthy, worry-free, diligent tradesman or worker to do a certain unit of work under normal working conditions during average weather conditions.

It is the factor which, if multiplied by the relevant rate, will give the labour cost for a particular operation or process.

Labour constant = time required to perform the unit of work

(Social Housing Foundation, 2006)

Individual labourers or a team of labourers performing a specific working task both have a labour constant. The labour constant is calculated by studying and monitoring the time it takes an individual labourer or a labour team to complete a specific working task over a specified period under all kinds of working and weather conditions. The quantity of work units or output is measured and the total time is divided by the total number of units of work completed. The labour constant multiplied by the total cost per hour, i.e. wage, contributions and labour overhead of all the workers required to produce the unit of work, is the net labour cost of that unit of work. (Social Housing Foundation, 2006)

3.3.1 EXAMPLE: LABOUR CONSTANT

Five workers take eight hours to excavate 5m³. Therefore one worker would take 40 hours to excavate 5m³. For 1m³ we therefore have to divide 40 by 5:

40 hours/5m³ = 8 (labour constant)

The labour constant is then multiplied by the hourly rate of a worker to arrive at the labour cost of a specific activity

3.3.2 COMPILING TABLES FOR LABOUR CONSTANTS

According to a study done by the Social Housing Foundation (2006) the basic principles to compiling labour constants are:

3.3.2.1 The unit used for the labour constant must relate to the unit of the working task performed.

Example:

The labour constant used for excavations must be expressed in hours per m^3.

3.3.2.2 All operations consist of different activities. These activities which all contribute to completing the activity will have different labour constants.

Examples: In concrete work, separate labour constants would be used for the following discrete activities:

- The transportation of ingredients from stockpile to place of mixing (e.g. LC = 0.5, therefore it would take one worker 0.5h to transport 1m^3 of materials)
- Mixing (by hand) (e.g. LC = 3.5, i.e. it would take one worker 3.5h to mix 1m^3 of concrete)
- Loading into barrows, and transportation to place of pouring (e.g. LC = 0.5, i.e. it would take one worker 0.5h to transport 1m^3 of materials)
- Placing and leveling of concrete in foundation trenches (e.g. LC = 0.75, i.e. it would take one worker 0.75h to place and level 1m^3 of mixed concrete)

3.3.2.3 The labour constant for the transport of materials on site must be based on average travelling distances, say 25m per trip.

3.3.2.4 Only distinguish between operations if there are measurable differences in the labour constant.

3.3.2.5 Instead of additional tables, use multipliers where possible.

3.4 LABOUR PRODUCTIVITY

Labour productivity is an essential part of estimating for labour costs. Wrongfully estimated production rates can cause severe financial losses to the contractor. Production rates cannot be defined somewhere in a text book as a black and white fact, because they differ under different circumstances.

A base labour productivity may be defined for a set of work conditions specified by the contractor who wishes to observe and measure the labour performance over a period of time under specific conditions (Hendrickson, 1998). A labour productivity index may then be defined as the ratio of the of the job-site labour productivity under a different set of working conditions to the base labour productivity, and is a measure of the relative labour efficiency of a project under this new set of working conditions.(Hendrickson, 1998)

The effects of new or different working conditions will have on labour productivity can be vital when estimating.

3.5 PRODUCTIVITY AT THE JOB SITE

Job-site productivity is influenced by many factors which can be categorized as labour characteristics, project working conditions, non-productive activities and weather conditions. These factors include the following:

3.5.1 LABOUR CHARACTERISTICS:

- Age, skill and experience of workforce
- Leadership and motivation of workforce

- Illness of workers
- Domestic problems: financial problems or illness in the home
- Exhaustion due to poor nutrition or work not suited to person's personal ability and strength
- Demand for and supply of labour: in times of high demand, production rates are generally lower than in situations of oversupply of labour

(Social Housing Foundation, 2006)

3.5.2 PROJECT WORKING CONDITIONS:

- Job size and complexity
- Job site accessibility
- Labor availability
- Equipment utilization
- Contractual agreements
- Local climate
- Local cultural characteristics, particularly in foreign operations
- Materials shortages: Results in waiting time and demoralization of workforce
- Materials stored untidily or far from the work area reduce efficiency
- Untidy site: Reduces efficiency and leads accidents
- Poor worker relations: Foreman shouting and swearing at workers, workers not properly informed and motivated, inappropriate grouping of people with regard to skills, etc.
- Poor lighting: leads to sloppy work, mistakes and accidents
- Inefficient and poorly maintained plant and equipment
- Workers' wages less than on other sites in the same area

(Social Housing Foundation, 2006)

3.5.3 Non-productive activities

- Indirect labor required to maintain the progress of the project
- Rework for correcting unsatisfactory work
- Temporary work stoppage due to inclement weather or material shortage
- Time off for union activities
- Absentee time, including late start and early quits
- Non-working holidays
- Strikes

  (Social Housing Foundation, 2006)

3.5.4 Weather conditions

- Wet weather: Roads can become impassable. Trucks cannot get out of basement excavations. Workers cannot work in the rain unless cover is provided.
- Exceptional cold weather: Workers constantly seek shelter to warm themselves. Concrete work cannot be carried out in freezing weather.
- Exceptionally warm weather: Workers become exhausted and must break for fluid intake more often.
- Wind and dust: Dust gets in workers' eyes. Materials are difficult to handle. Cranes cannot be used.
- Overcast weather: Lack of light slows down or stops work.

  (Social Housing Foundation, 2006)

The above categories affect the labour productivity as well as the efficiency of labour on site.

3.6 Example: Estimating labour costs

Description	Unit	Quantity	Rate	Price
Concrete Kerbing	m	120	?	?

Estimating labour cost for the above:

For this type of work, a small team consisting of two kerb layers and three assistants will be considered as a team working together. The assistants will be mixing mortar, transporting materials, helping with the erection of shutters, etc. so that the kerb layers are free to lay as many kerbs as possible in a day.

Say the unit is able to lay 60 kerbs in a day of 8 hours, and the team's total cost to the company is made up as follows:

Table 7: Labour used for Concrete Kerbing

Description	Kerb layer/h	Three assistants/h	Total cost per hour of the unit/team
Basic wage	R 20.00 x 2 = R40.00	R8.00 x 3 = R24.00	R64.00
Compulsory employer contributions	R 2.50 x 2 = R5.00	R1.50 x 3 = R4.50	R 9.50
Statutory contributions	R 1.50 x 2 = R3.00	R1.00 x 3 = R3.00	R 6.00
Total/Hour	**R 48.00**	**R 31.50**	**R 79.50**

At 60 kerbs a day, the LC for the unit is 60/8 = 7.5 kerbs/ h

Therefore at 1 kerb per m, the LC = 1/7.5 = 0.13 (h per m)

Table 8: Labour cost per linear meter

Labour cost per m: 0.13 x R79.50	R10.60/m
Add profit of 10%	R1.06/m
Total unit Rate	R11.66/m

The completed estimate for labour price for the item would be as follows:

Table 9: Final labour cost for concrete kerbing

Description	Unit	Quantity	Rate	Price
Concrete Kerbing	m	120	11.66	1399.20

3.7 SUMMARY

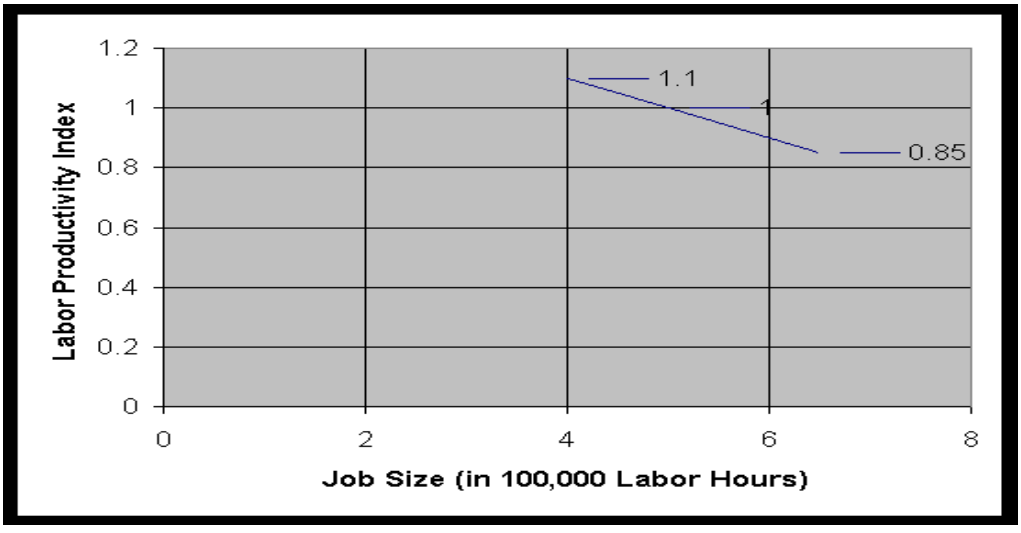
Labour rates should be carefully compiled to ensure that a “safe” rate is used in the estimate. There are numerous factors that could affect the productivity of labour on site. The estimator should investigate all the factors that are known to him at tender stage and then calculate a rate that is competitive to the specific project conditions. The estimator should also make an allowance in the rate to include for factors that could not have been foreseen at tender stage, i.e. strikes, absentees etc. These unforeseen factors can have a tremendous negative impact on a keen tender price.

3.8 TESTING OF HYPOTHESIS

3.8.1 EFFECTS OF JOB SIZE ON PRODUCTIVITY (Hendrickson, 1998)

A contractor has established that under a set of "standard" work conditions, a job requiring 500, 000 labour hours is considered standard in determining the base labour productivity. All other factors being the same, the labour productivity index will increase to 1.1 or 110% for a job requiring only 400, 000 labour hours. Assuming that a linear relation exists for the range between jobs requiring 300, 000 to 700, 000 labour hours, the following labour productivity index for a new job requiring 650, 000 labour hours (under the same work conditions) could be established:

FIGURE 1: Illustrative Relationship between Productivity Index and Job Size



(Hendrickson 1998)

The labour productivity index I for the new job can be obtained by linear interpolation of the available data as follows:

$$I = 1.0 + (1.1 - 1.0)\left(\frac{500{,}000 - 650{,}000}{500{,}000 - 400{,}000}\right) = 0.85$$

This implies that labour is 15% less productive on the large job than on the standard project.

3.8.2 PRODUCTIVE LABOUR YIELD (Hendrickson, 1998)

In the construction of an off-shore oil drilling platform, the potential labour hours were found to be L = 7.5 million hours. Of this total, the non-productive activities expressed in thousand labour hours were as follows:

- A = 417 for holidays and strikes
- B = 1415 for absentees (i.e. vacation, sick time, etc.)
- C = 1141 for temporary stoppage (i.e. weather, waiting, union activities, etc.)
- D = 1431 for indirect labour (i.e. cleaning up the site, rework to correct errors, etc.)

After the above factors were taken into consideration the actual productive labour yield could be calculated.

The percentage of time allocated to various non-productive activities, A, B, C, and D are:

$$\frac{A}{L} = \frac{417}{7{,}500} = 6\%; \qquad \frac{B}{L} = \frac{1{,}415}{7{,}500} = 19\%$$

$$\frac{C}{L} = \frac{1{,}141}{7{,}500} = 15\%; \qquad \frac{D}{L} = \frac{1{,}431}{7{,}500} = 19\%$$

The total percentage of time X for all non-productive activities is:

The productive yield, Y, when the given factors A, B, C and D are considered is as follows:

$$Y = \frac{L - A - B - C - D}{L} = 100\% - 6\% - 19\% - 15\% - 19\% = 41\%$$

As a result, only 41% of the estimated labour time was devoted directly to work on the facility.

3.9 CONCLUSION

The initial hypothesis is correct. Estimators do not have enough knowledge of the physical site conditions and the factors that would influence the productivity of labour. There are lots of factors that will influence the productivity of labour and therefore we a general production factor cannot be used for all projects.

CHAPTER 4 - MATERIAL

4.1 INTRODUCTION

One of the resources used by contractors in calculating a rate is materials. Prices of materials fluctuate over a period of time due to:

- Higher energy costs (included through both higher crude oil prices and an increase in local electricity prices), which have severe inflationary implications and which are becoming increasingly evident in the consumer price index. In addition, because the construction industry is particular sensitive to the cost of transport, it also impacts on the overall cost of construction
- Increases in material input costs, such as aluminum and copper, due to validity in world markets
- Increased labour costs
- Increased profit margins

  (Construction Industry Development Board, 2007)

However, what is of particular concern is that the Industry Insight output "Building Cost Index" is increasing at a far faster rate than the materials PPI.
(Construction Industry Development Board, 2007)

The rapid increases in the Building Cost Index can be attributed to increases in:

- Construction input costs (mainly labour, materials, plant and equipment and diesel)
- Non-construction costs (professional fees, etc.)

- Tendering factors (such as tendering risks, competition [or lack of] for tenders, etc.)
- Late payments to contractors and material suppliers, which are being priced into materials costs and construction costs
- Profit margins

  (Construction Industry Development Board, 2007)

According to the IISS Report (2007) increasing input costs and insufficiently detailed (poorly specified) tender contracts have seemingly led to risk premiums being added by contractors resulting in escalating tender prices. This emphasizes the need for Government to increase its procurement capacity (either through internal skills development by attracting relevant competencies to procurement offices or through the appointment of specific technical terms) that could improve tender specifications and contract guidelines.

When considering everything said above regarding the fluctuation of material prices, increasing cost of construction and risks priced into rates due to insufficient contract information provided by government – it is impossible to assume that a material price used on one project would be safe to use in a different project. Rates to a project should be seen as unique to only that specific project.

The following sub-problems were identified and will be solved in this chapter:

- Can one material price be used on a number different projects
- Does an escalated material price resemble current market related prices?
- Does escalation cover additional costs for material throughout the duration of the project?

4.2 THE MATERIALS MANUFACTURING SECTOR

Before the issue of escalation and the risk thereof is investigated, it is important to understand the impact materials have on the cost of construction.

The market for building and construction materials is derived from primary building and construction activity. Of the current building and construction investment of about R158, 6 billion p.a., materials accounts for about R95 billion (Construction Industry Development Board, 2007)

A large number of manufacturers supply the building and construction market; 65% of materials are sold into the building industry and 35% into construction. (Construction Industry Development Board, 2007)

Major product groups in the civil construction industry include:

4.2.1 CEMENT

Cement demand from the region, which includes SA, Lesotho, Botswana, Namibia and Swaziland, currently exceeds 14 million tones. It is projected that demand could increase to between 19 and 23 million tonnes of cement by 2010. (Construction Industry Development Board, 2007)

4.2.2 REINFORCING STEEL

Domestic Carbon steel sales totaled 5, 343, 523 tonnes during 2006, an increase of 26.2% compared with 2005. Sales of reinforcing steel and sections totaled 700

000 tonnes (an estimated R6, 3 billion) or 57% of total carbon steel sales to the industry. (Construction Industry Development Board, 2007)

4.2.3 AGGREGATE AND SAND

Aggregate is the name given to different sizes of stone that are used in the building, civil construction and road construction industries. Crushed stone is usually designated as coarse aggregate and sand as fine aggregate. Aggregate make up 70% to 80% of the volume of concrete and typically form between 90% and 95% of asphalt. The aggregates market is highly fragmented with more than 520 registered quarries. The Aggregate and Sand Producers Association of South Africa (ASPASA) estimated the total South African aggregate market, both formal and informal, in 2004 to be 90 million tones, which translates into revenues in the order of R3, 8 billion. (Construction Industry Development Board, 2007)

4.2.4 BITUMEN

There are 4 oil refineries that produce bitumen from refined crude oil residue. Domestic and export bitumen sales in 2006 were 308kt and 164kt respectively, with approximately 90% of local sales arising from government demand for road projects. Bitumen imports are costly due to the need for handling bitumen in hot bulk, and require additional investment in dockside tanks and support logistics. (Construction Industry Development Board, 2007)

4.3 ESTIMATION OF MATERIAL COSTS

It is important to understand which factors make up the cost of material to be able to argue why escalation cannot be used on old prices to make it applicable to current market conditions.

The cost of materials is made up of:

4.3.1 PRICE PER UNIT

Suppliers provide contractors with prices per their unit of measurement. (Social Housing Foundation, 2006)

4.3.2 DELIVERY COST

The supplier has the opportunity to price his cost to deliver the materials on site into his rate, i.e. his travelling cost. (Social Housing Foundation, 2006)

4.3.3 WASTE

Waste is that portion of materials that is lost in handling and processing and cannot be re-used in the permanent structure.

Deliberate and negligent wastage or damaging of materials is not regarded as waste. While loss through theft is not provided for, this insured against. (Social Housing Foundation, 2006)

4.3.4 DISCOUNT

> Suppliers sometimes offer contractors discount. It can either be general discount where the supplier really needs the business or decides to team up with contractor to deliver a very competitive tender, or it could be a settlement discount where the supplier offers the contractor discount if he pays his account earlier than agreed upon. (Social Housing Foundation, 2006)

When considering these 4 factors that make up the cost of a material (cost per unit, delivery charges, waste and discounts), it would be impossible to assume that they would remain the same for different projects.

The cost per unit of material will change continuously. It must be remembered that increases in labour cost, diesel, electricity etc. will also influence the supplier from which the contractor receives his quotations. From this statement it can be seen that inflation affects everybody in the construction industry. The contractor (when agreed upon in his contract) will be entitled to escalation, which "is supposed" to make up for price increases. The worrying factor then is if the indices used by Stats SA do not correspond with the increased/ decreased quotations for materials offered by the supplier. The contractor therefore relies fully on Stats SA to provide the right indices to ensure that he (contractor) does not lose money due to price increases. Fluctuations in prices do not always happen smoothly. Therefore it has got to be remembered when using an old tender rate, that the rate could have been compiled when there was a sharp increase/ decrease in prices. Such a rate would not necessarily be valid to the current period in which the new tender is compiled. An escalation factor needs to be used then to bring the rate to be valid for the specific period. All faith is again placed in the hands of escalation.

The cost of deliveries will never be the same for different projects. The costs depend on a lot of factors like: Travelling distance, quantity of materials delivered, cost of diesel,

etc. Each price received from a supplier will have a component of delivery cost worked into the price.

Waste on each project will also vary according to the difficulty of the project. Waste will not always be 5% or 10%, it could sometimes be 15% to 20%. A lot depends on the structure of the site, the smaller the working space, the bigger the waste factor will be. Restricted working space makes it harder to carry out the work, due to obstacles in the way, services, etc. Not all site layouts are the same for different projects.

Discounts also contribute to making one rate unique to a certain project. The buyer/ estimator in a construction firm will try and negotiate a price on tender stage for larger items such as, piling, blasting, etc. Suppliers will sometimes offer the contractor discount to ensure that he receives the contract. This makes the price offered to the contractor by the supplier cheaper than market related, therefore not a true resemblance of what is going on in the market. Such a price cannot be used on a different project, because the discount will not necessarily be applicable to the new contract.

4.4 MATERIAL QUANTITIES

The bills of quantities received from the client's quantity surveyor will not necessarily be faultless. Caution should be taken to always measure the quantities in the bill of quantities yourself. If a quantity is under measured it would make sense for the contractor to increase the rate of that item (he would be increasing his profit margin on a re-measurable contract). In doing this the contractor moves money around in his bills of quantities to ensure optimal profit margins. The rates used in such a "disbalanced" bills of quantities are then no longer a true reflection of what each item costs. Therefore the rates cannot be used for a different project.

4.5 THE IMPACT OF UNRELIABLE STATISTICS

Industry Insight (2 September 2008) posted a very interesting article regarding the use of statistics in the construction industry.

Statistics, to some – the root of all evil, exist for a very specific purpose - to guide and inform its users of past and current developments. Statistics are banded around frequently, to show economic performance, price fluctuations and changing demand for goods and services. Most (if not all) statistics published are inherently flawed, as it is in many cases based on sampling methods of accumulation. It is also difficult for statistics to accurately portray the impact of leads and lags, for example statistically the economy is still in a strong growth phase steaming ahead with a 5% growth, while other indicators statistically paint a different picture.

It is clear that statistics must be treated carefully and users must be aware of its shortcomings. Statistics in the construction industry are applied in many aspects of business intelligence including monitoring of building activity and inflation as well as budgetary allocations. This makes for interesting reading material and many consultants dedicate their careers to understanding the dynamics and interrelationships between these variables. Its real impact however is where using statistics directly affects your organizations bottom line. Take price escalation for example. In any contract, a contractor has two options; either undersign the contract including an escalation clause or based on a fixed price agreement. It is not certain how many contracts are signed that include an escalation clause, but given the fact that it is the preferred method used by government, and government contribute roughly 50% to total turnover in the industry, then it can potentially be a sizeable amount of contracts. Civil contracts base

their escalation clause on a specific formula that includes four key components (labour, diesel, materials and plant equipment).

The purpose of this formula is to fairly reimburse contractors for cost incurred as a result of an increase in input costs related to the cost of labour or materials, In order to apply this formula; price indices are needed to monitor price movement of various key materials in the industry. These price indices are currently complied by Stats SA. The credibility of Stats SA is however questioned as more and more users of the indices are disputing the accuracy of the price movements shown. This brings a serious question mark over the accuracy and reliability of using price indices to adjust contracts for payments. In fact, it would seem that most contractors would prefer not to use Stats SA information.

Consider the following example:

A contractor tenders on a 12 month contract to construct 3 km of road worth R3 million, using the escalation formula as stipulated in the contract:

Assuming the real escalation was 10%, but the composite price index showed an "incorrect" 5%, the contractor on this particular project stand to lose R127 000. If the real escalation was closer to 15%, he loses R255 000.

It is clear that the need and relevance of pricing information in the form of price indices cannot be undermined. An industry cannot operate sustainably without regular and accurate pricing information. So what is the problem?

Stats SA is the official distributor of statistics in the country and is therefore a credible organization to survey pricing information. Suppliers of pricing data are also more at ease to send their sensitive information to an official government body.

Unfortunately neither Stats SA nor the suppliers in many cases are in the position to constantly monitor the information published by Stats SA. Stats SA may be the official recognized institution in the country, but employees at Stats SA are not in any sense industry experts. Suppliers on the other hand bear no real benefit of publishing information and are therefore not overly concerned to ensure that the information released by stats SA is correct. Furthermore as the price indices are compiled from more than one supplier, how can a supplier be certain a price movement is incorrect as it could be caused by one or more of his competitors?

So If Stats SA is not placed to “see” errors and suppliers are not overly concerned to ensure its accuracy, the contractor is ultimately at the losing end (and government as client not paying the full reimbursement to the contractor – at the winning end).

Suppliers need to understand that the information supplied to Stats SA is of grave importance and is used by contractors on a daily basis in the industry to adjust their contracts for payments.

There needs to be an urgent industry drive to correct the accuracy of Stats SA’s price indices that affect the construction industry or ultimately price monitoring need to be privatized – for the benefit of its users.

4.6 SUMMARY

From all of the above arguments it can clearly be seen that a price is made up from a number of varying factors. These factors are never the same for each project and if assumed that they are, it could lead to serious financial losses for the contractor. By taking an old tender rate and using it in a current tender (after applying an escalation factor to it) can sometimes work, but it is not a guaranteed success. The safer option would always remain to get new prices from suppliers and compile a rate based on the specifics of each project.

4.7 TESTING OF HYPOTHESIS

Escalation formula:

$$(1 - x)[aLt/Lo + bPt/Po + cMt/Mo + dFt/Fo - 1]$$

x = factor of 0.15 (only 0.85 of the construction value is entitled to escalation)

a = percentage allowed for labour

Lt = indices for current month

Lo = indices for base month

b = percentage allowed for plant

Pt = indices for current month

Po = indices for base month

c = percentage allowed for material

Mt = indices for current month

Mo = indices for base month

d = percentage allowed for diesel

Ft = indices for current month

Fo = indices for base month

(Indices obtained from SAFCEC monthly report)

With the approval and consent from the Contractor Moseme Road Construction, a Civil Engineering Contractor based in Benoni, Johannesburg, a test was done on what the affects of escalation are on a specific project in Soshanguve. The only focus on this stage was the cost of a selected few materials.

The focus will be on the cost of Paving and G1 Material.

4.7.1 80mm INTERLOCKING PAVING (Soshanguve)

The tender price from the supplier was R83.99/m2. The price at which it was purchased for in January 2009 is R92.60.
The escalation proves that the contractor is currently receiving R15.11 more than on tender stage. This is equal to R99.11, which is R6.50 more than what the supplier is charging him to purchase the material. In this case the contractor is definitely benefitting from the escalation.
(See Annexure 1)

4.7.2 G1 MATERIAL (Soshanguve)

The tender price from the supplier was R94/ ton. The price at which it was purchased for in January 2009 is R105/ ton.
The escalation proves that the contractor is currently receiving R16.91 more than on tender stage. This is equal to R110.91, which is R5.91 more than what the supplier is charging him to purchase the material. In this case the contractor is definitely benefitting from the escalation.
(See Annexure 2)

The same Exercise was done for a site in Leratong (Krugersdorp).

4.7.3 G1 MATERIAL (Leratong)

The tender price from the supplier was R84.25. The price at which it was purchased for in January 2009 is R91.44.
The escalation proves that the contractor is currently receiving R14.39 more than on tender stage. This is equal to R98.64, which is R7.20 more than what the supplier is charging him to purchase the material. In this case the contractor is definitely benefitting from the escalation.
(See Annexure 3)

When comparing the cost of materials in Soshanguve to the cost of the same materials in Leratong (Krugersdorp), a different contract, a total different picture is sketched.

When comparing the cost of Paving and G1 materials purchased for the different sites, significant changes come to light.

The contractor is charged a lot more for G1 delivered to Soshanguve than what he is for G1 delivered to Krugersdorp. The reason for this is because Soshanguve is out of town and far from any industrial factories supplying these materials. Care should be taken when tendering not to base a rate for example, G1, on a price received for Leratong and then use it in a tender for a project in Soshanguve. Significant cost implications can be experienced if the prices vary too much. The price difference will be significantly influenced for example; by the fluctuations in the diesel price experienced in the last 6 months.

If the contractor used the rate for G1 received for Leratong in July 2007, for the Soshanguve tender in August 2008 he would have suffered a loss. The tender cost for G1 is now R84.25/ ton (Leratong Price). The escalation shows an additional amount of R15.16. This is equal to R99.41/ ton. The supplier is asking R105/ ton to deliver the materials to Soshanguve. This shows a loss of R5.59/ ton.

(See annexure 4)

4.8 CONCLUSION

The initial hypothesis is correct. It is dangerous to use escalated old prices for current required prices. It does not take a lot to ask suppliers for a quote on specific materials required. Escalation should also not be bargained on as fixed revenue that will be received. For example, considering the current fluctuation in the diesel price, the prices of materials also fluctuated, causing a positive and negative escalation.

CHAPTER 5 – APPLIED MARKUP

5.1 INTRODUCTION

To understand the reason why a Contractor would apply a markup on all items priced in the Bills of Quantities, it is important to understand what items are included in the main contractor's price build-up.

The following sub-problems were identified and will be solved in this chapter:

- Does the estimator know what his company overhead costs are?
- What percentage markup will ensure the contractor to still be competitive at tender stage, but also ensure him to make a profit on the project?

5.2 OVERHEAD COSTS

The quotes received from subcontractors normally include:

- Labour
- Materials (if applicable), including allowances for wastage
- The use of some tools and equipment, including allowances for wear and tear
- Subcontractor's site overheads (usually low or non-existent)
- Subcontractor's head office overheads (if applicable)
- Subcontractor's profit

(Social Housing Foundation 2006)

The contractor would make a big mistake if he simply adds up all the subcontract sums, and quotes from material suppliers, and think that this is the total building cost.

The main contractor needs to include the following allowances in his estimate:

5.2.1 INDIRECT ON-SITE COSTS ('Site Overhead")

5.2.1.1 Preliminaries

All of the above are usually priced separately from the direct labour and material costs, and are collectively referred to as preliminaries, which can vary from 7.5% to more than 25% of the contract value (Social Housing Foundation, 2006).

5.2.1.2 Attendance on Subcontractors

Providing subcontractors with scaffolding, power, water and storage; and assisting them with off-loading and handling of materials and equipment (usually varies from 2.5% to 10% of the value of the subcontract work). (Social Housing Foundation, 2006)

5.2.2 INDIRECT OFF-SITE COSTS ("General, or Head Office Overhead")

In a contractor's business, each contract must contribute towards paying overheads – usually in the ratio of its value to the total turnover of the company. Overheads can vary from 5% to 15% of annual turnover (total annual value of contracts of main contractor's work). (Social Housing Foundation, 2006)

Head Office overhead costs may include for the salaries of office personnel, equipment, office space, etc. It is difficult to accurately quantify the above costs, therefore the estimator must take care to make an allowance as close as possible to the true cost.

5.3 ESTIMATING THE COST OF PRELIMINARIES

Preliminaries include the following:

5.3.1 PERSONNEL

Salaries for all the site personnel (site agent, technicians, clerks, etc.) (Social Housing Foundation, 2006)

5.3.2 ACCOMMODATION

Site offices, sheds, toilets, stores, etc. (Social Housing Foundation, 2006)

5.3.3 PLANT

All the plant on site that cannot be exclusively linked to one specific activity, i.e. cranes, picks, shovels, etc. (Social Housing Foundation, 2006)

5.3.4 TEMPORARY SERVICE

Temporary water and power connections. (Social Housing Foundation, 2006)

5.3.5 CONTRACT REQUIREMENTS

Cost of sureties, insurance premiums, deposits and fees to the local authority. (Social Housing Foundation, 2006)

5.3.6 CONTRACT MANAGEMENT

Cost of site meetings, compiling work programs and cash flows, planning and co-coordinating the works. (Social Housing Foundation, 2006)

The cost of preliminaries on conventional building contracts usually range between 7.5% and 20% of contract value, but can vary considerably between projects, depending on:

- Type of work
- Size and phasing of project
- Location (urban, suburban, peri-urban, rural, out of country).
  (Social Housing Foundation, 2006)

In estimating preliminaries costs (the most difficult of cost estimating), the following activities are involved:

- After deciding what work will be done manually to increase employment, assessing what types of numbers of plant and equipment will be needed; and by studying the work program, estimating how long they will be needed on site
- Drawing up an organogram of site administrative staff needed (excluding labour directly involved in actual construction activities), and how long they will be needed

- Studying the work force requirement, and contract stipulations to see what temporary facilities and services are needed for the execution of the contract
- Studying the contract conditions and statutory requirements to see what insurances are required, and what fees and deposits are payable to the local and other authorities
- Discussing with contracts managers and site staff what the security requirements are

  (Social Housing Foundation 2006)

5.4 ESTIMATING OF GENERAL (HEAD OFFICE) OVERHEAD COSTS

Head Office overhead costs can not directly be linked to an activity on site. The cost of indirect or general overheads, which can vary from 5% to 20% of contract value, must be spread over all the projects executed in a particular year, meaning each project must make a “contribution” to overhead costs. (Social Housing Foundation 2006)

Typical general overhead costs include for:

5.4.1 PERSONNEL

- Office space for personnel
- Storage space for records, plant not in use, vehicles and materials

  (Social Housing Foundation, 2006)

5.4.2 OFFICE EQUIPMENT AND EXPENSES

- Office furniture and equipment

- Maintenance charges
- Stationary, postage, telephone/fax, lighting, heating and cooling

(Social Housing Foundation, 2006)

5.4.3 PERSONNEL

- Salaries of office personnel

(Social Housing Foundation, 2006)

5.4.4 TRANSPORT

- Company cars, bakkies, trucks, etc.
- Maintenance and service, repair, running costs, licenses, insurance

(Social Housing Foundation, 2006)

5.4.5 FINANCE COSTS

- Interest on capital (loans or own capital) in connection with financing the business
- Bank charges

(Social Housing Foundation, 2006)

5.4.6 REGULAR EXPENSES

- Fire, theft and third-party insurances
- Municipal service charges (water, power, refuse removal, sanitary charges)

(Social Housing Foundation, 2006)

Overhead contributions for each project are commonly estimated by:

- Estimating the total turnover of all projects for a particular year, say R10 million (value of actual construction work excluding preliminaries, provisional sums, overhead and profit).
- Estimating the total overhead cost that will be needed to support the estimated turnover for that year, say R0.5 million
- Expressing the estimated overhead cost as a percentage of estimated turnover (R0.5 million/ R10 million = 5% in this case) and adding that percentage to all bill rates for building work.
  (Social Housing Foundation 2006)

In this way, the total amount of construction work carried out during the year will contribute the full amount of overhead needed. This calculation must be reviewed constantly. This is because the estimates of turnover for the year will be adjusted as the real turnover figures start emerging. For example, if by mid-year it is evident that only 75% of estimated turnover is likely to be realized, the contractor will have to either increase the percentage (if market conditions allow), or start cutting overhead costs (Social Housing Foundation 2006).

5.5 SUMMARY

Estimators need to continuously update the allowed percentage for preliminaries and overheads. If the company's turnover drops the estimator either has to increase the allowed percentage for overheads that he uses in his estimates or if the market conditions does not allow for an increase, the company has to start cutting their overheads. The biggest mistake some estimators can make is to try and keep their tenders the lowest by reducing their applied markup. Anyone can win a tender, but not

everyone can do the job for the tendered price. Make sure to know and understand exactly what your overhead expenses are.

5.6 TESTING OF HYPOTHESIS

5.6.1 COMPANY OVERHEADS

In evaluating the company Moseme Road Construction's site overhead calculation sheet the following information could be gathered:

TABLE 10: SITE OVERHEADS

DESCRIPTION	UNIT	NUMBER	MONTHS	NETT	
				UNIT RATE	TOTAL AMOUNT
PERSONNEL					**3,678,165.00**
Contract Manager	month	0.5	15	79,950.00	599,625.00
Site Agent	month	1	15	58,500.00	877,500.00
Foreman - Senior	month	1	15	50,960.00	764,400.00
Foreman - Junior	month	1	15	29,250.00	438,750.00
Technician - Junior	month	1	15	17,550.00	263,250.00
Site Clerk	month	1	15	5,835.48	87,532.20
Storeman	month	1	15	3,852.45	57,786.75
Maid	month	1	15	3,283.77	49,256.55
Surveyor	month	0.5	15	29,120.00	218,400.00
Survey Leveller	month	1	15	9,336.60	140,049.00
Survey Assistant	month	2	15	4,035.90	121,077.00
Community Liason Officer	month	0	15	4,000.00	0.00
Health & Safety Officer	month	0	15	17,900.00	0.00
Health & Safety Representative	month	1	15	4,035.90	60,538.50
Soil Tester	month	0	15	5,298.26	0.00
TRANSPORT					**786,836.40**
Car - Light	month	0	15	5,655.00	0.00
Car - Medium	month	0.5	15	8,040.00	60,300.00
Bakkies	month	3	15	7,482.50	336,712.50
3t Trucks	month	1	15	22,457.82	336,867.30
7t Trucks	month	0	15	31,726.59	0.00
Crane Truck	month	0	15	31,726.59	0.00
Personnel Bus	month	0	15	26,949.38	0.00

Diesel Bowser	month	0	15	2,000.00	0.00
Lowbed Trips	day	24	0.5	4,413.05	52,956.60
Long car Trips	each	0	15	400.00	0.00
Airflights	each	0	15	1,000.00	0.00
SITE BUILDINGS					**102,111.83**
Fencing	sum	1	1	11,198.26	11,198.26
Office Rent	month	0	15	682.23	0.00
FSM Huts	no	4	1	14,881.17	59,524.68
Oarkhome	no	0	1	3,500.00	0.00
Stores	no	0	1	2,836.99	0.00
Shade Parking bays	no	4	1	1,960.70	7,842.80
Diesel Bundle Wall	sum	1	1	4,465.80	4,465.80
Workshop Floor	sum	1	1	3,945.10	3,945.10
Laboratiry Building & Equipment	sum	0	1	20,881.17	0.00
Remove camp site	sum	1	1	15,135.19	15,135.19
ACCOMMODATION					**0.00**
Single Quarters Erect	sum	0	0	0.00	0.00
Single Quarters Maintain	month	0	0	4,203.72	0.00
Compound Erect	sum	0	0	75,124.56	0.00
Compound Maintain	month	0	0	6,296.92	0.00
Hotel Accommodation	day	0	0	600.00	0.00
Living Out	month	0	0	5,000.00	0.00
SERVICES					**77,200.00**
Electricity Connection/ Supply	sum	1	1	6,000.00	6,000.00
Electricity consumption	month	1	15	500.00	7,500.00
Water Connection/ Supply Construction	sum	1	1	5,500.00	5,500.00
Water Connection Camp	sum	1	1	3,000.00	3,000.00
Water Consumption Camp	month	1	15	800.00	12,000.00
Toilets - Chemical	month	6	15	480.00	43,200.00
Toilets - Flush	no	0	1	400.00	0.00
COMMUNICATIONS					**67,500.00**
Cell Phones	month	4	15	1,000.00	60,000.00
Internet Connection	month	1	15	500.00	7,500.00
Telkom	month	0	15	600.00	0.00
RUNNING COST SITE					**184,845.90**
Personnel Protective clothing	month	60	15	60.00	54,000.00
Small Tools	month	1	15	4,437.50	66,562.50
Haul Road	day	12	1	5,356.95	64,283.40
Traffic Accommodation	sum	0		13,395.25	0.00
RUNNING COST SITE-OFFICE					**36,000.00**
Copy-Fax-Laptop-Machines	month	1	15	1,000.00	15,000.00
Stationary	month	1	15	1,000.00	15,000.00

Staff Welfare	no	2	1	3,000.00	6,000.00
SECURITY					**280,552.50**
Watchmen (own)	month	1	15	5,503.50	82,552.50
Watchmen (Security Company)	month	2	15	6,600.00	198,000.00
Re-Action Support	month	0	15	5,000.00	0.00
CIRCUMSTANTIAL FACTORS					**0.00**
Rain Delays (abnormal only)	sum	0	0	18,000.00	0.00
Dewatering	sum	0	0	7,500.00	0.00
Penalties	day	0	0	5,000.00	0.00
Foreseeable Losses	sum	0	0	17,000.00	0.00
INSURANCES					**437,500.00**
Contractors All Risk & PL	sum	0.0035	1	125,000,000.00	437,500.00
GUARANTEE					**187,500.00**
Guarantee	sum	0.015	1	12,500,000.00	187,500.00
TOTAL					**5,838,211.63**

From the above sheet it is clear that a thorough investigation was done to insure that the estimator allows for all site overheads for the specific tender (Beyers Naude). The estimator did not just use an average percentage; he pulled the job apart and made a specific (unique) allowance for every possible overhead item.

5.6.2 PROFIT

A further finalization sheet was then compiled where the contractor included for his profit.

TABLE 11: FINALISATION OF TENDER

Tendered Contract: Beyers Naude 11-Nov-08

Tender							
	Work at selling		a1	55,713,595.00			
less	Work at cost		a2	48,094,967.00			
		Initial mark-up	a3	7,618,628.00	15.84%	On work at cost	a1-a2
	Major Subcontractor at selling		b1	5,410,880.00			
less	Major Subcontractor at his price		b2	5,000,000.00			
less	Provisional Sum Attendance		b3	100,000.00	2.00%	On his price	
		MS mark-up	b4	310,880.00	6.22%	On his price	b1-b2-b3
	Provisional Sum		c1	17,917,893.00			
	Provisional Sum mark-up		c2	1,019,197.00	5.69%	On PC Sum	
less	Provisional Sum Attendance		c3	180,000.00	1.00%	On PC Sum	
		PC Mark-up	c4	839,197.00	4.68%	On PC Sum	c2-c3
Add-ons							
	Site Overheads at Cost		d1	5,838,211.63	10.48%	On work at selling	
	Head Office Overheads		d2	1,617,995.36	3.00%	On work at cost + site overheads	(a1+d1)* %
	Disbalance		d3	247,600.00			
	P&G of Major Subcontractor		e1	500,000.00	10.00%	On his work	
	Profit on Own Work		f1	8,369,816.10	15.00%	On cost of work, site OH, HO & Disbalance	(a2+d1+d2+d3)*%
	Profit on Major Subcontractor		f2	650,880.00	11.83%	On MS work + his P&G	(b2+e1)*%
	Profit on PC Sums		f3	895,894.65	5.00%		c1*%
	Escalation Under-recovery		g1	1,314,307.29	2.00%	On our income	(a2+d+f)*%
	Partner Cost		h1	2,000,000.00			
	Required mark-up		j1	21,434,705.03	44.57%	On work at cost	d+e+f+g+h
less	Initial + MS + PC markups		k1	8,768,705.00			a3+b4+c4
	Remaing or "250" mark-up		m1	12,666,000.03	13.66%	On tender Total	j1-k1

CALCULATED TENDER TOTAL	n1	**92,727,565.03**	a1+b1+c1+c2+m1
CONT 10%	o1	**9,272,756.50**	
SUB TOTAL	p1	**102,000,321.54**	
VAT	q1	**14,280,045.01**	
		116,280,366.55	

The estimator used a profit percentage of 15% on the cost of the project. Some experts would say that this percentage is too high, but the following reasons could be argued why the contractor submitted such a loaded tender:

- The estimator did a thorough investigation of the project, therefore it could be priced in the correct manner (no assumptions had to be made)
- The current market conditions allowed it (Nov 2008 – Civil Construction in South Africa was at a peak)
- It was a big job, only 9CE registered contractors could tender on the job
- Moseme is a 100% HDI owned company – the points allocated to HDI was almost 10% of the 90/10 scoring system (9 points) – that would favour Moseme tremendously

Moseme did eventually win the bid and are currently busy with the construction of the project. One could argue that because the estimator knew the job at tender stage, it allowed the contractor to push up his profit margin.
After doing an interview with one of Moseme's Contract Managers (former Senior Estimator) Mr. Christo van Dyk, the following questions were answered:

Question: What percentage profit on a job do you think will be enough for the company but still keep you competitive on tender stage?

Answer: 8%. Currently inflation in South Africa is in the order of 8% and you will have to at least cover inflation otherwise you are slipping slowly into a very deep, dark hole. Labour cost increased at about 12% over the last year so you cannot really afford less.

5.7 CONCLUSION

The initial hypothesis is correct. Considering the current financial situation in South Africa, work is not something that is served to anybody on a silver plate. Contractors therefore tender extremely keen. A big mistake some estimators can make is to reduce their markup added to each rate, without knowing what the company's overhead costs are. The markup added includes company - and site overhead costs and profit. When considering the fight for work it makes sense to reduce the estimate by first cutting on the markup. This is a dangerous exercise, because if the estimator does not have all the facts straight a loss can be suffered on the entire project.

CHAPTER 6 – CONCLUSION

6.1 INTRODUCTION

Estimators do not have the background, experience and therefore knowledge regarding the setup of a rate. Estimators in South Africa do make a lot of common mistakes when calculating a rate, as described in the previous chapters. Throughout this research the main focus was on the incorrect usage of resources. But instead of just focusing on the actual mistake, the focus can also be drawn to why these mistakes occur. As proven by the research done in the previous chapters, a clear conclusion can be drawn that estimators who lack background and experience in the construction industry are dangerous estimators, because they will not have enough knowledge to calculate feasible rates.

6.2 SOUTH AFRICAN ESTIMATORS

SAFCEC sends out a daily tender bulletin in which different construction projects can be advertised on a daily basis. This bulletin also reports on tender results for various construction projects. The following results were taken from this bulletin (please note that the different company names could not be used):

6.2.1 PROJECT ED(MP) 13/2009

This is a project where Ekurhuleni Metropolitan Municipality is the client. The scope of the project included for the construction of a cemetery and adjacent vacant land portion 87 of farm in Tembisa. The results were as follows:

Table 12: SAFCEC tender results

CONTRACTOR	TENDERED AMOUNT
Contractor (A)	6,857,573.00
Contractor (B)	29,865,225.00
Contractor (C) *	31,986,289.00
Contractor (D) *	33,168,435.00
Contractor (E) *	37,897,743.00
Contractor (F) *	39,156,895.00
Contractor (G) *	40,433,261.00
Contractor (H) *	42,020,968.00
Contractor (I)	47,014,955.00
Contractor (J)	48,151,594.00
Contractor (K)	60,878,458.00

Tender results from SAFCEC Daily Tender Bulletin

(Contractors with a star behind their name are well known contractors in South Africa, the rest of the contractors are all emerging contractors).

The estimate for this particular project was round about R35 million (Ekurhuleni Metropolitan Municipality). By looking at the average of the eleven contractors who tendered it comes down to almost R38 million, which is more than the initial estimate from the client's side. The important question to be raised however, is to why a contractor can have a price of R6.8 million on a R35 million project? Or why a contractor can have a R60.8 million price on a R35 million project?

6.2.2 REASONS FOR INCORRECT ESTIMATES

After doing an interview with Mr. Brent Dewar who is a Civil Engineer working for Aurecon which is a consulting Civil Engineering company, the following question was answered:

Question: What causes contractors to not be able to complete construction projects?

Answer: Experience, experience, experience!!!

The biggest problem South African Estimators have is that they lack experience. Some estimators do not even understand that they are not qualified or experienced enough to tender on certain projects, they just tender anyway. This causes a lot of tenders in the market to be either underpriced or completely overpriced, as shown in the example above.

When adjudicating a tender, the adjudicator or engineer who is doing the adjudication does not only look at the price offered by the tenderer, various other returnable information in the tender are also looked at. For example, just by looking at the name of the company, a certain degree of interest to the company is provoked. The adjudicator also looks at the availability of plant, key personnel and labour. The contractors previous work experience and financial stability are also evaluated. The way in which these documentation are completed will 9 out of 10 times also be an indication on whether a contractor can do the project or not. Normally there is a direct link between the way a contractor fills in the tender document and the price offered by the contractor. A correct, neat and complete tender document will 9 out of 10 times also offer a

relevant tender price. By completing the tender document correctly, the estimator (who completes the documentation) indicates that he or she understands what is required to actually physically perform the construction work. An estimator who understands the job will also be able to compile the rates for each specific item in the bills of quantities.

The offered tendered price should always be within fifteen percent of the original estimate. If the price exceeds the fifteen percent margin the tender should not even be considered. Individual rates should also be evaluated separately. Some bills of quantities are unbalanced, which means that some items are underpriced and others are overpriced. This is a clear indication that the estimator does not understand how to use resources to compile the rate. Such unbalanced bills of quantities can lead to a contractor going bankrupt, because he will not be able to complete the project if key items are underpriced (it must be noted that not all of the items measured and priced in the bills of quantities form part of the project at the end. The QS complies a bill that covers all possible activities that could take place in order to complete the construction. The contractor is not entitled to the value of money he priced into the bills of quantities, he is only entitled to the value of the work he actually performed. If the contractor moved all his money into items that never forms part of the project, he will not be able to complete the project)

Estimators also commonly make the mistake of underestimating the site conditions. It can be seen from the rates offered that estimators do not have enough experience to be able to accurately estimate production factors. It is commonly seen, especially in projects that cater for the uplifting of communities in South Africa, that the estimator does not understand how the project will be

constructed ON SITE at all. A lot of big plant items with very high production factors are used for projects that actually require smaller plant items and a lot of labour. This could lead to a disaster when the contractor with such an incorrect estimate is awarded the project, because the price difference in using plant and labour are enormous. Labour will never be as productive as large plant items and it will take longer to perform the work using labour, all of which have cost implications.

Estimators tend to also underprice the cost of materials. The cost of materials must be obtained from suppliers and subcontractors, they should not be guessed or assumed. Some rates used for material items, for example the laying of pavement blocks, does not even cover the cost of buying the pavement blocks from the supplier. Estimators who do not even know what the market price for just buying the materials are, will definitely not be able to compile a rate that accurately also covers for the installation of the material. If the contractor is not able to buy the materials as required during the project, he will not be able to complete the project.

The biggest mistake estimators most commonly make is to reduce their markup they apply to their rates. Estimators should understand and know what their overhead cost on site and off site (head office) are. To underestimate these costs will bankrupt the contractor, because he will not be able to pay the running cost of operating and maintaining his site and the company head office. This is a cost that requires a lot of experience and knowledge relating to the operational system of the company. When the market conditions force contractors to lower their estimates due to a scarcity of work, estimators tend to cut on the markup they apply to the estimate. From evaluating estimate rates the conclusion can be

drawn that estimators do not understand the difference between the profit they want from the project and the overhead provision they need to actually perform the job.

Everything comes down to the background and experience that an estimator needs. There are numerous emerging contractors in the South African construction industry that do not have the required background and work experience to actually tender accurately and competitively.

6.3 SUMMARY

Estimators make numerous mistakes in their estimates. Underestimating site conditions in relation to the productivity and choice of plant and labour provisions, using non-market related material prices and cutting on overhead provisions cause the downfall of many contractors in the South African construction industry. Estimators do not have the background, experience and therefore knowledge regarding the setup of a rate. This acquisition is not entirely true. The lack of background, experience and knowledge regarding the setup of rates to be used in estimate should be limited to the many emerging contractors that operate in the South African construction industry.

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ANNEXURE A:

80mm INTERLOCKING PAVING IN SOSHNGUVE

CONTRACT NO : CW 05/014

SOSHANGUVE BLOCK P COLLECTOR STREETS AND APPURTENANT STORMWATER STRUCTURES

Base Month **Aug-07**

(1 -x)[aLt/Lo + bPt/Po + cMt/Mo + dFt/Fo - 1]

x = 0.15

a = 0.21 b = 0.27 c = 0.42 d = 0.1

Lo = 144.4 Po = 152.1 Mo = 178.1 Fo = 255.7

MONTH	Lt	Pt	Mt	Ft	FACTOR F
Feb-08	0.0	0.0	186.8	0.0	0.04152162
Mar-08	0.0	0.0	187.8	0.0	0.04629422
Apr-08	0.0	0.0	191.0	0.0	0.06156654
May-08	0.0	0.0	199.0	0.0	0.09974733
Jun-08	0.0	0.0	201.8	0.0	0.11311061
Jul-08	0.0	0.0	203.9	0.0	0.12313307
Aug-08	0.0	0.0	217.3	0.0	0.18708591
Sep-08	0.0	0.0	218.8	0.0	0.19424481
Oct-08	0.0	0.0	219.6	0.0	0.19806289
Nov-08	0.0	0.0	219.2	0.0	0.19615385
Dec-08	0.0	0.0	216.6	0.0	0.18374509
Jan-09	0.0	0.0	215.8	0.0	0.17992701

DATE	TENDER RATE FOR 80mm INTERLOCKING PAVING	FACTOR F	ESCAL. FOR MONTH
25-Feb-08	R 83.99	0.04152162	R 3.49
25-Mar-08	R 83.99	0.04629422	R 3.89
25-Apr-08	R 83.99	0.06156654	R 5.17
25-May-08	R 83.99	0.09974733	R 8.38
25-Jun-08	R 83.99	0.11311061	R 9.50
25-Jul-08	R 83.99	0.12313307	R 10.34
25-Aug-08	R 83.99	0.18708591	R 15.71
25-Sep-08	R 83.99	0.19424481	R 16.31
25-Oct-08	R 83.99	0.19806289	R 16.64
25-Nov-08	R 83.99	0.19615385	R 16.47
25-Dec-08	R 83.99	0.18374509	R 15.43
25-Jan-09	R 83.99	0.17992701	R 15.11
		Totals	**R 56.48**

ANNEXURE B :
G1 MATERIAL IN SOSHANGUVE

CONTRACT NO : CW 05/014

SOSHANGUVE BLOCK P COLLECTOR STREETS AND APPURTENANT STORMWATER STRUCTURES

Base Month **Aug-07**

(1 -x)[aLt/Lo + bPt/Po + cMt/Mo + dFt/Fo - 1] x = 0.15

a = 0.21 b = 0.27 c = 0.42 d = 0.1

Lo = 144.4 Po = 152.1 Mo = 178.1 Fo = 255.7

MONTH	Lt	Pt	Mt	Ft	FACTOR F
Feb-08	0.0	0.0	186.8	0.0	0.04152162
Mar-08	0.0	0.0	187.8	0.0	0.04629422
Apr-08	0.0	0.0	191.0	0.0	0.06156654
May-08	0.0	0.0	199.0	0.0	0.09974733
Jun-08	0.0	0.0	201.8	0.0	0.11311061
Jul-08	0.0	0.0	203.9	0.0	0.12313307
Aug-08	0.0	0.0	217.3	0.0	0.18708591
Sep-08	0.0	0.0	218.8	0.0	0.19424481
Oct-08	0.0	0.0	219.6	0.0	0.19806289
Nov-08	0.0	0.0	219.2	0.0	0.19615385
Dec-08	0.0	0.0	216.6	0.0	0.18374509
Jan-09	0.0	0.0	215.8	0.0	0.17992701

DATE	TENDER RATE FOR G1 MATERIAL	FACTOR F	ESCAL. FOR MONTH
25-Feb-08	R 94.00	0.04152162	R 3.90
25-Mar-08	R 94.00	0.04629422	R 4.35
25-Apr-08	R 94.00	0.06156654	R 5.79
25-May-08	R 94.00	0.09974733	R 9.38
25-Jun-08	R 94.00	0.11311061	R 10.63
25-Jul-08	R 94.00	0.12313307	R 11.57
25-Aug-08	R 94.00	0.18708591	R 17.59
25-Sep-08	R 94.00	0.19424481	R 18.26
25-Oct-08	R 94.00	0.19806289	R 18.62
25-Nov-08	R 94.00	0.19615385	R 18.44
25-Dec-08	R 94.00	0.18374509	R 17.27
25-Jan-09	R 94.00	0.17992701	R 16.91
		Totals	**R 63.21**

ANNEXURE C:

G1 MATERIAL IN LERATONG

GCT 1503/07/2007

CONSTRUCTION OF ROADWORKS FOR ROAD K15 AT LERATONG BETWEEN ROAD K198 AND ROAD K102

Base Month **Jul-07**

(1 -x)[aLt/Lo + bPt/Po + cMt/Mo + dFt/Fo - 1]

x = 0.15

a = 0.26 b = 0.27 c = 0.37 d = 0.1

Lo = 145 Po = 150.3 Mo = 179.7 Fo= 252.0

MONTH	Lt	Pt	Mt	Ft	FACTOR F
Feb-08	0.0	0.0	186.8	0.0	0.03358375
Mar-08	0.0	0.0	187.8	0.0	0.03831386
Apr-08	0.0	0.0	191.0	0.0	0.05345019
May-08	0.0	0.0	199.0	0.0	0.09129104
Jun-08	0.0	0.0	201.8	0.0	0.10453534
Jul-08	0.0	0.0	203.9	0.0	0.11446856
Aug-08	0.0	0.0	217.3	0.0	0.17785198
Sep-08	0.0	0.0	218.8	0.0	0.18494713
Oct-08	0.0	0.0	219.6	0.0	0.18873122
Nov-08	0.0	0.0	219.2	0.0	0.18683918
Dec-08	0.0	0.0	216.6	0.0	0.17454090
Jan-09	0.0	0.0	215.8	0.0	0.17075682

DATE	TENDER RATE FOR G1 MATERIAL	FACTOR F	ESCAL. FOR MONTH
25-Feb-08	R 84.25	0.03358375	R 2.83
25-Mar-08	R 84.25	0.03831386	R 3.23
25-Apr-08	R 84.25	0.05345019	R 4.50
25-May-08	R 84.25	0.09129104	R 7.69
25-Jun-08	R 84.25	0.10453534	R 8.81
25-Jul-08	R 84.25	0.11446856	R 9.64
25-Aug-08	R 84.25	0.17785198	R 14.98
25-Sep-08	R 84.25	0.18494713	R 15.58
25-Oct-08	R 84.25	0.18873122	R 15.90
25-Nov-08	R 84.25	0.18683918	R 15.74
25-Dec-08	R 84.25	0.17454090	R 14.71
25-Jan-09	R 84.25	0.17075682	R 14.39
		Totals	**R 51.69**

ANNEXURE D:

LERATONG PRICE FOR G1 MATERIAL USED IN SOSHANGUVE TENDER

Base Month **Aug-07**

(1 -x)[aLt/Lo + bPt/Po + cMt/Mo + dFt/Fo - 1]

x = 0.15

a = 0.26 b = 0.27 c = 0.37 d = 0.1

Lo = 144.4 Po = 152.1 Mo = 178.1 Fo= 255.7

MONTH	Lt	Pt	Mt	Ft	FACTOR F
Feb-08	0.0	0.0	186.8	0.0	0.04152162
Mar-08	0.0	0.0	187.8	0.0	0.04629422
Apr-08	0.0	0.0	191.0	0.0	0.06156654
May-08	0.0	0.0	199.0	0.0	0.09974733
Jun-08	0.0	0.0	201.8	0.0	0.11311061
Jul-08	0.0	0.0	203.9	0.0	0.12313307
Aug-08	0.0	0.0	217.3	0.0	0.18708591
Sep-08	0.0	0.0	218.8	0.0	0.19424481
Oct-08	0.0	0.0	219.6	0.0	0.19806289
Nov-08	0.0	0.0	219.2	0.0	0.19615385
Dec-08	0.0	0.0	216.6	0.0	0.18374509
Jan-09	0.0	0.0	215.8	0.0	0.17992701

DATE	TENDER RATE FOR G1 MATERIAL	FACTOR F	ESCAL. FOR MONTH
25-Feb-08	R 84.25	0.04152162	R 3.50
25-Mar-08	R 84.25	0.04629422	R 3.90
25-Apr-08	R 84.25	0.06156654	R 5.19
25-May-08	R 84.25	0.09974733	R 8.40
25-Jun-08	R 84.25	0.11311061	R 9.53
25-Jul-08	R 84.25	0.12313307	R 10.37
25-Aug-08	R 84.25	0.18708591	R 15.76
25-Sep-08	R 84.25	0.19424481	R 16.37
25-Oct-08	R 84.25	0.19806289	R 16.69
25-Nov-08	R 84.25	0.19615385	R 16.53
25-Dec-08	R 84.25	0.18374509	R 15.48
25-Jan-09	R 84.25	0.17992701	R 15.16
		Totals	**R 56.65**