THE CAUSES OF DELAYS ON GOVERNMENT HOUSING CONSTRUCTION PROJECTS IN BOTSWANA

by

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Submitted in fulfilment of a part of the requirements for the degree

MASTER OF SCIENCE
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in the Faculty of Engineering, Built Environment and Information Technology

University of Pretoria

Study leader: Prof. Dr. Diederick Gerhardus Brümmer

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DECLARATION

I declare that this research is my own unaided work, except where otherwise stated.

This dissertation is being submitted in partial fulfilment of the requirements for the degree MSc (Project Management) at the University of Pretoria. It has not been submitted before for any degree or examination at any other university.

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Erick Kombuwa Libetwa

February 2006

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ABSTRACT

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The spate of delays on Botswana government housing construction projects has raised concern – not only to the government but also to the general public.

The conditions of contract applicable to the Botswana government building contracts make allowance for extension of construction periods under certain circumstances. Any such circumstances not dealt with by the conditions of contract, do not warrant extension of the construction period and is referred to as a circumstance which is

within the contractor's control. The aim of this study, amongst others, is to identify the major circumstances that cause delays on government housing construction projects.

This is achieved by means of *ex post facto* research on available data of completed projects.

By means of an analysis of response to questionnaires which were put to selected consultants and contractors, it is investigated whether the types of programming techniques utilised by contractors are appropriate and whether attributes other than price are taken into account by consultants at contractor selection stage. It is investigated in addition whether contract periods are realistically determined.

The abovementioned investigations have been tested against hypotheses statements.

Based on the findings and conclusions, recommendations are made with the objective of reducing delays on Botswana government housing construction projects in future. Recommendations for further research in fields related to the topic of the treatise have also been made.

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LIST OF ABBREVIATIONS

CTB	-	central tender board
PPADB	-	procurement and asset disposal board
P S	-	permanent secretary
DABS	-	department of architecture and building services
DBES	-	department of building and engineering services (Formerly DABS)

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CHAPTER 1

THE PROBLEM AND ITS SETTING

1.1 The statement of the problem

Informal observations indicate that delays in the completion of projects have consequences for both the employer and the contractor. Employers meet high holding costs when the contract overruns its time. Contractors are faced with additional overhead costs apart from penalties for late completion.

Finsen (1999:140) states that delays in the completion of projects frequently lead to disputes and currently a large proportion of arbitration cases have to do with additional time and additional expenses. It is therefore imperative that causes of delays should be investigated in order to minimise additional time and expenses due to delays in the completion of projects.

The Botswana government is concerned about the spate of delays on housing construction projects in Botswana, which not only create accommodation shortages for civil servants, but also the additional cost to the government in terms of providing alternative accommodation for these civil servants.

The aim and goal of this research is to find out what is the cause of these delays on government housing construction projects.

In view of this, this research/study proposes to identify and evaluate what is causing these delays on government housing construction projects in Botswana and to recommend more effective and efficient measures of reducing these delays.

1.2 The statement of the sub-problems

1.2.1 The first sub-problem

The first sub-problem is to identify the major causes of delays on government housing construction projects and to rank them in order of occurrence. (What are the major causes of delays on government housing construction projects?)

1.2.2 The second sub-problem

The second sub-problem is to evaluate how contractors programme their resources. (Do building contractors programme their resources in a scientific responsible way?)

1.2.3 The third sub-problem

The third sub-problem is to determine whether the employer's contract procurement strategy is adequate to detect potential delays. (Is the employer's contract procurement strategy adequate enough to detect potential delays?)

1.2.4 The fourth sub-problem

The fourth sub-problem is to evaluate how contract periods are determined. (Are the contract periods determined realistically?)

1.3 The hypotheses

The following four hypotheses form the basis of the research/study:

1.3.1 The majority of delays seem to be caused by factors which are within the contractor's control.

1.3.2 Contractors do not employ appropriate programming methods to achieve completion on time.

1.3.3 The employer's contract procurement strategy is not adequate to detect potential delays.

1.3.4 Construction periods are not determined realistically.

1.4 The limitations

1.4.1 The study excludes housing construction contracts for which the government has employed international contractors.

1.4.2 The study is limited to housing construction projects undertaken by citizen contractors in central tender board category C to unlimited within the past 10 years.

1.4.3 The study excludes scrutinising the validity of reasons and periods granted for any extension of time.

1.5 The definitions of terms

1.5.1 Delay - *Delay* is a situation whereby the original contractual completion date is exceeded with or without extension of time being granted.

1.5.2 Selected - A sample of government housing construction projects will be taken from each geographical region in the Republic of Botswana.

1.5.3 Building contract - The *building contract* referred to in this study is the standard form of building contract for the Government of the Republic of Botswana incorporating the Bill of Quantities.

1.6 The assumptions

1.6.1 The assumption is that contractors are capable of completing the housing construction projects they have undertaken with the resources like plant and skilled manpower at their disposal as these resources are freely available on the open market.

1.7 The importance of the study

Delays on government construction projects seem to be a common occurrence. The contractor is usually blamed for most of the delays. Sometimes extension of time is granted to the contractor with or without cost. In any delay situation the employer or contractor loses money.

The vice president of the Botswana Chamber of Commerce, Industry and Manpower (BOCCIM), Mr Modiri Mbaakanyi, recently issued a press statement indicating that citizen contractors should not be blamed for failure of building projects. He called for a comprehensive study to be carried out to determine why citizen contractors fail. According to Mbaakanyi (as quoted in Motshwane, 2004:3) other problems contributing to failure of building projects are poor performance of project managers and corruption in tendering.

The objectives of the study are to identify and evaluate the major causes of the delays on government housing construction projects and to recommend more effective and efficient measures of reducing these delays.

The importance of the study is based on the underlying assumption that the government is concerned about the spate of delays on construction projects, particularly when undertaken by citizen contractors in Botswana and that this research is determined to come up with more effective and efficient measures of reducing delays.

1.8 Research methodology

The research methodology adopted is that of non-experimental quantitative research.

Data for the first sub-problem (the identification of the major causes of delays on government housing construction projects) was obtained from records of past projects located from files at the department of building and engineering services. The research methodology appropriate for analysing and interpreting the data will be ex post facto research.

Data for the balance of the sub-problems was obtained in the form of structured questionnaires completed by contractors and consultant quantity surveying firms.

The research methodology appropriate for analysing and interpreting the data will be descriptive survey research.

Triangulation was used to ensure the internal validity of research. To ensure the external validity, the researcher's conclusions were based on a representative sample of the population.

To ensure the reliability of the research, the questionnaires were standardised. Furthermore, feedback from colleagues in the field and participants in the research was obtained to determine whether they agree or disagree with the interpretations drawn from the data to support the validity of the findings. Research participants were given a general idea of what the study is about without divulging the hypothesis. The research study respected the participant's right to privacy by treating their responses with confidentiality.

1.8.1 The specific treatment of the data for each sub-problem

1.8.1.1 Sub-problem 1 (What are the major causes of delays on government housing construction projects?)

The data obtained is documentary and is primary in nature. The data was located from files at the department of building and engineering services in Gaborone, the same city where the researcher resides. Permission was sought from the permanent secretary of the Ministry of Works, Transport and Communications. The data was collated and statistically analysed to determine the major causes of delays in a ranking order with the assistance of the department of statistics at the University of Pretoria.

1.8.1.2 Sub-problem 2 (Do building contractors programme their resources in a scientific responsible way?)

The data obtained was in the form of responses from the survey questionnaire. The data was retrieved from contractors. A Questionnaire

was sent to each of the building contractors registered with the PPADB in category C.

The data was collated and statistically analysed to determine the methods used in programming with the assistance of the department of statistics at the University of Pretoria.

1.8.1.3 **Sub-problem 3 (Is the contract procurement strategy adequate to detect potential delays?)**

The data was obtained in the form of responses from a survey questionnaire.

The data was retrieved from consultant quantity surveying firms.
A questionnaire was sent to each of the quantity surveying firms registered with the PPADB.

The data was collated and statistically analysed and correlated with the generally accepted theories of contractor selection, e.g. the diekman model in terms of cost, time and quality with the assistance of the department of statistics at the University of Pretoria.

1.8.1.4 **Sub-problem 4 (Are contract periods determined realistically?)**

The data obtained was in form of responses from a survey questionnaire.

The data was retrieved from contractors and consultants. A questionnaire was sent to each of the building contractors registered with the PPADB in category C and also each of the quantity surveying firms registered with the PPADB.

The data was collated and statistically analysed to determine the methods and their frequencies, and correlated to the generally accepted methods.

CHAPTER 2

LITERATURE REVIEW

2.1 Delays

2.1.1 Delays defined

Delay on a building contract can be defined as a situation where the contractor's contractual stipulated time for completion of the project and the authorised approved extension of time, if any, have been exceeded.

Informal observations indicate that in most building contracts if the contractor is in delay and no further extension of time has been granted to him, then the contractor is liable to pay liquidated and ascertained damages or penalties at a rate stipulated in the contract documents.

2.1.2 Liquidated and ascertained damages

Liquidated and *ascertained damages* are a genuine pre-estimate of the loss likely to be suffered by the employer should the contractor not complete the project by the stipulated or extended time.

Eggleston (1997:9) states that the only benefit out of liquidated damages for the employer is relief from the burden of proving his loss and the right to deduct liquidated damages from sums due to the contractor, but he may be disadvantaged in the event that his true losses may be greater than the stipulated level of liquidated damages.

Eggleston (1997:31) further states that the advantages of stipulating liquidated damages in a contract are that the employer does not need to prove his loss and the loss need not be suffered. The contractor also knows in advance what he is liable for if he does not complete the project within the stipulated or extended time.

Uff (1996:67) argues that in cases where liquidated damages are not stated in the contract, the contractor is still not relieved from liability for damages due to late completion. General damages can be claimed by the employer through the courts of law. If liquidated damages can be shown to be penalties, they can not be enforced, general damages will then apply and the employer will need to prove his loss.

2.1.3 Penalties

Finsen (1999:136) explains that penalties in lieu of liquidated and ascertained damages can be stipulated in the contract to avoid the employer having to prove the loss suffered. The penalties do not have to be an accurate pre-assessment of damages likely to be suffered.

Eggleston (1997:57) states that the distinction between liquidated and ascertained damages and penalties depends on the intention of the parties to the contract. Mr Justice Lopes in Law versus Redditch Local Board (1892) in the law reports of England (as quoted by Eggleston, 1997: 57) put it this way:

The distinction between penalties and liquidated damages depends on the intention of the parties to be gathered from the whole of the contract. If the intention is to secure performance of the contract by the imposition of a fine or penalty, then the sum specified is a penalty; but if, on the other hand, the intention is to assess the damages for the breach of the contract, it is liquidated damages.

However, section 3 of the Conventional Penalties Act of 1962 gives the courts power to reduce the amount of penalty if it appears to be excessive.

Relief against penalty clauses can be granted by the courts where it was possible to ascertain the loss likely to be suffered by the employer.

2.1.3 Time for performance

According to Eggleston (1997:21), most building contracts specify time for performance in achieving completion of the works. Some contracts may even have additional requirements for phased or sectional completion. Time for completion may be fixed by reference to the construction period. In fixing the time for completion, there must be no uncertainty as to whether the construction period takes into account or excludes public holidays. Time for completion can either be specified by the employer in the tender documents or tenderers can state their own time for completion.

Informal observations indicate that the advantage of having the employer to fix the time for completion is that all tenders can be assessed on cost alone,

but at times this can bring contentions by some contractors when they fail to complete the projects on time.

Uff (1996:67) states that in contracts where the time for completion has not been specified the contractor is required to complete the project within a reasonable time. The question of what is reasonable time is a matter to be decided in the circumstances of each case.

2.1.4 Time of the essence

When time is of the essence in a contract, failure to complete the project by the specified date is a breach of a condition entitling the innocent party to treat the contract as repudiated. This is in agreement with various authors (Eggleston, 1997:23, Murdoch & Hughes, 1996:198).

From informal observations an example of time being of the essence can be a contract to deliver a wedding cake for the ceremony on a Saturday morning. If the cake is delivered on a Sunday after the ceremony has taken place, it will be of no use and therefore the innocent party can treat the contract as repudiated.

This situation is unusual in construction contracts because of the provisions for extension of time and liquidated damages. It is only possible in circumstances when late completion would render everything valueless to the

employer, for example completion of a show exhibition stand after the show time.

2.1.5 Time at large

Eggleston (1997:29) maintains that time becomes at large when an obligation to complete the project within the specified time is lost, usually in circumstances where an act of prevention by the employer creates a delay and that delay is not covered by an extension of time provision. The contractor is then obliged to complete the project within a reasonable time. The question of what is a reasonable time, again is a matter to be decided in the circumstances of each case.

2.1.6 Delays and adjustment for extension of time

Murdoch and Hughes (1996:201) report that most building contracts contain express provisions under which the period allowed for the contractor to undertake and complete the works can be extended.

Eggleston (1997:162) states that an extension of time for completion is mainly granted for the following reasons:

- to retain a defined time for completion
- to reserve the employer's right to liquidated damages against acts of prevention
- to give the contractor relief from his strict duty to complete the work on time in respect of delays caused by designated neutral events

It seems that most building contracts specify the relevant events for which a contractor is entitled to claim an extension of time.

Murdoch and Hughes (1996:202) maintain that if the delay is caused by an event which the contract does not cover, the contractor will not be entitled to claim an extension of time.

According to Eggleston (1997:180) and Finsen (1999:141) the relevant events usually found in most contracts as grounds for an extension of time due to the employer's acts of prevention fall under the following categories:

(i) failure on the part of the employer to give the contractor access to the site

(ii) work done by local authorities or statutory undertakings

(iii) delay by nominated subcontractors or suppliers

(iv) delay by persons engaged by the employer

(v) Late issue of drawings or instructions

Eggleston (1997:195) states that drawings or instructions should be given to the contractor within a reasonable time in order not to disrupt his progress. A reasonable time for supply depends on the wording of the contract.

(vi) Variations and extra works

Eggleston (1997:196) argues that if the contract has no express provision for an extension of time due to variations and extra works,

the employer loses his right to deduct damages should this event occur. It is also worth noting that extra works do not necessarily entail an extension of time if the critical path is not affected.

(vii) Suspension or cancellation involved by a nominated or selected subcontract due to default of the employer or his agent

(viii) Insolvency of nominated subcontractor

According to Finsen (1999:141), the relevant events usually found in most contracts as grounds for an extension of time which are neither caused by employer nor the contractor, fall under the following categories:

- Force majeure

  These are events beyond control of either the employer or the contractor and have caused an unavoidable delay on the completion of the project.

- Adverse or exceptionally inclement weather
- Civil commotion, strikes, etc.

  Formal observations indicate that most contracts classify this event to mean strikes by other persons not engaged by the employer but affecting only the trades employed upon his work.

- Making good physical loss or repairing damage to the works
- Inability to obtain materials and goods

Formal observations indicate that this applies to circumstances where orders for materials or goods have been placed in good time by the contractor, but these materials or goods are in short supply.

- Perils which are insurable such as fire, lighting explosion and storm
- Government intervention
- Terrorism

Murdoch and Hughes (1996:209) state that amendment 12 of the Joint Contracts Tribunal 1980 contract form (JCT 80) introduced a new ground for extension of time. This covers the use or the threat of terrorism and any actions by the relevant authorities in dealing with it.

2.1.7 Contractor's entitlement to additional costs due to extension of time

The contractor's price apart from the cost of labour and materials, comprises overheads and running costs, usually known as preliminaries. For example, the cost of supervising the project and providing security is priced in the preliminaries section.

Some of the preliminary costs (like supervision) are related to the length of the construction period and are adjusted accordingly if any extension of time is given to the contractor where the delay has been caused by the employer's act of prevention. Finsen (1999: 150) explains it as follows:

> *Where delay had been caused by the employer, either lawfully in exercising a contractual right or unlawfully in some breach of his contractual obligations, there can be no doubt that in equity the*

contractor should be compensated. But where the delay has been caused by a circumstance over which neither has control, the contractor's right becomes questionable and it is generally held that this would be a contractual risk to be borne by him.

2.1.8 Procedure for claiming extension of time

Finsen (1999:148) states that most contracts usually set time limits for a contractor to put forward his extension of time claim. Failure by the contractor to give notice of an extension of time in reasonable time could lead to the contractor forfeiting his right to a revision of the date for practical completion. The architect is also required to respond to the contractor's claim within a stipulated time giving reasons for granting or refusing extension of time or reducing the extension of time claimed.

Formal observations indicate that in most contracts if the architect fails to give a decision within the stipulated time, the contractor's claim for an extension of time shall be deemed to have been refused.

2.1.9 The Botswana Government contract

The Botswana Government contract uses the standard form of contract as shown in Annexure 5. The standard form of contract is used for all projects undertaken by local contractors. The Federation International Des Ingenieurs Conseils (FIDIC) form of contract is used when international tenders are sought.

Clause 20 of the government standard form of contract deals with delay and extension of time. The following are the relevant events in clause 20 which entitle the contractor to be awarded extension of time to the completion date:

- force majeure
- exceptionally inclement weather
- permanent secretary's instructions
- late instructions
- civil commotion, local combination of workmen, strike or lockout affecting any of the trades employed upon the works
- delay on the part of nominated subcontractors or nominated suppliers which the contractor has, in the opinion of the permanent secretary taken all practical steps to avoid or reduce
- works of other contractors or tradesmen engaged by the employer which are not referred to in the bill of quantities

Clause 20 states that the permanent secretary shall make a fair and reasonable extension of time for completion of works.

Unlike the Joint Building Contracts Committee (JBCC) principal building contract and other types, the Botswana Government standard contract form is silent on the requirement of the contractor to give reasonable and timeous notice in the event of delay. The only relevant event for which the contractor is required to give notice is upon the happening of a strike or lockout.

The Botswana Government contract does not specify a time limit within which the contractor is required to give notice to claim for an extension of time after becoming aware of the potential delay.

The Botswana Government contract form also does not state the time limit for the permanent secretary to grant, reduce or refuse an extension of time.

The Botswana Government contract form does not specify which relevant events entitle the contractor to additional costs.

The following relevant events are found in other contract forms and are not covered by the Botswana Government contract:

- inability to obtain materials and goods where the contractor has taken all practical steps to avoid or reduce such delay
- making good physical loss and repairing damage to the works resulting from war, riot, civil commotion and other insurable risks
- failure by the employer to give possession of the site on the stipulated date

Clause 19 of the Botswana Government contract deals with damages for non-completion.

The contract allows for liquidated and ascertained damages to be deducted from the monies due to the contractor if he fails to complete the works by the contractual completion date or within any extended time.

The formula used by the Botswana Government for calculating liquidated and ascertained damages is as follows:

contract sum x 10% divided 365 per day

or part thereof

It is a requirement to state this formula in the preliminaries section of the tender documents. For public buildings this formula for calculating liquidated and ascertained damages may not be a genuine pre-estimate of loss, but is acceptable.

Eggleston (1997:65) supports this view and remarks as follows:

> *The essence of liquidated damages is that they are a genuine pre -estimate of loss. In commercial projects this usually presents no difficulty; the concept of loss is easy to understand and calculations can be based on figures which can readily be substantiated. In non-commercial projects, for public sector works and the like, the logic is not straight forward and the argument is often heard that liquidated damages cannot be applied for late completion of a road contract or school building contract because the employer has suffered no loss. This is wrong in fact and wrong in law. In fact, because the employer will usually have suffered a loss if only in extra supervision costs or financing charges and, in law, because the difficulty of precise calculation has long been recognised by the courts and provided that a genuine attempt is made at pre-estimating loss, such loss will be accepted as liquidated damages. Since loss needs not be proved it then matters not what actual loss, if any has been suffered.*

2.2 Programming of resources

To ensure timely completion of projects contractors need to plan the resources that will be used. Contractors need to employ planning techniques to present a realistic programme of works.

Cooke (1992:128) states that the utilisation and adoption of a planning technique within a company is dependent on factors such as the policy of the board towards supporting a planning policy for use throughout the company to ensure that it is adopted at all levels of management, the planning expertise engaged and the type and range of projects undertaken.

The contractor's programme is of relevance when considering an extension of time on a project.

Eggleston (1997:207) states that the programme could be of relevance also in considering rates of progress, if the contractor is determined because of a lack of progress.

In the light of the above it is therefore important that building contractors should use suitable planning techniques.

Brümmer (1998:2) makes the following observations:

- Building contractors over the past number of years use oversimplified planning techniques in the absence of contractually prescribed methods.

- Ignorance of more sophisticated planning techniques by contractors is a result of the shortcomings in the training of built environment professionals.
- Planning methods still serve the primary aims of the building contractor and calculations for an extension of time are of secondary importance.
- Claims arising from delays occur more than any other case.
- The employer has developed an increasing need for scientifically justifiable basis for an extension to the construction period.

Brümmer (1998:3) further suggests that building contracts should be more prescriptive regarding planning techniques, allowing architects to become involved pro-actively with the building contractor's progress programmes as is the case with some civil construction projects in South Africa and in countries such as the United States of America.

2.2.1 Legal status of programmes

Under most standard forms of building contract including the Botswana Government form of contract the contractor's programme is not a contract document. The responsibility for programming and constructing works rests with the contractor. The contractor is entitled to plan and perform his work as he pleases provided he finishes within the time fixed in the contract.

Sawyer and Gilliot (1981:146) claim that unless a particular format of programme is specified, the contractor will present a programme that will suit

himself and should the engineer require another format that would show the critical path then the contractor would be entitled to payment for providing such a programme.

The contractor's programme, if adequately annotated, could serve as written notice of requirements for information and drawing.

The National Contracts Advisory Committee 1990: Practice Notes 1 to 24 state that an extension of time should only be given when the delay affects the critical path of completion of building projects.

Knowles (1996:9) maintains that if a programme were to be given the status of a contract document, the contractor would be required to comply with it to the letter. All flexibility which is the key to catching up when progress gets behind would disappear.

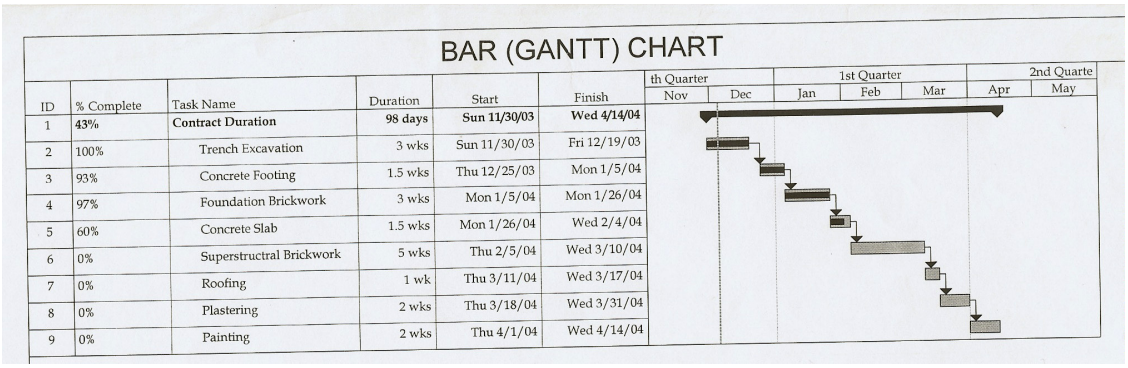
2.2.2 Planning techniques

There are various known planning techniques which contractors utilise to programme the works. This research will be limited to the following:

- Gantt or bar charts
- Line of balance
- Critical path method (CPM)
- Precedence diagrams

2.2.2.1 The bar (Gantt) chart

This is the most common and popular of all techniques. It shows activities against time. Figure 1 illustrates a bar chart for a factory construction project showing progress recorded to the end of January.



ID	% Complete	Task Name	Duration	Start	Finish
1	43%	**Contract Duration**	**98 days**	**Sun 11/30/03**	**Wed 4/14/04**
2	100%	Trench Excavation	3 wks	Sun 11/30/03	Fri 12/19/03
3	93%	Concrete Footing	1.5 wks	Thu 12/25/03	Mon 1/5/04
4	97%	Foundation Brickwork	3 wks	Mon 1/5/04	Mon 1/26/04
5	60%	Concrete Slab	1.5 wks	Mon 1/26/04	Wed 2/4/04
6	0%	Superstructral Brickwork	5 wks	Thu 2/5/04	Wed 3/10/04
7	0%	Roofing	1 wk	Thu 3/11/04	Wed 3/17/04
8	0%	Plastering	2 wks	Thu 3/18/04	Wed 3/31/04
9	0%	Painting	2 wks	Thu 4/1/04	Wed 4/14/04

Figure 1: Bar (Gantt) chart programme

Source: Microsoft project 98 generated

Cooke (1992:129) names the advantages of bar charts as being:

- simple in format
- well known
- easy to understand
- can be updated without total redrafting
- shows relationship of planned to actual performance by marking up as the job progresses
- enables delays to be shown in the course of the work.
- requirements and key date symbols can be introduced to aid materials control

- can be used to indicate the demand for resources over each week or month by entering values and summing under the appropriate date

According to Cooke (1992:129), the disadvantages of bar charts are:

- interdependence of activities is not shown and as such not suitable for complex projects
- no emphasis on critical activities in working up a bar chart

The bar chart as a readily understandable statement of general interest may be applied to pre-tender, master programmes and short-term planning procedures.

The bar chart can be utilised at site management level to present detailed sequence studies showing alternative labour and plant resources.

Subcontractor's programmes can also be shown in bar chart form in order to relate to the main contractor and other subcontractors with relative ease.

2.2.2.2. Line of balance

The line of balance is employed on repetitive type jobs like a housing site and multistorey buildings. Figure 2 indicates the format of presentation for three operations during the construction of ten houses.

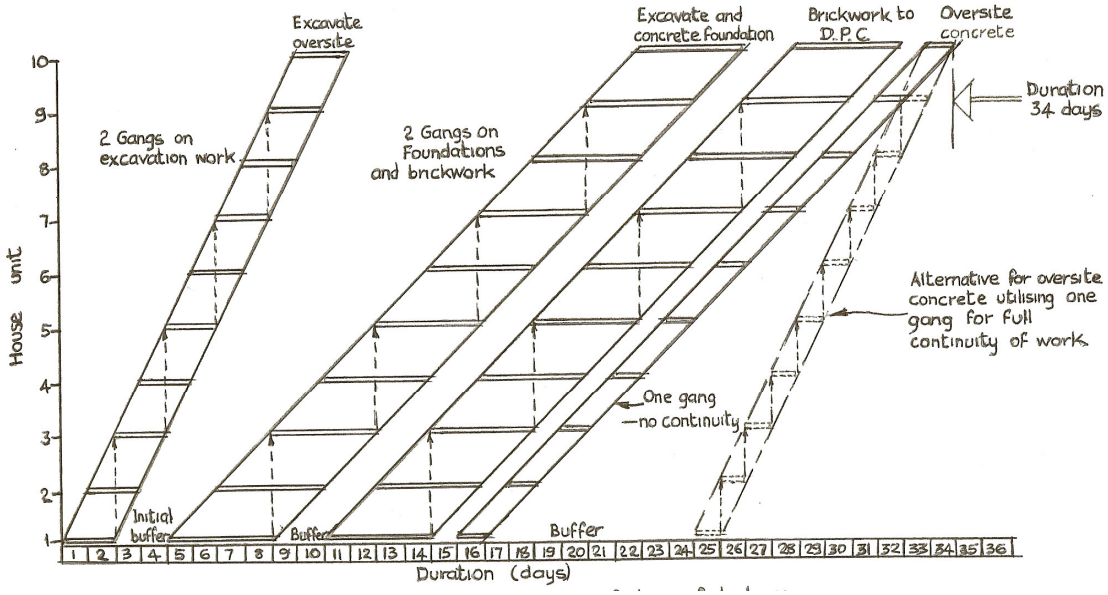


Figure 2: Principles of line of balance

Source: Cooke, B. 1992. *Contract planning and contractual procedures*. 3rd Ed. London: Macmillan

Cooke (1992:132) states that the advantages of line of balance techniques are:

- trades and sequence of work are shown
- relates to the number of teams, their activities, waiting times
- clearly indicates the number of units to be completed by a specific date
- the principles of line of balance are readily understood at site management level and can be easily updated
- out of sequence working between related trades and unbalanced manning are eliminated by the exercise of the technique in establishing output targets

According to Cooke (1992:132), the disadvantages of the line of balance are:

- it is only applicable to repetitive forms of construction
- activities are summarised, hence no detail or explanation is included

2.2.2.3. Critical path method (CPM)

Cooke (1992:136) states that this method of programming utilises a network diagram showing earliest and latest event times on the critical path. The *critical path* is the path in a network which has zero float. The critical path method of programming for a station project is shown in Figure 3.

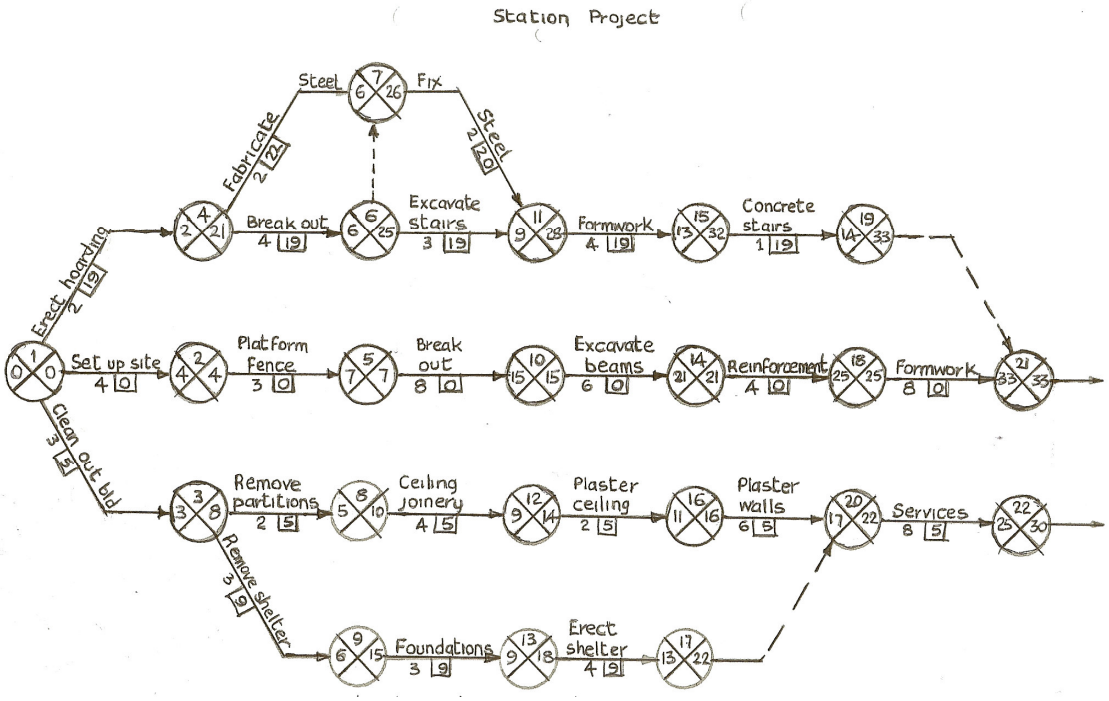


Figure 3: Network analysis example

Source: Cooke, B. 1992. *Contract planning and contractual procedures*. 3rd ed. London: Macmillan

Cooke (1992:136) presents the following advantages of the critical path method:

- It shows relationships and dependencies of activities.
- It shows the effects of variations.
- It requires the planner to think logically right from the beginning.
- It shows the critical path.
- Non-critical activities are identified and resource levelling is facilitated.
- Activities upon which the contractor must concentrate his efforts during the project are identified in the process of planning.
- Information and materials requirement times are identified in the process of planning.
- The method can be used to support claims.

Cooke (1992:136) gives the following disadvantages of the critical path method:

- It is complex and not easily understood by everybody.
- It requires expertise in construction process and sequences.

The critical path method has been most useful where size and complexity of projects render bar charts inadequate.

In other cases the critical path method is applied where it is imposed on the contractor by the contractual terms.

2.2.2.4. Precedence diagrams

Precedence diagrams can express various relationships between activities which cannot be readily shown on network diagrams. An example of a precedence diagram is shown in Figure 4.

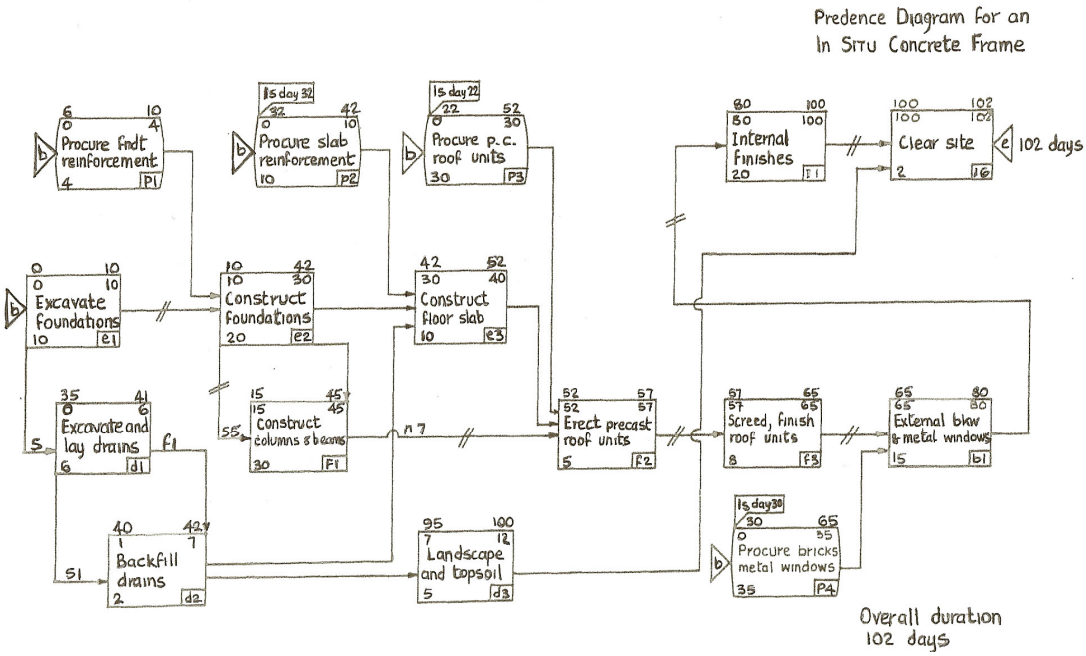


Figure 4: Precedence network diagram

Source: Cooke, B. 1992. *Contract planning and contractual procedures*.3rd ed. London: Macmillan

The terminology used in precedence diagrams is shown in Figure 5.

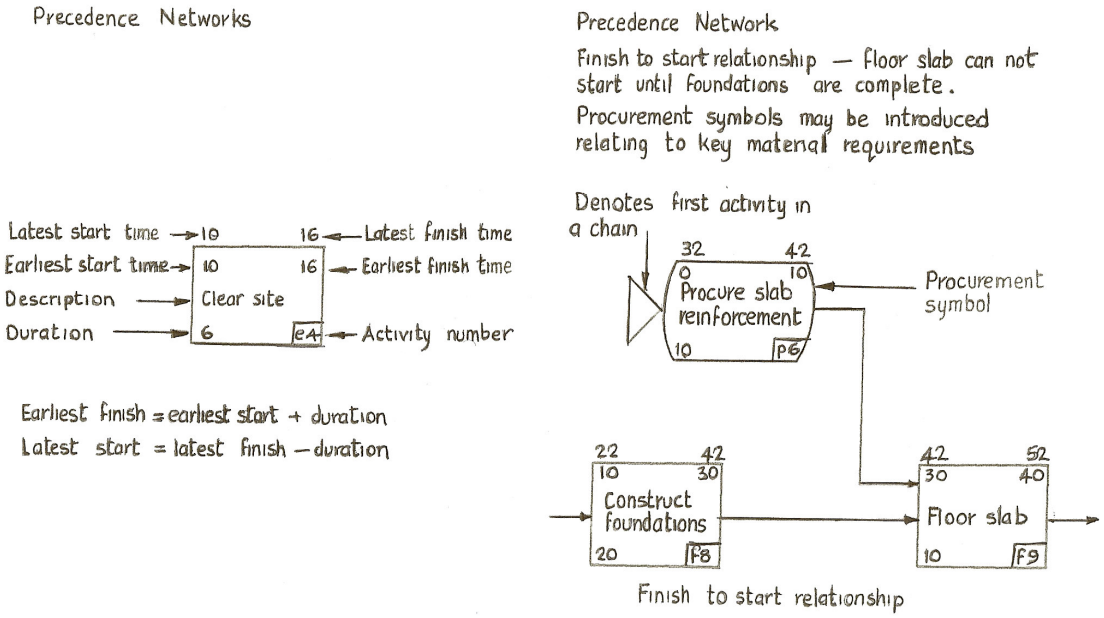


Figure 5: Terminology

Source: Cooke, B. 1992. *Contract planning and contractual procedures*.3rd ed .London: Macmillan

Activities are indicated by boxes linked by lines or arrows to show relationships in the sequence.

The concept of *splitting* is also introduced in precedence diagrams. *Splitting* is using float within the duration of an activity without adversely affecting the programme or constraints prescribed in relationships with its predecessor or successor.

2.3 Contract strategy

Brümmer (2000:1) defines the term *contract strategy* as referring to the total scope of decision- making by the employer regarding the definition of the organisation and procedures necessary for the execution of a building project.

Standard forms of building contract are employed in the building industry. The choice of a particular type of building contract depends on circumstances surrounding the project.

The size of the project will in most cases determine the type of building contract to be used.

The advantage of employing a standard form of building contract is familiarity for those who use them, enabling them to become aware of both its strengths and weaknesses. It is also impossible to write new conditions of contract for every contract.

2.3.1 Contract selection

The contract selection depends on the employer's objectives and the requirement methods which are available. Asworth (1992:83) states in broad terms the employer's objectives as:-

- function (use)
- economy (value for money)
- cost

- quality
- aesthetics
- time

The employer should determine the order of preference of his objectives.

Figure 6 below shows the range of contract types.

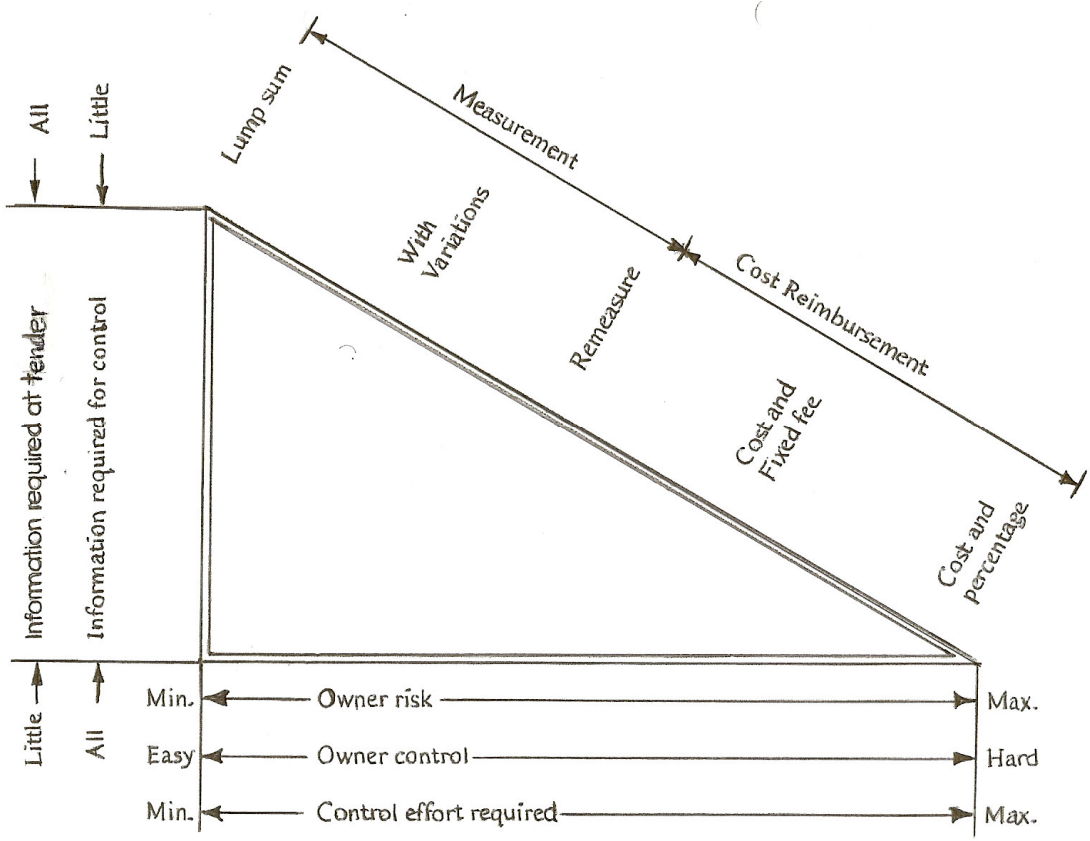


Figure 6: Range of contract types

Source: Willis, CJ & Ashworth, A. 1987. *Practice and procedures for the quantity surveyor*. 9th ed. Oxford: BSP Professional books (sighted in Burgess, R.A.(ed). 1980. Construction projects, their financial policy and control. Longman)

Under measurement contracts, work is measured on the basis of finished quantities. The contractor is paid on the basis of quantity multiplied by the rate.

Willis and Asworth (1987:156) provide the following alternate forms of measurement contracts used in the construction industry:

- Drawing and specification
- Performance specification
- Schedule of rates
- Bills of quantities
- Bills of approximate quantities

Under Cost reimbursement contracts, the contractor is able to recoup the actual costs of the materials, labour and plant on the work plus profit.

According to Willis and Asworth (1987:157), the different forms of cost reimbursement contracts are as follows:

- cost plus percentage
- cost plus fixed fee
- cost plus variable fee

The government of Botswana utilises the bill of quantities which is a measurement contract.

2.3.2 Organisational method

The organizational method deals with the way that the project will be managed from inception to completion. The choice of organisational method will depend on the employer's objectives associated with time, cost and quality of construction.

Brümmer (2000:1) says the organisational methods available are:

- conventional method
- management method
- all- inclusive method

With the *conventional method*, the employer appoints the architect as his principal agent. The architect designs and co-ordinates the functions of other professional consultants, supervises and administers the project.

The *management method* is where the employer appoints a firm (usually known as project managers) to manage and co-ordinate the design and supervision of the project.

The *all- inclusive method* is where the employer appoints a firm to undertake both the design and construction of the project.

Preece and Tarawneh (1997: 24) conducted research in the United Kingdom to find out whether clients are satisfied with the all- inclusive method. Their

findings were that most clients were dissatisfied with poor quality proposals and specifications, lack of detailed programming, as well as a lack of communication at post-contract stage by contractors.

The Botswana Government utilises the conventional method for executing projects which are included in the scope of this study.

2.3.3 Contract procurement methods

These are methods that are used to source out work. Willis and Asworth (1987:157) state the contract procurement methods that are mostly used as follows:

- Competitive tenders

  Competitive tenders have two forms, namely open and selective tenders.*Open tenders* are where tenderers are invited by advertisement without restriction of suitability of firms. Most public sector tenders are open. *Selective tenders* are where a restricted number of tenderers are invited by reference to a standing roster or by reputation. The employer is morally obliged to accept the lowest tender.

- Negotiated tenders

  This happens when the employer and his consultants negotiate with a contractor to determine a tender.

- Two-stage tenders

A contractor is selected early in the design process by means of competitive tenders based on relatively little information. The contractor then works together with the project team as the design develops and his final tender is developed out of cost and price data contained in his original tender.

- Continued tenders

  This is a situation where the employer offers the contractor packages of work or contracts on a continued basis subject to satisfactory performance at re-tendered or re-negotiated prices.

2.3.4 Risk allocation

The Aqua Group (1982:10) defines *risk* as the possible loss, which has to be stood by someone, resulting from the difference between what was anticipated and what finally happened.

The primary function of any contract is to identify, define and allocate risk. This will depend to a large extent on the employer's circumstances. Informal observations indicate that contractors usually allow for premiums in their tenders which will be used to pay insurance companies to carry the risk for them.

Table 1 on the following page shows risks which are usually met by contractors in South Africa and Third World countries in southern Africa.

Table 2.1: Risks influencing contract strategy, adapted from Klopper CH. 1985: *An investigation into and evaluation of the cost reimbursable basis for building contracts.* Pretoria: University of Pretoria. Unpublished DSc (Quantity Surveying) - thesis

RISKS INFLUENCING CONTRACT STRATEGY*

Technical

- Incomplete design
- Insufficient site inspection
- Uncertainty regarding the source and availability of material
- Correctness of specification

Logistical

- Availability of resources – particularly material, labour, plant, spare parts and fuel
- Availability of adequate transport facilities

Construction

- Uncertain productivity levels of resources
- Weather and seasonal implications
- Problems regarding industrial relations

Financial

- Inflation
- Availability and fluctuations in foreign exchange rates
- Loan taxes

Political

- Customs and import restrictions and procedures
- Possible problems regarding selling of plant and equipment after completion of the project
- Pressure to make use of local firms and agents

* The risks indicated in this table are deemed to have been caused by factors such as the programme requirements of the employer rendering complete documentation and necessary inspections impossible, lack of relevant statistics and unstable political and economical circumstances. Such risks thus fall completely outside the control of the design team.

SOURCE: Brümmer DG. Risk allocation in building contracts, 2000:3

2.3.5 Contractor selection

Willis and Asworth (1987:165) state that the method used for contractor selection and price determination is a difficult one because of varying opinions amongst construction experts as to their advantages and disadvantages. Specific attributes of tenderers other than price should be regarded.

According to Brümmer D.G (2000:2), the following attributes should be considered:

- commercial terms being offered
- experience
- craftsmanship
- reputation
- financial stability

Models which take into account specific attributes of tenderers at contractor selection stage, like the Diekman model, have been developed.

2.4 Determination of contract periods

There is very little literature regarding the determination of contract periods available. Brümmer (1998:2) suggests that contractors could by means of applying the appropriate planning techniques and with the consideration of resources available plan their work to be completed within the given construction period.

CP de leeuw (1988) has developed a formula for determining construction periods and this formula has been applied on most building contracts in South Africa.

The department of public works in South Africa uses graphical methods to determine construction periods. It is important to note that when the procedure for calculating construction periods is established, its effectiveness should be monitored. A database could also be used by contractors to determine construction periods.

2.5 Summary

The literature review indicates research reports and scholarly writings that bear a relationship to the problems under consideration. The literature review was organised by hypothesis.

Delays are a common occurrence in building and civil engineering projects. Most building contracts contain provision for an extension of time in order to retain a defined time for completion, to reserve the employer's right to liquidated damages against acts of prevention and to give the contractor relief against his strict duty to complete the project on time. Building contracts specify the relevant events which entitle the contractor to an extension of time. The contractor's claim for an extension of time will in most cases not succeed if the grounds of claims are not one of the relevant events provided for in the contract. There are other relevant events in other building contracts which are not entertained in the Botswana Government contract. It will be

attempted to determine whether these missing relevant events contribute to the causes of delays on construction projects in Botswana.

There are various known planning techniques which contractors employ to programme their works. The most important is the critical path method because with this method the consultants are able to adjudicate claims for an extension of time in a scientific manner. Most contracts do not require the programme to be a contract document. Contractors are at times requested in the preliminaries section of the bill of quantities to submit a specific type of programme. In situations where the contractor is not requested to submit a specific type of programme, most contractors will submit a bar chart programme which is the simplest form but difficult to assess claims for extension of time, because the interrelationships of activities are not shown.

Standard forms of building contracts are employed in the building industry. The choice of a particular form will depend on the circumstances surrounding the project and the objectives of the employer. Academics recommend that in contractor selection, specific attributes of tenderers other than price should also be regarded.

In determining construction periods, some writers suggest that a database should be used. CP de leeuw has developed a formula for determining construction periods and this formula is being applied by most built environment professionals in South Africa.

In the next chapter an analysis of the findings and deductions made from questionnaires, interviews and from other researchers are presented.

CHAPTER 3

MAJOR CAUSES OF DELAYS ON GOVERNMENT HOUSING CONSTRUCTION PROJECTS

3.1 Introduction

This chapter contains analysis and interpretations of the research findings pertaining to the major causes of delays on government housing construction projects in Botswana.

The sub-problem as stated in the first chapter was to determine the major causes of delays on government housing construction projects and rank them in order of occurrence. (What are the major causes of delays on government housing construction projects?)

The hypothesis postulated was that the most of delays seem to be caused by factors which are within the contractor's control (i.e. insufficient work rate by the contractor).

The main objective of this chapter is to analyse case studies which will determine the causes of delays and their contribution to the delay of government housing projects.

3.2 Data-collection method

The research methodology applied for this sub-problem was ex post facto research.

Leedy and Ormrod (2001:182) define *ex post facto research* as the process of beginning with a phenomenon and going backwards in time to identify the causal factors.

The collection of data for this sub-problem entailed going back to the records of completed housing construction projects and determining the causes of delays.
The data was obtained by permission from the permanent secretary of the ministry of works, communication and transport to access the files available at the department of building and engineering services. (see Annexure 1 for a copy of the letter.)

Further permission was granted to access the files of the consultant architects who had worked on housing construction projects delayed beyond the original practical completion date within the past ten years. (see Annexure 2.)

A list of delayed housing construction projects undertaken by the central government is shown in Annexure 7.

Clause 20 of the Botswana Government building contract (see Annexure 4) allows for revision of time occasioned by the following:

a) force majeure

b) exceptionally inclement weather

c) the permanent secretary's instructions given in pursuance of clause 1 (scope of the contract)

d) late information

e) civil commotion, local combination of workmen, strike or lockout affecting any trades employed upon the works

f) delay on the part of nominated sub-contractors or nominated suppliers

g) delay by contractors or tradesmen engaged by the employer not referred to in the bill of quantities

To further clarify item c) above, clause 1 (scope of contract) lists the permanent secretary's instructions as follows:

(i) The variation or modification of design, quality or quantity of the works or the addition or omission or substitution of any work

(ii) any discrepancy in the drawings or between the bill of quantities, and drawings

(iii) the removal from the site of any materials brought thereon by the contractor and the substitution of any other materials therefore

(iv) the removal and/or re-execution of any works executed by the contractor

(v) the dismissal from the works and any person employed thereupon

(vi) the opening up for inspection of any work covered up

(vii) the amending and making good of any defects under clause no. 13 (defects after completion)

The data for this sub-problem was statistically analysed to determine the major causes of delays.

3.3 Results and data interpretation

The number of housing construction projects which were delayed beyond their original completion date was extracted from the raw data in Annexure 6 and is shown in Table 3.1 below.

Table 3.1: Housing construction projects delayed beyond the original completion date

Case study number	Number of days from tender closing to tender award	Delay factor (Days)								Total number of days delayed
		a	b	c	d	e	f	g	h	
1	49	-	-	-	-	-	50	5	70	125
2	52	-	9	-	35	-	11	-	-	55
3	76	-	-	26	-	-	-	-	819	845
4	53	-	-	-	-	-	58	-	44	102
5	225	-	7	-	31	-	-	350	-1	387
6	107	-	-	-	-	-	156	-	179	335
7	107	-	-	-	60	16	-	-	27	103
8	76	-	-	204	229	-	-	26	433	892
9	85	-	-	55	56	-	-	-	-	111
10	86	-	-	46	-	-	-	-	67	113
11	86	-	-	-	-	-	-	-	340	340
12	126	-	-	-	-	-	-	-	890	890
13	133	-	-	60	-	-	-	-	917	977
14	85	-	-	29	-	-	45	29	964	1067
15	98	-	-	-	-	-	-	-	995	995
16	42	-	-	42	-	-	-	-	912	954
17	33	-	-	-	-	-	-	-	976	976
18	110	-	-	-	-	-	-	-	769	769
19	118	-	-	324	-	-	-	-	-	324
20	89	-	8	43	-	-	-	38	195	284
21	117	-	-	70	90	-	21	-	199	380
22	80	-	-	31	-	-	53	-	-	84
23	64	-	-	206	-	-	-	-	34	240

Legend for Table 3.1

a = force majeure

b = exceptionally inclement whether

c = the permanent secretary's instructions

d = late information

e = civil commotion, strike, etc

f = nominated subcontractor or nominated supplier

g = contractors or tradesmen engaged by the employer

h = insufficient work rate by the contractor

From Table 3.1 above it is evident that none of the projects from the cases studied were delayed by (a) namely "force majeure". This could be attributed to the fact that Botswana's geographic position is stable and free from earthquakes, waves, etc. The causes of delays were first analysed in terms of frequency.

Figure 7 below indicates the frequencies of the causes of delays.

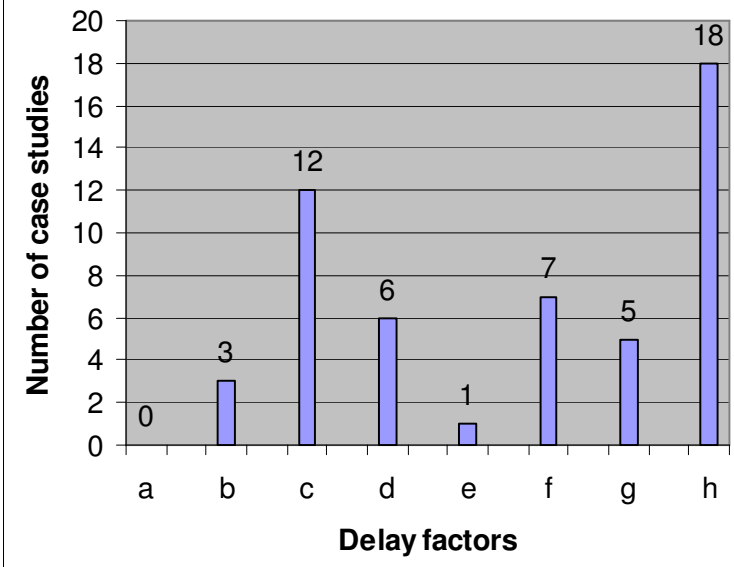


Figure 7: Frequencies of delay factors

From Figure 7 above it can be seen that item h namely, insufficient work rate by the contractor, has the highest frequency, occurring in 18 case studies.

In descending order of occurrence the causes of delay are as follows:

1. Insufficient work rate by contractor (18)
2. The permanent secretary's instructions (12)
3. Nominated subcontractor or supplier (7)
4. Late information (6)
5. Contractors or tradesmen engaged by the employer (5)
6. Exceptionally inclement weather (30)
7. Civil commotion, strike or lockout, etc (1)

8. Force majeure (0)

The causes of delay were further analysed using the average percentage time contribution on each project.

Extension of time due to exceptionally inclement weather occurred in three cases. Figure 8 below shows the percentage contribution of delay due to exceptionally inclement weather.

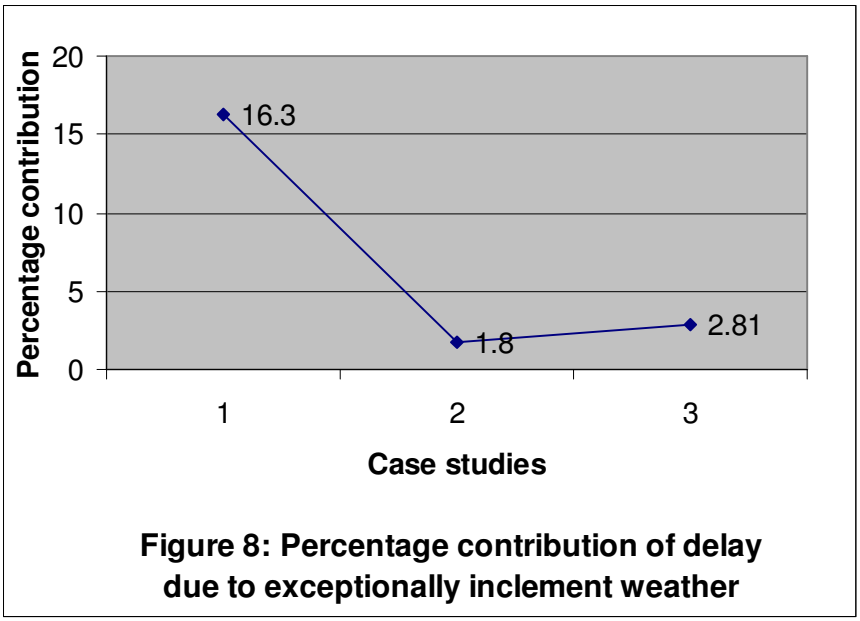


Figure 8: Percentage contribution of delay due to exceptionally inclement weather

The average percentage contribution of delay due to exceptionally inclement weather is **0.95%.**

An extension of time due to the permanent secretary's instructions occurred in twelve cases. Figure 9 below shows the percentage contribution of delay due to the permanent secretary's instructions.

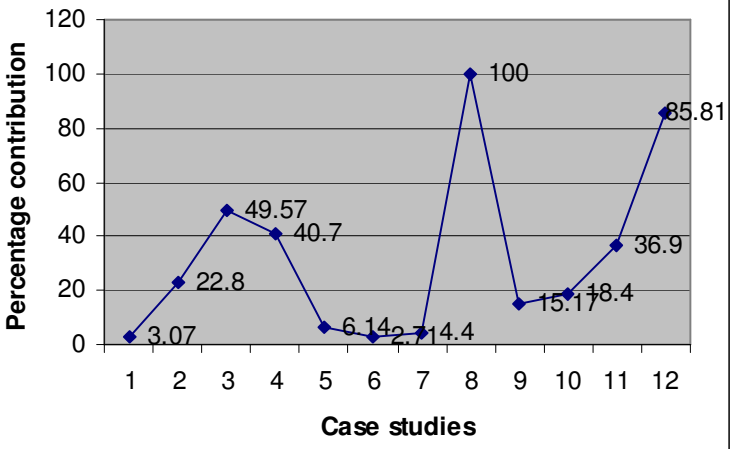


Figure 9: Percentage contribution of delay due to the permanent secretary's instructions

The average percentage contribution of delay due to the permanent secretary's instructions is **16.75%.**

Extension of time due to late information occurred in six cases. Figure 10 below shows the percentage contribution of delay due to late information.

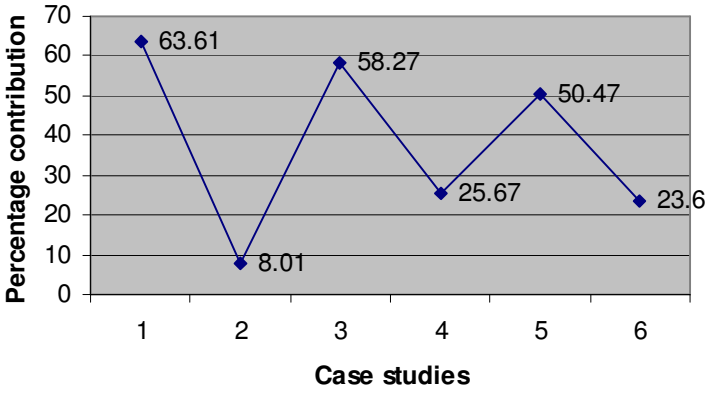


Figure 10: Percentage contribution of delay due to late information

The average percentage contribution delay due to late information is **10.03%.**

An extension of time due to civil commotion, strike, etc occurred in one case only. The average percentage contribution to delay due to civil commotion, strike, etc is **0.73%.**

An extension of time due to delay on the part of the nominated subcontractor or nominated supplier occurred in seven cases. Figure 11 below shows the percentage contribution of delay on the part of nominated subcontractors or nominated suppliers.

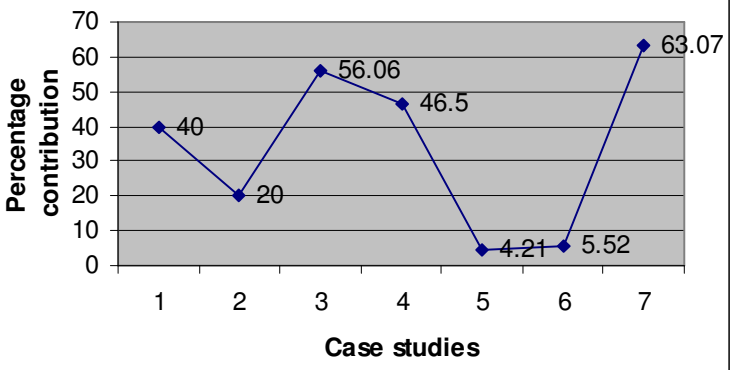


Figure 11: Percentage contribution of delay on the part of nominated subcontractors or suppliers

The average percentage contribution of delay on the part of the nominated subcontractor or nominated supplier is calculated as **10.26%.**

An extension of time due to contractors or tradesman engaged by the employer occurred in five cases. Figure 12 below shows the percentage contribution of delay due to contractors or tradesmen engaged by the employer.

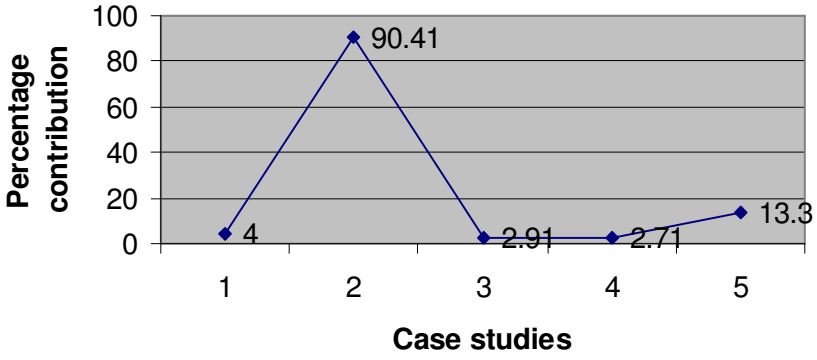


Figure 12: Percentage contribution of delay due to contractors or tradesmen engaged by the employer

The average percentage contribution of delay due to contractors or tradesmen engaged by the employer is calculated as **4.85%.**

Delay due to insufficient work rate by the contractor occurred in 18 cases. Figure 13 below shows the percentage contribution of delay due to an insufficient work rate by the contractor.

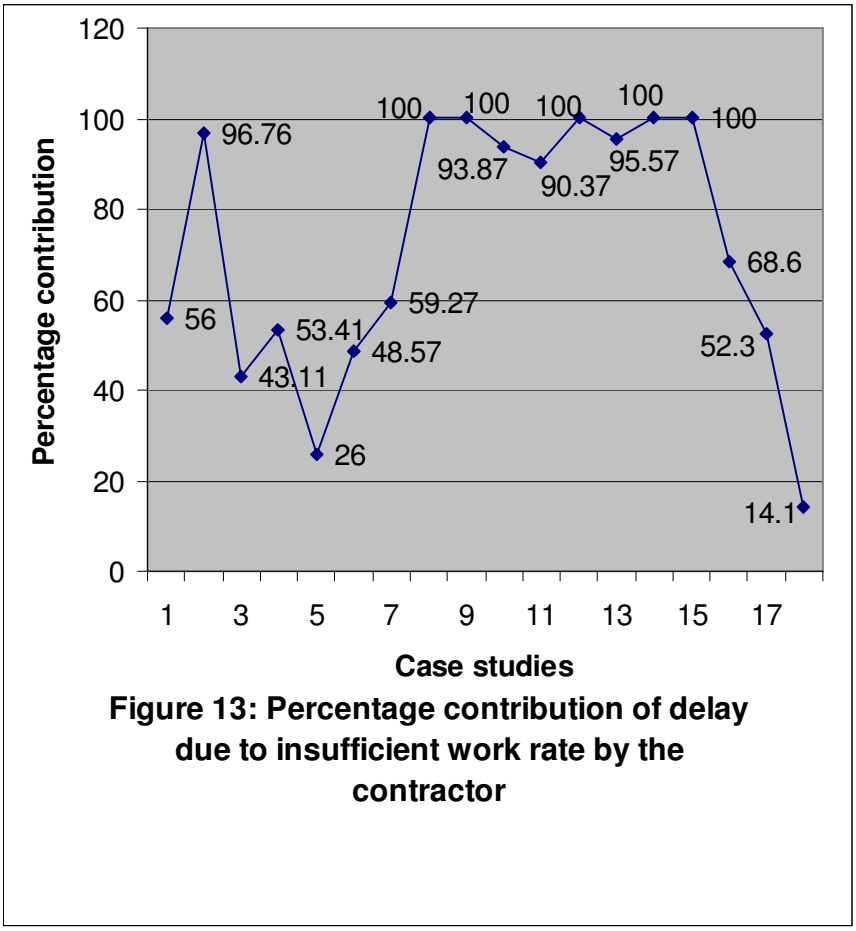


Figure 13: Percentage contribution of delay due to insufficient work rate by the contractor

The average percentage contribution of delay due to an insufficient work rate by the contractor is **56.43%.**

The causes of delay according to the percentage time contribution to delay are as follows:

Contribution			(%)
1.	Insufficient work rate by contractor	-	56.43%
2.	The permanent secretary's instructions	-	16.75%
3.	Nominated subcontractor or supplier	-	10.26%
4.	Late information	-	10.03%
5.	Contractors or tradesmen engaged by the employer	-	4.85%
6.	Exceptionally inclement weather	-	0.95%
7.	Civil commotion, strike or lockout, etc	-	0.73%
8.	Force majeure	-	0.00%
	Total	-	100.00%

3.4 Analysis of the data

In view of the hypothesis postulated that the majority of delays seem to be caused by factors which are within the contractor's control (i.e. insufficient work rate by the contractor), the case studies were aimed to determine what are the major causes of delays on government housing construction projects.

Once the above is answered, this could lead the researcher to determine whether the hypothesis postulated is affirmative or not.

The research carried out has revealed that the major causes of delays are insufficient work rate by the contractor, the permanent secretary's instructions, delay by nominated subcontractors or suppliers and late information (see Table 3.2 below).

Table 3.2: Frequency and percentage contribution to delayed time

Cause	Frequency	Contribution to delayed time (%)	Rank
Insufficient work rate by contractor	18	56.43	1
Permanent secretary's instructions	12	16.75	2
Nominated subcontractor or supplier	7	10.26	3
Late information	6	10.03	4
Contractors or tradesmen engaged by the employer	5	4.85	5
Exceptionally inclement weather	3	0.95	6
Civil commotion, strike or lockout, etc	1	0.73	7
Force majeure	0	0.00	8

From Table 3.2 above, it can also be noted that an insufficient work rate by the contractor has the highest occurrence (frequency) and the largest contribution to delay in terms of time. Civil commotion, strike or lockout, etc. has the least occurrence and the least contribution to delay in terms of time.

Figure 14 below indicates the percentage contribution to delayed time by delay factors.

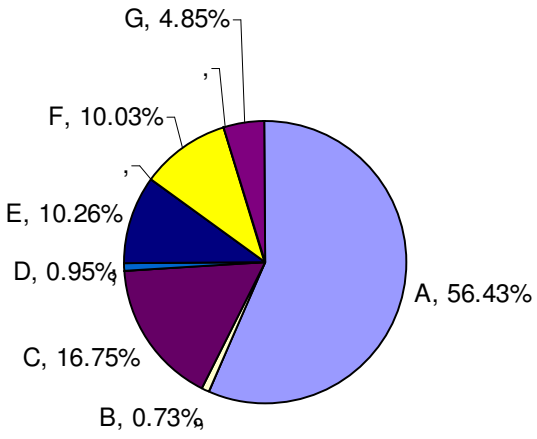


Figure 14 : Percentage contribution to delayed time by delay factors

Legend

A = Insufficient work rate by contractor

B = Civil commotion, strike or lockout, etc

C = The permanent secretary's instructions

D = Exceptionally inclement weather

E = Nominated subcontractor or supplier

F = Late information

G = Contractors or tradesmen engaged by the employer

From Figure 14 above, it can be seen that insufficient work rate by the contractor contributes over half of the total delayed time.

3.5 Testing of the hypothesis

The majority of delays seem to be caused by factors which are within the contractor's control.

The largest contribution to delays is insufficient work rate by the contractor. This is a factor which is within the contractor's control.

The findings do support this hypothesis.

3.6 Summary

The work in this chapter entailed determining the major causes of delays on government housing construction projects in Botswana.

The hypothesis postulated was that the majority of delays seem to be caused by factors which are within the contractor's control (i.e. insufficient work rate by the contractor).

The ex post facto research methodology was applied by extracting data from the records of past government housing projects by permission.

Exploratory data analysis techniques such as tables, charts and graphs, were utilised to interpret the data and demonstrate how it resolves the research problem.

The research revealed that the major causes of delay on government housing construction projects in order of occurrence are:-

1. insufficient work rate by the contractor
2. the permanent secretary's instructions
3. delay by nominated subcontractors or suppliers
4. late information

The hypothesis postulated that the majority of delays seem to be caused by factors which are within the contractor's control (i.e. insufficient work rate by the contractor) is supported.

The next chapter deals with the programming of resources by contractors. The research attempts to find out how contractors programme their resources and to determine whether the methods employed are appropriate to achieve completion on time or not.

CHAPTER 4

PROGRAMMING OF RESOURCES

4.1 Introduction

This chapter contains the analysis and interpretation of research findings pertaining to the programming of resources.

The sub-problem as stated in the first chapter was to determine how building contractors programme their resources. (Do building contractors programme their resources in a scientific responsible way?)

The hypothesis postulated was that some contractors do not employ appropriate programming methods to achieve completion on time.

The data for this sub-problem was obtained by a questionnaire to contractors and another questionnaire to consultant quantity surveying firms.

4.2 Data-collection method

Data was collected in the form of a questionnaire to construction firms registered in category C with the PPADB and to consultant quantity surveying firms. The questionnaires were pilot-tested by a few colleagues before distribution (see Annexures 3 and 4 for the questionnaires).

Pilot-testing is a process whereby a few friends or colleagues are given the questionnaire to fill out before it is sent to the respondents. Pilot testing was

necessary in order to find out whether there would be any difficulties in understanding any items on the questionnaire and also to make sure that the responses would be of sufficient quality to answer the research question.

Owing to the small size of the population, the whole population of construction companies and quantity surveying firms were used.

The aim of the questionnaire to the contractors was to find out how they programme their resources.

Fifty-one (51) questionnaires were distributed to all contractors registered with the PPADB in category C (see Annexure 7 for a list of citizen contractors).
Twenty-eight (28) questionnaires were returned. The survey response rate was 54.90 %.

The questionnaire to contractors was divided into three sections, namely

- Section A: This dealt with data concerning the company.
- Section B: This dealt with data concerning programming.
- Section C: This dealt with data concerning the determination of contract periods.

The sub-problem in this chapter concerns sections A and B.

Section A (data concerning the company) had seven questions which were structured on a mixture of matrix, choice and interval scale type of questions.

Section B (data concerning programming) had nine questions, which were structured on both choice and interval scale type of questions.

Twenty-five (25) questionnaires were distributed to all the quantity surveying firms.

Twenty-one (21) questionnaires were returned. The survey response rate was 84 %.

The questionnaire was divided into three sections, namely

- Section A: This dealt with data concerning contractor selection.
- Section B: This dealt with data concerning the programming of resources.
- Section C: This dealt with data concerning the determination of contract periods.

The sub-problem in this chapter concerns section B (data concerning contractor selection). Section B had 14 questions, which were structured on an interval scale. The interval scale was from" never "(1) to" always" (7) and the consultants had to circle the relevant number.

4.3 Results and data interpretation

The data obtained from the questionnaires was sent to the department of statistics at the University of Pretoria for both exploratory and confirmatory data analysis.

The data on the continuum scale from" never" (1) to" always" (7) was interpreted as follows:

1	-	Never
2	-	Hardly
3	-	Occasionally
4	-	Neutral
5	-	Sometimes
6	-	Frequently
7	-	Always

The results of the data obtained were interpreted using the one-way frequency procedure owing to the small sample population.

An example of how the highest frequency on a one-way frequency procedure was calculated and the interpretation of the results thereof are shown in Table 4.1.

Table 4.1: Example of how the highest frequency was calculated

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometime	Frequently	Always
Number of respondents (frequency)	0	0	1	1	4	6	8
Cumulative frequency	0	0	1	2	6	12	20
Percentage	0	0	5.00	5.00	20.00	30.00	40.00
Cumulative percentage	0	0	5.00	10.00	30.00	60.00	100.00

The interpretation of the results to the questions was done by taking the response with the highest frequency and percentage as the representative of the population. In Table 4.1 the interpretation of the response on the scale is 7, meaning" always".

4.3.1 Questionnaire to contractors

The questions on the questionnaire to the contractors were phrased as follows:

- ***How long have you been in business?***

This question sought to establish the experience of the contractors.

The results obtained are shown in Table 4.2 below.

Table 4.2: Contractor's number of years in business

Answer on scale	1	2	3	4	5
Meaning	Less than 5 years	5 to 10 years	11 to 15 years	16 to 20 years	More than 20 years
No of respondents (frequency)	2	13	6	2	5
Cumulative frequency	2	15	21	23	28
Percentage	7.14	46.43	21.43	7.14	17.86
Cumulative percentage	7.14	53.57	75.00	82.14	100.00

The research results indicate that most of the contractors had between 5 to 15 years' experience.

The highest frequency indicate a scale of **2 (5 to 10 years).**

- ***How many people does your company employ?***

This question sought to establish the workforce of the contractors.

The results obtained are shown in Table 4.3

Table 4.3: Workforce employed by contractors

Answer on scale	1	2	3	4	5
Meaning	Less than 50	51 to 200	201 to 400	401 to 600	Over 600
Number of respondents (frequency)	13	10	4	1	0
Cumulative frequency	13	23	27	28	28
Percentage	46.43	35.71	14.29	3.57	0
Cumulative percentage	46.43	82.14	96.43	100.00	100.00

The research results indicate that most of the contractors had a workforce of less than 200 people.

The highest frequency indicate a scale of **1 (less than 50).**

- ***What was your company's annual turnover for the last financial year?***

This question sought to find out what is the turnover of the contractors.

The results obtained are shown in Table 4.4.

Table 4.4: Contractor's turnover in 2003

Answer on scale	1	2	3	4	5
Meaning	Less than P1.8 million	P1.8m to P4.0m	P4.0m to P8.0m	P8.0m to P12.0m	Over P12.0 million
Number of respondents (frequency)	7	4	9	0	8
Cumulative frequency	7	11	20	20	28
Percentage	25.00	14.29	32.14	0	28.57
Cumulative percentage	25.00	39.29	71.43	71.43	100.00

The research results indicate that most of the contractors had a turnover of less than P8.0 million in the 2003 financial year.

The highest frequency indicate a scale of **3 (P4.0m to P8.0 million).**

- ***Please indicate the number of management personnel employed in your company in each of the following categories.***

The inquiry sought to establish the number of management personnel employed in each category.

Managing director/general manager

Table 4.5: Number of managing directors/general managers employed by contractors

Number of personnel scale	1	2	3
No of respondents (frequency)	19	8	1
Cumulative frequency	19	27	28
Percentage	67.86	28.57	3.57
Cumulative percentage	67.76	96.43	100.00

The research results as shown in Table 4.5 indicate that the highest frequency was **one managing director/general manager.**

Only nine companies had more than one managing director/general manager.

Contract/project manager

Table 4.6: Number of contract/project managers employed by contractors

Number of personnel	0	1	2	3	4	5
No. of respondents (frequency)	8	14	4	1	0	1
Cumulative frequency	8	22	26	27	27	28
Percentage	28.57	50.00	14.29	3.57	0	3.57
Cumulative percentage	28.57	78.57	92.86	96.43	0	100.00

The research results as shown in Table 4.6 indicate that the highest frequency was

one contracts/ project manager.

Six companies employed more than one contract/project manager.

Estimator/quantity surveyor.

Table 4.7: Number of estimators/quantity surveyors employed by contractors

Number of personnel	0	1	2	3
No. of respondents (frequency)	6	16	4	2
Cumulative frequency	6	22	26	28
Percentage	21.43	57.14	14.29	7.14
Cumulative percentage	21.43	78.57	92.86	100.00

The research results indicate that the highest frequency was **one estimator /quantity surveyor.**

Six companies indicated that they did not employ an estimator/quantity surveyor. This could mean that they either engaged the part-time services of an estimator/quantity surveyor or did not have work.

Six companies had more than one estimator/quantity surveyor.

Site agent/engineer

Table 4.8: Number of site agents/engineers employed by contractors

Number of personnel	0	1	2	3	4	5	6	7
No. of respondents (frequency)	2	9	5	3	5	0	3	1
Cumulative frequency	2	11	16	19	24	24	27	28
Percentage	7.14	32.14	17.86	10.71	17.86	0	10.71	3.57
Cumulative percentage	7.14	39.29	57.14	67.86	85.71	85.71	96.43	100.00

The research results indicate that the highest frequency was **one site agent/engineer**.

Sixteen companies employed more than one site agent/engineer up to a maximum of seven.

Site foreman

Table 4.9: Number of site foremen employed by contractors

Number of personnel	0	1	2	3	4	5	6	7	8	9	10	11	12
No. of respondents (frequency)	2	3	5	4	6	1	1	1	1	1	2	0	1
Cumulative frequency	2	5	10	14	20	21	22	23	24	25	27	27	28
Percentage	7.14	10.86	17.86	14.29	21.43	3.57	3.57	3.57	3.57	3.57	7.14	0	3.57
Cumulative percentage	7.14	17.86	35.71	50.00	71.43	75.00	78.57	82.14	85.71	89.29	96.43	96.43	100.00

The research results indicate that the highest frequency was **four site foremen.**

Two companies did not have site foremen which could mean they did not have work.

Eight companies had more than four site foreman up to a maximum of twelve.

- ***What qualifications do your management personnel possess?***

This question sought to establish the level of qualifications of the management personnel.

The results obtained are shown as follows:

Managing director/general manager

Table 4.10: Qualification of managing directors/general managers

Answer on scale	1	2	3	4	5	6
Meaning	Trade certificate	City & guild	Diploma	Bachelor's & honours degree	Master's degree	Doctorate
No. of respondents (frequency)	3	10	7	9	3	0
Cumulative frequency	3	13	20	29	32	32
Percentage	9.38	31.25	21.87	28.12	9.38	0
Cumulative percentage	9.32	40.63	62.50	90.62	100.00	100.00

The results of the research indicate that the highest frequency was **2 (City and Guilds).**

Only eleven persons (37.50%) had a bachelor's or master's degree.

Contract/project manager

Table 4.11: Qualification of contract/project managers

Answer on scale	1	2	3	4	5	6
Meaning	Trade Cert.	City & guild	Diploma	Bachelor's & honours degree	Master's degree	Doctorate
No. of respondents (frequency)	0	0	15	12	1	0
Cumulative frequency	0	0	15	27	28	28
Percentage	0	0	53.57	42.85	3.58	0
Cumulative percentage	0	0	53.57	96.42	100.00	100.00

The results of the research indicate that the highest frequency was **3 (diploma).**

One person (3.58%) had a master's degree and twelve persons (42.85%) had bachelor's or honours degrees.

Estimator/quantity surveyor

Table 4.12: Qualification of estimators/quantity surveyors

Answer on scale	1	2	3	4	5	6
Meaning	Trade cert.	City & guild	Diploma	Bachelor's & honours degree	Master's degree	Doctorate
No. of respondents (frequency)	0	0	2	20	0	0
Cumulative frequency	0	0	2	22	22	22
Percentage	0	0	9.09	90.91	0	0
Cumulative percentage	0	0	9.09	100.00	100.00	100.00

The results of the research indicate that the highest frequency was **4 (bachelor's & honours degrees).**

Six companies did not indicate anything. This could either mean that they did not have work or engaged the part-time services of an estimator/quantity surveyor whose qualifications were unknown to them.

Site agent/engineer

Table 4.13: Qualification of site agents/engineers

Answer on scale	1	2	3	4	5	6
Meaning	Trade cert.	City & guild	Diploma	Bachelor's & honours degree	Master's degree	Doctorate
No. of respondents (frequency)	1	6	13	11	0	0
Cumulative frequency	1	7	20	31	31	31
Percentage	3.22	19.35	41.94	35.49	0	0
Cumulative percentage	3.22	22.57	64.51	100.00	100.00	100.00

The research results indicate that the highest frequency was **3 (diploma).**

About 35% of the site agents/engineers had bachelor's and honours degree.

Site foreman

Table 4.14: Qualification of site foremen

Answer on scale	1	2	3	4		
Meaning	Trade cert.	City & guild	Diploma	Bachelor's & honours degree	Master's degree	Doctorate
No. of respondents (frequency)	21	5	4	0	0	0
Cumulative frequency	21	26	30	30	30	30
Percentage	70.00	16.66	13.34	0	0	0
Cumulative percentage	70.00	86.66	100.00	100.00	100.00	100.00

The research results indicate that the highest frequency was **1 (trade certificate).**

- ***Which of the following personnel are responsible for the programming of the construction projects that your company undertakes?***

Table 4.15: Personnel responsible for programming of construction projects

Answer on scale	1	2	3	4	5
Meaning	Managing director/ general manager	Contract/ projects managers	Estimators/ quantity surveyors	Site agents/ engineers	Site foremen
No. of respondents (frequency)	8	17	10	15	0
Cumulative frequency	8	25	35	50	50
Percentage	16.00	34.00	20.00	30.00	0
Cumulative percentage	16.00	50.00	70.00	100.00	100.00

The results of the research indicated that the highest frequency was 2 (Contract/projects manager).

The second highest frequency was 4 (site agents/engineers).

None of the companies involved the foremen in the programming of the construction projects.

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- ***Is the plant or equipment which the company hires regularly available when required?***

The question sought to determine whether contractors experience difficulties with hiring plant when required.

The results obtained are shown in Table 4.16.

Table 4.16: Availability of plant for hire

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequency	Always
No. of respondents (frequency)	1	0	1	7	11	4	4
Cumulative frequency	1	1	2	9	20	24	28
Percentage	3.57	0	3.57	25.00	39.29	14.29	14.29
Cumulative percentage	3.57	3.57	7.14	32.14	71.43	85.71	100.00

The results of the research indicate that the highest frequency was **5 (sometimes).**

Only one company indicated that the plant is never available when required.

- ***Which planning techniques does your company utilise in programming for construction projects?***

This question sought to establish the common planning techniques utilised by contractors.

The results of the research are shown in Table 4.17 below.

Table 4.17: Planning techniques utilised in programming for construction projects

Answer on scale	1	2	3	4	5	6
Meaning	Simple bar chart	Time-linked/ Gantt chart	Line of balance	Critical path method	Precedence diagram	Other
No. of respondents (frequency)	9	23	0	6	0	1
Cumulative frequency	9	32	32	38	38	39
Percentage	23.07	58.97	0	15.38	0	2.58
Cumulative percentage	23.07	82.04	82.04	97.42	97.42	100.00

The results of the research indicate that the highest frequency was **2 (time-linked/Gantt chart).**

The line of balance and precedence diagram methods are not utilised by the contractors.

- ***Which of the planning techniques are you familiar with?***

This question sought to find out which planning techniques the contractors are familiar with.

The results of the research are shown in Table 4.18 below.

Table 4.18: Planning techniques which contractors are familiar with

Answer on scale	1	2	3	4	5
Meaning	Simple bar chart	Time-linked/ Gantt chart	Line of balance	Critical path method	Precedence diagram
No. of respondents (frequency)	23	20	3	13	3
Cumulative frequency	23	43	46	59	62
Percentage	37.09	32.25	4.85	20.96	4.85
Cumulative percentage	37.09	69.34	74.19	95.15	100.00

The research results indicate that the highest frequency was **1 (simple bar charts)**.

Only three contractors from the sample population were familiar with the line of balance and precedence diagram methods of programming.

- ***Critical paths are shown on your programme.***

This statement sought to establish whether contractors show critical paths on their programmes.

The research results are shown in Table 4.19.

Table 4.19: Extent to which critical paths are shown on programmes

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	2	1	4	5	4	4	8
Cumulative frequency	2	3	7	12	16	20	28
Percent	7.14	3.57	14.29	17.86	14.29	14.29	28.57
Cumulative percentage	7.14	10.71	25.00	42.86	57.14	71.43	100.00

The research results indicate that the highest frequency was **7 (always).**

Three contractors from the sample population indicated that they never or hardly show the critical path on their programmes.

- ***Extension of time claims are based on the critical path.***

This statement sought to establish whether the contractor's extensions of time claims are based on the critical path.

The research results are shown in Table 4.20 below.

Table 4.20: Extent to which extension of time claims are based on the critical path

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequency	Always
No of respondents (frequency)	1	2	1	4	4	6	10
Cumulative frequency	1	3	4	8	12	18	28
Percentage	3.57	7.14	3.57	14.29	14.29	21.43	35.71
Cumulative percentage	3.57	10.71	14.29	28.57	42.86	64.29	100.00

The research results indicate that the highest frequency was **7 (always**).

Three contractors from the sample population indicated that their claims for extension of time are never or hardly based on the critical path.

- ***Plant and labour resources are matched to the programme.***

This statement sought to establish whether plant and labour resources are considered when drawing up the construction programme.

The research results are shown in Table 4.21 below.

Table 4.21: Extent to which plant and labour resources are considered when drawing up a construction programme

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	frequently	Always
No. of respondents (frequency)	4	6	1	4	4	2	7
Cumulative frequency	4	10	11	15	19	21	28
Percentage	14.29	21.43	3.57	14.29	14.29	7.14	25.00
Cumulative percentage	14.29	35.71	39.29	53.57	67.86	75.00	100.00

The research results indicate that the highest frequency was **7 (always).**

Of the sample population 35.71% indicated that plant and labour resources are never or hardly matched to their programme.

- ***Labour shortages are experienced in urban areas.***

This statement sought to establish whether the contractors experience any labour shortages in urban areas.

The results of the research are shown in Table 4.22 below.

Table 4.22: Extent to which labour shortages are experienced in urban areas

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	frequently	Always
No. of respondents (frequency)	7	10	5	5	1	0	0
Cumulative frequency	7	17	22	27	28	28	28
Percentage	25.00	35.71	17.88	17.86	3.57	0	0
Cumulative percentage	25.00	60.71	78.57	96.43	100.00	100.00	100.00

The research results indicated that the highest frequency was **2 (hardly).**

Of the sample population 60.71% indicated that they never or hardly experience labour shortages in urban areas.

- ***Labour shortages are experienced in remote areas.***

The statement sought to establish whether the contractors experience any labour shortages in remote areas.

The results of the research are shown in Table 4.23 below.

Table 4.23: Extent to which labour shortages are experienced in remote areas

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	0	3	5	2	6	9	3
Cumulative frequency	0	3	8	10	16	25	28
Percentage	0	10.71	17.86	7.14	21.43	32.14	10.71
Cumulative percentage	0	10.71	28.57	35.71	57.14	89.29	100.00

The research results indicate that the highest frequency was **6 (frequently).**

- ***Work study is conducted on projects to determine output rates which will be utilised for future tenders.***

This statement sought to determine whether contractors carry out work studies to determine output rates (i.e. production rates, for example the number of bricks one bricklayer can lay per hour) in order to determine the number of resources required to complete work in time

for future tenders.

The results of the research are shown in Table 4.24 below.

Table 4.24: Extent to which work study is conducted on projects

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	9	5	1	5	1	5	2
Cumulative frequency	9	14	15	20	21	26	28
Percentage	32.14	17.86	3.57	17.86	3.57	17.86	7.14
Cumulative percentage	32.14	50.00	53.57	71.43	75.00	92.86	100.00

The research results indicate that the highest frequency was **1 (never).**

Only 25% of the sample population indicated 5 (sometimes) to 7 (always).

- ***We are prepared to show our methods of programming to justify our claim for extension of time.***

This statement sought to determine whether the contractors are prepared to show their methods of programming to justify their claim for extension of time.

The results of the research are shown in Table 4.25

Table 4.25: Extent to which contractors are prepared to show their methods of programming

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	2	1	1	3	6	5	10
Cumulative frequency	2	3	3	7	13	18	28
Percenaget	7.14	3.57	3.57	10.71	21.43	17.86	35.71
Cumulative percentage	7.14	10.71	10.71	25.00	46.43	64.29	100.00

The research results indicate that the highest frequency was **7 (always).**

4.3.2 Questionnaire to consultants

The questionnaires to consultants were phrased as follows:

- ***Programme requirements are stated in tender documents.***

This statement sought to establish whether the tender documents state the programme requirements from contractors.

The research results are shown in Table 4.26 below

Table 4.26: Extent to which programme requirements are stated in tender documents

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	2	0	0	0	7	6	6
Cumulative frequency	2	2	2	2	9	15	21
Percentage	9.52	0	0	0	33.33	28.57	28.57
Cumulative percentage	9.52	9.52	9.52	9.52	42.86	71.43	100.00

The results of the research indicate that the highest frequency was **5 (sometimes).**

- ***Simple bar chart programmes are produced by contractors.***

This statement sought to establish to what extent contractors produce simple bar chart programmes.

The results of the research are shown in Table 4.27 below.

Table 4.27: Extent to which contractors produce simple bar chart programmes

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	0	0	1	3	6	7	4
Cumulative frequency	0	0	1	4	10	17	21
Percentage	0	0	4.76	14.29	28.57	33.33	19.05
Cumulative percentage	0	0	4.76	19.05	47.62	80.95	100.00

The results of the research indicate that the highest frequency was **6 (frequently).**

- ***Time-linked/Gantt chart programmes are produced by contractors.***

The statement sought to establish to what extent contractors produce time-linked/Gantt chart programmes.

The results of the research are shown in Table 4.28

Table 4.28: Extent to which contractors produce time-linked/Gantt chart programmes

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	0	3	6	5	3	0	4
Cumulative frequently	0	3	9	14	17	17	21
Percentage	0	14.29	28.57	23.81	14.29	0	19.05
Cumulative percentage	0	14.29	42.86	66.67	80.95	80.95	100.00

The results of the research indicate that the highest frequency was **3 (occasionally).**

- **Line of balance programmes are prepared by contractors**.

The statement sought to establish to what extent contractors produce line of balance programmes.

The results of the research are shown in Table 4.29 below.

Table 4.29: Extent to which contractors prepare line of balance programmes

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	8	4	2	5	1	0	0
Cumulative frequency	8	12	14	19	20	20	20
Percentage	40.00	20.00	10.00	25.00	5.00	0	0
Cumulative percentage	40.00	60.00	70.00	95.00	100.00	100.00	100.00

The results of the research indicate that the highest frequency was **1 (never).**

- ***Critical path method of programming is produced by contractors.***

The statement sought to establish to what extent critical path method of programming are produced by contractors.

The results of the research are shown in Table 4.30 below.

Table 4.30: Extent to which the critical path method of programming is produced by contractors

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequently)	4	1	4	8	2	0	2
Cumulative frequency	4	5	9	17	19	19	21
Percentage	19.05	4.76	19.05	38.10	9.52	0	9.52
Cumulative percentage	19.05	23.81	42.86	80.95	90.48	90.48	100.00

The results of the research indicate that the highest frequency was **4 (neutral).**

Most contractors could neither confirm nor deny that they utilise the critical path method of programming.

- ***Precedence diagrammes are produced by the contractors.***

The statement sought to establish to what extent precedence diagrammes are produced by the contractors.

The results of the research are shown in Table 4.31.

Table 4.31: Extent to which precedence diagrammes are produced by the contractors

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequently)	13	4	1	3	0	0	0
Cumulative frequency	13	17	18	21	21	21	21
Percentage	61.90	19.05	4.76	14.29	0	0	0
Cumulative percentage	61.90	80.95	85.71	100.00	100.00	100.00	100.00

The results of the research indicate that the highest frequency was **1 (never).**

Precedence diagrammes are never produced by the contractors.

- ***Labour schedules are shown on the contractor's programmes.***

This statement sought to establish whether contractors show labour schedule on their programmes.

The results of the research are shown in Table 4.32 below.

Table 4.32: Extent to which contractors show labour schedules on their programmes

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	16	3	1	1	0	0	0
Cumulative frequency	16	19	20	21	21	21	21
Percentage	76.19	14.29	4.76	4.76	0	0	0
Cumulative percentage	76.19	90.48	95.24	100.00	100.00	100.00	100.00

The results of the research indicate that the highest frequency was **1 (never).**

Most contractors never show labour schedules on their programmes.

- ***Plant schedules are shown on the contractor's programmes.***

This question sought to establish to what extent plant schedules are shown on the contractor's programmes.

The results of the research are shown in table 4.33 below.

Table 4.33: Extent to which plant schedules are shown on contractor's programmes

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	14	6	0	1	0	0	0
Cumulative frequency	14	20	20	21	21	21	21
Percentage	66.67	28.57	0	4.76	0	0	0
Cumulative percentage	66.67	95.24	95.24	100.00	100.00	100.00	100.00

The results of the research indicate that the highest frequency was **1 (never).**

Most contractors never show plant schedules on their programmes.

- ***Construction programmes are produced by the managing directors/general managers.***

The statement sought to establish whether programmes are produced by managing directors/general managers.

The results of the research are shown in Table 4.34.

Table 4.34: Extent to which construction programmes are produced by managing directors/general managers

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	6	6	1	4	2	1	1
Cumulative frequency	6	12	13	17	19	20	21
Percentage	28.57	28.57	4.76	19.05	9.52	4.76	4.76
Cumulative percentage	28.57	57.14	61.90	80.95	90.48	95.24	100.00

The results of the research indicate that the highest frequencies were **1 (never**) and 2 **(hardly).** Construction programmes are never produced by managing directors/general managers.

- ***Construction programmes are produced by contracs/project managers.***

  This statement sought to establish to what extent are construction programmes produced by contract/project managers.

  The results of the research are shown in Table 4.35 below.

Table 4.35: Extent to which construction programmes are produced by contract /project managers

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	0	2	1	1	2	11	4
Cumulative frequency	0	2	3	4	6	17	21
Percentage	0	9.52	4.76	4.76	9.52	52.38	19.05
Cumulative percentage	0	9.52	14.29	19.05	28.57	80.95	100.00

The results of the research indicate that the highest frequency was **6 (frequently).**

Construction programmes are mostly produced by contract/project managers.

- ***Construction programmes are produced by estimators/quantity surveyors.***

The results of the research are shown in Table 4.36 below.

Table 4.36: Extent to which construction programmes are produced by estimators/quantity surveyors

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	0	4	2	8	2	2	3
Cumulative frequency	0	4	6	14	16	18	21
Percentage	0	19.05	9.52	38.10	9.52	9.52	14.29
Cumulative percentage	0	19.05	28.57	66.67	76.19	85.71	100.00

The results of the research indicate that the highest frequency was **4 (neutral).**

The majority of the respondents were from" neutral" down to" hardly".

- ***Construction programmes are produced by site agents/engineers.***

  This statement sought to establish to what extent are construction programmes produced by

  site agents/engineers.

  The results of the research are shown in Table 4.37.

Table 4.37: Extent to which construction programmes are produced by site agents/engineers

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	4	2	6	6	1	1	0
Cumulative frequency	4	6	12	18	19	20	20
Percentage	20.00	10.00	30.00	30.00	5.00	5.00	20
Cumulative percentage	20.00	30.00	60.00	90.00	95.00	100.00	100.00

The results of the research indicate that the highest frequencies were **3 (occasionally**) and

4 (neutral).

Only one respondent did not attempt to answer this question.

- ***Construction programmes are produced by the site foremen.***

  This statement sought to establish to what extent are construction programmes produced by

  the site foremen.

  The results of the research are shown in Table 4.38 below.

Table 4.38: Extent to which construction programmes are produced by site foremen

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	11	7	0	2	1	0	0
Cumulative frequency	11	18	18	20	21	21	21
Percentage	52.38	33.33	0	9.52	4.76	0	0
Cumulative percentage	52.38	85.71	85.71	95.24	100.00	100.00	100.00

The results of the research indicate that the highest frequency was **1 (never).**

Construction programmes are never produced by site foremen.

- ***Insufficient work rate by the contractor is the likely cause of project delays***.

This statement sought to solicit the consultant's opinion on whether insufficient work rate by the contractor is the likely cause of project delays.

The results of the research are shown in Table 4.39 below

Table 4.39: Consultants' opinion on whether insufficient work rate by the contractor is the likely cause of project delays

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	0	1	0	8	1	5	6
Cumulative frequency	0	1	1	9	10	15	21
Percentage	0	4.76	0	38.10	4.76	23.81	28.57
Cumulative percentage	0	4.76	4.76	42.86	47.62	71.43	100.00

The results of the research indicate that the highest frequency was **4 (neutral).**

The majority of the responses were between **4 (neutral**) and **7 (always).**

Most consultants could neither confirm nor deny that insufficient work rate by the contractor is the likely cause of project delays.

4.4 Analysis of the data

In view of the hypothesis postulated, namely that some contractors do not employ appropriate programming methods to achieve completion on time, the questionnaires to contractors and consultants were aimed at finding out the following:

1. a general profile of contractors in category C

2. qualifications of management personnel and persons responsible for programming
3. planning techniques utilised by contractors
4. consultant's views regarding programming by contractors

Once the above factors have been answered, this could lead the researcher to determine whether the hypothesis postulated is affirmative or not.

Most of the building contractors registered with the PPADB in category C have between 5 and 10 years' experience and employ a workforce of less than 200 people.

The turnover in the financial year 2003 of most building contractors was between P4 million and P8 million.

Six companies indicated that they did not have an estimator which could mean that they either had no work or engaged the services of part-time estimators/quantity surveyors.

Only two companies indicated that they did not have a site foreman. This could only mean they had no work.

The qualifications of most personnel from managing director to site foremen using the highest frequency were as follows:

1. Managing director/general manager
    - city & guilds
2. Contract/project manager
    - diploma
3. Estimator/quantity surveyor
    - degree
4. Site agent
    - diploma

5 Site foreman
    - trade certificate

In most of the construction firms, the contract/project manager and the site agent are responsible for programming. Most of the contract/project managers and site agents are qualified with diplomas. They may not posses the necessary requirements to make complex programmes such as the line of balance and the critical path method. The site foremen in all the construction firms are not involved in programming.

Most of the construction firms have indicated that plant or equipment which they hire is sometimes available when required.

Figure 15 below shows the planning techniques utilised by contractors.

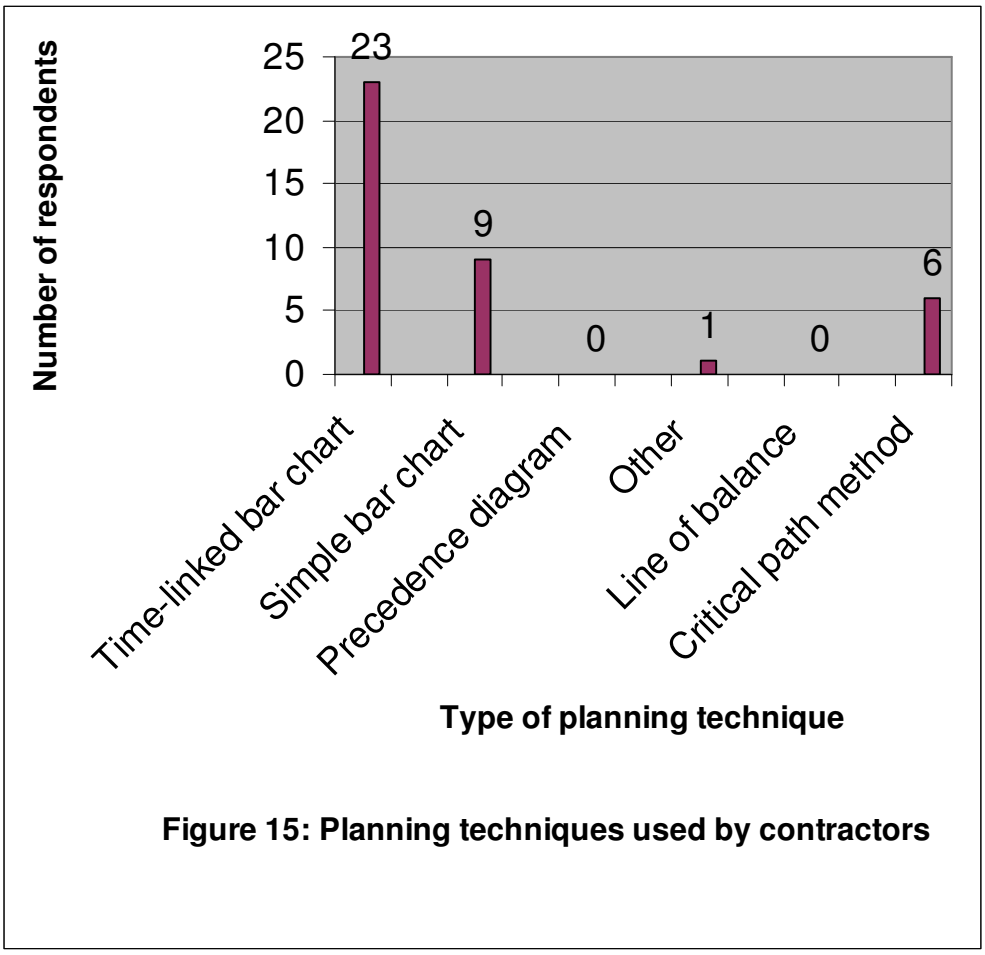

Figure 15: Planning techniques used by contractors

The research findings indicate that time linked bar charts are more commonly used than any other type by contractors.

Line of balance and precedence diagrams are never used by contractors. The consultants have also attested to this in their questionnaire response. In housing projects, the line of balance method of programming is the most appropriate to employ due to the repetitive nature of work.

In this regard, the time-linked bar chart method utilised by most contractors is not the most appropriate programming method for housing projects.

Most contractors have indicated that work study is never conducted to determine the output rates for future tenders and the programming of resources. It is not known how the contractors determine programme durations without determining output rate. This falls beyond the scope of the study.

Consultants have also indicated that labour and plant schedules are never shown on the contractor's programmes. It is therefore difficult to determine whether the rate of progress is affected by insufficient labour on plant.

In view of the above, the researcher established that none of the contractors is utilising the most appropriate method of programming and persons at the operational level, like site foremen, are not involved in the programming of construction projects.

4.5 Testing of the hypothesis

Contractors do not employ appropriate programming methods to achieve completion on time.

The findings do support this hypothesis.

4.6 Summary

The work in this chapter entailed investigating the programming techniques which contractors employ and determining the suitability of these techniques to housing projects.

The hypothesis postulated was that some contractors do not employ appropriate programming methods to achieve completion on time.

The data required for this research emanated from contractors and consultants. A survey was required to determine the programming techniques utilised by contractors at that time. The data required was not on record, this meant posing questions to contractors and consultants. The descriptive survey research methodology utilising questionnaires was employed.

Both exploratory and confirmatory data analysis techniques were used to interpret the data and demonstrate how it resolves the research problem.

The research revealed that time-linked bar charts, which are not very appropriate for mass housing projects, are mostly used. The line of balance technique, which is very appropriate for mass housing projects, is hardly ever used by contractors.

The hypothesis postulated that some contractors do not employ appropriate programming methods to achieve completion on time, is supported.

The next chapter deals with the contract procurement strategy. It attempts to determine whether the contract procurement strategy used is adequate to detect potential delays.

CHAPTER 5

CONTRACT PROCUREMENT STRATEGY

5.1 Introduction

This chapter contains an analysis and interpretations of research findings pertaining to contract procurement strategy.

The sub-problem as stated in the first chapter was to determine whether the employer's contract procurement strategy was adequate to detect potential delay. (Is the employer's contract procurement strategy adequate enough to detect potential delays?)

The hypothesis postulated was that the employer's contract procurement strategy is not adequate to detect potential delays.

According to Asworth (1992: 83), contract selection depends on the employer's objectives and requirement methods which are available. The employer's objectives, in broad terms, usually are function, economy, cost, quality, aesthetics and time. The employer should determine the order of preference of his objectives.

The data for this sub-problem was obtained by a questionnaire to government-registered quantity surveying firms in Botswana.

Quantity surveying firms and not architectural or engineering firms were selected for the questionnaire due to the fact that tender reports for government housing construction projects are prepared by quantity surveying firms.

There are twenty-five (25) quantity surveying firms registered with the government of the Republic of Botswana to carry out all aspects of quantity surveying.

5.2 Data-collection method

Data was collected in the form of a questionnaire to quantity surveying firms. The questionnaire was pilot-tested by a few colleagues before distributing it (see Annexure 4 for the questionnaire).

Pilot testing was necessary in order to find out whether there would be any difficulties in understanding any items on the questionnaire and also to make sure that the responses would be of sufficient quality to answer the research question.

Owing to the size of the population under consideration, the whole population of quantity surveying firms was used.

The aim of the questionnaire was to find out what consultants do, think or feel regarding contractor selection criteria.

Twenty-five (25) questionnaires were distributed to all quantity surveying firms.

Twenty-one (21) questionnaires were returned. The survey response rate was 84%.

The questionnaire was divided into three sections, namely

- Section A: This dealt with data concerning contractor selection.

- Section B: This dealt with data concerning the programming of resources

- Section C: This dealt with data concerning the determination of contract periods.

The sub-problem in this chapter only concerns section A (data concerning contractor selection). Section A had fifteen questions, which were structured on a rating scale using a continuum and provisions for relevant comments.

The continuum used was from “never” (1) to” always” (7) and the consultants had to circle the relevant number.

5.3 Results and data interpretation

The data obtained from the questionnaires was sent to the department of statistics at the University of Pretoria for both exploratory and confirmatory data analysis.

The data on the continuum scale from” never” (1) to” always” (7) was interpreted as follows:

1	-	Never
2	-	Hardly
3	-	Occasionally
4	-	Neutral
5	-	Sometimes
6	-	Frequently
7	-	Always

The results of the data obtained were interpreted using the one-way frequency procedure owing to the small sample population.

An example of how the highest frequency on a one-way frequency procedure was calculated, as well as the interpretation of the results thereof shown in Table 5.1.

Table 5.1: An example of how the highest frequency was calculated

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
Number of respondents (frequency)	0	1	0	9	6	2	3
Cumulative frequency	0	1	1	10	16	18	21
Percentage	0	4.76	0	42.86	28.57	9.52	14.29
Cumulative percentage	0	4.76	4.76	47.62	76.19	85.71	100.00

The interpretation of the results to the questions was done by taking the response with the highest frequency and percentage as the representative of the population. In Table 5.2 above, the interpretation of the response on the scale is 4, meaning" neutral".

The questionnaire was phrased as follows:

- ***The client states his objectives for the project in terms of time.***
  This statement sought to establish whether the client stipulates the time requirements for the project adequately.

The results obtained are shown in Table 5.2 .

Table 5.2: Extent to which the client stipulates the time requirements for the project

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	0	1	0	9	6	2	3
Cumulative frequency	0	1	1	10	16	18	21
Percentage	0	4.76	0	42.86	28.57	9.52	14.29
Cumulative percentage	0	4.76	4.76	47.62	76.19	85.71	100.00

The research results indicate that there was more variance with the highest frequency of the respondents being **neutral.**

Most consultants could neither confirm nor deny whether the client stipulates the time requirements for the project.

- ***The client states his objectives for the project in terms of cost***

This statement sought to establish whether the client adequately stipulates his requirements in terms of cost.

The results obtained are shown in Table 5.3.

Table 5.3: Extent to which the client states his objectives for the project in terms of cost

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
Number of respondents (frequency)	0	1	0	2	2	7	9
Cumulative frequency	0	1	1	3	5	12	21
Percentage	0	4.76	0	9.52	9.52	33.33	42.86
Cumulative percentage	0	4.76	4.76	14.29	23.81	57.14	100.00

The research results indicate that most of the respondents were inclined from "neutral" to" always".

The highest frequency indicates a scale of **7 (always).** Most consultants indicated that the client always states his objectives in terms of cost.

- ***The client states his objectives in terms of quality***

This statement sought to establish whether the client adequately stipulates his requirements in terms of quality.

The results obtained are shown in Table 5.4.

Table 5.4: Extent to which it is important for the client to states his objectives in terms of quality

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	frequently	Always
No. of respondents (frequency)	1	6	4	2	2	2	4
Cumulative frequency	1	7	11	13	15	17	21
Percentage	4.76	28.57	19.05	9.52	9.52	9.52	19.05
Cumulative percentage	4.76	33.33	52.38	61.90	71.43	80.95	100.00

The highest frequency mean indicates a scale of 2 **(hardly).**

Most consultants indicated that the client rarely states his objectives in terms of quality.

- ***It is important for the client to state his objectives for the project in terms of time***.

The statement sought to establish the consultan's opinions in terms of the importance of the client in stipulating the project time.

The results obtained are shown in Table 5.5.

Table 5.5: Extent to which it is important for the client to state his objectives in terms of Time

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	0	0	0	2	4	5	10
Cumulative frequency	0	0	0	2	6	11	21
Percentage	0	0	0	9.52	19.05	23.81	47.62
Cumulative percentage	0	0	0	9.52	28.57	52.38	100.00

The highest frequency mean indicated a scale of **7 (always).**

Most of the consultants felt it is always important for the client to state his objectives in terms of time.

- ***It is important for the client to state his objectives for the project in terms of cost.***

The statement sought to establish the consultant's opinions in terms of the importance of the client in stipulating the cost of the project.

The results obtained are shown in Table 5.6.

Table 5.6: Extent to which it is important for the client to state his objectives in terms of cost

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	0	0	0	0	1	7	13
Cumulative frequency	0	0	0	0	1	8	21
Percentage	0	0	0	0	4.76	33.33	61.90
Cumulative percentage	0	0	0	0	4.76	38.10	100.00

The highest frequency indicates a scale of **7 (always).**

The majority of the consultants felt it is always important for the client to state his objectives in terms of cost.

- ***It is important for the client to state his objectives in terms of quality.***

The statement sought to establish the consultant's opinions in terms of the importance of the client stipulating the quality requirements of the project.

The results obtained are shown in Table 5.7.

Table 5.7: Extent to which it is important for the client to state his objectives in terms of quality

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	0	0	1	1	4	6	8
Cumulative frequency	0	0	1	2	6	12	20
Percentage	0	0	5.00	5.00	20.00	30.00	40.00
Cumulative percentage	0	0	5.00	10.00	30.00	60.00	100.00

Frequency missing = 1

One respondent did not answer this question hence frequency of one missing.

The highest frequency indicated a scale of **7 (always).**

Most of the consultants felt that it is always important for the client to stipulate the quality requirements of the project**.**

Figure 16 shows the percentage of consultant's opinions regarding the importance of clients stating their objectives in terms of time, cost and quality.

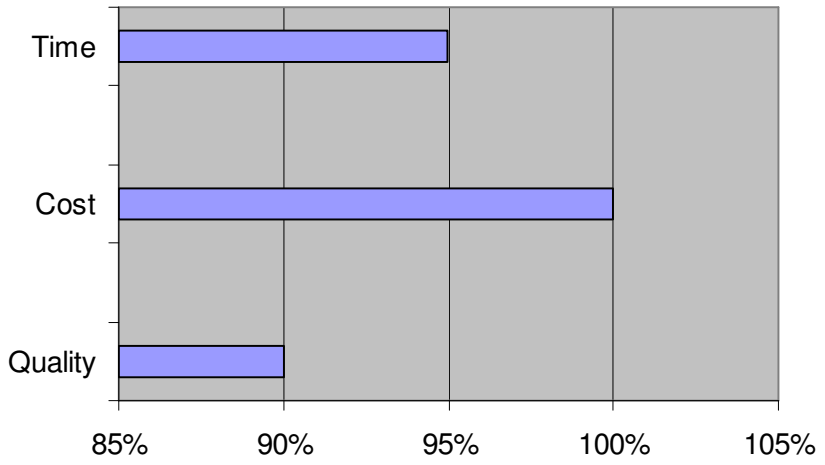

Figure 16: Percentage of consultants' opinions regarding the importance of clients stating their objectives

The client stating his objectives in terms of cost had the highest percentage.

The results obtained in order of importance were as follows:-

1. cost (13 respondents)
2. time (10 respondents)
3. quality (8 respondents)

- ***When evaluating tenders, the lowest price is recommended for award***

This statement sought to establish whether consultants recommend the award of tenders based on the lowest price.

The results obtained are shown in Table 5.8.

Table 5.8: Extent to which the lowest price is recommended for award when evaluating tenders

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	1	2	3	4	3	5	3
Cumulative frequency	1	3	6	10	13	18	21
Percentage	4.76	9.52	14.29	19.05	14.29	23.81	14.29
Cumulative percentage	4.76	14.29	28.57	47.62	61.90	85.71	100.00

There was a broad variance of indications obtained from "never" to " always".

The highest frequency indicates a scale of **6 (frequently).**

Most consultants indicated that the lowest price is frequently recommended.

- ***When evaluating tenders, experience, workmanship and capability to complete the project by the tenderer is considered.***

This statement sought to establish to what extent consultants consider the tenderer's experience, workmanship and capability to complete the project in their tender evaluation.

The results obtained are shown in Table 5.9.

Table 5.9: Extent to which experience, workmanship and capability to complete the project by the tenderer are considered when evaluating tenders

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequency	Always
No. of respondents (frequency)	0	0	1	4	4	5	7
Cumulative frequency	0	0	1	5	9	14	21
Percentage	0	0	4.76	19.05	19.05	23.81	33.33
Cumulative percentage	0	0	4.76	23.81	42.86	66.67	100.00

The highest frequency indicates a scale of **7 (always).**

Most consultants consider the experience, workmanship and capability to complete the project by the tenderer when evaluating tenders.

- ***When evaluating tenders, the qualifications and experience of personnel to be deployed in the project are considered.***

The statement sought to establish to what extent consultants consider qualifications and experience of personnel to be deployed in the project when evaluating tenders.

The results obtained are shown in Table 5.10.

Table 5.10: Extent to which qualifications and experience of personnel to be deployed are considered when evaluating tenders

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	0	2	6	1	2	7	3
Cumulative frequency	0	2	8	9	11	18	21
Percentage	0	9.52	28.57	4.76	9.52	33.33	14.29
Cumulative percentage	0	9.52	38.10	42.86	52.38	85.71	100.00

The response varied from 2 to 7 on the Likert scale. The highest frequency indicates a scale of **6 (frequently).** Consultants frequently consider the qualifications and experience of personnel to be deployed in the project when evaluating tenders.

- ***When evaluating tenders, the financial stability of a tenderer is considered.***

The statement sought to establish to what extent consultants consider the financial stability of a tenderer when evaluating tenders.

The results obtained are shown in Table 5.11.

Table 5.11: Extent to which the financial stability of a tenderer is considered when evaluating tenders

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	1	2	4	7	1	4	2
Cumulative frequency	1	3	7	14	15	19	21
Percentage	4.76	9,52	19.05	33.33	4.76	19.05	9.52
Cumulative percentage	4.76	14.29	33.33	66.67	71.43	90.48	100.00

The response varied from 1 to 7 on the Likert scale. The highest frequency indicates a scale of **4 (neutral).**

Most consultants could neither confirm nor deny whether the financial stability of a tenderer is considered when evaluating tenders.

- ***When evaluating tenders, the plant resources of a tenderer are considered.***

The statement sought to establish to what extent consultants considered plant resources of a tenderer when evaluating tenders.

The results obtained are shown in Table 5.12.

Table 5.12: Extent to which plant resources of a tenderer are considered when evaluating tenders

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	0	3	3	6	6	1	2
Cumulative frequency	0	3	6	12	18	19	21
Percentage	0	14.29	14.29	28.57	28.57	4.76	9.52
Cumulative percentage	0	14.29	28.57	57.14	85.71	90.48	100.00

The response varied from 2 to 7 on the Likert scale.The highest frequencies indicate a scale of **4 (neutral)** and **5 (sometimes).**

The researcher chose to adopt the frequency of **5 (sometimes)** since it has the highest cumulative percentage of 85.71.

Consultants at times consider plant resources of a tenderer when evaluating tenders.

- ***The Diekman value model is used for contractor selection.***

The Diekman value model was explained to the respondents in a footnote in the questionnaire. The statement sought to establish to what extent the Diekman model is used by consultants in contractor selection.The results obtained are shown in Table 5.13.

Table 5.13: Extent to which the Diekman model is used for contractor selection

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	13	2	2	1	1	0	0
Cumulative frequency	13	15	17	18	19	19	19
Percentage	68.42	10.53	10.53	5.26	5.26	0	0
Cumulative percentage	68.42	78.95	89.47	94.74	100.00	100.00	100.00

Frequency missing = 2

Two respondents did not answer this question hence frequency of two missing.

The response varied from 1 to 5 on the Likert scale. The highest frequency indicates a scale of **1 (never).**

Most consultants never use the Diekman model for contractor selection. The respondents were given an opportunity at the end of the questionnaire to indicate any alternative models used for contractor selection, which might be used in their firms. Only one respondent indicated that their firm utilised a matrix analysis system. The definition and function of the matrix analysis system is beyond the scope of this study.

- ***Projects undertaken by contractors not recommended by consultants, but chosen by the client, result in delays.***

The statement sought to solicit opinions from consultants on how they feel about projects undertaken by contractors not recommended by them, but chosen by the client, in terms of project delays.

The results obtained are shown in table 5.14 as follows:-

Table 5.14: Extent to which projects undertaken by contractors not recommended by consultants, but chosen by the client, result in delay

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	1	2	0	4	3	7	3
Cumulative frequency	1	3	3	7	10	17	20
Percentage	5.00	10.00	0	20.00	15.00	35.00	15.00
Cumulative percentage	5.00	15.00	15.00	35.00	50.00	85.00	100.00

Frequency missing = 1

One respondent did not answer this question hence frequency of one missing.The response varied from 1 to 7 on the Likert scale. The highest frequency indicates a scale of **6 (frequently).**

Most consultants were of the opinion that projects which are undertaken by contractors not recommended by consultants, but chosen by the client, result in delay.

- ***Tenderers are given the opportunity to be shown the mistakes in their bids which could adversely affect their cash flow***

The statement sought to establish to what extent are tenderers given the opportunity to be shown the mistakes which could adversely affect the cash flow in their bids.

The results obtained are shown in Table 5.15.

Table 5.15: Extent to which tenderers are given the opportunity to be shown the mistakes in their bids which could adversely affect their cash flow

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	0	2	2	2	1	5	9
Cumulative frequency	0	2	4	6	7	12	21
Percentage	0	9.52	9.52	9.52	4.76	23.81	42.86
Cumulative percentage	0	9.52	19.05	28.57	33.33	57.14	100.00

The response varied from 2 to 7 on the Likert scale. The highest frequency indicates a scale of **7 (always).**

Most consultants always afford tenderers the opportunity to be shown the mistakes which could adversely affect their cashflow.

5.4 Analysis of the data

In view of the hypothesis postulated, namely that some delays can be avoided at selection stage if a proper criterion is instigated, the questionnaire aimed at establishing the following:

1. whether the client's objectives pertaining to time, quality and cost are always adequately stated
2. whether the lowest tenderer is always recommended
3. whether other factors such as experience, qualifications of personnel, financial stability and plant resources of the tenderers are considered
4. whether any model of contractor selection is followed to justify fairness

Once the above factors are answered, this could lead the researcher to determine whether the hypotheses posted are affirmative or not.

Figure 17 below shows the relationship between the stated (by client) and expected (by consultant) levels of the client's objectives utilising the highest frequencies.

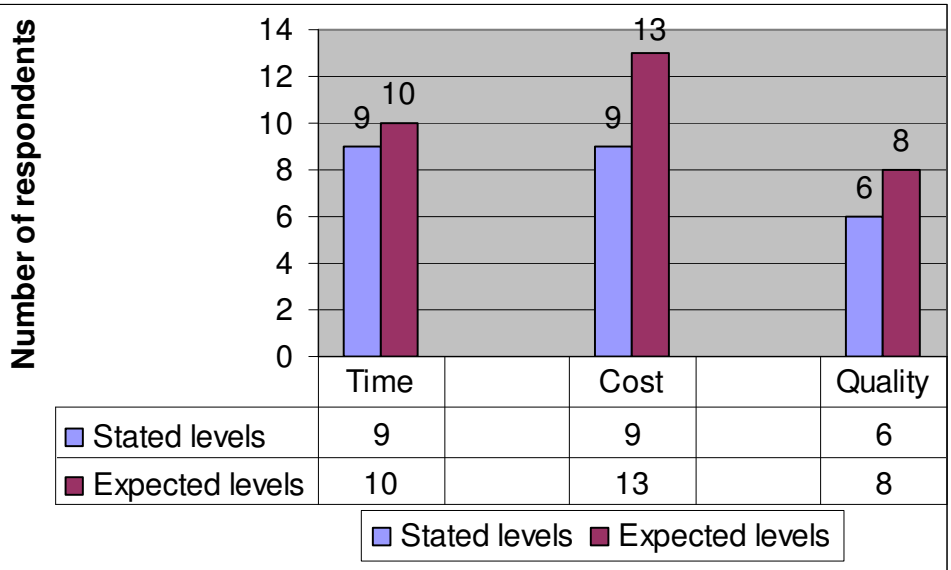

Figure 17: Stated and expected levels of clients' objectives

From Figure 17 above it can be seen that the client's objectives stated in terms of time, cost and quality are exceeded by the consultant's expectations from the client.

The above shows that the client's objectives are not adequately stated.

It could be argued that the client need not state his objectives in terms of quality because of the existence of a government specification on quality and workmanship

.

The research indicates that the lowest price is recommended frequently.

The lowest tenderer might not necessarily mean a saving on the part of the client, but it might also indicate poor pricing leading to delays due to financial constraints especially when the lowest tender is far below the consultant's budget.

Figure 18 below shows the extent to which factors such as qualifications and experience of personnel, tenderer's experience, workmanship and capability, financial stability and plant resources are considered by consultants at tender evaluation stage.

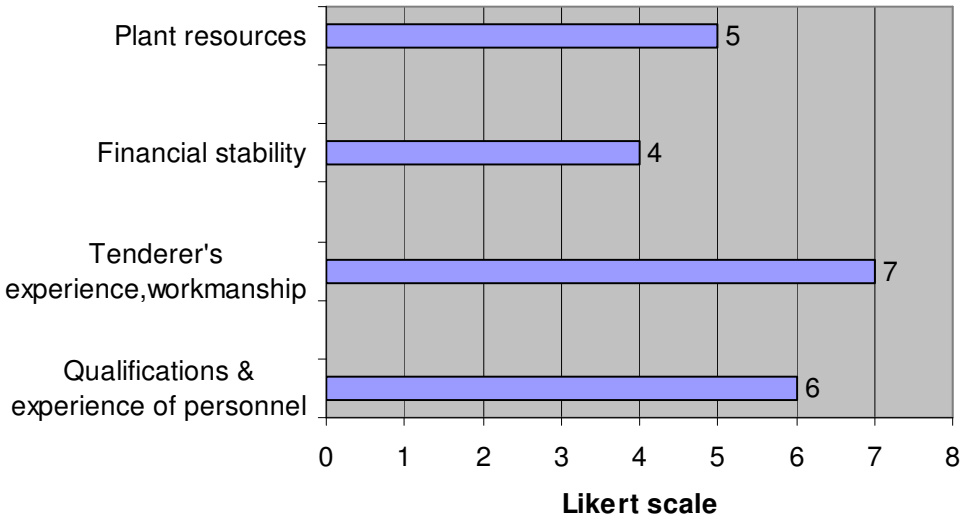

Figure 18: Extent to which other factors are considered by consultants at tender evaluation stage

It is clear from the above that factors such as plant resources and financial stability of the tenderer are occasionally considered.

The reason why financial stability of tenderers is occasionally considered could be that citizen contractors are entitled to a mobilisation advance loan of up to 15%, hence no need to be strict on the financial stability of the tenderers.

Plant resources may also be considered occasionally by consultants owing to the fact that single-storey housing, unlike multi-storey office blocks and the like, do not require a lot of sophisticated equipment.

Qualifications and experience of project personnel, tenderer's experience, workmanship and capability are well considered.

In view of the above, the researcher concludes that factors such as qualifications and experience of personnel, Tenderer's experience, workmanship and capability, plant resources and financial stability are adequately considered.

Only one out of the 21 respondents which represents 5% of the sample population uses a model for contractor selection.

It is not established how the other consultants justify fairness in their recommendations, since most of the consultants indicated that tenderers are given the opportunity to be shown the mistakes in their bids which could affect their cash flow. Some degree of fairness in their recommendation could be considered.

5.5 Testing of the hypothesis

The employer's contract procurement strategy is not adequate to detect potential delays.

The findings do not support this hypothesis.

5.6 Summary

The research in this chapter entailed determining whether the contract procurement strategy was adequate to detect potential delays.

The hypothesis postulated was that the employer's contract procurement strategy is not adequate to detect potential delays.

The data required for this research emanated from consultants. A survey was required to determine whether the contract procurement strategy was adequate to detect potential delays. The data required was not on record, this meant posing questions to consultants. The descriptive survey research methodology utilising questionnaires was employed.

Both exploratory and confirmatory data analysis techniques were used to interpret the data and demonstrate how it resolves the research problem.

The research revealed the following:

1. Client's objectives are adequately stated.
2. Factors such as experience, qualifications of personnel, financial stability and plant resources of the tenderers are considered.
3. The lowest tenderer is recommended in most instances.
4. A model for contractor selection is seldom applied, but tenderers are given the opportunity to be shown their mistakes in the bids which could adversely affect their cash flow.

The hypothesis postulated that the employer's contract procurement strategy is not adequate to detect potential delay is not supported.

The next chapter deals with determination of contract periods in an attempt to establish whether contract periods are determined realistically.

CHAPTER 6

DETERMINATION OF CONTRACT PERIODS

6.1 Introduction

This chapter contains analysis and interpretations of research findings pertaining to the determination of contract periods.

The sub-problem stated in the first chapter was to establish whether contract periods are determined realistically. (Are the contract periods determined realistically?)

The hypothesis postulated was that construction periods are not determined realistically.

The data for this sub-problem was obtained from questionnaires completed by contractors and consultant quantity surveying firms.

6.2 Data-collection method

Data was collected in the form of a questionnaire to construction firms registered in category C with the PPADB and consultant quantity surveying firms. The questionnaires were pilot-tested before distribution (see Annexures 3 and 4 for the questionnaires).

Due to the small size of the population, the whole population of construction companies and quantity surveying firms were used.

The aim of the questionnaire to the contractors was to find out who they felt should determine the construction period and how they felt about unrealistic periods.

Fifty-one (51) questionnaires were distributed to all contractors registered with the PPADB in category C (see Annexure 7 for a list of citizen contractors).

Twenty-eight (28) questionnaires were returned. The survey response rate was 54.90%.

The questionnaire to contractors was divided into three sections, namely

- Section A: This dealt with data concerning the company.
- Section B: This dealt with data concerning programming.
- Section C: This dealt with data concerning the determination of contract periods.

The sub-problem in this chapter was concerns Section C.

Section 3 (data concerning the determination of contract periods) had three questions structured on the interval type of questions.

Twenty-five (25) questionnaires were distributed to all quantity surveying firms.

Twenty-one (21) questionnaires were returned. The survey response rate was 84%.

The aim of the questionnaire to consultants was to establish how construction periods are determined.

The questionnaire was divided into three sections, namely

- Section A: This dealt with data concerning contractor selection.
- Section B: This dealt with data concerning the programming of resources.
- Section C: This dealt with data concerning the determination of contract periods.

The sub-problem in this chapter is concerns Section C (data concerning determination).

Section C had eight questions, which were structured on an interval scale.

The interval scale was from " never" (1) to "always" (7) and consultants had to circle the relevant number.

6.3 Results and data interpretation

The data obtained from the questionnaires was sent to the department of statistics at the University of Pretoria for both exploratory and confirmatory data analysis.

The data on the interval scale from "never" (1) to "Always" (7) was interpreted as follows:

1. - Never

2 - Hardly

3 - Occasionally

4 - Neutral

5 - Sometimes

6 - Frequently

7 - Always

The results of the data obtained were interpreted using a one-way frequency procedure owing to the small population.

An example of how the highest frequency on a one-way frequency procedure was calculated, and the interpretation of the results thereof, are shown in table 6.1.

Table 6.1: Example of how the highest frequency was calculated

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	1	0	5	4	3	4	3
Cumulative frequency	1	1	6	10	13	17	20
Percentage	5.00	0	25.00	20.00	15.00	20.00	15.00
Cumulative percentage	5.00	5.00	30.00	50.00	65.00	85.00	100.00

The interpretation of the results to the questions was done by taking the response with the highest frequency and percentage as the representative of the population. In table 6.1 above the response with the highest frequency is **5** which falls under **occasionally**.

6.3.1 Questionnaire to contractors

The questions to the contractors were phrased as follows:

- ***Consultants should determine and stipulate the contract periods in tender documents*.**

The statement sought to establish the contractors' view regarding who should determine the contract periods.

The results obtained are shown in Table 6.2.

Table 6.2: Extent to which consultants should determine and stipulate the contract periods in tender documents

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	8	1	2	3	3	4	7
Cumulative frequency	8	9	11	14	17	21	28
Percentage	28.57	3.57	7.14	10.71	10.71	14.29	25.00
Cumulative percentage	28.27	32.14	39.29	50.00	60.71	75.00	100.00

The results of the research indicate that the highest frequency was **1 (never).**

Most of the contractors are of the opinion that consultants should never determine and stipulate the contract periods in tender documents.

- ***Contractors should determine the contract periods in tenders.***

This statement sought to find out the contractors' view regarding who should determine the contract periods.

The results obtained are shown in Table 6.3.

Table 6.3: Extent to which contractors should determine the contract period in tenders

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	6	4	0	2	2	5	9
Cumulative frequency	6	10	10	12	14	19	28
Percentage	21.43	14.29	0	7.14	7.14	17.86	32.14
Cumulative percentage	21.43	35.71	35.71	50.00	50.00	67.86	100.00

The results of the research indicate that the highest frequency was **7 (always).**

Most of the contractors are of the opinion that contractors should always determine the contract periods.

- ***Projects should be awarded to contractors even when they have quoted a shorter construction period than realistic/normal.***

The results obtained are shown in Table 6.4.

Table 6.4: Extent to which projects should be awarded to contractors even when they have quoted a shorter construction period than realistic/normal

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	16	1	1	9	1	0	0
Cumulative frequency	16	17	18	27	27	28	28
Percentage	57.14	3.57	3.57	32.14	32.14	0	0
Cumulative percentage	57.14	60.71	64.71	64.29	100.00	100.00	100.00

The results of the research indicate that the highest frequency was **1 (never).**

Most contractors are of the opinion that projects should never be awarded to contractors who quote a shorter construction period than realistic.

6.3.2 Questionnaire to consultants

The questions to the consultants were phrased as follows:

- ***Contract periods are stipulated in tender documents.***

The statement sought to find out from consultants whether contract periods are stipulated in tender documents.

The results of the research obtained are shown in Table 6.5.

Table 6.5: Extent to which contract periods are stipulated in tender documents

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	0	1	1	7	6	2	4
Cumulative frequency	0	1	2	9	15	17	21
Percentage	0	4.76	4.76	33.33	28.57	9.53	19.05
Cumulative percentage	0	4.76	9.52	42.85	71.42	80.95	100.00

The results of the research indicate that the highest frequency was 4 **(neutral).**

The majority of the respondents (90.48%) are indicated on the scale from **4 (neutral)** to 7 **(always).**

Consultants are not steadfast on stipulating contract periods in their tender documents. A few of them always stipulate the contract periods whilst others at times do not.

- ***Past experience is used in determining construction periods.***

This statement sought to establish whether consultants use past experience to determine the construction periods.

The results of the research obtained are shown in Table 6.6.

Table 6.6: Extent to which past experience is used in determining construction periods

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	1	0	2	0	3	10	6
Cumulative frequency	1	1	2	2	5	15	21
Percentage	4.76	0	4.76	0	14.29	47.62	28.57
Cumulative percentage	4.76	4.76	9.52	9.52	23.81	71.43	100.00

The results of the research indicate that the highest frequency was 6 **(frequently).**

Consultants almost always use past experience to determine construction periods.

- ***The formula developed by Dr CP de Leeuw is used to determine construction periods.***

This statement sought to establish whether Dr CP de Leeuw formula to determine construction periods.

The results of the research obtained are shown in Table 6.7.

Table 6.7: Extent to which the formula developed by Dr CP de Leeuw is used to determine construction periods

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	16	1	1	2	0	0	0
Cumulative frequency	16	17	18	20	20	20	20
Percentage	80.00	5.00	5.00	10.00	0	0	0
Cumulative percentage	80.00	85.00	90.00	100.00	100.00	100.00	100.00

One respondent did not answer this question.

The results of the research indicate that the highest frequency was 1 **(never).**

Consultants never use the formula developed by Dr CP de Leeuw to determine construction periods.

- ***Other methods apart from the above are used to determine construction periods***.

This statement sought to find out if consultants use any other methods than those stated above to determine construction periods.

The results of the research obtained are shown in Table 6.8.

Table 6.8: Extent to which other methods apart from the formula developed by Dr CP de Leeuw are used to determine construction periods

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	8	1	2	2	1	1	4
Cumulative frequency	8	9	11	13	14	15	19
Percent	42.11	5.26	10.53	10.53	5.26	5.26	21.05
Cumulative percentage	42.11	47.37	57.89	68.42	73.68	78.95	100.00

Two respondents did not answer this question.

The results of the research indicate that the highest frequency was 1 **(never).**

Consultants are not utilising any other formulas to determine construction periods.

- ***When determining construction periods, the project location is taken into consideration.***

This statement sought to find out whether consultants consider the location of the project when determining construction periods.

The results of the research obtained are shown in Table 6.9.

Table 6.9: Extent to which the project location is taken into consideration when determining construction periods

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No. of respondents (frequency)	1	0	1	1	3	4	11
Cumulative frequency	1	1	2	3	6	10	21
Percentage	4.76	0	4.76	4.76	14.29	19.05	52.38
Cumulative percentage	4.76	4.76	9.52	14.29	28.57	47.62	100.00

The results of the research indicate that the highest frequency was 7 **(always).**

Consultants always take into consideration the project location when determining construction periods.

- ***When determining construction periods, the optimisation of labour and plant resources by the contractor is considered.***

This statement sought to find out whether consultants take into account the optimisation of labour and plant resources by the contractor when determining construction periods.

The results of the research obtained are shown in Table 6.10.

Table 6.10: Extent to which the optimisation of labour and plant resources by the contractor is considered when determining construction periods

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	3	0	1	8	6	1	2
Cumulative frequency	3	3	4	12	18	19	21
Percentage	14.29	0	4.76	38.10	28.57	4.76	9.52
Cumulative percentage	14.29	14.29	19.05	57.14	85.71	90.48	100.00

The results of the research indicate that the highest frequency was **4 (neutral).**

Most consultants are silent on this issue. They have neither agreed nor denied that the optimisation of labour and plant resources by the contractors' are considered when determining construction periods.

- ***Contractors normally complain about the construction periods determined by consultants, being short.***

This statement sought to find out whether consultants encounter any problem from contractors when they stipulate the contract periods.

The results of the research obtained are shown in Table 6.11.

Table 6.11: Extent to which contractors normally complain about construction periods, determined by consultants, being short

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	1	3	1	7	3	2	4
Cumulative frequency	1	4	5	12	15	17	21
Percentage	4.76	14.29	4.76	33.33	14.29	9.52	19.05
Cumulative percentage	4.76	19.05	23.81	57.14	71.43	80.95	100.00

The results of the research indicated that the highest frequency was 4 **(neutral)**.

Contractors seldom complain about construction periods, determined by consultants, being short.

- ***Contractors claim extension of time due to shorter periods specified by consultants.***

This statement sought to find out whether contractors try to justify their extension of time claims by claiming that shorter periods were stipulated by consultants.

The results of the research obtained are shown in Table 6.12.

Table 6.12: Extent to which contractors claim extension of time due to shorter periods specified by consultants

Answer on scale	1	2	3	4	5	6	7
Meaning	Never	Hardly	Occasionally	Neutral	Sometimes	Frequently	Always
No of respondents (frequency)	2	4	5	5	1	4	0
Cumulative frequency	2	6	11	16	17	21	21
Percentage	9.52	19.05	23.81	23.81	4.76	19.05	0
Cumulative percentage	9.52	28.57	52.38	76.19	80.95	100.00	100.00

The results of the research indicate that the highest frequencies were **3 (occasionally)** and **4 (neutral).**

Contractors occasionally claim extension of time due to shorter periods specified by the consultants.

- ***If you are using other methods to determine the contract periods apart from the ones specified above, please state here below the method used by your firm.***

This was an open statement to consultants.

The comments received were as follows:

- Estimates of time are made using the major components of the project and given the cost estimate, average cash flow.
- Tender periods are guessed by looking at the expected tender sum.

- ***Relevant comments***

A provision for relevant comments was made in the questionnaire.

The comments received were as follows:

- Contract periods should be tied to the complexity of the project and location.
- Construction periods should be determined by the contractor who manages the resources.
- Based on past experience of a project, a realistic time can be used to evaluate tenders.

6.4 Analysis of the data

In view of the hypothesis postulated, namely that construction periods are not realistically determined, the questionnaires aimed at finding out the following:

1. the contractors' opinion on who should determine the contract period
2. whether the methods used by consultants to determine contract periods are realistic
3. whether contractors complain about the construction period determined by Consultants

Once the above factors have been answered, this could lead the researcher to determine whether the hypothesis posted is affirmative or not.

In September 1999, the DBES (formerly the department of architecture and building services) issued a circular to all quantity surveying consultants instructing them to determine and insert in the form of tender the construction periods for projects in conjunction with the client and co-consultants (see Annexure 8).

Figure 19 below shows the response of levels of contractors regarding the determination of contract periods.

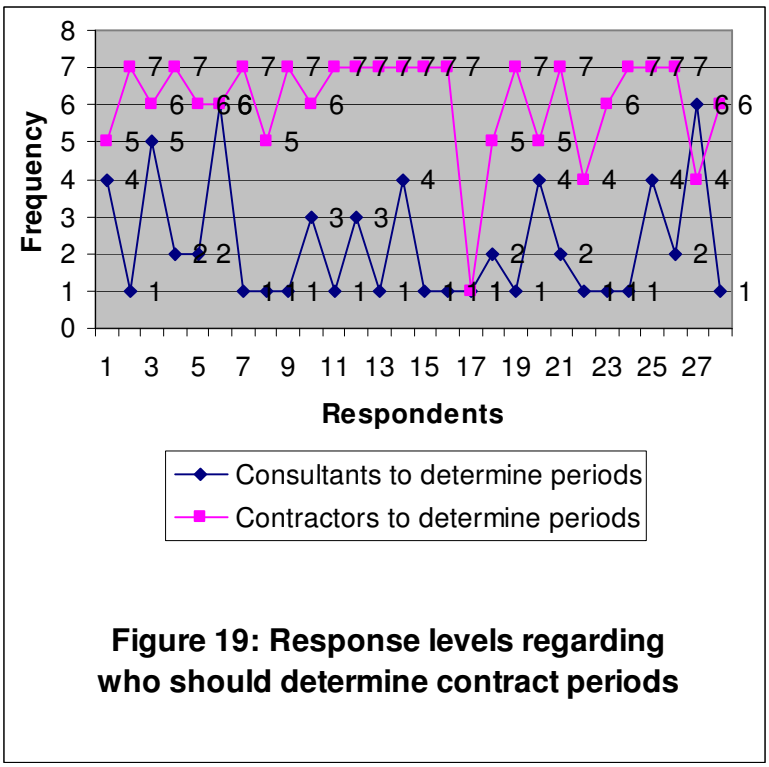

Figure 19: Response levels regarding who should determine contract periods

It can be seen from the above that the response from contractors indicating that contractors should determine contract periods was higher than that of consultants determining contract periods.

When contractors were asked whether consultants should determine contract periods, the highest frequency from the responses received was 1 **(never).**

When contractors were asked whether they should determine contract periods themselves, the highest frequency from the responses received was 7 **(always).**

It is therefore evident that more contractors preferred to determine the contract periods themselves.

Furthermore, most contractors felt that projects should not be awarded to contractors with unrealistic construction periods.

Figure 20 below indicates the methods utilised by contractors to determine contract periods.

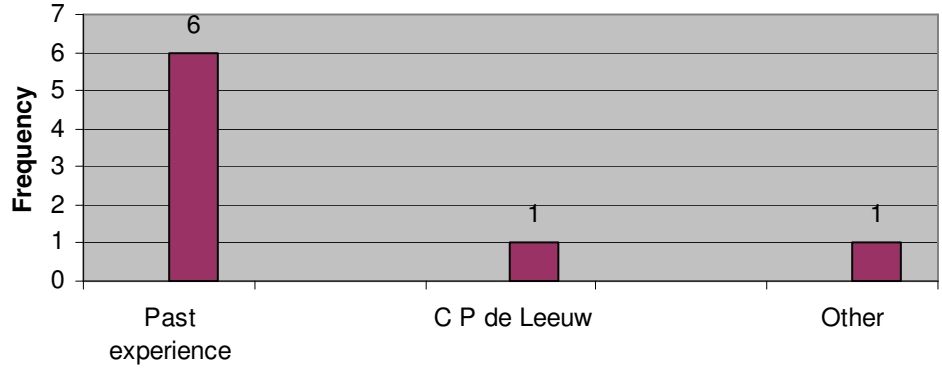

Figure 20: Methods used by consultants to determine construction periods

Past experience seems to be the most common method of contract period determination by consultants. The C.P de Leeuw formula or similar formula is seldom used.

One respondent indicated that another method used to determine the contract period is by considering the estimate of cost.

The research findings indicate that when considering the contract periods, most consultants always take into account the location of the project.

When consultants were asked if contractors complain about the contract periods being short the response by many consultants were neutral.

Many consultants were again neutral when asked if they receive extension of time claims by contractors claiming that the stipulated periods were short.

6.5 Testing of the hypothesis

Construction periods are not determined realistically.

The findings do not support this hypothesis.

6.6 Summary

Analysis of the data has established the following:

1. Most contractors prefer to determine the contract periods themselves.
2. Most consultants use past experience when determining construction periods. They also take into account the project location. This method seems realistic although not scientific in manner.
3. Extension of time claims by contractors due to shorter construction periods

stipulated by consultants are of a rare occurrence.

The next chapter consists of the summary, conclusion and recommendations. It summarises the main parts of the research and brings it to a conclusion. This last chapter also offers recommendations aimed at reducing delays on government housing construction projects and offers suggestions for future research.

CHAPTER 7

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

Delays on construction projects can be expected, but the stakeholders must understand the causes in order to minimise them.

Delays on construction projects need to be minimised due to the inconvenience and unexpected costs that are encountered by both the employers and the contractors.

This study focused on identifying and evaluating the major causes of delays on government housing construction projects in Botswana with a view to recommending more effective and efficient measures of reducing these delays.

7.2 Summary

Chapter 1 presented an introduction to the problem and its setting. It was stated that there is concern about the spate of delays on government housing projects in Botswana. Chapter 1 therefore stated the problem with four sub-problems. Each of the sub-problems had a hypothesis to be tested. The sub-problems are covered more fully in the conclusion of this chapter.

In chapter 2 the literature review related to the problem, as well as the sub-problems set out in chapter 1, were dealt with. *Delays* were defined and the

provisions for extension of the construction period, planning techniques, contract strategies and methods of determining contract periods that are being used in the building industry globally were identified.

Chapters 3, 4, 5 and 6 were devoted to the four sub-problems, with each chapter dedicated to one sub-problem.

7.3 Conclusions

7.3.1 Sub-problem 1

To identify the major causes of delays on selected government housing projects and rank them in order of occurrence. (What are the major causes of delays on selected government housing projects?)

The case studies revealed the causes of delays in order of occurrence and percentage contribution to delay time as follows:

- Insufficient work rate by the contractor (56.43%)
- The permanent secretary's instructions (16.75%)
- Nominated subcontractors or suppliers (10.26%)
- Late information (10.03%)
- Contractors or tradesmen engaged by the employer (4.85%)
- Exceptionally inclement whether (0.95%)
- Civil commotion, strike or lockout, etc (0.73%)
- Force majeure (0.00%)

From the above, the four major causes of delays in order of significance were as follows:

- insufficient work rate by contractors
- the permanent secretary's instructions
- nominated sub-contractors or suppliers
- late information

7.3.2 Hypothesis to sub-problem 1

The majority of delays seem to be caused by factors which are within the contractor's control.

Considering the analysis and interpretations of the findings related to sub-problem 1, the hypothesis was found to be affirmative.

7.3.3 Sub-problem 2

To evaluate how contractors programme their resources. (Do building contractors employ appropriate programming methods to achieve completion on time?)

Responses from questionnaires were interpreted using the highest frequency (score). These responses revealed that:

- In most construction firms the contract/project managers are responsible for programming.
- Most of the contract/project managers are qualified up to diploma level.
- Site foremen do not participate in programming.
- Time-linked bar charts are commonly used by contractors.
- Line of balance and Precedence diagramme methods programming are never used by contractors.
- Most contractors indicated that they never conduct work studies to determine output rates for future tenders and the programming of resources.

7.3.4 Hypothesis to sub-problem 2

Contractors do not employ appropriate programming methods to achieve completion on time.

The findings related to sub-problem 2 support the hypothesis.

7.3.5 Sub-problem 3

To determine whether the contract procurement strategy used is adequate to detect potential delays. (is the contract procurement strategy adequate enough to detect potential delays?)

The responses from questionnaires completed by consultants were interpreted using the highest frequency (score). It was established that:

- Clients' objectives are stated adequately.
- Other factors such as experience, qualification of personnel, financial stability and plant resources of tenderers are considered during tender evaluation.
- A model for contractor selection is seldom applied, but tenderers are given the opportunity to be shown their mistakes in the bids which could adversely affect their cash flow.

7.3.6 Hypothesis to sub-problem 3

The employer's contract procurement strategy is not adequate to detect potential delays.

Although a model for contractor selection is seldom applied by consultants, the findings revealed that almost all attributes to be taken into account at contractor selection are considered.

The findings therefore do not support this hypothesis.

7.3.7 Sub-problem 4

To evaluate how contract periods are determined. (Are contract periods determined realistically?)

Responses from questionnaires to both consultants and contractors were interpreted using the highest frequency (score) and this revealed that past experience is used to determine construction periods.

7.3.8 Hypothesis to sub-problem 4

Construction periods are not determined realistically.

Although using past experience is not scientific in manner, it appears to be a realistic way of determining construction periods.

The findings therefore do not support this hypothesis.

7.4 Recommendations and proposals for further research

1. This research established that most delays are caused by an insufficient work rate by contractors and that the most appropriate programming methods are not employed. Therefore intervention by voluntary associations such as Tshipidi Badiri Builders Association (TBBA) is

necessary by introducing short courses in construction management for all personnel involved in the planning process. Certificates of attendance to these courses should be produced by contractors before any projects are awarded to them.

2. Consultants should prescribe requirements for most appropriate programmes, such as line of balance, as mandatory in the tender submissions in order to force contractors to familiarise themselves to these programmes.
3. In order to reduce delays due to the permanent secretary's instructions, project management professionals should be engaged by the government to manage the total scope of work so that variations due to additional work can be minimised.
4. Contractors should be encouraged to employ specialist subcontractors on a domestic basis instead of nominated subcontractors provided the required criteria are met. This will help reduce delays due to nominated subcontractors or suppliers.
5. In order to reduce delays due to late information, consultants who submit information late without any specific reason should be surcharged by the client at a predetermined rate.
6. To ensure consistency in tender adjudication a model such as the Diekman value model should be adopted by the consultant quantity surveyors. This would also help the quantity surveyors not to overlook

other important factors which should be taken into consideration when adjudicating tenders and also show impartiality on their part.

7. Construction periods should be determined by consultants. This will help in assessing tenders on the basis of price alone.

8. The study is limited to the causes of delays for which the contractor is entitled to extension of the construction period under the Botswana Government building contract. It is recommended that further study should be undertaken to establish the occurrence and influence of other grounds of extension of time which are covered in other building contracts, such as the JBCC 2000, but not covered in the Botswana Government building contract.

9. The study is limited to identifying the types of programmes utilised by contractors. It was not attempted to study how contractors determine contract durations, especially as it has been established that work studies are rarely done. Further research is recommended in this area.

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List of Annexures

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THE CAUSES OF DELAYS ON GOVERNMENT HOUSING CONSTRUCTION PROJECTS IN BOTSWANA

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ABSTRACT

This treatise identifies the major causes of delays on government housing construction projects, determines the programme techniques utilised by contractors, the attributes taken into account by consultants at contractor selection stage and whether contract periods are realistically determined.

The research findings are that insufficient work rate by contractors is the major cause of delays, most contractors do not employ appropriate programming methods to achieve completion on time, almost all attributes are taken into account by consultants at selection stage and that contract periods are determined using past experience.

Based on the above findings, recommendations are made with the objective to reduce futures delays.

KEYWORDS

Delay, building contract, extension of time, completion date

DEFINITIONS

Delay: A situation whereby the original contractual completion date is exceeded with or without extension of time being granted.

1.0 BACKGROUND

1.1 Introduction

The spate of delays on building construction projects undertaken by citizen contractors has raised concern not only the government but also to the general public.

It is important to identify and evaluate the major causes of delays in order to recommend more effective and efficient measures aimed at reducing these delays.

1.2 Limitations

1.2.1 The study is limited to housing construction projects undertaken by citizen contractors registered with the central tender board in category C within the past 10 years.

1.2.2 The data collected is limited to selected housing construction projects only undertaken by the Department of Building and Engineering Services (DBES).

1.3 The statement of the sub-problems

1.3.1 The first sub-problem

The first sub-problem is to identify the major causes of delays on government housing construction projects and to rank them in order of occurrence. (What are the major causes of delays on government housing construction projects?)

1.3.2 The second sub-problem

The second sub-problem is to evaluate how contractors programme their resources. (Do building contractors programme their resources in a scientific responsible way?)

1.3.3 The third sub-problem

The third sub-problem is to determine whether the employer's contract procurement strategy is adequate to detect potential delays. (Is the employer's contract procurement strategy adequate enough to detect potential delays?)

1.3.4 The fourth sub-problem

The fourth sub-problem is to evaluate how contract periods are determined. (Are the contract periods determined realistically?)

2.0 LITERATURE REVIEW

2.1 Delays

Delay on a building contract can be defined as a situation where by the original contractual completion date is exceeded with or without extension of time being granted.

In most building contracts if the contractor is in delay and no further extension of time is granted to him, the contractor is then liable to pay liquidated and ascertained damages or penalties at the rate stipulated in the contract documents.

Eggleston [8] states that the only thing the employer gets of liquidated damages is relief from the burden of proving his loss and the right to deduct liquidated damages from sums due to the contractor, but he may be disadvantaged in the event that his true losses may be greater than the stipulated level of liquidated damages.

Penalties, on the other hand, do not have to be an accurate pre-assessment of damages likely to be suffered.

Mr. Justice Lopes in Law versus Redditch Local Board (1892) in the law reports of England as quoted by Eggleston [8] put it this way:

> *The distinction between penalties and liquidated damages depends on the intentions of the parties to be gathered from the whole of the contract. If the intention is to secure performance of the contract by the imposition of a fine or penalty, then the sum specified is a penalty; but if, on the other hand, the*

intention is to assess the damages for the breach of contract, it is liquidated damages.

Most building contracts specify time for performance in achieving completion of the works. Some contracts may even have additional requirements for phased or sectional completion.

Most building contracts contain express provisions under which the period allowed for the contractor to undertake and complete the works can be extended.

Clause 20 of the Botswana standard government contact deals with delay and extension of time.

The following are the relevant events, as stated in clause 20 of the Botswana standard government contract, which entitle the contractor to be awarded extension of time to the completion date:

- Force majeure
- Exceptionally inclement weather
- P.S's instructions
- Late instructions
- Civil commotion, local combination of workmen, strike or lockout affecting any of the trades employed upon the Works
- Delay on the part of nominated sub-contractors or nominated

suppliers which the contractor has, in the opinion of the P.S taken all practical steps to avoid or reduce

- Works of other contractors or tradesmen engaged by the employer which are not referred to in the bills of quantities

2.2 Programming of resources

To ensure timely completion of projects contractors need to plan the resources that will be used. Contractors need to employ planning techniques to present a realistic programme of works.

Cooke [6] states that the utilisation and adoption of a planning technique within a company is dependent on factors such as the policy of the board towards supporting a planning policy for use throughout the company to ensure that it is adopted at all levels of management, the planning expertise engaged and the type of and range of projects undertaken.

Sawyer and Gilliot [17] claim that unless a particular format of programme is specified, the contractor will present a programme that will suit himself and should the engineer require another format that would show the critical path then the contractor would be entitled to payment for providing such a programme.

Knowles [11] argues that if a programme were to be given the status of a contract document, the contractor would be required to comply with it to the letter. All

flexibility which is the key to catching up when progress gets behind would disappear.

The various known planning techniques which contractors utilise to programme their works are:

- Gantt or bar charts
- Line of Balance
- Critical Path Method
- Precedence diagrams.

2.3 Contract strategy

Brümmer [5] defines the term *contract strategy* as referring to the total scope of decision-making by the employer regarding the definition of the organisation and procedures necessary for the execution of a building project.

Standard forms of building contract are employed in the building industry. The choice of a particular type depends on circumstances surrounding the project.

2.3.1 Contract selection

The contract selection depends on the employer's objectives and the requirement methods which are available.

Ashworth [2] states in broad terms the employers objectives as:

- function (use)

- economy (value for money)
- cost
- quality
- aesthetics
- time.

The employer should determine the order of preference of his objectives.

The types of contracts available are measurement and cost reimbursable contracts.

Under measurement contracts, work is measured on the basis of finished quantities. The contractor is paid on the basis of quantity multiplied by the rate. Examples of measurement type of contracts are:

(i) lump sum

(ii) bills of Quantities

(iii) bill of Approximate quantities

(iv) schedule of Rates

(v) schedule of Prices

Under cost reimbursement contracts, the contractor is able to recoup the actual costs of the materials, labour and plant on the work plus profit. Examples of cost reimbursement contracts are:

(i) cost plus percentage

(ii) cost plus fixed fee

(iii) cost plus variable fee

The Government of Botswana utilises the bill of quantities which is a measurement contract.

2.3.2 Organisational method

The organisational method deals with the way that the project will be managed from inception to completion.

The choice of organisational method will depend on the employer's objectives associated with time, cost and quality of construction.

The organisational methods available are namely:

(i) Conventional method

(ii) Management method

(iii) All inclusive method

With the *conventional method*, the employer appoints the Architect as his principal agent. The Architect designs and co-ordinates the functions of other professional consultants, supervises and administers the project.

The *management method* is where the employer appoints a firm (usually known as Project Managers) to manage and co-ordinate the design and supervision of the project.

The *all inclusive method* is where the employer appoints a firm to undertake both the design and construction of the project.

Preece and Tarawneh [15] conducted research in the United Kingdom to find out whether clients are happy with the all-inclusive method. Their findings were that most clients were dissatisfied with poor quality proposals and specifications, a lack of detailed programming as well as a lack of communication at post-contract stage by contractors.

The Botswana Government utilises the conventional method for executing projects which are included in the scope of this study.

2.3.3 Contract Procurement Methods

These are methods that are used to source out work.

The contract procurement methods commonly used are as follows:

(i) competitive tenders

(ii) negotiated tenders

(iii) two - stage tenders

(iv) continued tenders

The Botswana Government in most cases sources out work utilising competitive tenders.

2.3.4 Risk Allocation

The Aqua group [21] defines risk as the possible loss, which has to be stood by someone, resulting from the difference between what was anticipated and what finally happened.

The primary function of any contract is to identify, define and allocate risk. This will depend to a large extent on the employer's circumstances.

Informal observations indicate that contractors usually allow in their tenders for premiums which will be used to pay insurance companies to carry the risk for them.

2.3.5 Contractor Selection

Willis & Asworth [24] state that the method used for contractor selection and price determination is a difficult one because of varying opinions amongst construction experts as to their advantages and disadvantages. Specific attributes of tenderers other than price should be regarded.

According to Brümmer [5] the following attributes should be considered:

- commercial terms being offered
- experience
- craftsmanship
- reputation and
- financial stability

2.4 Determination of contract periods

There is very little literature regarding the determination of contract periods available. Brümmer [5] suggests that contractors could by means of applying the appropriate planning techniques and with the consideration of resources available plan their work to be completed within the given construction period.

A database could also be used by contractors to determine construction periods.

3.0 RESEARCH METHODOLOGY

The research methodology adopted is that of non-experimental quantitative research encompassing descriptive survey and ex-post facto research designs. The descriptive survey research design method was used to describe the observed phenomena regarding programming methods, procurement strategies and determination of contract periods. Data was obtained by questionnaires. The ex-post facto research design method was used to establish causes of delays. Data was obtained from case studies

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The survey targeted all quantity surveying consultants and contractors registered in category C with the Public Procurement and Asset Disposal Board (PPADB) of the Republic of Botswana.

The survey was conducted by means of questionnaires to the aforementioned consultants and contractors case studies of projects were obtained by permission from the Department of Building and Engineering Services (DBES).

4.0 MAJOR CAUSES OF DELAYS

4.1 Introduction

The first sub-problem was to find out the major causes of delays on government housing construction projects in Botswana.

The hypothesis postulated was that most delays seem to be caused by factors which are within the contractor's control. (i.e. insufficient work rate by the contractor).

Case studies of completed government housing construction projects were analysed. Therefore the research methodology applied for this first sub-problem was ex-post facto research.

4.2 Data collection method

4.2.1 In order to determine the causes of delay on each building project included in the survey, the following data was collected:-

- Planned completion date
- Date of actual completion
- Determining the frequency and contribution of delay caused by each delay factor.

4.3 Results and Data interpretation

The contribution of delay caused by each delay factor is shown in table 1.

Table 1: Housing projects delayed beyond the original completion date

Legend for Table 1

a = force majeure

b = exceptionally inclement whether

c = P.S's instructions

d = late information

e = civil commotion, strike etc.

f = nominated sub-contractor or nominated supplier

g = contractors or tradesmen engaged by the employer

h = insufficient work rate by the contractor.

Case study no.	No of days from tender closing to Tender award	Delay factor (days)								Total no. of days delayed
		a	b	c	d	e	f	g	h	
1	49	-	-	-	-	-	50	5	70	125
2	52	-	9	-	35	-	11	-	-	55
3	76	-	-	26	-	-	-	-	819	845
4	53	-	-	-	-	-	58	-	44	102
5	225	-	7	-	31	-	-	350	-1	387
6	107	-	-	-	-	-	156	-	179	335
7	107	-	-	-	60	16	-	-	27	103
8	76	-	-	204	229	-	-	26	433	892
9	85	-	-	55	56	-	-	-	-	111
10	86	-	-	46	-	-	-	-	67	113
11	86	-	-	-	-	-	-	-	340	340
12	126	-	-	-	-	-	-	-	890	890
13	133	-	-	60	-	-	-	-	917	977
14	85	-	-	29	-	-	45	29	964	1067
15	98	-	-	-	-	-	-	-	995	995
16	42	-	-	42	-	-	-	-	912	954
17	33	-	-	-	-	-	-	-	976	976
18	110	-	-	-	-	-	-	-	769	769
19	118	-	-	324	-	-	-	-	-	324
20	89	-	8	43	-	-	-	38	195	284
21	117	-	-	70	90	-	21	-	199	380
22	80	-	-	31	-	-	53	-	-	84
23	64	-	-	206	-	-	-	-	34	240

Figure 1 shows the frequencies of the delay factors.

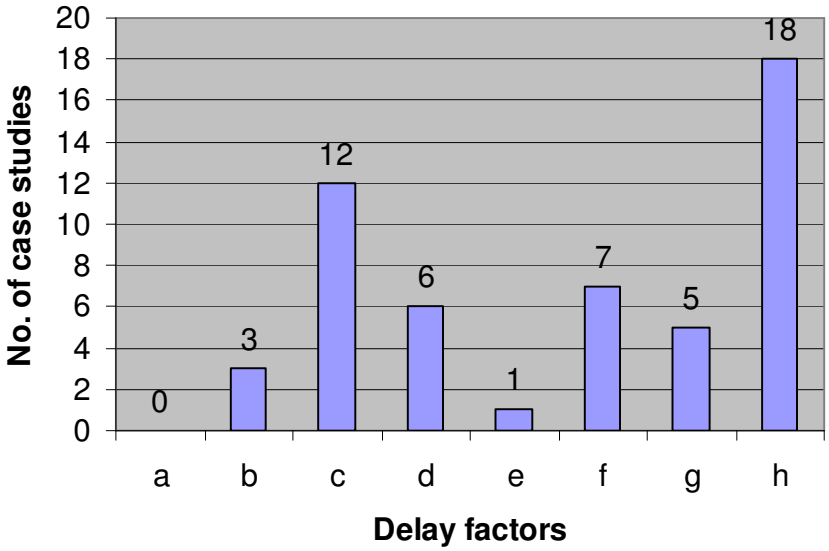

Fig.7: Frequencies of delay factors

None of the projects experienced delay caused by force majeure (a). Insufficient work rate by the contractor (h) has the highest frequency occurring in eighteen case studies. The least in occurrence was civil commotion, strike or lockout etc (e).

The delay factors according to the percentage of time contribution to delay are as follows:

	Delay factor		% age contribution
1.	Insufficient work rate by contractor	-	56.43%
2.	The permanent secretary's	-	16.75%
3.	Nominated subcontractor or supplier	-	10.26%
4.	Late information	-	10.03%
5.	Contractors or tradesmen engaged by the employer	-	4.85%
6.	Exceptionally inclement weather	-	0.95%
7.	Civil commotion, strike or lockout, etc.	-	0.73%
8.	Force majeure	-	0.00%
	TOTAL	**-**	**100.00%**

4.4 Analysis of the data

Research findings indicate that the major causes of delays in rank order are:

1. Insufficient work rate by contractor
2. The permanent secretary's
3. Delay by nominated subcontractors or suppliers
4. Late information

4.5 Testing of the hypothesis

The largest contribution to delays is insufficient work rate by the Contractor.

The hypothesis that most delays are caused by factors which are within the contractors control is therefore affirmed.

5.0 PROGRAMMING OF RESOURCES

5.1 Introduction

The second sub-problem was to determine out how building contractors programme their resources.

The hypothesis posted was that some contractors do not employ appropriate programming methods to achieve completion on time.

5.2 Data collection method

5.2.1 Data for this sub-problem was obtained by questionnaires to both consultants and contractors.

5.2.2 Consultants were asked on an interval scale from “never” (1) to” always” (7) concerning the types of programmes received from contractors.

5.2.3 Contractors similarly were asked about their familiarity with the following planning techniques such as simple bar charts, time linked/Gantt charts, line of balance, critical path method and precedence diagrammes.

5.2.4 Contractors were further asked regarding their staff complement and qualifications.

5.3 Results and Data Interpretation

The results obtained indicated the following:

5.3.1 Most of the Building contractors had five to ten years experience.

5.3.2 Six out of the twenty three companies indicated that they did not employ an estimator/quantity surveyor.

5.3.3 In most construction companies, the contracts/project manager and site agent are responsible for programming and are qualified to diploma level.

5.3.4 Time linked bar charts are commonly used.

5.3.5 Line of balance and precedence diagrammes are never used by contractors.

5.4 Analysis of the data

Research findings indicate that:

5.4.1 The time linked bar chart method utilised by most contractors is not the most appropriate programming method for housing projects.

5.4.2 The most appropriate method for housing projects, i.e. line of balance, is never utilised.

5.5 Testing of the hypothesis

The most appropriate programming methods are not utilised.

The hypothesis that some contractors do not employ appropriate programming methods to achieve completion on time is therefore affirmed.

6.0 CONTRACT PROCUREMENT STRATEGY

6.1 Introduction

The third sub-problem was to find out whether the contract procurement strategy was adequate to detect potential delays.

The hypothesis posted was that the employer's contract procurement strategy is not adequate to detect potential delays.

6.2 Data collection method

6.2.1 Data for this sub-problem was obtained by questionnaires to consultants.

6.2.2 Consultants were asked on an internal scale from "never"(1) to "always" (7) on the clients objectives for the project and tender evaluation criteria used.

6.3 Results and Data Interpretation

The results obtained indicated that:-

6.3.1 Figure 2 shows the relationships between the stated (by) client) and expected (by consultants) levels of the clients objectives utilising the highest frequencies.

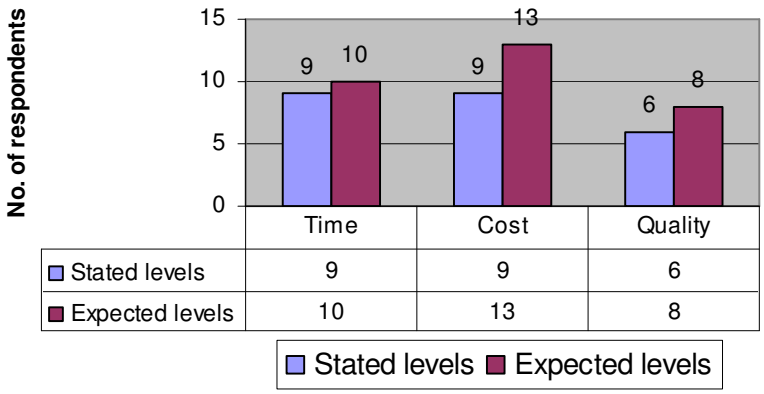

Fig.17: Stated and Expected levels of clients objectives

The clients objectives stated in terms of time, cost and quality are exceeded by the consultant's expectations from the client.

6.3.2 The lowest price is recommended frequently.

6.3.3 Factors such as qualifications and experience of personnel, tenderers experience, workmanship and capability, financial stability and plant resources are considered by the consultants at tender evaluation stage.

6.3.4 A model for contractor selection, like the Diekman model, is hardly used.

6.4 Analysis of the data

6.4.1 The client's objectives are adequately stated.

6.4.2 Factors such as experience, qualifications of personnel, financial stability and plant resources of the tenderers are considered.

6.4.3 The lowest tenderer is recommended in most instances.

6.4.4 A model for contractor selection is seldom applied, but tenderers are given the opportunity to be shown their mistakes in their bids which could adversely affect their cash flow.

6.5 Testing of the hypothesis

The Clients objectives are adequately stated, other factors are considered and tenderers are given the opportunity to be shown their mistakes. Therefore, the hypothesis that the employer's contract procurement strategy is not adequate to detect potential delays is not supported.

7.0 DETERMINATION OF CONTRACT PERIODS

7.1 Introduction

The fourth sub-problem was to establish whether contract periods are determined realistically.

The hypothesis posted was that construction periods are not realistically determined.

7.2 Data collection method

7.2.1 Data for this sub-problem was obtained by questionnaires to both consultants and contractors.

7.2.2 Both consultants and contractors were asked on an interval scale from "never" (1) to "always" (7) concerning who should stipulate the contract periods in tender documents, how contract periods are currently determined and whether factors such is location, labour and plant resources are considered.

7.3 Results and data interpretation

The results obtained indicate that:

7.3.1 Contractors preferred to stipulate the contract periods for themselves in their tenders.

7.3.2 Past experience is frequently used to determine construction periods.

7.3.3 Factors such as location are considered when determining the construction period.

7.3.4 Labour and plant resources are sometimes considered when determining the construction periods.

7.4 Analysis of the data

7.4.1 The use of past experience to determine construction periods seems to be realistic although not scientific in manner. This also supported by the fact that contractors rarely complain about the periods set up in the tender documents by consultants.

7.5 Testing of the hypothesis

The hypothesis that construction periods are not determined realistically is therefore not supported.

8.0 CONCLUSIONS

This study focussed on identifying and evaluating the major causes of delays on selected Government housing projects in Botswana with a view of recommending more effective and efficient measures of reducing delays.

The study arrived at the following conclusions:

8.1 Major causes of delays on selected Government housing construction projects

8.1.1 The case studies revealed the cause of delays in order of occurrence and percentage contribution to delay time as follows:

- Insufficient work rate by the contractor
- Permanent secretary's
- Nominated subcontractors or suppliers
- Late information
- Contractors or tradesmen engaged by the employer.
- Exceptionally inclement whether
- Civil commotion, strike or lockout, etc.
- Force majeure

8.1.2 Out of the above four major causes of delay in order of significance was as follows:

- Insufficient work rate by contractors
- Permanent secretary's
- Nominated sub-contractors or suppliers
- Late information

A doctoral thesis by D. G. Brümmer [5] also revealed that insufficient work rate by contractors on building projects in the Republic of South Africa was the factor having the most substantial influence on the overrun of originally planned construction periods.

8.2 How contractors programme their resources

8.2.1 Responses from questionnaires were interpreted using the highest frequency (score) and revealed that:

- In most construction firms, the contract/project managers are responsible for programming.
- Most of the contract/projects managers are qualified to Diploma level.
- Site foremen do not participate in programming.
- Time linked bar charts are commonly used by contractors.
- Line of balance and precedence diagrammes types of programming techniques are used by contractors.

- Most contractors indicated that never conduct work study to determine output rates for future tenders and programming of resources.

8.3 whether the contract procurement strategy used is adequate to detect potential delays

8.3.1 The responses from questionnaires to consultants were interpreted using the highest frequency (score) and established that:

- Clients objectives are stated adequately
- Other factors such as experience, qualifications of personnel, financial stability and plant resources of tenderers are considered during tender evaluation.
- A model for contractor selection is seldom applied but tenders are given the opportunity to be shown their mistakes in the bids which could adversely affect their cash flow.

8.4 How contract periods are determined

8.4.1 Responses from questionnaires to both consultants and contractors were interpreted using the highest frequency (score) and revealed that past experience is used to determine construction periods.

9.0 RECOMMENDATIONS AND PROPOSALS FOR FURTHER RESEARCH

1. This research established that most delays are caused by an insufficient work rate by contractors and that the most appropriate programming methods are not employed. Therefore intervention by voluntary associations such as Tshipidi Badiri Builders Association (TBBA) is necessary by introducing short courses in construction management for all personnel involved in the planning process. Certificates of attendance to these courses should be produced by contractors before any projects are awarded to them.
2. Consultants should prescribe requirements for most appropriate programmes, such as line of balance, as mandatory in the tender submissions in order to force contractors to familiarise themselves to these programmes.
3. In order to reduce delays due to the permanent secretary's instructions, project management professionals should be engaged by the government to manage the total scope of work so that variations due to additional work can be minimised.
4. Contractors should be encouraged to employ specialist subcontractors on a domestic basis instead of nominated subcontractors provided the required criteria are met. This will help reduce delays due to nominated subcontractors or suppliers.
5. In order to reduce delays due to late information, consultants who submit information late without any specific reason should be surcharged by the client at a predetermined rate.

6. To ensure consistency in tender adjudication a model such as the Diekman value model should be adopted by the consultant quantity surveyors. This would also help the quantity surveyors not to overlook other important factors which should be taken into consideration when adjudicating tenders and also show impartiality on their part.

7. Construction periods should be determined by consultants. This will help in assessing tenders on the basis of price alone.

8. The study is limited to the causes of delays for which the contractor is entitled to extension of the construction period under the Botswana Government building contract. It is recommended that further study should be undertaken to establish the occurrence and influence of other grounds of extension of time which are covered in other building contracts, such as the JBCC 2000, but not covered in the Botswana Government building contract.

9. The study is limited to identifying the types of programmes utilised by contractors. It was not attempted to study how contractors determine contract durations, especially as it has been established that work studies are rarely done. Further research is recommended in this area.

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ANNEXURE 1: Letter granting research permission from the Permanent Secretary

TELEPHONE : 3958500
TELEGRAMS: WORKCOM
REFERENCE:
FAX No: 313303/312922

REPUBLIC OF BOTSWANA

MINISTRY OF WORKS & TRANSPORT
PRIVATE BAG 007
GABORONE
BOTSWANA

WC 4/37 V (23) PPO II

3rd November 2004

QS Botswana (Pty) Ltd
P.O. Box 2851
Gaborone.

Attn: Erick Lebetwa

Dear Sir,

RE: GRANT OF A RESEARCH PERMIT: MR ERICK LEBETW A

Your application for a research permit refers.

You are herewith granted permission to conduct a study entitled "Investigation into the causes of delays on selected Government construction projects in Botswana."

The permit is valid for a period not exceeding six (6) months effective 8th November 2004.

The permit is granted subject to the following conditions:

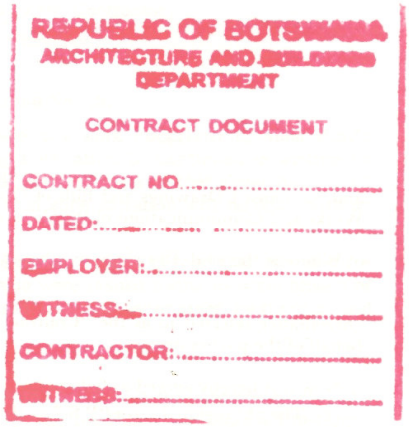
1. You conduct the study according tot he particulars f umished in the application.

2. Any changes to the approved proposal should be resubmitted to this office for review. A copy of the permit should be attached to all correspondence relating to the said permit.

3. Copies of the final report should be directly deposited with the Office of the President; Ministry of Works and Transport; National Assembly; National Archives; National Library Service; Department of Building and

ANNEXURE 5: The Botswana government contract

REPUBLIC OF BOTSWANA



Agreement and

Schedule of Conditions

of Building Contract

between

Government of the Republic of Botswana

and

. . . . . .

. . . . . .

. . . . . .

For the erection and completion of

. . . . . .

. . . . . .

. . . . . .

Contract No. . . . . . *Dated* . . . . . .

Form of Contract incorporating Bills of Quantities

ARTICLES OF AGREEMENT made the.....day of.....200.....
between the GOVERNMENT of the REPUBLIC of BOTSWANA of Private Bag 7, Gaborone (hereinafter

called "the Employer") of the one part and .....

.....

of, or whose Registered Office is situate at .....

.....

(hereinafter called "the Contractor") of the other part.

Whereas the Employer is desirous of .....

.....

.....

.....

.....

.....

.....

and has caused Drawings and Bills of Quantities to be prepared by or under the direction of the Ministry of Works and Communications of the Government of the Republic of Botswana.

Whereas the said Drawings numbered.....

.....

(hereinafter referred to as the "Contract Drawings") and the Bills of Quantities have been signed by or on behalf of the parties hereto:

Now it is hereby agreed as follows:

(1) The abbreviated term "P.S." in the said Conditions shall mean the Permanent Secretary of the Ministry of Works and Communications for the Republic of Botswana Government duly appointed or his successors in office and shall include the officer for the time being executing the duties of such officer or any person duly deputed to act on behalf of the Permanent Secretary.

(2) For the consideration hereinafter mentioned the Contractor will upon and subject to the Conditions annexed hereto execute and complete the works shown upon the said Drawings and described or referred to in the said Bills of Quantities and Conditions.

(3) The Employer will pay the Contractor the Sum of

(P

hereinafter referred to as "the Contract sum" or such other sum as shall become payable hereunder at the times and in the manner specified in the said Conditions.

As witness the hands of the said parties

Signed by the Employer .....
in the presence of

Signature.....

Address .....

Signed by the Contractor .....
in the presence of

Signature.....

Address .....

for use under this Contract or for the execution of any works and the Employer shall pay the agreed price (if unpaid) for such materials or works supplied or executed after the said determination.

(3) The Contractor shall during the execution or after completion of the Works under this clause as and when required remove from the site his temporary buildings, plant, appliances and any materials within such reasonable time as the P.S. may specify in a written notice to him and in default the Employer may (without being responsible for any loss or damage) remove and sell the same holding the proceeds less all costs incurred to the credit of the Contractor.

(4) Until after completion of the Works under this clause no payment shall be made to the Contractor under this Contract provided that when completion as aforesaid and the verification within a reasonable time of the accounts therefor the P.S. shall certify the amount of expenses properly incurred by the Employer and if such amount added to the moneys paid to the Contractor before such determination exceeds the total amount which would have been payable on due completion the difference shall be a debt payable to the Employer by the Contractor; and if the said amount added to the said moneys be less than the said total amount the difference shall be a debt payable by the Employer to the Contractor.

23. Determination of Contract by Contractor

If the Employer does not pay the Contractor within the period stated in Clause 25(a) and thereafter for seven days after written notice from the Contractor fails to pay the amount due on any certificate of the P.S. or if the Employer interferes with or obstructs the issue of any such certificate or if the whole or substantially the whole of the Works (other than works in respect of defects under Clause 13 hereof) is delayed under the provisions of Clause 20 (excepting local combination of workmen strike or lock-out) for three months the Contractor may by written and registered notice to the Employer or P.S. determine this Contract and thereupon without prejudice to the accrued rights of either party their respective rights and liabilities shall be as follows, viz:–

(a) The Contractor shall with reasonable dispatch remove from the site all his goods machinery and plant and give facility for his Sub-Contractors so also to do.

(b) The Contractor shall be paid by the Employer:–

(1) The Contract value of the Works completed at the date of such determination as aforesaid subject to Clause 10 hereof.

(2) The value of work commenced and executed but not completed at the date of such determination the value being ascertained *mutatis mutandis* in accordance with the provisions of Clause 10 hereof.

(3) The cost of materials or goods properly ordered and delivered for the Works actually paid for by the Contractor or of which he is legally bound to accept delivery and on such costs being paid by the Employer the same shall become his sole property.

(4) The reasonable cost of removal under Sub-Clause (a) hereof.

(5) Any loss or damage caused to the Contractor owing to such determination as aforesaid.

Provided that in addition to all other remedies the Contractor upon the said determination may take possession of and shall have a lien upon all unfixed materials and/or goods intended for the Works which may have become the property of the Employer under this Contract until payment of all moneys due to the Contractor from the Employer.

24. Prime Cost – Provisional Sums

(a) Items in the Bills of Quantities containing the words "Prime Cost" or the initials "P.C." for goods to be obtained and fixed by the Contractor shall be dealt with as follows, viz:–

The Contractor shall be debited with all such Prime Cost or P.C. amounts in the priced Bills of Quantities and shall then be credited with such sums as are actually paid by him which correspond to the several Prime Cost or P.C. amounts (including in such corresponding sums a cash discount of 5 per cent, but not including any trade discounts or other allowances) provided that where in the opinion of the P.S. the Contractor has incurred expense for special packing or special carriage he shall be allowed for the same as part of the sums actually paid by him.

(b) The provisional sums mentioned in the Bills of Quantities for materials to be supplied or for work to be performed by nominated Sub-Contractors or for other work or fittings to the Works shall be paid and expended at such times and in such amounts in favour of such persons as the P.S. shall direct and sums so expended shall be payable by the Contractor without discount or deduction except the appropriate cash discount as hereinbefore mentioned or (without prejudice to any rights of the Contractor under the Contract referred to in Clause 15 hereof) by the Employer to the said Sub-Contractors or suppliers. The value of works which are executed by the Contractor in respect of provisional sums or in additional works shall be ascertained as provided in Clause 10 hereof. At the settlement of the accounts the amount paid by the Contractor to the said Sub-Contractors or suppliers (including a cash discount of 5 per cent) and the said value of such works executed by the Contractor shall be set against all such provisional sums or any sum provided for additional works and the balance after allowing pro rata for the Contractor's profits at the rates contained in the priced Bills of Quantities shall be added to or deducted from the Contract sum; provided that no deductions shall be made by or

on behalf of the Employer in respect of any damages paid or allowed by any Sub-Contractor to the Contractor the intention being that the Contractor and not the Employer shall have the benefit of any such damages.

(c) The Contractor shall permit the execution of work, not provided for in the Bills of Quantities, by artists, tradesmen or other like persons engaged by the Employer. Every such person shall for the purpose of Clause 15 hereof, be deemed to be a person for whom the Employer is responsible and not to be a nominated sub-contractor. The consent of the Contractor to the employment of such persons shall be procured in writing by the Employer, and such consent shall not be unreasonably withheld.

(d) Where the Contractor in the ordinary course of his business directly carries out works for which provisional sums are contained in the Bills of Quantities and the P.S. is prepared to accept tenders from the Contractor for such items the Contractor shall be permitted to tender for the same or any of them without prejudice to the Employer's right to reject the lowest or any tender.

25. Certificates and Payments

(a) The Contractor shall (subject to Clause 15 hereof) be entitled to a monthly certificate from the P.S. of the amount due to him from the Employer; and within 21 days (twenty one) of the issue thereof to payment therefor by the Employer.

(b) The amount so due as aforesaid shall be the total value of the work duly executed and of the materials and goods delivered upon the site for use in the Works assessed up to and including a date not more than seven days prior to the date of the said certificate less the amount to be retained by the Employer (as hereinafter provided and less any instalments previously paid under this Clause). Provided that such certificate shall only include the value of the said materials and goods as and from such time as they are reasonably properly and not prematurely brought upon the site and then only if adequately stored and/or protected against weather or other casualties.

(c) The Contractor shall be entitled to delivery, concurrently with the issue of a certificate, of a detailed statement in support of the amount reflected in the certificate.

(d) The amounts to be retained as aforesaid, which shall be called "The Retention Fund," shall be 10 per cent of the value of the work and material as aforesaid (the amount so retained shall in no case exceed 10 per cent of the Contract sum); and upon reaching such limit or such reduced sum as provided by Clause 15, thereafter the full value of work and materials as aforesaid shall be certified by the P.S.

(e) The Contractor shall (subject to Clause 19 hereof) be entitled to a certificate for one half of the Retention Fund upon practical completion of the Works.

(f) Within six months after completion of the Works or upon completion of making good defects under Clause 13 (a) hereof, whichever is later, the P.S. shall issue a final certificate of the value of the works executed by the Contractor and such final certificate save in cases of fraud, dishonesty or fraudulent concealment relating to the Works or materials or to any matter dealt in the certificate and save as regards all defects and insufficiencies in the Works or materials which a reasonable examination would not have disclosed shall be conclusive evidence as to the sufficiency of the said Works and materials and of the value thereof.

(g) The P.S. shall within fourteen days of a written demand by the Contractor, specify in writing all such matters as are required to be performed by the Contractor which are occasioning delay in the issue of the final certificate and the Employer shall be bound by such P.S.'s written intimation.

(h) Save as aforesaid no certificate of the P.S. shall of itself be conclusive evidence that any works or materials to which it relates are in accordance with the Contract.

26. Arbitration

Provided always that in case any dispute or difference shall arise between the Employer or the P.S. on his behalf and the Contractor, either during the progress or after completion of the Works, or after the determination, abandonment or breach of the Contract, as to the construction of the Contract or as to any matter or thing arising thereunder, or as to the withholding by the P.S. of any certificate to which the Contractor may claim to be entitled; then the P.S. shall determine such dispute or difference by a written decision given to the Contractor. The said decision shall be final and binding on the parties unless the Contractor within 14 days of the receipt thereof by written notice to the P.S. disputes the same in which case or in case the P.S. for 14 days after a written request to him by the Employer or the Contractor fails to give a decision as aforesaid; such dispute or difference shall be and is hereby referred to Arbitration in accordance with The Arbitration Proclamation, 1959 (No. 75 of 1959) of Botswana or as later amended.

27. Surety

The deed of Surety dated ..... issued by .....

..... shall form part of this contract.

ANNEXURE 6: LIST OF DELAYED PROJECTS

Sheet	Project	Location	Contractor	C-sum
1	Primary Hospital Housing	Tutume	Tlhoraboroko	5911081.35
2	Police Station Housing	Letlhakeng	Tamlac	17897985.74
3	Primary Hospital Housing	Rakops	Colemo	3226961.05
4	I.H.S Housing	Molepolole	Chocholoza	11,736,115.00
5	Athlone Hosp. Housing	Lobatse	Chocholoza	15,307,281.70
6	Masunga SSS Housing	Masunga	Moramosi	7,522,103.00
7	Shoshong SSS Housing	Shoshong	Kopano	8481357.75
8	BDF Housing & Flats	Francistown	S.P Construction	7299479.39
9	Ghanzi SSS Housing	Ghanzi	Moramosi	4816428.5
10	Selibe Phikwe SSS Housing	Selibe Phikwe	Kopano	6478776.60
11	Hukuntsi T/A Housing	Hukuntsi	Bekama	456,182.90
12	Goohope T/A Housing	Goodhope	M&N	1639814.44
13	Tsabong T/A Housing	Tsabong	Thekiso	1192909.10
14	Cwagare T/A Housing	Cwagare	Thaku	138319.95
15	Leshibitse T/A Housing	Leshibitse	Sega	145917.10
16	Oodi T/A Housing	Oodi	Mavis Contracting	270801.00
17	Tlhareseleele T/A Housing	Tlhareseleele	KJL	150,014.00
18	Gumare T/A Housing	Gumare	Keyarona moshupa	1603728.00
19	D.O.S staff Housing	Francistown	Jamon	842000.00
20	Primary Hospital Housing	Bobonong	Universal Builders	4645665.20
21	D.O.S staff Housing	Kasane	Scotsca	1486102.00
22	Primary Hospital Housing	Ghanzi	Pabala	12261886.60
23	Primary Hospital Housing	Mmadinare	Moramosi	5346656.00

	T-close-date	T-award-date	F-H (Days)	Comp-date
1	28\03\2001	14\06\2001	49	27\04\2002
2	28\08\2002	18\10\2002	52	27\02\2004
3	21\02\2001	07\05\2001	76	07\12\2001
4	11/09/2002	01/11/2002	53	13/10/2003
5	17/03/1999	27/10/1999	225	29/11/2000
6	11/07/2001	25/10/2001	107	24/09/2002
7	11/07/2001	25/10/2001	107	21/04/2003
8	15/04/1998	30/06/1998	76	3/05/1999
9	15/11/2000	08/02/2001	85	21/11/2001
10	10/03/1999	14/06/1999	96	07/06/1999
11	14/10/1998	07/01/1999	86	21/06/1999
12	16/09/1998	19/01/1999	126	06/11/1999
13	7/10/1998	17/02/1999	133	31/08/1999
14	21/10/1998	13/01/1999	85	12/05/1999
15	19/11/1998	24/02/1999	98	21/07/1999
16	10/12/1998	20/01/1999	42	31/08/1999
17	03/12/1998	05/01/1999	33	12/08/1999
18	18/02/1999	07/06/1999	110	27/03/2000
19	15/12/1999	11/04/2000	118	3/12/2000
20	13/12/2000	12/03/2001	89	31/12/2001
21	01/08/2001	26/11/2001	117	24/09/2002
22	27/03/2002	15/06/2002	80	07/07/2002
23	13/12/2000	15/02/2001	64	04/12/2001

	Extd. Comp-date	P-comp-date	M-L (Days)	A
1	21/06/2002	30\08\2002	70	.
2	23/04/2004	23/04/2004	0	.
3	02/01/2002	determined 19/04/04	819	.
4	10/12/2003	23/01/2004	44	-
5	29/01/2002	28/01/2002	-1	-
6	28/02/2003	determined 26/08/03	179	-
7	4/08/2003	01/09/2003	27	-
8	6/08/2000	determined 15/10/01	433	-
9	13/03/2002	13/03/2002	0	-
10	23/07/1999	28/09/1999	67	-
11	Nil	determined 27/05/02	340	-
12	Nil	determined 03/05/02	890	-
13	30/10/1999	determined 23/05/02	917	-
14	23/08/1999	determined 03/05/02	964	-
15	Nil	determined 30/04/02	995	-
16	12/10/1999	determned 30/04/02	912	-
17	Nil	determined 3/05/02	976	-
18	Nil	determined 14/05/02	769	-
19	23/10/2001	23/10/2001	0	-
20	30/03/2002	11/10/2002	195	-
21	24/03/2003	determined 09/10/03	199	-
22	29/09/2003	29/09/2003	0	-
23	28/06/2002	01/08/2002	34	-

B	C	D	E	F
.	.	.	.	50
9	.	35	.	11
.	26	.	.	.
-	-	-	-	58
7	-	31	-	-
-	-	-	-	156
-	-	60	16	-
-	204	229	-	-
-	55	56	-	-
-	46	-	-	-
-	-	-	-	-
-	-	-	-	-
-	60	-	-	-
-	29	-	-	45
-	-	-	-	-
-	42	-	-	-
-	-	-	-	-
-	-	-	-	-
-	324	-	-	-
8	43	-	-	-
-	70	90	-	21
-	31	-	-	53
-	206	-	-	-

G	Other	LAD-charged
5	0	YES
.	.	NO
.	0	YES
-	0	YES
-	350	NO
-	-	YES
-	-	YES
26	-	YES
-	-	NO
-	-	YES
-	-	YES
-	-	YES
-	-	YES
29	-	YES
-	-	YES
-	-	YES
-	-	YES
-	-	YES
-	-	NO
38	-	YES
-	-	YES
-	-	NO
-	-	YES

ANNEXURE 7: LIST OF CITIZEN CONTRACTORS

30% RESERVATION POLICY

LIST OF CITIZEN CONTRACTORS AS AT 28TH MAY 2004

A: BUILDING CONTRACTORS

GRADE C

1. **Foundation Builders (Proprietary) Limited**
2. **Major Construction (Proprietary) Limited**
3. **Oodi Construction (Proprietary) Limited**
4. **Oriah's Construction and Allied Products (Proprietary) Limited**
5. **Ngandwe Construction (Proprietary) Limited**
6. **City Painters (Proprietary) Limited**
7. **JMER Builders (Proprietary) Limited**
8. **Kutlwano Builders (Proprietary) Limited**
9. **G.L. Building & Maintenance Contractor (Proprietary) Limited**
10. **Ali's Transport (Proprietary) Limited***
11. **Jeewan Enterprises (Proprietary) Limited**
12. **Super Services Building Construction (Proprietary) Limited)**
13. **Tlhomamo (Proprietary) Limited**
14. **CMC Builders (Proprietary) Limited**
15. **L & H Construction (Proprietary) Limited**
16. **Dowa Enterprises (Proprietary) Limited**
17. **B.J.L. Construction (Proprietary) Limited**
18. **S.B. BUILDING Construction (Proprietary) Limited**

*** Suspended Companies**

19. **Fairdeal Shopfitters & General Construction (Proprietary) Limited**
20. **Colemo (Proprietary) Limited**
21. **C.P.K. Building Construction (Proprietary) Limited**
22. **A1 Tina Construction (Proprietary) Limited**
23. **D.K.M. Building Construction (Proprietary) Limited**
24. **Emang Construction ({Proprietary) Limited**
25. **Net Builders (Proprietary) Limited**
26. **Easy Jobs & Services (Proprietary) Limited**
27. **Denkent Construction (Proprietary) Limited**
28. **Iteke Construction (Proprietary) Limited**
29. **Nako Construction (Proprietary) Limited**
30. **B.M. Construction (Proprietary) Limited**
31. **Boikago Construction (Proprietary) Limited**
32. **P.G.M. Building Construction (Proprietary) Limited**
33. **Shumba Projects (Proprietary) Limited**
34. **K.B. Construction (Proprietary) Limited**
35. **B.S.A. Contractors (Proprietary) Limited**
36. **Rona Construction (Proprietary) Limited**
37. **Tedo General Maintenance (Proprietary) Limited**
38. **Signo Projects (Proprietary) Limited***
39. **Manillah Investments (Proprietary) Limited**
40. **Jamon Enterprieses (Proprietary) Limited**
41. **M.G. Construction (Proprietary) Limited**

* **Suspended companies**

42. **Rapid master Construction (Proprietary) Limited**

43. **Joko & Sons Construction (Proprietary) Limited**

44. **Democracy foundation (Proprietary) Limited**

45. **LAN Construction (Proprietary) Limited**

46. **Seemise Seabelo construction (Proprietary) Limited**

47. **Sijo Construction (Proprietry) Limited**

48. **T & T Painters and Decorators (Proprietary) Limited**

49. **I & B Building Construction (Proprietary) limited**

50. **Majola & Sons Building construction (Proprietary) Limited**

51. **SE Contracting (Proprietary) Limied**

52. **Supreme Construction (Proprietary) Limited**

53. **Tsabong Building Construction (Proprietary) Limited**

***Suspended Companies**

30% RESERVATION POLICY

LIST OF CITIZEN CONTRACTORS
AS AT 28TH MAY2004

C: MECHANICAL CONTRACTORS

Grade C

1. **Sherday Engineering (Proprietary) Limited**
2. **Shabba Comm Enterprises (Proprietary) Limited**

ANNEXURE 8: Letter from the Chief Quantity Surveyor regarding fixing of Contract periods

TELEPHONE: 351901-5

FAX NO: 374832

TELEGRAMS: MINBRICKS

REP'ERENCE:

CON/GEN/33 (45) CQS

REPUBLIC OF BOTSWANA

MINISTRY OF WORKS, TRANSPORT
AND COMMUNICATIONS,
DIRECTOR OF ARCHITECTURE,
AND BUILDINGS SERVICES,
PRIVATE BAG 0025,
GABORONE.

14 September 1999

TO: All Quantity Surveying Consultants

Dear Sir/Madam

RE: TENDER PROVISIONS FOR FIXED AND FLUCTUATING PRICE' CONTRACTS

Following a recent review of tender stipulations in respect of the above, it would appear that the choices taken by this Department and by consultants vary considerably. Some tender documents might incorporate only a single bid option, fIXed or fluctuating, whereas others might require that two or more alternative bid options are submitted.

It seems that this situation has arisen because no clear guidelines have been issued in this regard. In order to remedy .the situatio'h and t(f standardise procedures,...you are. hereby instructed to prepare your tender documents "as follows:

(a) Projects with an estimated co.mpletion time..af nine months o~ l~ss, should bave fIxed contract sums.

(b) Projects with an estimated completion time of more than nine months should provide for the contract sum to be adjusted for both materials and labour on the "proven cost" basis. Tenders for this class of contract must not include an alternative for a fIxed price submission.

As a linked issue, another variable factor is that of establishing the construction period. Sometimes the fonn of tender is left open to allow tenderers to insert the time required and sometimes a fIXed duration is given. In future, you should establish with the client and your co-consultants a reasonable construction period for the type of work to be executed and insert this period on the fonn of Tender.

All consultants are hereby asked to implement the above arrangements immediately for all projects for which Tender notices have not yet been placed.

You are kindly requested to acknowledge receipt by returning the attached copy duly signed for our records.

Yours faithfully

R.H. Damp
For/Director
DEPARTMENT OF ARCHITECTURE AND BUILDING SERVICES

QS BOTSWANA (PTY) LTD
P.O. BOX 2851
GABORONE, BOTSWANA
TEL: 4188 FAX: 56418

For and on behalf of: .....

Signed: .....

Position: DIRECTOR

Date: 22/04/99

Engineering Services; Institute of Research and Documentation at University of Botswana and University of Botswana Library.

4. The permit does not give authority to enter any premises, private establishment or protected area. Permission for such entry should be negotiated with those concerned.

5. Failure to comply with any of the above-stipulated conditions will result in the immediate cancellation of the permit.

Yours sincerely

G. L. Tlogelang
For/Permanent Secretary

cc. Permanent Secretary, Office of the President
Clerk of the National Assembly
Director, Department of Building and Engineering Services
Director, National Archives
Director, National Library Service
Director, Institute of Research and Documentation, University of Botswana
Librarian, University of Botswana
District Commissioner/Town Clerk, Gaborone

ANNEXURE 2: Letter requesting Architectural firms to access information

TELEPHONE: 3610740
FAX NO: 3167467
TELEGRAMS : MINBRICKS
REFERENCE: DBES/6/1/3 I

REPUBLIC OF BOTSWANA

DEPARTMENT OF BUILDING AND ENGINEERING SERVICES
PRIVATE BAG 0025
GABORONE
BOTSWANA

17th November, 2004

1. Architect Botswana
2. Mosienyane & Partners
3. Ramani Consultants
4. Tectura-International Architects

Attention: Project Architect.

RESEARCH PERMIT – DELAYS TO VARIOUS GOVERNMENT PROJECTS

Mr. E. Libetwa has secured an approval from our Permanent Secretary to collect and analyse data from selected government project regarding causes of delays on such projects. According to the officer, the research will confine itself to housing projects only or projects where the housing component was very high.

In an attempt to assist Mr. Libetwa, we call upon your office to facilitate for all relevant information on appropriate and relevant projects that were under your supervision to be made available to the officer.

The information required relates to the recommendations that your office submitted to DBES for consideration and the approval that you received from our office. We are unable at this juncture to directly provide the information to Mr. Libetwa. This is so mainly because we are in the process of locating and merging all our project data (filing system) subsequent to the merger and our relocation to our new offices.

Please accept our sincere gratitude for your assistance and co-operation in this regard.

Yours faithfully,

T. Molotsi
For/ Director
Department of Building and Engineering Services

ANNEXURE 3: QUESTIONNAIRE TO CONTRACTORS

QUESTIONNAIRE TO CONTRACTORS

TOPIC OF STUDY

Investigation into causes of delays on selected government construction projects in Botswana

This questionnaire constitutes three sections:-

Section A: Information regarding the company

Section B: Information regarding Programming

Section C: Information regarding determination of contract periods

You are requested to respond to all sections. This questionnaire will take no more than 15 minutes of your time to answer.

Thank you for the courtesy of your assistance.

A INFORMATION REGARDING THE COMPANY

Please tick / or mark x in one box

1 How long have you been in business?

Office use

A	less than 5 yes	
B	5 to 10 years	
C	11 to 15 years	
D	16 to 20 years	
E	More than 20 years	

2 How many people does your company employ?

A	Less than 50			
B	51 to 200			
C	201 to 400			
D	401 to 600			
E	Over 600			

3 What was your company's annual turnover last financial year?

A	Less than P1.8 million	
B	P1.8 million to P4.0 million	
C	P4.0m to P8.0 million	
D	P8.0m to P12.0 million	
E	Over P12.0 million	

4 Please indicate the number of Management personnel employed in your company in each of the following categories.

Office use

		No of people
A	Managing Director/General Manager	
B	Contracts/Project Managers	
C	Estimators/Quantity Surveyors	
D	Site Agents/Engineers	
E	Site Foremen	

5 Which qualifications does your management personnel possess. (Please tick in the appropriate box or boxes for each category).

		Trade certificate	City & Guilds	Diploma	Bachelors and Honours degree	Masters Degree	Doctorate Degree
A	Managing Director/Gen. Manager						
B	Contracts/Project Managers						
C	Estimators/Quantity Surveyors						
D	Site Agents/Engineers						
E	Site Foremae						

6 Which of the following personnel are responsible for programming of construction projects that your company undertakes? (Please tick the appropriate box/boxes for each category).

A	Managing Director/General Manager	
B	Contracts/Project Managers	
C	Estimators/Quantity Surveyors	
D	Site Agents/Engineers	
E	Site Foremen	

7 Is the plant or equipment which the company hires regularly available when required? (Please circle the relevant number on a seven point scale from never (1) to Always (7)).

Never	1	2	3	4	5	6	7	Always

office use

B

INFORMATION REGARDING PROGRAMMING

Please tick / or mark x in one box

Office use

1 Which planning techniques does your company utilise in programming for construction projects?

A	Simple bar chart	
B	Time linked bar/Gantt Chart	
C	Line of Balance	
D	Critical Path Method	
E	Precedence Diagram	
F	Other	

2 Which of the planning techniques are you familiar with?

A	Simple bar chart	
B	Time linked bar / Gantt chart	
C	Line of Balance	
D	Critical Path Method	
E	Precedence Diagram	

Your answer should make use of the seven point scale which varies from:

"Never (1)" to "Always 7"

Please circle the relevant number.

Office use

3 Critical paths are shown on your programmes.

Never	1	2	3	4	5	6	7	Always

4 Extension of time claims are based on the critical path

Never	1	2	3	4	5	6	7	Always

5 Plant and labour resources are matched to the programme.

Never	1	2	3	4	5	6	7	Always

6 Labour shortages are experienced in urban areas.

Never	1	2	3	4	5	6	7	Always

Office use

7 Labour shortages are experienced in remote areas.

Never	1	2	3	4	5	6	7	Always

8 Work study is conducted on projects to determine output rates which will be utilised for future tenders.

Never	1	2	3	4	5	6	7	Always

9 We are prepared to show our methods of programming to justify our claim for extension of time.

Never	1	2	3	4	5	6	7	Always

C **INFORMATION REGARDING DETERMINATION OF CONTRACT PERIODS**

Your answer should make use of the seven point scale which varies from:

"Never (1)" to "Always (7)"

Please circle the relevant number

Office use

1 Consultants should determine & stipulate the contract periods in tender documents.

Never	1	2	3	4	5	6	7	Always

2 Contractors should determine the contract periods in tender documents.

Never	1	2	3	4	5	6	7	Always

3 Projects should be awarded to contractors even when they have qouted a shorter construction period than realistic/normal period. .

Never	1	2	3	4	5	6	7	Always

ANNNEXURE 4: QUESTIONNAIRE TO CONSULTANTS

QUESTIONNAIRE TO CONSULTANTS

TOPIC OF STUDY

Investigation into causes of delays on selected government construction projects in Botswana.

This questionaire constitutes three sections:-

Section A: Information concerning contractor Selection

Section B: Information concerning Programming of Resources

Section C: Information concerning determination of contract periods

You are requested to respond to all sections. This questionnaire will take no more than 15 minutes of your time to answer.

Thank you for the courtesy of your assistance.

A. **INFORMATION CONCERNING CONTRACTOR SELECTION**

Your answer should make use of the seven point scale which varies from:

"Never (1)" to "Always (7)"

Please circle the relevant number
When in doubt do not indicate your preference

QUESTION 1	SCALE							
The following questions or comments relate to contractor selection	1 x	2 x x	3 x x x	4 x x x x	5 x x x x x	6 x x x x x x	7 x x x x x x x	
The client states his objectives for the project in terms of time	1	2	3	4	5	6	7	Office use:
The client states his objectives in terms of cost	1	2	3	4	5	6	7	
The client states his objectives in terms of quality	1	2	3	4	5	6	7	
It is important for the client to state his objectives for the project in terms of time	1	2	3	4	5	6	7	
It is important for the client to state his objectives for the project in terms of cost	1	2	3	4	5	6	7	

It is important for the client to state his objectives for the project in terms of quality	1	2	3	4	5	6	7	
Open tendering system is adopted	1	2	3	4	5	6	7	
When evaluating tenders the lowest price is recommended for award	1	2	3	4	5	6	7	
When evaluating tenders, experience, workmanship and capability to complete the project by the tenderer is considered	1	2	3	4	5	6	7	
When evaluating tenders, the qualifications and experience of personnel to be deployed in the project is considered	1	2	3	4	5	6	7	
When evaluating tenders, the financial stability of a tenderer is considered	1	2	3	4	5	6	7	
When evaluating tenders, the plant resources of a tenderer are considered	1	2	3	4	5	6	7	
The Diekman* value model is used for contractor selection	1	2	3	4	5	6	7	
Projects undertaken by contractors not recommended by consultants but chosen by the client result in delays	1	2	3	4	5	6	7	
Tenderers are given the opportunity to be shown the mistakes in their bids which could adversely affect their cashflow	1	2	3	4	5	6	7	

* The Diekman value model was formulated by J. E.. Diekman as a basis for evaluating contractors in the case of cost reimbursable contractors. The model offers a methodology to the decision maker to which he can formulate his decision making objectives. Various criteria are quantified and subsequently combined with each other to form ajoint value yardstick. This provides the decision maker with a means whereby his decision can be explained and justified.

RELEVANT COMMENTS:	
If you are not conversant with the Diekman value model, please state here any alternative model which you firm utilises for contractor selection:	

B. **INFORMATION CONCERNING PROGRAMMING OF RESOURCES**

Your answer should make use of the seven point scale which various from:

"Never (1)" to "Always (7)"

Please circle the relevant number, when in doubt do not indicate your preference

QUESTION 2	**SCALE**							
The following questions or comments relate to programming of resources	1 x	2 x x	3 x x x	4 x x x x	5 x x x x x	6 x x x x x x	7 x x x x x x x	
								Office Use
Programme requirements are stated in the tender documents	1	2	3	4	5	6	7	
Simple Bar chart programmes are produced by contractors	1	2	3	4	5	6	7	
Time linked/Gantt Chart programmes are produced by contractors	1	2	3	4	5	6	7	
Line of balance programmes are produced by contractors	1	2	3	4	5	6	7	
Critical Path Method of programming are produced by the contractors	1	2	3	4	5	6	7	
Precedence Diagrammes are produced by the contractors	1	2	3	4	5	6	7	
Labour schedules are shown on the contractors programmes	1	2	3	4	5	6	7	
Plant schedules are shown on the contractors programmes	1	2	3	4	5	6	7	

Construction programmes are produced by the Managing Directors/General Managers	1	2	3	4	5	6	7	
Construction programmes are produced by the Contracts/Projects Managers	1	2	3	4	5	6	7	
Construction programmes are produced by the Estimators/Quantity Surveyors	1	2	3	4	5	6	7	
Construction programmes are produced by the Site Agents/Engineers	1	2	3	4	5	6	7	
Constructin programmes are produced by the Site Foremen	1	2	3	4	5	6	7	
Insuficient work rate by the contractor is the likely cause of project delays	1	2	3	4	5	6	7	

RELEVANT COMMENTS:

C. **INFORMATION CONCERNING DETERMINATION OF CONTRACT PERIODS**

Your answer should make use of the seven point scale which varies from:

"Never (1)" to "Always (7)"
Please circle the relevant number, when in doubt do not indicate your preference.

QUESTION 3		SCALE							
The following questions relate to the determination of contract periods	1 x	2 x x	3 x x x	4 x x x x	5 x x x x x	6 x x x x x x	7 x x x x x x x		
Contract periods are stipulated in tender documents	1	2	3	4	5	6	7	Office use:	
Past experience is used in determining construction periods	1	2	3	4	5	6	7		
*The formula developed by Dr. CP De Leuw is used to determine construction periods	1	2	3	4	5	6	7		
Other methods apart from are the above used to determine construciton periods	1	2	3	4	5	6	7		
When determining construction periods, the project location is taken into consideration	1	2	3	4	5	6	7		
When determining construction periods, optimisation of labour and plant resources by the contractor is considered	1	2	3	4	5	6	7		

*Dr. C. P De leuw has developed a formula for estimating contract periods for varous classes of buildings after extensive research into the durations of past building projects in the Republic of South Africa.

Contractors normally complain about the construction periods determined by consultants being short	1	2	3	4	5	6	7	
Contractors claim extension of time due to shorter periods specified by consultants	1	2	3	4	5	6	7	

RELEVANT COMMENTS:	
If you are using other methods, to determine the contract periods apart from the ones specified above, please state herebelow the method used by your firm:	

THANK YOU VERY MUCH FOR YOUR PRECIOUS TIME

THE CONDITIONS HEREINBEFORE REFERRED TO:

1. Scope of Contract

The Contractor shall carry out and complete the Works in accordance with this Contract in every respect in accordance with the directions and to the reasonable satisfaction of the P.S. who may in his absolute discretion and from time to time issue further drawings, details and/or written instructions, written directions and written explanations (all of which are hereafter collectively referred to as "P.S.'s Instructions") in regard to:

(a) The variation or modification of the design, quality or quantity of the Works or the addition or omission or substitution of any work:

(b) Any discrepancy in the Drawings or between the Bills of Quantities, and Drawings;

(c) The removal from the site of any materials brought thereon by the Contractor and the substitution of any other materials therefor;

(d) The removal and/or re-execution of any works executed by the Contractor;

(e) The dismissal from the Works and any person employed thereupon;

(f) The opening up for inspection of any work covered up;

(g) The amending and making good of any defects under Clause No. 13.

The Contractor shall forthwith comply with and duly execute any work comprised in such P.S.'s Instructions, provided that verbal instructions shall if involving a variation be confirmed in writing by the Contractor to the P.S. within seven days and if not dissented from within a further seven days shall be deemed to be P.S.'s Instructions and if involving a variation then such variation will be dealt with as an authorised extra or omission.

If compliance with P.S.'s Instructions as aforesaid involves expense or loss beyond that provided for in or reasonably contemplated by the Contract then unless the same were issued owing to some breach of this Contract by the Contractor the amount of such expense or loss shall be ascertained by the P.S. and added to the Contract sum.

2. Drawings and Bills of Quantities

The Contractor on or before the signing hereof shall furnish to the P.S. a fully priced copy of the original Bills of Quantities which shall have been previously verified by the P.S. The Contract Drawings, and the priced copy aforesaid shall remain in the custody of the P.S. and by him be produced at his office as and when required by the Employer or the Contractor. The P.S. shall furnish to the Contractor two copies of the signed Contract Drawings and one of blank Bills of Quantities free of cost, and one copy of all further Drawings issued during the progress of the works. The Contractor shall keep one copy of all Contract Drawings and Bills of Quantities on the Works and the P.S. or his representatives shall at all reasonable times have access to the same. Upon final payment to the Contractor he shall forthwith return to the P.S. all Drawings, and Bills of Quantities.

None of the documents hereinbefore mentioned shall be used by either of the parties hereto for any purpose other than this Contract, and neither the Employer, nor the P.S. shall divulge or use, except for the purposes of this Contract, any information contained in the priced Bills of Quantities.

3. Contractor to provide everything necessary

The Contractor shall provide everything necessary for the proper execution of the Works according to the true intent and meaning of the Drawings and Bills of Quantities taken together whether the same may or may not be particularly shown or described provided that the same is reasonably to be inferred therefrom and if the Contractor finds any discrepancy therein he shall immediately and in writing refer the same to the P.S. who shall decide the procedure. Figured dimensions are to be followed in preference to scale.

4. Local and other Authorities' Notices and Fees

(a) The Contractor shall comply with and give notices required by the provisions of any relevant Proclamations in force in the Republic of Botswana Government and By-Laws of any Local Authority and/or any public service company or authority relating to the Works, and he shall pay and indemnify the Employer against any fees or charges demandable by law thereunder in respect of the Works; provided that the said fees and charges if not expressly included in the Contract sum or stated by way of provisional sum shall be added to the Contract sum and be payable to the Contractor accordingly.

(b) The Contractor before making any variation from the Drawings and Bills of Quantities necessitated by such compliance shall give to the P.S. written notice specifying and giving the reason for such variation and applying for instructions in reference thereto. If the Contractor within seven days does not receive instruction he shall proceed with the work conforming to the provision, regulation or by-law in question and any variation necessitated as aforesaid shall be deemed a variation under Clause 10 hereof and dealt with as such.

5. Setting Out of Works

The P.S. shall furnish to the Contractor, either by way of carefully dimensioned drawings or by personal supervision at the time of setting out the Works such information as shall enable the Contractor to set out the enclosing walls of the building at ground level after which the Contractor shall be responsible and shall at his own cost amend any errors arising from his own inaccurate setting out unless the P.S. shall decide otherwise.

6. Materials and Workmanship to conform to Description

All materials and workmanship shall so far as procurable be of the respective kinds described in the Bills of Quantities and the Contractor shall upon the request of the P.S. furnish him with vouchers to prove that the materials comply therewith. The Contractor shall arrange for and/or carry out any test of any materials which the P.S. may in writing require and the cost thereof shall be added to the Contract sum unless provided for in the Bills of Quantities by way of provisional sum or unless the test shows that the said materials and/or workmanship are not in accordance with this Clause.

7. Foreman

The Contractor shall constantly keep upon the Works a competent Foreman and any instructions given to him by the P.S. shall be deemed to be given to the Contractor in pursuance of Clause 1 hereof.

8. Access for P.S. to Works

The P.S. and his representatives shall at all reasonable times have access to the Works and/or to the workshops or other places of the Contractor where work is being prepared for the Contract.

9. Clerk of Works

The Clerk of Works shall be considered to act solely as inspector on behalf of the Employer under the Directions of the P.S. and the Contractor shall afford him every facility for the performance of such duties.

10. Prices for Extras, etc., Ascertainment of

No variation shall vitiate this Contract. All extras, omissions and variations authorised in terms of Clause 1 hereof shall be measured by the P.S. who shall give to the Contractor opportunity to be present with him on the Works at the time and to take such notes and measurements as he may require. The Contractor shall be supplied with a copy of the measured Bill in respect of such extras and omissions and the valuation thereof unless previously or otherwise agreed shall be made in accordance with the following rules:–

(a) The prices in the original Bills of Quantities shall determine the valuation of extra work of similar character executed under similar conditions as work priced therein;

(b) The said prices, where extra works are not of a similar character or executed under similar conditions as aforesaid, shall be the basis of prices for the same so far as may be reasonable; failing which, a fair valuation thereof shall be made based upon prices for similar work in the locality current at the time the extra works are executed;

(c) Where extra work cannot properly be measured or valued, the Contractor shall be allowed day-work prices therefore as stated in the Bills of Quantities or, if not so stated, then calculated upon the cost of the materials used at the then current market value plus the labour costs involved inclusive of all direct charges in connection therewith which the Contractor is bound to pay, and all transport costs, plus 15 per cent which shall cover Foreman's supervision and all other overhead costs and profit, the total thus arrived at being the total amount recoverable by the Contractor for performing this work. At or before the end of the week following that in which the work has been executed, supporting vouchers shall be delivered to the P.S. or his authorised representative, for verification and proof that any wages in excess of the legalised rates have been paid to individual workmen prior to the commencement of the extra work referred to.

(d) The prices in the original Bills of Quantities shall determine the valuation of items omitted; provided that if omissions vary the conditions under which any remaining items or work are carried out the prices for such remaining items shall be valued under (b) hereof.

The measurements and valuation of the Works shall be completed on or before the expiry date as defined in Clause 25 (f) hereof. Interim measurements and valuations shall be made whenever necessary to enable the P.S. to issue certificates under Clause 25 hereof.

11. Bills of Quantities

The quality and quantity of the work included in the Contract sum shall be deemed to be that which is set out in the Bills of Quantities which Bills unless otherwise stated shall be deemed to have been prepared in accordance with the latest edition of the Standard System of Measurement of Building Works issued by the Chapter of South African Quantity Surveyors. The signed Bills of Quantities shall be the basis on which all adjustments and variations arising out of the performance of the Contract Works shall be measured.

Any error in description or in quantity or in omission of items from the Bills of Quantities shall not vitiate this Contract but shall be rectified and treated as an extra or ommission as the case may be under Clause 10 hereof, and the value thereof shall be added to or deducted from the Contract sum (as the case may be) provided that there shall be no rectification of errors in the prices inserted by the Contractor in the said Bills of Quantities.

12. Unfixed Materials when taken into account to be the Property of the Employer

Where in any certificate (of which the Contractor has received payment) the P.S. has included the value of any unfixed materials and/or goods intended for and placed on or adjacent to the Works such materials and/or goods shall become the property of the Employer (for any loss or damage to which the Contractor shall be responsible) and they shall not be removed except for use upon the Works without the authority of the P.S. in writing.

13. Defects after Completion

(a) Any defects, shrinkage or other faults which may appear within 6 months from the completion of the Works due to materials or workmanship not in accordance with this Contract or to frost occurring before completion of the Works shall within a reasonable time after receipt of the P.S.'s written instruction be made good by the Contractor and (unless the P.S. shall otherwise decide) at his own cost; provided that the Contractor shall not be required to make good at his own cost any damage by frost which may appear after completion unless the P.S. shall decide that such damage is due to injury which took place before completion.

(b) Any leakage in the roof, and any damage to the Contract Works caused thereby, arising from faulty materials or workmanship, occurring within a period of six months after the completion of the Contract Works shall be made good by the Contractor at his own cost. If no heavy rain falls during the period of six months as aforesaid, this period shall be extended as necessary to permit a test of the roof by sufficiently heavy rain.

14. Assignment or Sub-Letting

The Contractor shall not without the written consent of the P.S. assign this Contract or sub-let any portion of the Works; provided that such consent shall not be unreasonably withheld to the prejudice of the Contractor.

15. Sub-Contractors

(a) All Specialists and others executing any work or supplying and fixing any goods for which provisional sums are included in the Bills of Quantities who may be nominated or selected by the P.S. are hereby declared to be Sub-Contractors employed by the Contractor and are herein referred to as "nominated Sub-Contractors".

No nominated Sub-Contractor shall be employed upon or in connection with the Works against whom the Contractor shall make reasonable objection or (save where the P.S. and Contractor shall otherwise agree) who will not enter into a Sub-contract which provides:—

(1) That the nominated Sub-Contractor shall indemnify the Contractor against the same obligations in respect of the Sub-Contract as the Contractor is liable for in respect of this Contract.

(2) That the nominated Sub-Contractor shall indemnify the Contractor against claims in respect of any negligence by the Sub-Contractor his servants or agents or any misuse by him or them of any scaffolding or other plant the property of the Contractor or any Workmen's Compensation Act in force.

(3) That payment less only cash discount of 5 per cent shall be made to the nominated Sub-Contractor by the Contractor within seven day of his receipt of the P.S.'s certificate under Clause 25 hereof which includes the value of such Sub-Contractor's work.

(b) Before any such certificate is issued to the Contractor he shall if requested by the P.S. furnish to him reasonable proof that all nominated Sub-Contractor's accounts included in previous certificates have been duly discharged in default whereof the Employer may pay the same upon a certificate of the P.S. and deduct the amount thereof from any sums due to the Contractor. The exercise of this power shall not create privity of contract as between Employer and Sub-Contractor.

(c) Should the P.S. desire to secure final payment to any nominated Sub-Contractor before final payment is due to the Contractor and the Sub-Contractor has satisfactorily indemnified the Contractor against any latent defects then the P.S. may in a certificate under Clause 25 hereof include an amount to cover the said final payment and upon payment thereof to the Sub-Contractor the Contractor shall be discharged from all liability for the work or materials covered thereby save for such latent defects aforesaid and he shall pay to the Sub-Contractor the amount (subject to Clause 24 hereof) so certified whereupon the limit of retention money named in Clause 25 hereof shall be reduced by such certified amount.

16. Damage to Persons and Property

(a) Injury to Persons. The Contractor shall be liable for and shall indemnify the Employer in respect of any liability loss claim or proceedings whatsoever whether arising in Common Law or by Statute in respect of personal injuries to or death of any person whomsoever arising out of or in the course of or caused by the execution of the Works unless due to any act or neglect of the Employer or his servants.

(b) Injury to Property. The Contractor shall be liable for and shall indemnify the Employer in respect of any liability loss claim or proceedings and for any injury or damage whatsoever arising out of or in the course of or by reason of the execution of the Contract Works to any property real or personal due to any negligence ommission or default of himself his agents or his servants or of any Sub-Contractor or to any circumstances within his control.

17. Insurance

The Contractor shall in the joint names of the Employer and Contractor insure and keep insured against loss and damage by fire for the full value thereof the Works until they are delivered up. Such insurance shall be with a company approved by the P.S. and the Contractor shall deposit with him the policies and

premium receipts. Should the Contractor make default the Employer may insure as aforesaid and deduct the premiums paid from any moneys due or to become due to the Contractor. The Contractor shall keep the completed Works insured against loss by fire until seven days after written notice has been given to the Employer of the intention to deliver up the Works.

The Contractor shall upon settlement of any claim under the policies aforesaid proceed with due diligence to rebuild or repair the Works destroyed or injured and a reasonable extension of time for completion will be made therefor under Clause 20 hereof. All moneys received under such policies are to be paid to the Contractor by instalments under certificates of the P.S. and the Contractor shall not be entitled to any payment in respect of the rebuilding or repair of the Works destroyed or injured other than the moneys received under the said policies.

18. Date for Possession and Completion

Possession of the site shall be given on or before the
to the Contractor who shall thereupon and forthwith begin the Works and regularly proceed with and complete the same (except such painting, papering or other decorative work as the P.S. may instruct him to delay) on or before the subject nevertheless to the provisions for extension of time hereinafter contained.

19. Damages for Non-Completion

If the Contractor fails to complete the Works by the
or within any extended time under Clause 20 hereof and the P.S. certifies in writing that in his opinion the same ought reasonably so to have been completed the Contractor shall pay or allow to the Employer as liquidated and ascertained damages the sum of P per
for the period during which the said Works shall so remain or have remained incomplete and the Employer may deduct such damages from any moneys due to the Contractor.

20. Delay and Extension of Time

If the Works be delayed by force majeure or by reason of any exceptionally inclement weather or by reason of P.S.'s Instructions given in pursuance of Clause 1 hereof or in consequence of the Contractor not having received in due time necessary instructions from P.S. for which he shall have specifically applied in writing or by reason of civil commotion, local combination of workmen, strike or lock-out affecting any of the trades employed upon the Works, or by delay on the part of nominated Sub-Contractors or nominated suppliers which the Contractor has, in the opinion of the P.S., taken all practical steps to avoid or reduce, or by the works of other Contractors or Tradesmen engaged by the Employer which are not referred to in the Bills of Quantities then in such case the P.S. shall make a fair and reasonable extension of time for completion of the Works. Upon the happening of a strike or lock-out the Contractor shall immediately give notice thereof in writing to the P.S., but he shall nevertheless use constantly his best endeavours to prevent delay and shall do all that may reasonably be required to the satisfaction of the P.S. to proceed with the Works.

21. Failure by Contractor to Comply with P.S.'s Instructions

If the Contractor after receipt of a written notice from the P.S. requiring compliance within seven days fails to comply with such further Drawings and/or P.S.'s Instructions the Employer may employ and pay other persons to execute any work whatsoever which may be necessary to give effect thereto and all costs incurred in connection therewith shall be recoverable from the Contractor by the Employer as a debt or may be deducted by him from any moneys due or to become due to the Contractor.

22. Determination of Contract by Employer

(a) Default. If the Contractor shall make default in any of the following respects, viz:–

(1) Without reasonable cause wholly suspends the Works before completion;

(2) Fails to proceed with the Works with reasonable diligence;

(3) Refuses or to a substantial degree persistently neglects after notice in writing from the P.S. to remove defective work or improper materials. Then, if such default shall continue for fourteen days after a written and registered notice to the Contractor from the P.S. specifying the same, the Employer may (without prejudice to any other rights herein contained) thereupon by written and registered notice determine this Contract; provided that notice hereunder shall not be given unreasonably or vexatiously and such notice shall be void if the Employer is at the time of the notice in breach of this Contract.

(b) Insolvency of Contractor. If the Contractor commit any "act of insolvency" or is declared insolvent or is sequestrated as insolvent, the Employer may without prejudice to any other rights herein contained by a written and registered notice determine this Contract.

In either of the above cases the following shall apply, viz:–

(1) The Employer may employ and pay a Contractor or other person or persons to carry out and complete the Works and he or they may enter upon the site and use all materials, temporary buildings plant and appliances thereon, and may purchase all materials necessary for the purposes aforesaid.

(2) The Contractor shall if so required by the Employer or P.S. assign to the Employer without further payment the benefit of any contract for the supply of materials and/or works intended