"CONTROL OF LABOUR COSTS IN BUILDINGS

BY

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A thesis submitted to the postgraduate School, Ahmadu Bello University, Zaria, in partial fulfillment of the requirements for the degree of Master of Science in Construction Management.

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DECEMBER, 1989

D E C L A R A T I O N .

I hereby declare that this thesis has been produced by me and infact a pure record of my work. Such a topic has not been presented in any previous work here for a higher degree.

The Sources of information are specifically acknowledged by means of references at the end of the thesis.

Signed: .....

Name: FRANCIS ALABO OGAREE .....

Date: DECEMBER 1989

CERTIFICATION

This thesis entitled "Control of Labour Cost" (A Case Study of Buildings) by Francis Alabo Ogaree meets the regulations governing the award of the degree of Masters of Science of Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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Head of Department

..... Date: 25-6-90
Dean, Postgraduate School

DEDICATION

The thesis is dedicated to all my beloved ones, thoughts of whom, have always inspired me.

ACKNOWLEDGEMENT

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Finally, my unquantifiable gratitude goes to my Heavenly Father, to whom 1 owe all that 1 am today.

The title of the thesis is **"Control of Labour Cost",** based on investigative studies conducted into its applications in the construction of building projects. Investigative studies conducted into the operations of some construction firms revealed the absence of a labour cost control system, but the presence of an achaic project cost system, which is based on overall profit /Loss state of the contract at the end of construction, which are historical.

The absence and non-operation of a labour cost control system were based on the inherent fears of:

i) The quality of manpower requirement in the management of the system

ii) Cost of installing and operating the system

iii) Time, involved in the operation of the system

In tackling these fears, literature reviews on existing practices of cost control processes were undertaken. This with a view of extracting a labour cost control system that could be adopted for use in the companies investigated. Finally, recommendations of the composition of project teams for big and small companies were made. This is hoped, will help in allaying the fears expressed.

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DEFINITIONS

1. LABOUR COST:- This is the total expenditure on Labour in the production of work items. The cost includes both direct Labour costs and indirect labour costs.

2. DIRECT LABOUR COST:- This is the actual cost of labour expended in the production of work items devoid of fringe benefits.

3. INDIRECT LABOUR COST:- This is the additional fringe benefits cost added to direct labour cost.

4. ON GOING PROJECT:- This is a construction work that is still in progress.

5. SOURCES DOCUMENTS:- These are documents used in monitoring production and progress on work sites.

6. MASTER PROGRAMME:- This is a carefully planned format that shows the schedules of different operations in a construction project.

7. PROJECT TEAM:- A project team is a composition of professionals involved in the planning and execution of a construction project.

Chapter 1

INTRODUCTION

1.1 Background

Labour cost is one of the categories of construction expenses which also includes; equipment, material and subcontract costs. Of all the above categories, labour and equipment costs are characterised by considerable uncertainty and can fluctuate substantially during the construction period. Labour cost, if not carefully monitored and controlled on site could have undesirable consequence on the profit margin of any project. Hence there will be need for the contractor to want to control them to a reasonable extent, if cost and invariable time overruns are to be avoided or minimised. This calls for an effective and adequate cost control system to be installed within the construction organisation. Clough et al Sears, (1979).

The labour costs referred to in this thesis, pertains to the work hours consumed by the various trades at the construction site. "In the parlance of the trade, they are called craftmen or craft labour. They are also, reffered to as 'Direct labour forces', for their tasks are directly related to the construction work, and their time is assessed in terms of a direct cost not covered under an overhead umbrella." Fisher, (1981).

This thesis is on "Control of labour cost", based on investigative studies into its application, in the construction of buildings in selected parts of Nigeria. It revealed the non-existence of a labour cost control system, rather, what existed, was a control based on the overall project profit/loss situation on the entire contract. This is

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somehow historical, in the sense that, no meaningful corrective actions could be introduced to check cost deviations during the construction stages.

1.2 Aims & Objectives

The thesis on the control of labour cost, as it applies to building construction, has as its aim:

(a) *Verification of the existence/non existence of a* labour labour cost control system in particular, and a project cost control system in general, in the construction of building projects in some selected organisations in Nigeria.

Where it exists, the objectives will be:

(a) To ascertain its advantages and limitations and suggest ways of improvement.

(b) Comparison of the system in existence to extracted system on labour cost control.

Where it does not exist, the objective will be:

(a) To recommend a suggested system extracted from established system. Which in its mode and operation can be adapted to suit the organisation installing it.

1.3 Methodology.

The approach adopted in achieving the stated aims and objectives will involve in-depth study of the mode and operations of selected construction organisations, associated with building projects. Attempt will be made as much as possible, to collect relevant data from "on-going" construction works. Where this is not possible, information will be extracted from collected records of past projects.

The information that will be sorted for, includes their methods of determination of Labour rates, the building-up of estimates for projects and the pre-contract /post-contract planning processes. Other information would be sort on methods adopted for monitoring and reporting on executed projects. Cognisance note will be taken of the type of time/labour cards used, for work reports and the type of tools used for up-dating construction works. The method for reporting on work progress and the frequency of ducumentation will also be noted.

1.4 Scope & Limitations.

The scope of this thesis is limited to the construction of building projects in Nigeria. Studies have been limited to three constructing firms, one in Kaduna State and two in Rivers State. Further limitations were imposed by the reluctance of firms approached in divulging extensive information on their modes of operation.

It is suffice to say, here that the approached used by the selected construction organisations in regulating the works might not exactly represent those used by other major constructing firms. Hence, informations based on their modes of operations do not reflect standard practice in other outfits in the states mentioned, and, indeed the whole of Nigeria.

1.5 Breakdown

In an attempt to bring into focus the aspect of Labour Cost Control, this thesis has been divided into 5 chapters.

Chapter 1: Has been already outlined.

Chapter 2: Is on review of existing practice.

Chapter 3: Is on Assessment of case studies.

Chapter 4: Proposal based on findings.

Chapter 5: Is on conclusion and recommendation.

Chapter 2.

2.1 A REVIEW OF EXISTING PRACTICE
Categories of Labour Cost.

Labour cost is one of the categories of construction expenses that is inherently variable and the most difficult to estimate accurately. Labour cost as referred to in this thesis pertains to the work- hours consumed by the various trades at the construction site. They are also called "Direct Labour Forces", for their time is assessed in terms of direct cost not covered under an overhead umbrella. A construction manager or client might refer to these forces as being manual as opposed to the manual nomenclature used to describe personnel located at field site, who performs clerical, accounting or administrative work etc. Fisher, (1981).

There are basically two categories of labour cost, namely:

(a) Direct labour cost

(b) Indirect labour cost

2.1.1 Direct Labour Cost

Direct labour cost is detemined from the workmen"s basic wage rates. This includes the hourly rates used for payroll purposed. It could also be obtained from records on similar operations done in the past, where suitable project cost system was instituted. Calvert, (1981).

2.1.2 Indirect Labour Cost

Indirect labour costs are those expenses that are additions to the basic hourly rates and that are paid by the employer. Indirect labour expenses involves forms of payroll taxes, insurance, and employee fringe benefits of wide variety. Employers in the construction industry typically provide for various kinds of fringe benefits, such as health and welfare funds, employee insurance and apprenticeship

Programmes. The cost of these benefits is customarily based on direct payroll costs.

Indirect labour costs are substantial in amount usually constituting a 30-40 percent addition to direct payroll costs.
Exactly when and how indirect labour costs are added into a project estimate are unimportant, so long as it is done. For most estimating purposes, total labour cost can be computed in one operation by using hourly labour rates that includes both direct and indirect costs. This process however, does not related well with labour cost accounting methods. For this reason, direct and indirect costs are often computed separately when jobs are being estimated. One commonly used scheme is to add a percentage allowed for indirect costs to the total direct labour costs, either for the entire project or for each major work category. (2) Clough et al Sears, (1979)

Despite the considerable impact of indirect costs on the total labour cost, this thesis is concerned with direct labour costs only. Since it has set out to study labour cost control which is more pertaining to work hours on the construction sites than on fringe benefits.

2.2 Determination of Labour Cost.

Labour cost together with equipment cost, material cost, and subcontract costs normally form the project cost or construction budget. It is therefore very important that the estimation of labour cost must be done thoroughly in order to reflect a more reliable project cost or construction budget. This then constitute a suitable format, for subsequent cost control which actually begins with the preparation of the original cost estimate.

To do an acceptable job of establishing labour cost, the contractors estimator must make a complete and thorough job analysis of the project, from the drawings, bill of quantities, and specifications. Schedules of operations are initiated, which are represented by using any of the scheduling and planning tools e.g bar charts, CPM, etc. A meticulous resource levelling is then carried out to reflect economic gang or crew sizes for effective and efficient completion of operation involved in schedules. The use of the schedules and the resource levels, coupled with a comprehensive library of costs and production rates from past projects, and knowledge in advance on how construction operations will be conducted, further ennances the accuracy of the labour cost estimation. Clough et al Sear, (1979).

> Contractors differ widely in how they estimate labour costs. some choose to include all elements of labour expense into a single hourly rate. Others evaluate direct labour cost separately from indirect. Some contractors compute regular and overtime labour costs separately, while others combine schedule overtime with straight time in to an average hourly rate. Some evaluate labour costs using production rates; others use labour unit costs. There are usually good reasons why a given contractor evaluates his labour cost as he does.

The thesis is not concerned with singlying out the best methods of labour estimation, but tries to point out the various methods adopted in its estimation. One of the method, is used in the preparation of the labour cost, which forms parts of the construction budget.

There are basically two methods of computing direct labour cost namely:

(a) Production rate, and (b) Labour unit rate. Clough et al Sears, (1979)

2.2.1 Production Rates

Production rates of labour can be obtained from cost accounting reports from completed projects, but cognisance must be taken of the difference in productivity from one geographical location to another. Of equal importance, is the variability in seanson and many other job constraints.

2.2.2 Labour Unit Rate

The labour unit cost, is the direct labour cost per unit of work type. The use of labour unit cost in estimating practice is usually limited to the determination of direct labour costs. When they are used, care must be exercised in order that they are based on appropriated levels of work productivity and the proper wage rates. It is never advisable to use a labour unit cost derived from another source without knowing exactly the categories of cost it does, and, does not include. Harris et al McCaffer, (1978).

2.3 Basis for the Control of Labour Cost

A contractor"s primary aim when he sets out on a project is to make profit. This stems out of the philosophical saying "We all know that a business can only survive, if it makes profit." Apart from the aspect of making profit a good contractor will strive to extract the maximum utility from the resources at his disposal, chiefly amongst these, is his labour force. Failure to recognise this will bring on him, the attendant economic restraint imposed by a cashflow situation. Adequate management of the resources at his disposal is therefore necessary on "on-going" project, which will determine the level of profit to be realised. Ward, (1980).

Also worth recognising is the fact that the project cost can can easily get out of hand due to time overruns and other lapses,

that delays scheduled completion of projects. This is not only fatal to the project, but also to the contractor, and the client. Which [illegible]lay, will bring about the "looking-up" of essential resources [illegible] and equipment) that might be needed urgently elsewhere, and [illegible]itional expenses. Fisher, (1981).

The above situations clearly points out the need, for control to be effected right from the planning stages of a project, through its design, and finally, to its construction and completion. The need for the control of labour becomes even more important when it is realised that the quality and quantity of production depends to a great extent on the corrective actions of management. Without effective cost control there can"t be effective management. Gobourine, (1973),

Timely information is required if effective actions against cost overruns is to taken. The detection of cost overruns only after the work is finished leaves the contractor with no possibility of taking corrective action.

Labour cost control or cost monitoring whilst it elevates the word cost, has infact three dimensions, namely: (a) Cost (b) Time (c) Quality.

These three factors are inter-related and interdependent. They can all be expressed in monetary terms. Shorter completion times and improvement in quality will inevitable lead to higher cost. The target of the contractor therefore can best be defined as "project completion in a reasonable time, at an economic cost, with adequate quality". This is of necessity, a generalised statement of qualitative nature. How far, for each and every project, it has to be quantified.

There is no escape from the series of decisions that have to be taken to achieve the appropriate compromise. Fisher, (1981).

2.4 Cost Codes

With the preparation of schedules of operations and computations of labour cost and subsequent construction budget; control of labour cost as work proceeds in the field can be initiated by keeping the cost within budget. This is enhanced by the development of a project cost system, which is designed primarily to accomplish two important objectives with respect to labour cost, namely:

(a) To develop labour production information in a form suitable for estimating the cost of future works.

(b) To keep the construction costs of the project within the established control budget.

The application of project cost system involves the use of either standard or project cost codes, to outline specific operations that will facilitate the accurate allocation of costs for different operations involving labour. This is an area of cost accounting methods, that helps to determine the actual cost of production on site that can then be compared with budget and schedule of operations. Clough et al Sears, (1979).

Regardless of the type of contract with the client, it is important that the contractor exercise the maximum control possible over his field costs during the construction period. A functioning and reliable cost system therefore, plays a vital role in the proper management of the construction project.

Labour, materials, supplies equipment charges subcontract payment overhead costs, and other items of expenses should be charged to the project where they are incurred. To ensure that all costs are properly allocated every expenditure is coded in accordance with a cost code Clough et al Sears, (1979).

Cost codes provides the basic framework upon which a cost engineering system is built. In a sense they provide a structural discipline analogous to what CPM network method give to schedule and resource planning and control. Like networks, a good cost code can facilitate the cost engineering process and hence aid perfect management. On the otherhand, a poor developed code can cause nothing but trouble. It is therefore vital that management as well as cost engineers understand the proper development and the application of cost codes and that thay have insight into the details that determine a code sucess or failure. Fisher, (1981).

Cost codes in most organisation falls into two categories, Namely: (a) Standard cost codes, and (b) Project cost codes.

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The first, provides for uniformity transfer and comparison of information amongst projects. While the second, serves as the framework the control budget on a specific project. Both are often used to interface with the numbering of drawings and specifications; materials procurement documents, activities of labour on schedule, quality assurance records, etc. In many cases, the codes form the focal point for all these elements in the project control system. It is therefore important to understand the purpose, content and differences between these two types of codes, and to know how to convert from one to the other. Thomes, (1978).

2.4.1 Standard Cost Codes

A standard cost code is a systematic classification and categorisation of all items of work or costs pertaining to a particular type of work. There may be different standard codes for different types of work even within the same organisation. Infact, one of the major problems in the development of a cost code for a project results from forcing a standard cost code for one type of work, to be used in another. Some examples of different types of work that might each have its own standard cost codes are the following. General building construction (e,g. Offices, Schools, Warehouses, etc). Thermal power plants (both nuclear and fossil fuel), Heavy engineering project (e.g. dams, hydroelectric schemes, etc). *Oil refineries and petrochemical plants. Thomes, (1978).*

2.5.2 Project Cost Codes

A project cost code is a systematic classification and categorisation of all items of work or cost pertaining to a particular project. There is normally a different project cost code for each project, but each should be derived from the standard cost code, so that different projects can be compared and especially so that meaningful information can be obtained for estimating purposes. It is also important that the project cost code be prepared as soon as possible after project is authorised so that cost from the very beginning can be accurately allocated. Thomes, (1978).

A project code, however, is adopted to incorporate the particular features and characteristics of the specific project.

It thus contains some components not found in the standard code and deletes anything not required for the job at hand. In contrast with the exhaustive check list desirable for standard code, the project cost code is a day-to-day working documents. For practical purposes, it must be kept concise and simple as possible, in keeping with the objectives for planning, documentation and control. A good rule of the thumb in selecting items for the project code is "if in doubt, delete it". Thomes. (1978).

Once developed, the project cost code may be used for refrencing and documenting items such as the following expenditures: (a) Labour (b) Equipment (c) Sub-contractor (d) Indirect costs (e) Procurement documents.

The project cost code thus serves as an interface among all parties involved in the administration and supervision of the project. Since each party has an input into the making and smooth working of the project cost code, its unlimited benefits for planning, monitoring and control of cost of elements such as labour cannot be overemphasised, Fisher, (1981).

Each individual account of a contractor"s financial accounting system is usually assigned its own code designation as means of classification and identification; here only the cost codes for job expense accounts should be involved. Many construction firms use their own customized project cost codes that they have developed and tailored to suit their individual preferences and needs. Fisher, (1981).

A number of project cost coding systems have been developed for different types of construction by various trade and professional groups. On of these is the MASTER FORMAT. Here, each item of expenses

incurred carries a 14 - digit cost code identification. The cost code number contains the following data groups: (a) Project Number (b) Area Code (c) Work Type code (d) Distribution Clough et al Sears, (1979).

Project number: is chosen to identify the cost colated for this code specifically, with the particular project from which they came. The number will often be a shorthand notation in itself, that indicates such things as the type of project e.g. H indicates heavy construction; the type of contract e.g. L indicates lump sum; the year it was started; its sequence with other projects started that year, and possibly its location. In this way, if the home office estimator is trying to figure out why one set of cost, say concrete footing, differ so much from another set. The project number may show that one set was from say plateau State, and the other from Rivers State; help to give a clearer picture, for the discrepancy.

The project number should be normally implict rather than explicit. In the day-to-day project reports that use the cost codes rather than include extra digit for the project number on each line item coding, it is printed in the heading for the report. Clough et al Sears, (1979).

8603	05	03157.20	3
PROJECT NUMBER	AREA CODE	WORK TYPE CODE	DISTRIBUTION CODE
Third project undertaken by company in 1986.	Area or location of activity with in the project can also represent geographical area where project is undertaken.	The first five digits represent the work type and the last two digit after the decimal point further classifies the work type.	Indicates the category of constructed expenses involved. 3 here, represents labour.

Fig 2.0. Example of project cost code.

Source; Construction Project Managements; John Wiley and Sons;

1979.

Area Code: Often in a project, there are certain distinct geographical and physical features that logically separate one part of the project from another. Often, the management of a project may also be structured according to these geographical and physical or technological features, eg. hydroelectric dam project migh logically be separated into (a) turnnels, (b) Shafts, etc. and "support facilities". Clough et al Sears, (1979).

These major breakdown referred to as facility may be further broken down into intake valves, turbines, drive shafts, generator,etc, which are work normally handled in the "work type code". Once derived, the code, helps keep track of cost in the different areas. With regard to labour cost, it ensures that distinction is made between certain operations which may, on the surface, appear to be similar but, in practice, may be quite different. An example of this may be the concreting of a reinforced concrete column at a height of 20 metres on a bunker as compared to concreting a similar column at ground level.

Work type code: Ios the part that is based on the standard cost code. It is categorised along recognised trade and subcontractors specialities, and also helps on identifying cost with the parties responsible for them.

Distribution code: To serve a variety of accounting purposes, in addition to that of project cost accounting, it is necessary to indicate the category of expense involved in construction. This may be done by means of a standard company distribution code. For example, "1" may be total expenses; "2" may be material expense; "3" may be labour expense, and so forth. Thus wherever the space for distribution code is "3", the cost must be allocated to labour.

2.5 Use of Project Cost Code

In the preceeding headings, I have attempted to bring into focus, all about cost codes, particularly, project cost codes, in order that its importance and utility in the controlling process will be better appreciated. Before the introduction of project cost code, it is necessary that the project be broken down into identical work units to facilitate both estimating and field cost accounting as pointed out in the introductory part of the thesis. These work units are further subdivided into many classifications, with are identified by their code designations. From the commencement of the construction, cost accounting process is used to provide a continuous record of the actual cost of production of each work classfication.

The labour expense accounts collated from cost accounting making use of cost codes, then provides the basic information for the periodic project cost reports. This is used by management for decision making

ertaining to labour cost control on specific items of the project that indicates cost overruns, when compared to budgeted cots, for the particular period. This enables corrective action to be instituted for "on-going" work item and facilitates a more reliable forecasting of eventual labour cost of project and its effects on the margin of profit.

An important point to be noted is that each work unit must consistenly contain the same elements of cost. For example, labour unit costs used for estimating and determined by cost accounting must consistently not include fringe benefits and payroll taxes, since the emphasis here in on "Direct Labour Cost" as applied to productivity. Clough at al Sears, (1979).

2.6 labour Cost Accounting

Labour cost accounting, here, relates solely to determining the detailed "make-up" of productivity and cost associated witht the production of a construction product in the field. Labour cost accounting should not be entirely separated from the contractors general system of accounts. rather, it should elaborate on specific project expense - labour. Labour cost accounting should involve the continuous determination of productivity and cost date; the analysis of results in summary form. In this aense, it will provide the date required for both labour cost control and estimating. Fisher(1981).

Labour cost accounting should not be only concerned with costs, but also with man-hours and the amounts of work accomplished. This systematic and regular checking of costs, is necessary part of obtaining reliable time-average production information.

In the operation of the system, a workable balance must be struck between too little and too much details, while a too general system will not produce the detail costs necessary for meaningful management control, excessive detail will result in the objectives of the cost system being obliterated by nmasses of data and paper work as well as needlessly increasing the time lag in making the information available.

Finally, a labour cost accounting system, should be seen as supplementing field supervision and not replacing it. Naturally, the best cost-control system that a contractor can have is skilled, experienced and energetic field supervision. Therefore, it is important to make field supervisors realise that labour cost accounting is meant and not to undermine their capabilities. In this respect, their support helps in the satisfactory operationof the cost system and the eventual achievement of useful results. Clough et al sears (1979).

2.7 Monitoring and Reporting

How the labour costs of a construction project should be controlled is a variable with its size and character. A large and complex job requires a detailed complex reporting and information system, to serve project management needs. simpler and less elaborate cost systems are sufficient for smaller and simpler projects. The important thing should be the installation of an effective feedback control system that has the basic elements of:

(a) Observation

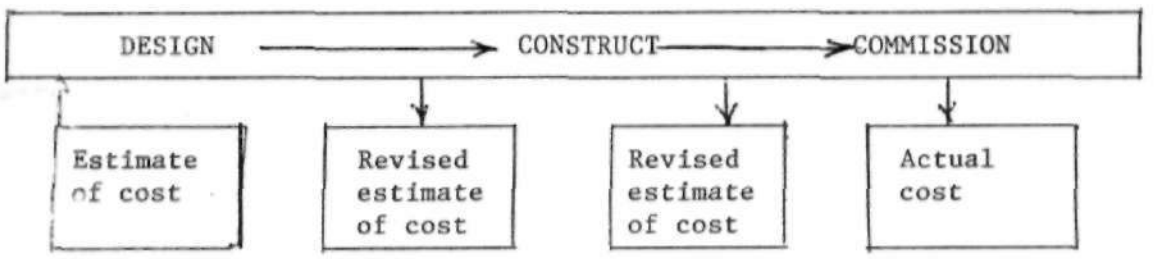
(b) Comparison of observation with some desired standard

(c) Institution of corrective action.

Fisher, (1981).

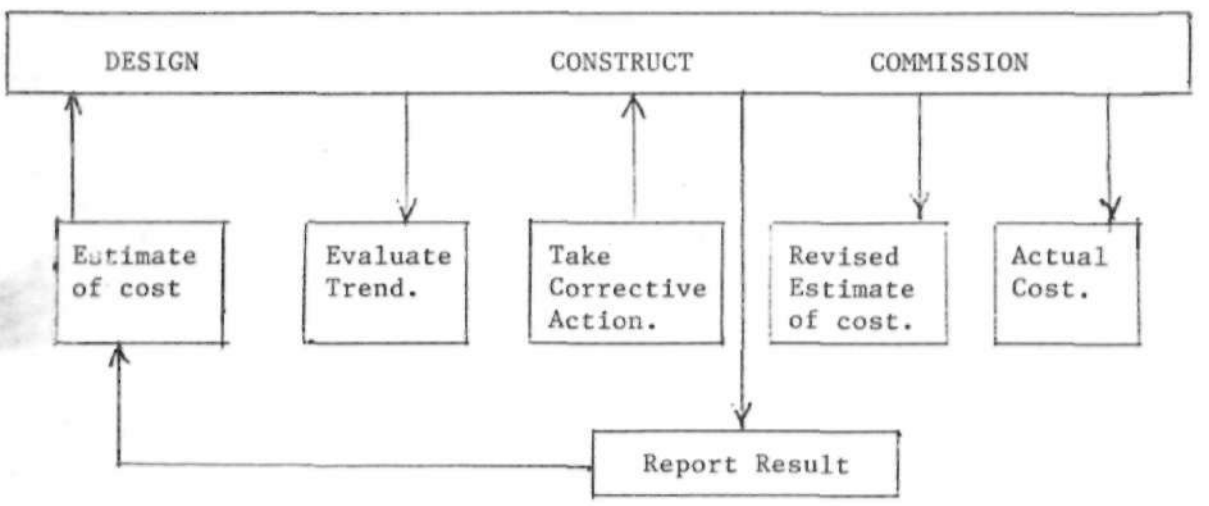
Too often in paying lip service to cost control, all that is ...ally achieved is "cost monitoring". Cost control is the difference between an active, forward looking, dynamic approach and a ...ssive backward looking one. Fisher, (1981). The feedback control system that is being envisaged in this thesis, would elevate the ...ortance of adequate and exceptional reporting, that is, reporting at regular intervals during the construction period. As toenble management initiate corrective action. This will significantly differentiate between cost reporting and cost control.

The effective monitoring and eventual control of labour cost on site is not very easy. It calls for conscientious and consistent effort from the very beginning to the very end of the project. Something easier said than done. With most of the so-called cost control procedures in use, the costs that ae being incurred are carefully, recorded but not controlled. Recording is of course vital to control, but if that is all that is being done, those running the project are infact helpless, although they may have masses of cost information from field reports. Effective labour cost control, therefore, involves both reporting project status a few daysafter the event and then interpreting the "trends". This, if well carried out, results in what can be referred to as "EFFECTIVE FEEDBACK CONTROL SYSTEM", or otherwise as "EARLY WARNING SIGNALS". A system which makes purely spasmodic checks in the form of spot ...tsneither effectively serves as an adequate control system not provides relaible feedback data of the type which will be of use ...he future. The fundamental difference between cost reporting and ...st control is illustrated in figure 2.1, A and B.



CASE "A" - COST REPORTING Figure 2.1 (A).

With case A, the project is reviewed at intervals and revised estimates of the final cost of labour are then prepared. In preparing these estimates, an appraisal must be made of the time that is still required to complete the project; so that both cost and time are under surveillance when the revised is being prepared. If successive estimate indicate that labour costs are rising, or that the project is taking longer to complete, then steps should be taken to remedy the situation. Any corrective action instituted in Case "A", however, has minimal effect, since it comes very much after the event.



CASE "B" - COST CONTROL. Figure 2.1 (B).

The approach in Case "B" differs slightly from Case "A". Here, the process of evaluation is followed by corrective action. The [illegible]ich also indicates that in order to evaluate a trend, a forcast h[illegible]o be made not only of the anticipated end result, but also of the route by which that end result is going to be reached. Comparison of the route that is now going to be followed with that forecast earlier allows the trend either along the route we want to f[illegible]y, or away from it, to be seen. Any potential divergence c[illegible]n be studied before it becomes too significant and the appropriate [illegible]cion taken. The result of the system of control is to be fully [illegible]ective. If this is done, we will have a cycle: (a) Evaluate [illegible]rect (c) Report.

This cycle of event, constantly repeated, is foundamental to an effective feedback control system.

2.8 Installing Feedback Control System

It is the responsibility of the project manager to get the project completed within the specified time and cost limitations. Hence, it falls on him to install an effective feedback control system in the organisation. He should therefore, act as the focal point of all departments having inputs into the construction process. He should coordinate matters relevant to the successful implementation of the project and expedite projection operations by dealing directly with the individuals and departments involved in [illegible]peration.

In installing an effective feedback control system, the project

ager's duties involves working with the foreman, coordinating sub-contractor, directing construction operations and keeping work progressing smoothly and on schedule. In addition, he ces the use of "source documents", such as labour time, ld quantity reports, and so forth, which are designed to adequa- bserve and record job situation on site. Extractions from the source documents coupled with personal observation can then be analysed and used in preparing periodic reports for management dy of situation at site.

2.9 Operation of Feedback System

The operation of the feedback control system envisaged is shown in figure 2.2. The cycle of tasks and actions taken is constantly repeated during the period of the construction project. These are outlined below:

Project Manager

i) The Project Manager prepares the schedule of work for the project.

ii) He makes regular field inspection and observes specific work items.

iii) He introduces well designed source documents to observe and record job situation on site.

Site Manager

i) The Site Manager organises the labour for maximum utility on owrk items. He makes entries into the sources documents, for example, labour time card, on daily basis, reflecting the man-hours put into the work item for the day.

ii) He sends back to the Project Manager, weekly documents together with additional reports on the situation at the site.

Project Manager

i) The Project Manager analises the field report, compares with schedule output and budgeted cost for the reported period.

ii) Prepares a periodic situation report for management delibration.

Management

Management delibrates on reports and makes recommendations for immediate execution.

Project Manager

Project Manager sees to the execution of the recommendations as it affects job progress.

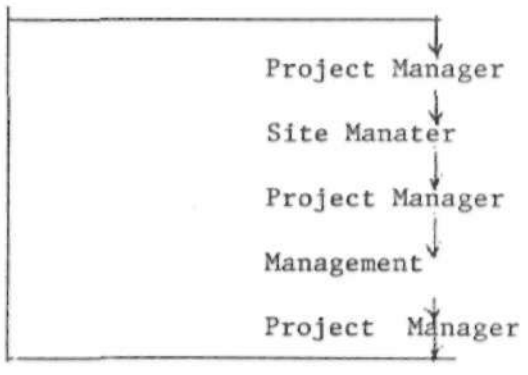


Figure 2.2.

PROJECT:..... DAILY LABOUR TIME CARD WEATHER:.....

DATE:..... PROJECT NO. PREPARED:.....

EMPLOYEE NUMBER	NAME	GRAFT	TIME CLASSIC FICATION	HOUR RATE	COST CODE					TOTAL HOURS	CROSS AMOUNT
TOTAL HOURS											
TOTAL COST											

Fig. 2.3 Example Format for Labour Time Card

Source: Construction Project Management; John Wiley & Sons, 1979.

NAME:.....
EMPLOYEE NO.:.....
WEEK ENDING: .....

WEEKLY LABOUR TIME CARD

CRAFT:

PRESENT:.....
PROJECT:.....
PREPARED BY: .....

COST CODE	TIME CLASSIFICATION	HOURLY RATE	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT	TOTAL HOURS	TOTAL COST
TOTAL HOURS										
GROSS AMOUNT										
WEATHER										

Fig. 2.4 Example Format for Labour Time Card

Source: Construction Project Management; John Wiley & Sons, 1979.

2.10 Documents in the Feedback System

The documents are:- (a) Labour Time Card

(b) Field quantity reports, and (c) Up-dated graphical repirte

2.10.1 Labour Time Cards.

It provides information on the man-hours spent by different trades in a day or a week. It may be further improved to provide information on the specific operations performed by the different trades. Which will facilitate the allocation to relevant cost code for accurate cost accounting. See figure 2.3. and 2.4 for example format of labour time cards.

2.10.2 Field Quantity Reports.

It provides information on the production for the day or week by different trades or on the operations involved in the project. Information so provided enables the Project Manager to have a better insight into the utility of the resources at his disposal, and to effect changes where necessary. For it cannot be over emphasised that a mojor factor in labour cost control is to be able to match the work force with the workload. This demands careful and detailed reporting of production levels, which is the prime responsibility of the site manager. An example of the format for "weekly field Quantity Report" is shown in figure 2.5.

2.10.3 Up-dated Graphical Reports

These could be any of the planning and scheduling tools, for example, bar charts, networks, and so forth, which are prepared in such a way to make the extraction of work quantities, tailored after the cost codes used, easier to obtain.

the up-dated graphical reports are used for monitoring and reporting work quantities achieved. Unlike the field quantity report that are obtained by measurement on the field, the graphical reports are up-dated from situation report of progress on the site. The use of up-dated graphical reports will also have the advantage of facilitating the allocation of activities of their respective cost codes.

2.11 Measurement of Field Quantities

The control of labour cost is not so much inherent in the checking on the cost and time overruns but also fundamentally in evaluating production rates as commensurate with the production cost. In this respect, adequate and effective means of measurement of work quantities is also important for the smooth running of a feedback control system.

On some types of work, it may be feasible and convenient for the field supervisors to report work quantities accomplished as of the end of each day or each shift. It is common practice, that labour work measurement are made at valuation periods or could depend on the internal for periodic report to management. Clough et al Sears (1979).

Work quantities can be obtained in a variety of ways depending on the nature of the work involved and the Company"s Management methods. Direct field measurement, estimation of percentages completed, computation from up-dated graphical progress reports are all used. Direct measurement on the job is common. This proceedure will be simple and direct on projects that involve few cost code classifications.

The field measurement of work quantities are often done by field supervisors. However, on large projects and especially those with many work codes, the manager carries out this function because of the time and effort required. From work measurements, reports of work done

WEEKLY FIELD QUANTITY REPORT

PROJECT:..... PROJECT:.....

WEEK ENDING:..... PREPARED BY:.....

COST CODE	WORK TYPE	UNIT	TOTAL LAST REPORT	TOTAL THIS WEEK	TOTAL TO DATE

Fig. 2.5. Example Format for Field Quantity Report

Source: Construction Project Management; John Wiley & Sons, 1979.

periodically can be submitted on standard format (see fig. 2.5).

Up-dated graphical reports used for planning and scheduling and time control can also serve as convenient packages for determining work quantities accomplished in the field. When activities are used as the basis for work quantity determination, the completed amounts of different work classification must be readily and accurately established for those activities that have been completed.

2.12 Labour Cost Report

At periodic intervals, say one week, labour costs obtained from time cards are matched to the work quantities produced. The result which are summarised in labour cost report. Where the cost system is maintained manually, some form of workbook would be needed for the collecting and analysis of the cost and quantities data. A separate record should be kept of each cost account, in which entry is made of all labour charges allocated to that account number, and, of all quantities of that work type accomplished in the field.

The level of the detail of the information gathered and that used in cost reporting should be adjust according to the level of managment for which it is intended. The cost information that would be routinely provided to Managers or Supervisors should be tuned to the scope and nature of their responsibilities. Clough et al Sears (1979).

PROJECT: WEEKLY LABOUR COST REPORT PROJECT NO:

PERIOD ENDING: PREPARED BY:

COST CODE (1)	WORK TYPE (2)	UNIT (3)	TOTAL QUANTITY BUDGETED (4)	TOTAL QTY. TO DATE (5)	PERCENT COMPLETED (6)	BUDGETED DIRECT LABOUR (7)	BUDGETED LABOUR TO DATE (8)	ACTUAL LABOUR TO DATE (9)	COST DEFFERENCE (10)	DEVIATION (11)
TOTAL TO DATE										

Fig. 2.6. Example Format for Labour Cost Report.

Source: Construction Project Management; John Wiley & Sons, 1979.

PROJECT:
PERIOD ENDING :

WEEKLY LABOUR COST R[illegible]

PROJECT NO.
PREPARED BY:

COST (1)	WORK TYPE (2)	UNIT (3)	QUANTITY			DIRECT LABOUR COST			LABOUR UNIT COST			TO DATE		PROJECTED	
			BUDGET (4)	THIS WEEK (5)	TO DATE (6)	BUDGET (7)	THIS WEEK (8)	TO DATE (9)	BUDGET (10)	THIS WEEK (11)	TO DATE (12)	SAVING (13)	LOSS (14)	SAVING (15)	LOSS (16)
	CONCRETING														
	BLOCK WORK														

Fig. 2.7. Example Format for Labour Cost Report.

Source: Construction Project Management; John Wiley & Sons, 1979.

Labour cost reports have the objective of providing job management with detailed information concerning the current statue of labour costs, and of indicating how these costs compare with those estimated. It is perceived that labour cost reports would definitely vary from one construction company to another, but nevertheless, all such reports should be designed to convey adequate information to management on the current level of manpower utilisation at the project site. Figures 2.6 and 2.7 are example formats of labour cost reports.

Chapter 3

ASSESSMENT OF CASE STUDIES

3.1 Case Study

In an attempt to compare what obtains in actual practice with the theories outlined in the previous chapters, investigative studies were conducted into the construction practices of three companies that were willingto divulge information on their operating practices. Incidentally, these companies are in the Northern, and, southern part of the country. This is hoped will present insights into the similarities and differences in project management from the two areas of the country. However, this is not saying that informations obtained from these companies conclusively represent the operational methods of other constructing firms in their respective location. The information obtained all the same, should present a basis for comparison of practice with theory, and will enable useful suggestions and recommendations of an innovative labour cost control system.

The Companies studied are:

(a) Case A: Belag Construction Engineering Limited, Kaduna.

(b) Case B: A. Micheletti Limited, Port Harcourt, Rivers State.

(c) Case C: F.K. Agara Nigeria Limited, Port Harcourt, Rivers State.

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AHMADU BELLO UNIVERSITY
ZARIA, NIGERIA.

3.2 Case A

Investigative studies were made into the constructing practices of Belag Construction Engineering Limited, Kaduna, on two of their building projects namely:

(i) AERLS Office Blocks, Ahmadu Bello University (A.B.U.), Zaria.

(ii) Extension to Medical Centre, Nigerian National Petroleum Corporation, (N.N.PC.), Zaria.

3.2.1. AERLS Office Blocks, A.B.U., Zaria

The project was tendered for in September, 1983, and was awarded at a contract sum of ₦1,000,000 (one million naira). Work started on the project in September, 1984 and was completed in October, 1985.

The tendering for the project was through priced bill of quantities. Pricing was done by an all-in-rate from Company's production rates on workitems. Copies of which are provided in Appendix A. After the contract was awarded, schedule of operations referred to as the "Master Programme" (See Appendix B) were prepared by the Project Manager from thorough job analysis, drawings and bill of quantities. The master programme was schemmatically represented, using bar charts. Each item of work was arranged to suit specific labour requirement. From the schedule, cost estimates were prepared, which encompassed, labour, material, plant and subcontracts. This then forms the construction budget. The cost estimate that was submitted to managemetn, will reflect the expenses that will be made on labour, materials and plant at the various construction stages outlined in the master programme. This will add management to ascertain the cashflow situation to be envisaged for the project.

From inception of work at the site, "monthly labour time cards" are used to record the man-hours spent on the job. Which are then submitted at the end of the month for payroll purposes only (See figures 3.0 and 3.1 for wages record card). Throughout the duration, work measurement were carrried at valuation periods, by estimation of percentages completed or measured directly in the field by the site supervisor. At theend of the project, the efficiency was judged, using the formula:

Normal Days	₦
less 5% N.P.F.	
Total	
Add Over time and Sundays	
Add others	
Total	
less Income Tax	
less Advance/ Deductions	
TOTAL	₦
Received:	

B E L A G
CONSTRUCTION ENGINEERING LTD
21, IBRAHIM BIU CRESCENT,
P.O. BOX 744, PHONE 217358,
KADUNA.

WAGES RECORD CARD

NAME: _____

TRADE: _____

REG.NO.: _____

N.P.F.: _____

MONTH: _____

Fig. 3.0 Wages Record Card
Source: BELAG CONSTRUCTION COMPANY LIMITED, KADUNA.

25	26	27	28	29	30	31
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24				

DAYS: _____

RATE: _____

TOTAL:

DEDUCTIONS/ADVANCE:

TOTAL:

OVERTIME AND SUNDAYS

Date	S	Hrs.	Rate	Total	Sig.
TOTAL:					

OTHERS:

TOTAL:

Fig. 3.1 Wagen Record Card

Source: BELAG CONSTRUCTION COMPANY LIMITED, KADUNA.

$$\frac{\text{TOTAL SUM OF CONTRACT}}{\text{TOTAL MANHOURS}} \Rightarrow ₦1,200.00/\text{hour}.$$

3.2.2 Extention to Medical Centre, N.N.P.C., Kaduna

This project was tendered for in January, 1985 and was awarded at a contract sum of ₦500,000 (five hundred thousand naira). Work commenced on the site in September, 1985 and was completed in March, 1986.

The tendering for the project was done the same was as in " "ARLS Office Blocks, A.B.U., "Zaria. The master programme of the job is as shown in Appendix C. Here the outline of the bars in the barchart were shown to be overlapping for the various construction activities, which does not give much clarity.

As in 3.2.1, the same procedure was used for estimating and eventual assessment of job performance.

3.3 Case B

Investigative studies were made into the constructing practices of A. Micheletti Limited, Port Harcourt, on two of their building projects, namely:

i) Union Bank office, Port Harcourt.

ii) Shell Office, Second Floor Extension, Port Harcourt.

3.3.1. *Union Bank Office, Port Harcourt*

Project was awarded to the company at a contract sum of ₦5,500,000 (five million, five hundred thousand naira). Work commenced in February, 1986 and is still in progress.

The tendering and pricing for the job follows the same pattern as

in "Case A". Bar charts were used in preparing the scheduled operations, cost estimate of expenses were made, which subsequently makes up the construction budget.

3.3.2 Shell Office, Second Floor Extentsion, Port Harcourt.

Project was awarded to the company at a contract sum of ₦700,000 (Seven hundred thousand Naira). Work started in May, 1986 and was completed a t the end of October, 1986.

The tendering, pricing and general procedure for the timely completion of the project, is the same as in 3.3.1. The schedule of operations or programme chart is shown in Appendix E.

3.4 Case C

Investigate studies were also made into the constructing practices of F. K. Agara Nigeria Limited, Port Harcourt, a medium size constructing outfit. The project was the - Renovation of the Bank of the North Building, situated at 8, Azikwe Road, Port Harcourt.

3.4.1 Bank of The North Renovation

The choice of this project was not based on the fact that it was the best suited but for the fact that, most of the other projects handled by the company has been completed without adequate documentation for investigative studies. Also, since it was an "on - going" project, the temptation of putting into practice outlined theory on labour cost control was very strong.

The project was tendered for in February, 1987 and was awarded at a contract sum of ₦450,000 (Four hundred and fifty thousand naira).

The tendering was through priced bill of quantities. Work Commenced on 3 May, 1987 at the site. The master programme of the work was prepared by me, and is shown in Appendix F.

From the inception of the work, daily and weekly labour time cards were used tor ecord man-hours spent on the job, which are then reduced to monetary terms. They are then submitted to the Main Office for payroll purposes.(See Fig. 2.3 for labour time sheet) Measurement was carried out as in "CASE A", and, also at valuation period.

3.5 Treatment of Case Studies

The thesis has set out to investigate labour cost control in practice namely, the set out theory in the previous chapters. In this respect, the case studies highlighted so far, will be subjected to the treatment of finding out if cost control measures in terms of labour are applied, and in what form. We shall now critically look into the practices of the companies, on their construction projects, taking them one at a time.

3.5.1 Belag Construction Engineering Limited

The construction practice here, on the award of the project, is to first of all, draw up the schedule of activities based on work programmes envisaged by the Project Manager. After which, cost estimates are preparation of construction budget. As work progresses in the field, wages record card (see figs. 3.0 and 3.1) are used in recording man-hours spent on the project, which are used for payroll purposes. Work measurements are carried out at valuation periods for the purposes of interim payments on job progress. At the end of the project, all costs incurred, are allocated according to the cost codes operated in the company.

The cost codes used are indicated below:

001 - Materials

005 - Subcontractor

010 - Labour

011 - Expertriate Supervision(Salaries)

012 - Other Allowances

015 - Site Expenses

016 - Small tools and equipments

017 - Fuel, Oil and Gases

020 - Expenses - Vehicles

021 - Hire of Vehicles and equipments

022 - Conveyance Expenses

025 - Miscellaneous Expenses.

026 - Medical Expenses

040 - Guaranteed period Expenses.

For a project such as the "AERLS Office Blocks", A.B.U, Zaria, the cost code for cost accounting purpose is designated for examples as: AB - 010.

Where AB stands for A.B.U. and 010 for labour. This process is adopted for other projects with two-letter designate representing the client or the project and three digits representing the expenses.

The performance of efficiency of a project is tested by using the formula:

$$\frac{\text{TOTAL SUM OF CONTRACT}}{\text{TOTAL MAN-HOURS}} \Rightarrow ₦1,200.00/\text{hours}.$$

This is used mostly for projects where a very high percentage of labour requirements are controlled by the company, that is, the level of sub-contracting is low. The above, thus sums up the approach of the

company to construction management, From which I shall attempt to compare their labour cost control measures, to set out theory.

In the set out theory, I have stated that labour cost control begins with the preparation of a well defined schedules of activities or operations and the allocation of economic gang sizes or crew to scheduled activities (resource levelling). The operations of the company reflects this, although, the schedule of activities of master programme for case studies was not well detailed. Next comes the estimation of labour cost from the scheduled activities and the resource levelling that forms part of the subsequent construction budget. Estimation of labour cost is either done by prdducetion rate available from past records on projects or labour unit rates calculated on wage basis. The estimation of labour in the company is however based on an all-in-rate; which is outlined below:

Basic daily wage for craftman = ₦8.00

Basic daily wage for labour = ₦5.50

Effective Yearly working Hours

Total working days/year	= 52 x 5	=	260 days
Less:			
Public Holidays	= 13 days		
Annual leave	= 10 days		
Sick leave	= 5 days		
Wet Weather	= 25 days	-	53 days
			207 days

Therefore, effective working days = 207 x 8 = 1,656 hours.

Basic Annual Wage

Craftman: 260 x 8.00 = ₦2,080.00

Labour: 260 x 5.50 = ₦1,430.00

National Provident Fund Contributions

Craftman: = ₦48,00

Labour: = ₦48,00

Trade Supervision

Craftman: = ₦208.00

Labour: = ₦143.00

All-in-hourly rate

Craftman: ₦2714 ÷ 1656 = ₦1.64

Labour: ₦1861 ÷ 1656 = ₦1.17

Allow 10% Contigencies:

Therefore use Craftman: = ₦1.80

Labour: = ₦ 1.30

For, inclusive of profit and overhead, multiply by 1.30

That is, Craftman = ₦2.35

Labour = ₦1.70

The basic estimating system of the company is attached in Appendix A, which shows the matrix method employed in the estimation of all construction expenses. The Company's production rate in Appendix A, gives further insight into how it arrives at a suitable crew size for work quantities reflected in the bill of quantities. This further enhances estimation of labour cost.

From the eventual preparation of labour expenses, the basis for labour cost control has been laid. Cost of labour as they occur in the field are compared to the budget and revised budgets are prepared. These costs are monitored and computed using information from labour time card, field quantity reports and up-dated graphical reports. The costs are allocated to the cost codes designated to them. This facilitates comparison to budgeted cost and effective labour

cost accounting. In comparison the company's approach, makes use of wages record cards, which serves solely for payroll purposes. Field quantities are only gathered at valuation periods for interim payment purposes. There were visible evidence of up-dating of graphical reports or work programme, rather, extension of time was asked for, where project lags behind schedule.

Finally, from theory, labour cost reports are prepared periodically, outlining the labour cost status of the project, thereby pinpointing work classification where expenses were deviating from budget. The approach of the company did not in any way indicate the use of labour cost report. although reports are made to management, they generally contain information concerning the overall cost expenses on the project. Occassionally, attempt is made to itemize the cost of the various construction expenses as at the time of the report. Reports however, are not regular and most cases comes at the end of the project,. This serves no other purpose, than comparing expenses against contract sum so as to ascertain the margin of profit on the project.

3.5.2 A. Micheletti Limited

The approach of this company shows resemblance in some areas to that of Belag Construction Engineering. The schedule of operations referred to as the "Progress Chart" is drawn up after the award of a project. Which is then used to estimate the number and cost of work gangs for specific activity on the chart. The determination of work gans in this organisation, are based on the company's established production rates of craftmen and labourers. This approach is the same with that of Belag and the set out theoty. The estimation for labour, like that of Belag, is based on an all-in-rate.

The monitoring and recordings of man-hours spent on the project are done by the labour time sheets, which like in the case for Belag, is also used for payroll purposes. Work measurement on the project are also carried out at valuation periods. In comparison to set out theory, the labour time card, used in the company do not serve as a tool for collating cost and eventual comparison with budget. There were no visible evidence of the existence of cost codes unlike Belag for proper cost accounting. The ultimate efficiency of a project was determined by the "profit and loss" position at the end of the project. This further shows that enough attention was not given to the control of the labour cost during the construction period.

Preparation of periodic labour cost reports were also not a norm in the organisation. The project Manager, was highly confident that their programme charts were adequately designed with efficent and sufficient human resources to fulfill schedulled targets wihtout necessary resorting to strict cost control measures on labour. Reports, were however made at the completion of the project to describe the conduction of the project, and the final profit/loss situation on the work.

3.5.3 F.K. Agara Nigeria Limited

The renovation of the Bank of The North, was used as a text case, to attempt to put into practice the advocated theory on labour cost control. The management permitted me to come up with a work programme (as shown in Appendix F) and to monitor activities without interferring with the project.

The work entailed the conversion of a former warehouse into an office block. After a thorough job analysis, a master programme was

prepared (Appendix F), showing nine major activities, which could be further broken down into smaller activities. Of the nine, four were to be given out on subcontract, while the rest were to be undertaken directly by the company's workmen. Priority was given specifically to labour related activities. A network diagram was thus developed, which which followed by resource allocation and levelling, (figs 3.2 and 3.3). The network produced showed that the project would take twelve weeks to be completed, following yhe critical path line.

Planning of Construction Work: Planning of the work programme statted with a thorough job analysis that involved detailed study of available documents, like; drawing, specifications and conditions of the contract. From analysis of the works involved, mobilisation at sites was first considered. This will include arrangement for the procurement of necessary materials, plant and labour, and the conveyance to site. A Duration of one week was deemed fit for this.

Super concrete workwas considered next. This comprises the construction floor slab and beam. The quantity of concrete to be casted was $4.83m^3$. The average production rate of mason with a labour assistance from colated facts is $0.125m^3$ per day. Based on this, the concreting was estimated to last four weeks of six working days per week.

For the blockwork, that involves blocklaying and plastering, the production rate per mason was fixed at 50 blocks per day. For a total of 1,800 blocks to be layed with a gang size of 3 masons and 3 labout, a time duration of two weeks at six working days/week was arrived at.

The restructioning of the roof comes next. The work involved the welding and bolting of shop fabrcated roof trusses, which are to be placed at five bays. The production rate envisaged, was one bay per day using a welder and two labour. A duration of one week was found adquate for completion.

The planning of individual operations was based on the knowledge of job quantities, the production rate (both objective and subjective) of labour, total out-put required, and the duration expected of the project.

Estimation of Direct Labour: The estimation here, has been restricted only to selected job activities for investigation. The activities selected are: (a) Concreting (b) Blockwork (C) Roofing (d) Fixing of doors and windows.

In estimating the direct labour cost for each operation, the workmen's basic wage rates, reduced to hourly rates, were multiplied by the duration of each operations. The total sum computed for the planned operation, forms part of the labour budgets. Calculations for some operations are shown below:

Concreting:

Quantity: $4.83m^3$

Planned Crew: 1 mason, 1 carpenter, 2 labours.

Duration: 4 weeks.

Budgeted Cost:

i) Craftmen:

Straight Time = 8 hours at ₦0.88/hour = ₦7.04

Overtime	=	2hours at ₦0.88/hour	= ₦1.76
			₦8.80/day
Total Cost	=	₦8.80 x 2 x 4 x 6	₦422.40

ii) Labour:

Straight Time	=	8 hours at ₦0.63/hour	= ₦5.04
Overtime	=	2 hours at ₦0.63/hour	= ₦1.26
			₦6.30/day
Total cost	=	₦6.30 x 2 x 4 x 6	₦302.40
Grand Total for operation = = = =			₦724.80

Block Work:

Quantity: 1,800 No.

Planned Crew; 3 masons, 3 labours.

Duration: 2 weeks.

Budgeted Cost:

i) Craftmen:

Cost = ₦8.80 x 3 x 2 x 6 = = = ₦316.80

ii) Labour:

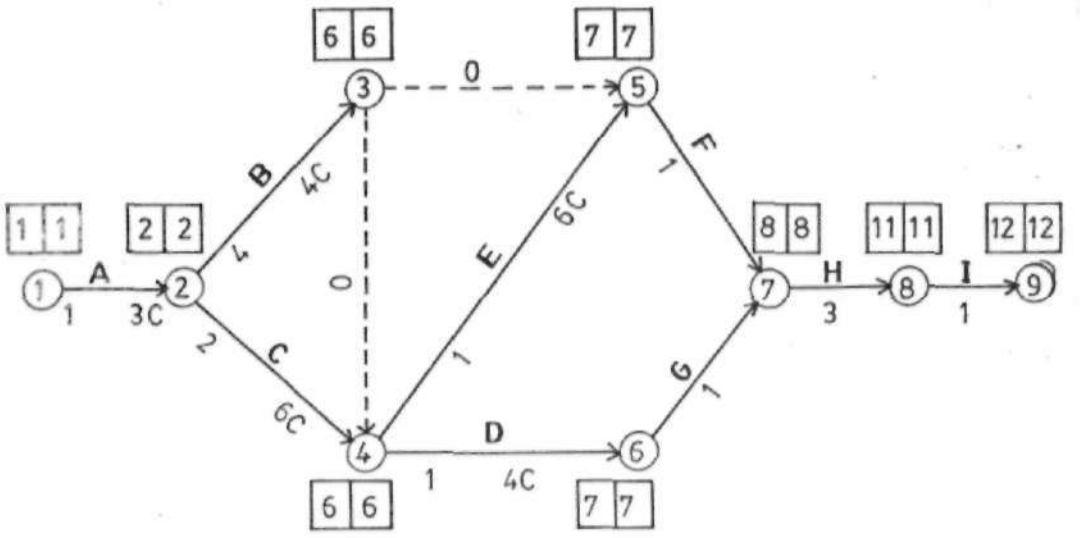
Cost = ₦6.30x 3 x 2 x 6 = = = ₦226.80

Total cost of operation = = = = ₦543. 60

RESOURCE LEVELING

ACTIVITY	1	2	3	4	5	6	7	8	9	10	11	12
1 ——— 2	3											
2 ——— 3		4	4	4	4							
3 ——— 4				D	U	M	M	Y				
4 ——— 5						6						
4 ——— 6						4						
5 ——— 7		S	U	B		C	O	N	T	R	A	C T
6 ——— 7		——	——	——	——	D	O	——	——	——	——	——
7 ——— 8		——	——	——	——	D	O	——	——	——	——	——
8 ——— 9		——	——	——	——	D	O	——	——	——	——	——
2 ——— 4		6	6 6	6 (6)	(6)							
3 ——— 5				D	U	M	M	Y				
E S	3	10	10	4	4	10						
L S	3	4	4	10	10	10						
R L	3	4	10	10	4	10						

CRITICAL PATH ANALYSIS



NETWORK CALCULATION

ACTIVITY	DURATION	EST	EFT	LST	LFT	TF	FF	IF
1 —— 2	1 WK	1	2	1	2	0	0	0
2 —— 4	4 ✓	2	6	2	6	0	0	0
2 —— 4	2 ✓	2	4	4	6	2	2	0
3 —— 4	0 ✓	6	6	6	6	0	0	0
3 —— 5	0 ✓	6	6	7	7	1	1	0
4 —— 5	1 ✓	6	7	6	7	0	0	0
4 —— 6	1 ✓	6	7	6	7	0	0	0
5 —— 7	1 ✓	7	8	7	8	0	0	0
6 —— 7	1 ✓	7	8	7	8	0	0	0
7 —— 8	3 ✓	8	11	8	11	0	0	0
8 —— 9	1 ✓	11	12	11	12	0	0	0

Fig. 3.2 Network Diagram for Bank of The North.

3.0 Summary of Activities Duration, Crew Size and Budget.

ACTIVITY	DURATION(WEEKS)	GANG SIZE	BUDGET(₦)
Concreting	4	4	724.80
Block work	2	6	543.60
Roofing	1	3	181.20
Doors and Windows	1	6	271.80

Data Collection and Analysis: From daily and weekly labour time sheets, (appendices G. H. I,J,K,L) the total number of hours expended per worker for each of the selected activities were converted to monetary value. Giving the actual production cost incurred for a certain duration, complations of total cost per activity per week are shown on the next pages. From field quantity report sheets (appendices M and N) in conjuction with up-dated graphical reports. (appendices O and P), computation of actual production on site are made. Which is then used to prepare weekly labour cost reports (appendices Q. R. S. T.). The cost differences between actual costs and budgeted costs. The deviations are derived from the actual costs divided by the budgeted costs. a negative difference anda deviation of more than unity indicate an over-run in cost. Whereas, a positive difference and a deviation less than one indicates a smooth running and profit.

TABLE 3.1. CRAFT: LABOUR

COST Code	Time. Classi-fication	Hourly .Rate	. Mon	. Tue.	Wed	.Thu.	Fri.	Sat	. Total Hours	. Total cost
				WEEK 1						
	S.T	₦0.63	8	8	8	8	8	8	48	₦30.24
	O.T	₦0.63	-	-	-	2	2	2	6	₦3 .78
	GROSS AMOUNT									₦34.02
				WEEK 2						
	S.T	₦0.63	8	8	8	8	8	8	48	₦30.24
	O.T	₦0.63	2	2	1	1	2	2	10	₦ 6.30
	GROSS AMOUNT									₦36.54
				WEEK 3						
	S.T	₦0.63	8	8	8	8	8	8	48	₦30.24
	O.T	₦0.63	2	2	2	2	2	2	12	₦ 7.56
	GROSS AMOUNT									₦37.80
				WEEK 4						
	S.T	₦0.63	8	8	8	8	8	8	48	₦30.24
	O.T	₦0.63	2	2	2	2	2	2	12	₦ 7.56
	GROSS AMOUNT									₦37.80
				WEEK 5						
	S.T	₦0.63	8	8	8	8	8	8	48	₦30.24
	O.T	₦0.63	2	2	2	2	2	2	12	₦ 7.56
	GROSS AMOUNT									₦37.80
				WEEK 6						
	S.T	₦0.63	8	8	8	8	8	8	48	₦30.24
	O.T	₦0.63	2	2	2	2	2	2	12	₦ 7.56
	GROSS AMOUNT									₦37.80
				WEEK 7						
-	-	-	-	-	-	-	-	-	-	- - -
				WEEK 8						
	S.T	₦0.63	8	8	8	8	8	8	48	₦30.24
	O.T	₦0.63	2	2	2	2	2	2	12	₦ 7.56
	GROSS AMOUNT									₦37.80

TABLE 3.2. CRAFT: CARPENTER

Cost Code	Time Classification	Hourly Rate	Mon	Tue	Wed	Thu	Fri	Sat	Total Hours	Total Cost
				WEEK 1						
-	-	-	-	-	-	-	-	-	-	- -
				WEEK 2						
	S.T	₦0.88	8	8	8	8	8	8	48	₦42.24
	O.T	₦0.88	2	2	1	1	2	2	10	₦ 8.80
	GROSS AMOUNT									₦51.04
				WEEK 3						
	S.T	₦0.88	8	8	8	8	8	8	48	₦42.24
	O.T	₦0.88	-	-	-	-	-	-	-	- -
	GROSS AMOUNT									₦42.24
				WEEK 4						
	S.T	₦0.88	8	8	8	8	8	8	48	₦42.24
	O.T	₦0.88	2	2	2	2	2	2	12	₦10.56
	GROSS AMOUNT									₦52.80
				WEEK 5						
	S.T	₦0.88	8	8	8	8	8	8	48	₦42.24
	O.T	₦0.88	2	2	2	2	2	2	12	₦10.56
	GROSS AMOUNT									₦52.80
				WEEK 6						
	S.T	₦0.88	8	8	8	8	8	8	48	₦42.24
	O.T	₦0.88	2	2	2	2	2	2	12	₦10.56
	GROSS AMOUNT									₦52.80
				WEEK 7						
-	-	-	-	-	-	-	-	-	-	- - -
				WEEK 8						
	S.T	₦0.88	8	8	8	8	8	8	48	₦42.24
	O.T	₦0.88	2	2	2	2	2	2	12	₦10.56
	GROSS AMOUNT									₦52.80

TABLE 3.3. CRAFT: MASON

Time Occupation	Hourly Rate	Mon	Tue	Wed	Thu	Fri	Sat	Total Hour	Total Cost
			WEEK 1						
-	-	-	-	-	-	-	-	-	- - -
			WEEK 2						
S.T	₦0.88	8	8	8	8	8	8	48	₦42.24
O.T	₦0.88	2	2	1	1	2	2	10	₦ 8.80
GROSS AMOUNT									₦51.04
			WEEK 3						
S.T	₦0.88	8	8	8	8	8	8	48	₦42.24
O.T	₦0.88	-	-	-	-	-	-	-	- - -
GROSS AMOUNT									₦42.24
			WEEK 4						
S.T	₦0.88	8	8	8	8	8	8	48	₦42.24
O.T	₦0.88	2	2	2	2	2	2	12	₦10.56
GROSS AMOUNT									₦ 52.80
			WEEK 5						
S.T	₦0.88	8	8	8	8	8	8	48	₦42.24
O.T	₦0.88	2	2	2	2	2	2	12	₦10.56
GROSS AMOUNT									₦52.80

ACTUAL LABOUR COST.

1. CONCRETING

Week 1 :- No concrete work was done for week one.

Week 2 :- Four people worked, that is:-

1 mason, 1 carpenter and 2 labours

1 mason	₦51.04	
1 carpenter	₦51.04	
2 labours	₦36.54 x 2	= ₦73.08
		₦175.16

Week 3:- Four people worked, that is:-

1 mason, 1 carpenter and 2 labours

1 mason	₦42.24	
1 carpenter	₦42.24	
2 labours	₦37.80 x 2	= ₦75.60
		₦160.00

Week 4:- Four people worked, that is:-

1 mason, 1 carpenter and 2 labours

1 mason	₦52.80	
1 carpenter	₦52.80	
2 labours	₦37.80 x 2	= ₦75.60
		₦181.20

Week 5:- Four people worked, that is:-

1 mason, 1 carpenter, 2 labours

1 mason	₦52.80	
1 carpenter	₦52.80	
2 labours	₦37.80 x 2	= ₦75.60
		₦181.20

ACTUAL LABOUR COST.

Total actual cost for concreting as at 30th May 1987 = ₦175.16
₦160.08
₦181.20
₦516.44

Total actual cost for concreting as at 27th June 1987 ₦516.44
₦181.20
₦697.64

2. BLOCK WORK

There was no work done for weeks one and two

Weeks 3:- Six people worked, that is:- 3 masons and 3 labours.

3 masons ₦42.24 x 3 = ₦126.72

3 labours ₦37.80 x 3 = ₦113.40
₦240.12

Week 4:- Six people worked, that is:- 3 masons and 3 labours.

3 masons ₦52.80 x 3 = ₦158.40

3 labours ₦37.80 x 3 = ₦113.40
₦271.80

Week 5:- Two people worked, that is:- 1 mason and 1 labour.

1 mason ₦52.80

1 labour ₦ 37.80
₦90.60

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ZARIA, NIGERIA.

Total actual cost for block work as at 30th May 1987 = ₦240.12
₦271.80
₦511.92

Total actual labour cost for block work as at 27th June 1987
= ₦511.92
₦ 90.60
₦602.52

ACTUAL LABOUR COST.

3. ROOFING

There was no work done on roofing for weeks one, two, three, four and five.

Week 6:- Four people worked, that is:- 2 carpenters and 2 labours.

2 carpenters	₦52.80 x 2	=	₦105.60
2 labours	₦37.80 x 2	=	₦ 75.50
			₦181.20

Total actual labour cost for roofing as at 27th June 1987 = ₦181.20.

4. DOORS AND WINDOWS

There was no work done on doors and windows for week one, two, three, four, five, six and seven.

Week 8:- Six people worked, that is:- 3 carpenters and 3 labours.

3 carpenters	₦52.80 x 3	=	₦158.40
3 labours	₦37.80 x 3	=	₦113.40
			₦271.80

Total actual labour cost for doors and windows as at 27th May 1987. = ₦271.80.

S U M M A R Y

TABLE 3.4. SUMMARY OF COST OF ACTIVITIES.

WEEK	CONCRETING	BLOCKWORK	ROOFING	DOORS/WINDOWS
One	-	-	-	-
Two	₦175.16	-	-	-
Three	₦160.08	₦240.12	-	-
Four	₦181.20	₦271.80	-	-
Five	₦181.20	₦ 90.60	-	-
Six	-	-	₦181.20	-
Seven	-	-	-	-
Eight	-	-	-	₦271.80
TOTAL	₦697.64	₦602.52	₦181.20	₦271.80

3.6. Overall Assessment of Case Studies

The approaches of the companies on project management shows similarities. Their take-off on a project starts with a drawing-up of schedule of activities, followed by estimation of gang sizes and cost of each scheduled activity. The costs are then summed-up to give the construction budget. With the commencement of work at site, manhours of production are recorded on time cards, which in these companies, serves payroll purposes. At the end of the project, all costs are tallied and subtracted from total payments to give the profit margin.

The above apparently indicates no form of cost control in the project implementation. This observation was confirmed by the project managers of the companies. One of whom believed in the infallibility of his work programme on account of his skilled work force, strict supervision and personal constant monitoring of job progress at site. While his assertation might be true to an extent, the unavoidably accurate periodic recording of cost on projects cannot be replaced. This method gives a clearer picture of how costs are incurred; and will definitely aid, if adjustments are to be made to spending.

In the light of the set out theory on labour cost control, the approaches in the companies have not in any way indicated any conscientiousness in that direction. Like was stated earlier, there were not delibrate attempt to control overall cost, least of all controlling labour cost. I must quickly add here, that though the idea of controlling cost, especially labour, cost occurs to the project managers, the machinery of operation, mostly in terms of man-

r and time, are too awesome coupled with the construction itself. Another fear, borders on the cost of operating such machiry. This inherent phobia might not be totally uncomfirmed.

ur cost control is not easy. It calls for conscientious and sistent effort from the very beginning to the bitter end. From day the project was conceived to the day the last work item is completed. Something easier said than done.

abour cost control is a prime example of the potential gap een theory and successful practice. Effective labour cost ntrol is so much more than just the application of sophisticated ques. The heart of effective labour cost control and indeed ct management is keeping it simple. Decisions are after all e by people and the human brain is not very good at weighing up ge amounts of often conflicting data and factors of varying vance and importance, keeping it simple, by sticking to tials only in terms of designed work items and cost coding, for easier allocation, paves the way for clear and timely decisions. are the keys to successful project management.

The cost of labour is controlled in the first place by the scope of the project and the drawing-up realistic budgets. Budgets are important aid to labour cost control, and they should be viewed as evidence of actions and not actions themselves. The major reasons for projects not being completed on time and within budget could mmed-up as follows:

(a) Poor morale

(b) Poor human relations between management and labour

(c) Poor labour productivity

(d) Shortage of technicians

(e) Lack of commitment by those involved.

All these except (d) are mostly due to poor communication.

The key person in the cost controlling system, the project manager must therefore have the full co-operation of his team. He must in addition, have a carefully constructed framework within which the rest of the manpower control activities can be carried out.

The need to take action to control manpower costs and perhaps increase productivity arises from three major facts:

(a) Economic pressures in terms of cashflow situation within the company.

(b) Productivity crisis

(c) The cost of employing people.

Labour cost control is thus in essence the prevention of the waste of basic resources, or it is an effective tool to avoid, reduce and minimise waste. It is a set of procedures whereby the actual results being achieved in terms of time and money are compared with the targets set, and the appropriate action indicated. Realistic targets in terms of time and money must therefore be set.

The case study on The Bank of The North, which was used in testing the theory on labour cost control, although not very elaborate, clearly shows that the system could be efficiently operated if adequate care and time were given. The use of cost codes for effective cost accounting could easily be introduced. For example, concreting works which can be broken down into;

	Code Number
(a) Formwork	.01

	Code Number
(b) Placing of reinforcement	.02
(c) Mixing and Placing of concrete	.03

can be designated under the work type code. If work type core is designated 03157, for isntance, and formwork is given. 01, for accurate coding, all operations of formwork would be designated 03157.01. This would facilitate its allocation in cost accounting.

Comparison of actual cost with budgeted cost indicated the concrete activity to be running at a profit, while the block work, and the fixing of doors and windows activities were at a loss. Analysis from the case study could easily be projected to forecast that the profit margin of the overall project would be affected. A comparison of the actual labour strength to a planned one, for each individual activity (Table 3.3).

Table 3.5

ACTIVITY	ESTIMATED GANG SIZE	ACTUAL GANG SIZE
Concreting	4	4
Block work	6	8
Roofing	3	4
Doors and Windows	6	7

Shows more man for actual labour force. This one would expect will increase productivity, rather, it was the contrary that was observed. This could be attributed to the fact that the management of resources becomes difficult when the gang sizes are large and could have a negative effect on production. Optimisation and effective management

of labour force must therefore be a necessity for optimised productivity.

Chapter 4.

PROPOSAL BASED ON FINDINGS.

4.1. Techniques for Control of Labour Cost

To the comparative newcomer, whether an engineer, a contractor or a small constructing outfit frequently concerned with new projects, the art of actually doing effective labour cost control rather than just applying the techniques available often remains obscrue. This explains why in the companies observed, there was the admittance of an effort to introduce a cost control system, that have always met with painful results. The proccesses adopted has always failed to give adequate information to facilitate the control of cost.

The use of labour cost controlling techniques will bring fringe benefits, not quantifiable, such as; (a) Better communications (b) Better human relations.

This will in turn lead to smooth project execution and increased morale and productivity. In the use of the techniques the basic features to be noted are:

(a) To start the control early before work commences at the site. By knowing the scope of the work, choosing economically justifiable mode of construction and allocating manpower for the successful implementation of the work.

(b) To watch out for the early warning signals during the construction period.

This thesis is therefore suggesting the use of the accompaning techniques for the control of labour cost, which is hoped, will not only monitor cost but will also help in spotting cost overruns, and

the eventual institution of corrective actions where such activities are still in progress; or as a guide against similar operations in future projects. Also, information gathered from the use of the technique could be used for estimating and tendering in future projects. It must be quickly pointed out here though, that no two projects are alike. Each project is unique, with the result that the results of one project cannot be directly transferred to another. They can only be tailored in order that comparisons may be made.

4.1.1. Procedure for Technique

After the preparation of a well defined schedule of activities which are drawn to reflect the project cost code adopted by the Company, for effective cost allocating; specific resource levelling charts are prepared, together with histogram of the manpower requirements. See figure 4.0. These resource levelling charts will define tasks and give the relationship between tasks and completion dates. During the construction phase, the following steps are observed.

i) Record manhours of productivity on specific work items according to adopted cost code. Either on a daily or weekly basis, stipulating the category of workers. This is usually done by the site supervisors and involves the use of a well defined labour time, which is examplified in the Appendices.

ii) Record the productivity at regular period on all work items performed to enable matching against their actual cost and eventual comparison with budget. Here the use of field quantity report as examplified in Appendices, comes handy.

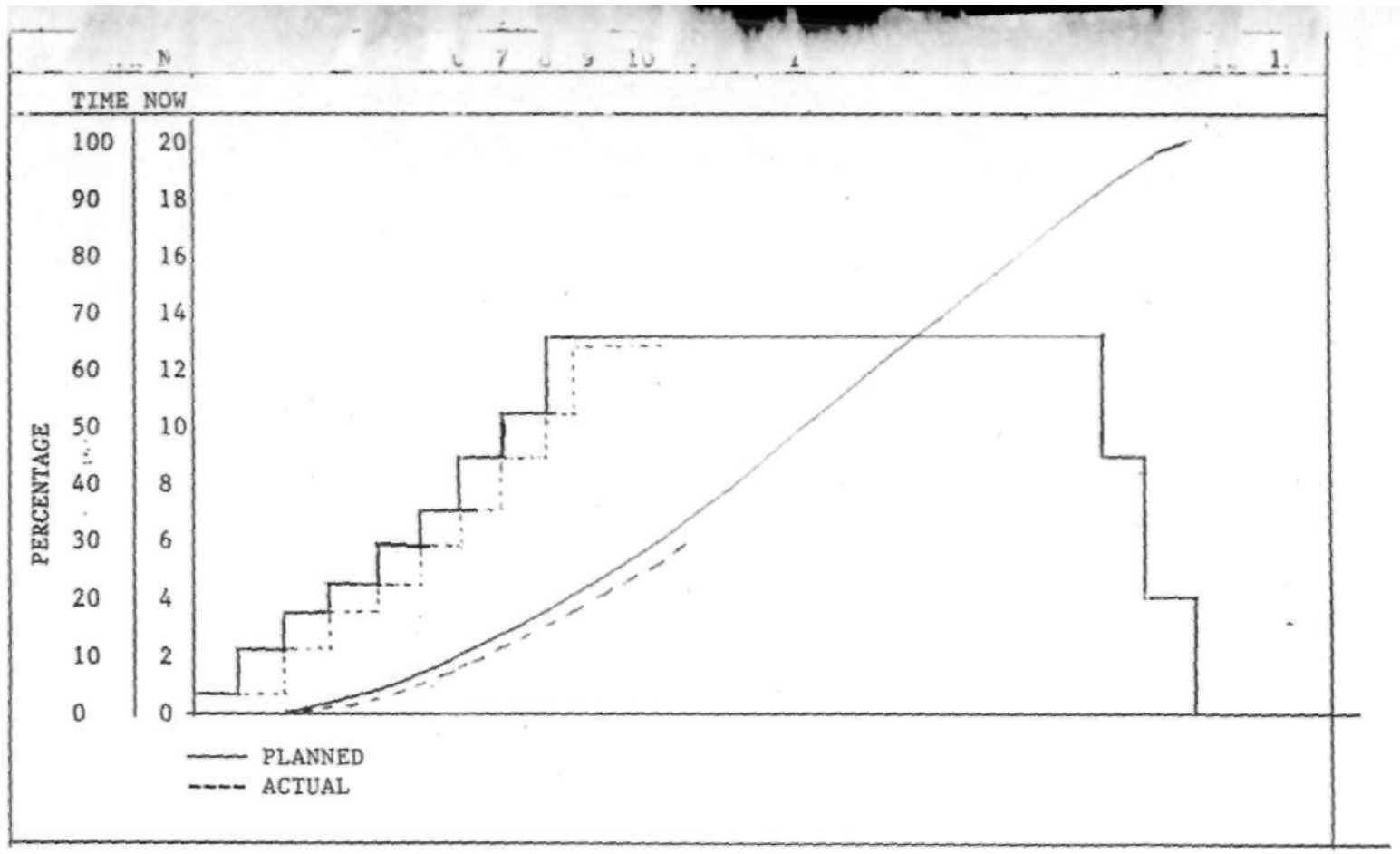


Fig. 4.0 Manpower Histogram

Source: Project Cost Control in Action; Gower Publishers, 1980.

This format could however, be modified to suit Company's usage.

iii) Project Manager should regularly up-date graphical reports, such as the resources levelling chart, the manpower histogram as the schedule of activities to reflect actual situation at the site.

iv) Prepare weekly labour cost report from all information gathered to present clearly situation at site and forecast trends which could lead to review of budget.

v) Project Manager should arrange site meetings every two-weeks during the construction phase, to highlight variances and discuss possible action and review actions already taken.

vi) Project Manager should prepare monthly labour cost forecast report (see fig. 4.1 for management evaluation and decision.

The above sums up the techniques to be adopted in labour cost control. In addition, the following ratios can be used to assess the effectiveness of labour cost and productivity on a project.

(a) Work performance or productivity

$$= \frac{\text{Standard hours produced}}{\text{Actual hours worked}}$$

This should be very close to unity for effective labour utilisation.

(b) Efficiency $= \frac{\text{Actual Performance}}{\text{Target Performance}}$

Which should be close to unity.

(c) Cost $= \frac{\text{Wage}}{\text{Salary cost per standard hour}}$

PRODUCT: MONTHLY LABOUR COST FORECAST REPORT PROJECT NO:

PROJECT ENDING PREPARED BY:

COST (1)	DESCRIP-TION (2)	LABOUR BUDGET (3)	COST TO DATE (4)	ESTIMATE TO COMPLETE (5)	VARIANCE (6)	ESTIMATED FINAL COST (7)	ESTIMATED VARIANCE (8)	PERCENT COMPLETE (9)

Fig. 4.1 Example Format for Monthly Labour Cost Forecast Report.

Source: Construction Project Management; John Wiley & Sons, 1979.

(d) Cost Performance:

$$= \frac{\text{Actual Cost}}{\text{Standard hour}} \div \frac{\text{Target Cost}}{\text{Standard hour}}$$

$$= \frac{\text{Actual Cost}}{\text{Target Cost.}}$$

Must also be close to unity for effective control.

Chapter 5.

CONCLUSION AND RECOMMENDATION

In the use of the suggested techniques of labour cost control, the following are recommended.

(a) Considering the vital role played by the project management in the effective running of a smooth cost control system, it is recommended that in order not to be over-laboured, a cost/scheduling controlling teams should be formed within the Company, called the "project team". This will involved not only the construction team at the site but also staff at the main office of the company. The members of the team should belong to the various different disciplines, that facilitate the smooth running of a project. For example, the engineers, the quantity surveyors, the accountants, the site supervisors, and so forth, and there must be a common ground where they all meet.

(b) The organisation of the project team should reflect the size of the Company and its ability to handle the masses of information to be gathered. In this respect, the set out models in figures 5.1 and 5.2 are recommended for large and small constructing companies respectively.

(c) Adoption of a well defined project cost code by the company.

(d) All members of the project team must be cost conscious and there must be constant and continuous effort to control cost throughout the life of the project. Also, initial cost targets set should be seen as a challenge to be beaten.

(e) Finally, management should have faith in labour cost control and trust it.

The above should however be accompanied by the realisation that the ability to have any influence at all on labour cost, let alone control it, diminishes rapidly as the project progresses.

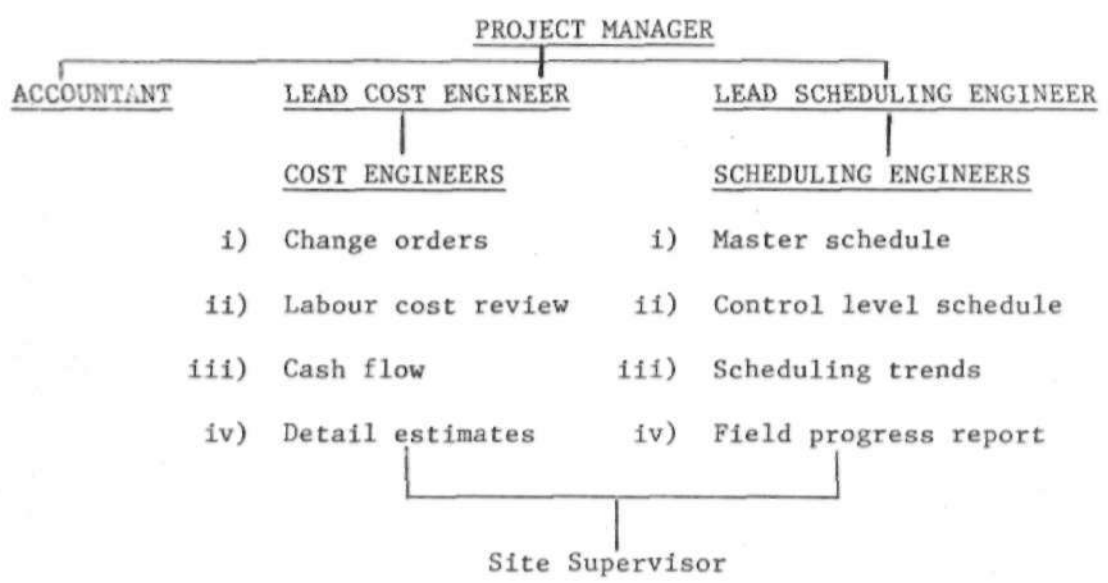


Figure 5.0 PROJECT TEAM, BIG COMPANY.

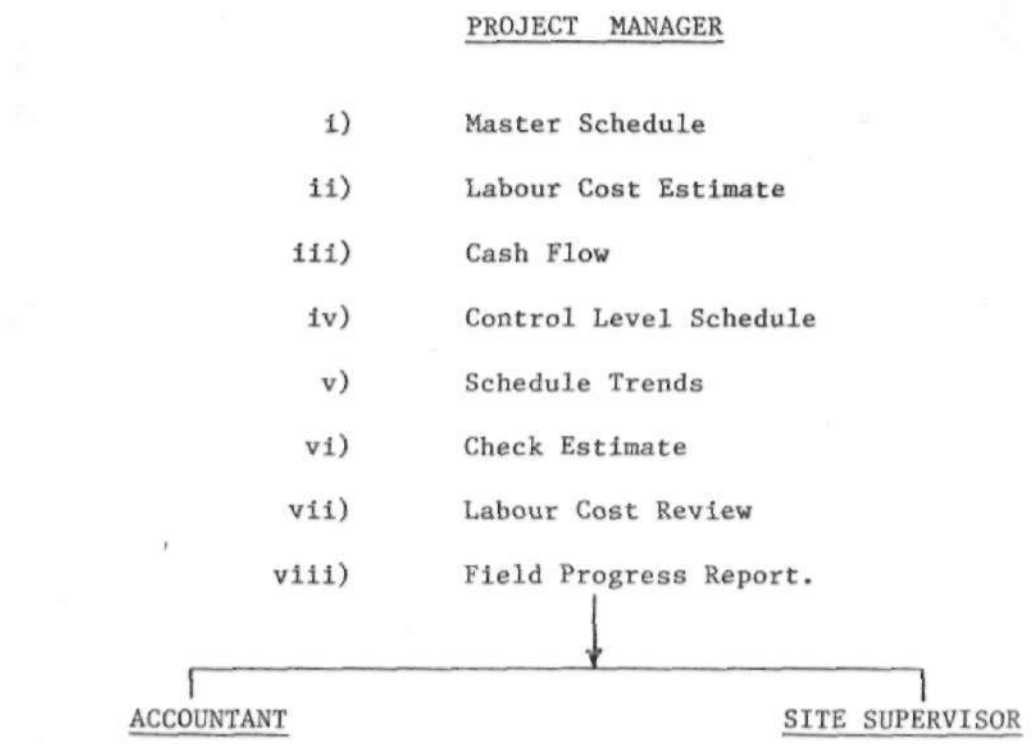


Figure 5.0. PROJECT TEAM, SMALL COMPANY

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BELAG CONSTRUCTION ENGINEERING LIMITED

May, 1982
Jan, 1983 - revised

BASIC ESTIMATING SYSTEM

****

1. ESTIMATING MATRIX

Table 1.0

W	x	T/U	=	L
R	x	T/U		+ P
M_1	x	(1-f)		+ M
	=	UP		
	x	1 + OH %		
	=	TP		

Legend:

W = Wage rate (all inclusive)
R = Plant/Subcontract rate
M_1 = Material rate / cost
T/U = Estimated time/unit
f = wastage (overlap) factor
L = Labour cost
P = Plant/Subcontractor cost
M = Material cost
UP = Unitprice (bare cost)
OH = Overhead %
TP = TENDER UNIT PRICE

2. MATERIAL COST (M)

Materials for permanent use on the project (concrete, reinforcement, etc.) are estimated as follows:

01	Materialprice/Unit	ex works	.....		m_1
	or	delivered	.....		
02	add: Handling	.....			
	Procurement	.....			
	Storage	.....			f
	Pilfarage	.....			
	Wastage	.....	=	.....	
03	evtl. Transport			.....	
			N	...../Unit	M

Parameters for 02: 5 to 30% depending on material type and quantity, as an average - figure 15% is acceptable

3. LABOUR COST (W)

We distinguish three types of labour-cost (each of them requires seperate treatment) to be included in the bill item prices.

01 CASUAL WORKERS

02 NON CASUAL WORKERS

03 DIRECT EXPAT. SUPERVISION

Casual workers do not belong to the permanent workforce of the company, they are employed on a daily hire and fire basis without protection and social and fringe benefits. Although their basic salary may be somewhat higher than of the non-casuals, their total cost due to omittance of many compulsory committments, are far lower, according to the General Manager and the Management (inlcuding Mr. Huegli as Site Manager)

The following schedule is established to facilitate establishing weighted average direct job-wages

		①	②	③	④ = ① x ②	⑤ = ③ x ④
	LABOUR TYP	Basic Rate per Day	Factor	% of Total Workforce	Rate incl. Factor	Weighted Av. Cost
1	Casual	7.80	1.07	60	8.35	5.01
2	Non-Casual	7.68	1.80	38	13.82	5.25
						10.26
3	Direct Ex-pat. Super-vision			2	220	4.40
					-W =	14.65

4. PLANT/EQUIPMENT - SUBCONTRACTOR COST (R)

Under this cathegory we find all costs for Plant and Equipment, either provided by subcontractor, hire-equipment or self-owned from the company yard. Subcontractors providing any kind of work or services can be treated in the same manner and also fall under this heading for the purpose of estimating.

r = plant or equipment rate offered by subcontractor quoted by hire-company or internally established for cost-accounting

add: Supervision, Assistance, Downtime, Sundries — 15 % for N 100,000.-- ; 25 % for N 25,000.--

R = 1.15 to 1.25 x r

LABOUR CONSTANTS FOR
ND EXCAVATIONS

ITEM	Labourer hours per m^3 Lose soil or dry sand	firm soil or clay	compact soil of gravel
Excavate to reduce levels	1½	2½	3
Excavate trd trench n.e. 1.5m dp.	2	3	4½
Excavate pit n.e. 1.5m dp.	3	4	6
Excavate basement n.e. 1.5m dp.	1½	2½	3
Throw 1 stage of 1.5m dp.			
(i) Foundation	1	1½	2½
(ii) Pit.	2	3	4½
(iii) Basement.	1	1½	2½

Constants for
avations

Item.	Output per labourer.
Excavate oversite t remove top soil	2½ hrs/m^3
ted material 25m and deposit	¾ " "
ional 25m wheeling ADD.	½ "
ound foundations	1 "
evel in layers 150mm thick	⅓ "
te from spoil heaps and load int ry	1½ "
ram b a of excavations	1/6 hrs/m^2.

e in bulk due to Excavation

re of Material	Bulkage
l	10%
avel	20%
Vegetabel Soil	30%
y soil, soft or sandy clay	40%
Chalk	40%
Stiff clay	50%

Qty. of timber per m^2 of formwork

Walls and foundations	1/16 m^3
Soffits of floors and roofs	1/12 "
Columns and suspended beams	1/12 "

Nails

First use: 0.50kg. per m^2 of fwk.
Each subsequent use: 0.10kg. per m^2 of fwk.

Labour Outputs
Fixing and Striking:

	Tradesman hours per m^2
Walls and foundations	2½
Soffit of floors and roofs	2
Columns and suspended beams	3

Fabrication of formwork
Allow 26 tradesman hours per m^3

Unloading stack timber
One labourer hour for 1 m^3 of timber.

Outputs for Unloading, Bending and fix'g reinf. rods

	Steel fixed in tonne			
	6mm	12mm	20mm	25mm
Foundations and beds	70	60	50	40
Walls and roofs	120	100	80	60
Columns	140	120	100	80
Beams, Cols. & Staircases	160	140	120	100

Note: Reduce outputs by 30% where rods are supplied already cut and bent.

Average Output of Concrete Mixers per Hour

Size Imperial(c.ft.)	Metric Equivalent(m^3)	Output (m^3)	No. of men Attending
5 - 3½	0.140/0.100	1.00	2
7 - 5	0.200/0.140	1.40	2
10- 7	0.280/0.200	2.00	3
14- 10	0.400/0.280	2.80	4

Data required in calculations

1 m^3 of cement	=	1.44 tonnes
1 m^3 of sand	=	1.60 tonnes
1 m^3 of aggregate	=	1.28 - 1.77 tonnes.
1 bag of cement	=	50kg.
50kg. of cement	=	0.035m^3
1 litre of water	=	1kg.

Labour Outputs

It..	Labourer hours
Unload and stack cement	0.75hr. per tonne.
Mixing concrete	5.00hr. per m^3
Transporting, placing and compacting concrete	
Foundations	3.50 hrs per m^3
Beds	4.00 hrs " "
Suspended slabs	7.50 hrs " "
Columns	12.00 hrs " "
Beams	13.00 hrs " "
Staircases	15.50 hrs " "

Note: The figures quoted above include for transporting a distance not exceeding 25m and also uplifting (by crane or otherwise) to various floor levels in the bldg.

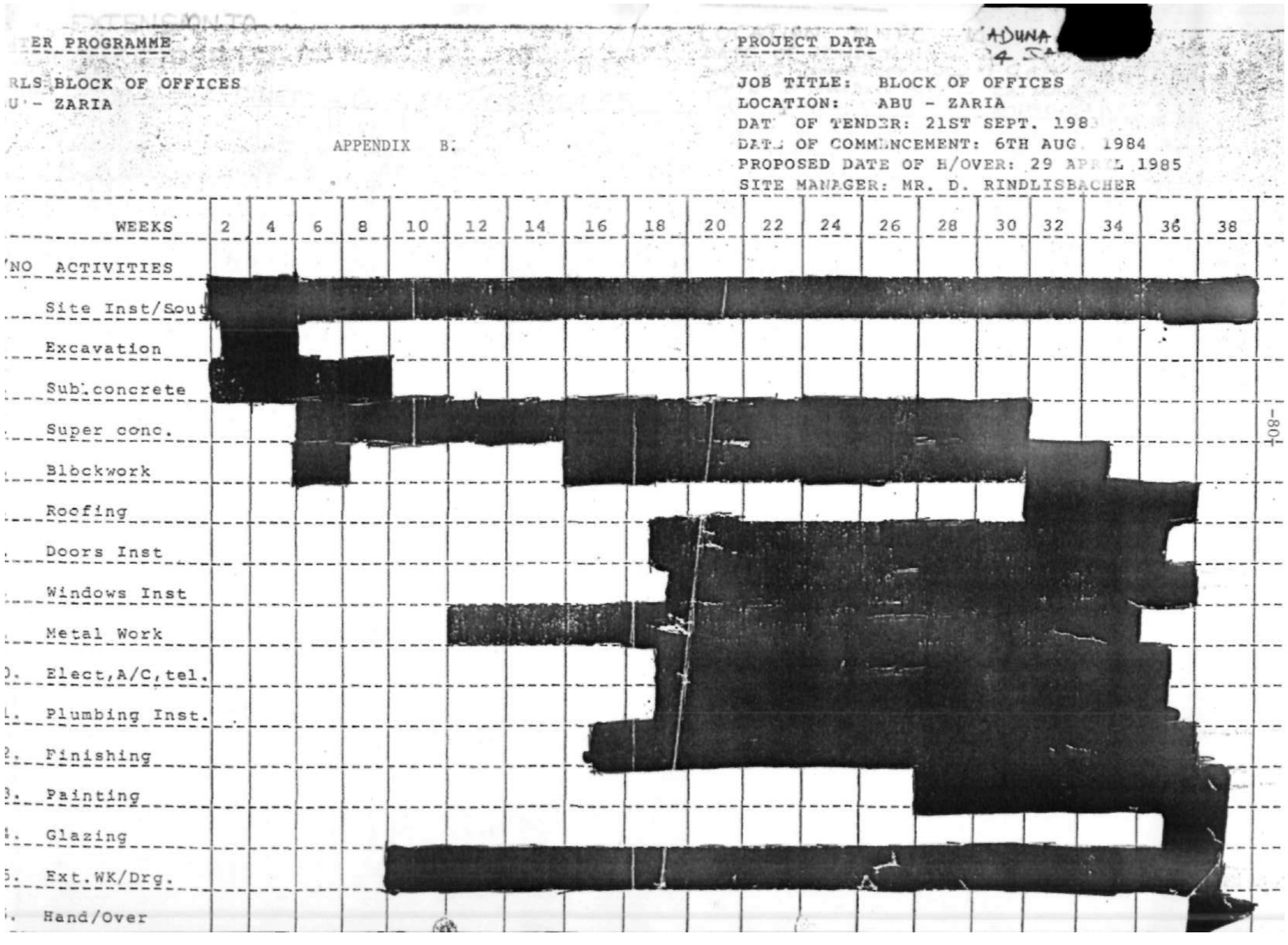
ER PROGRAMME

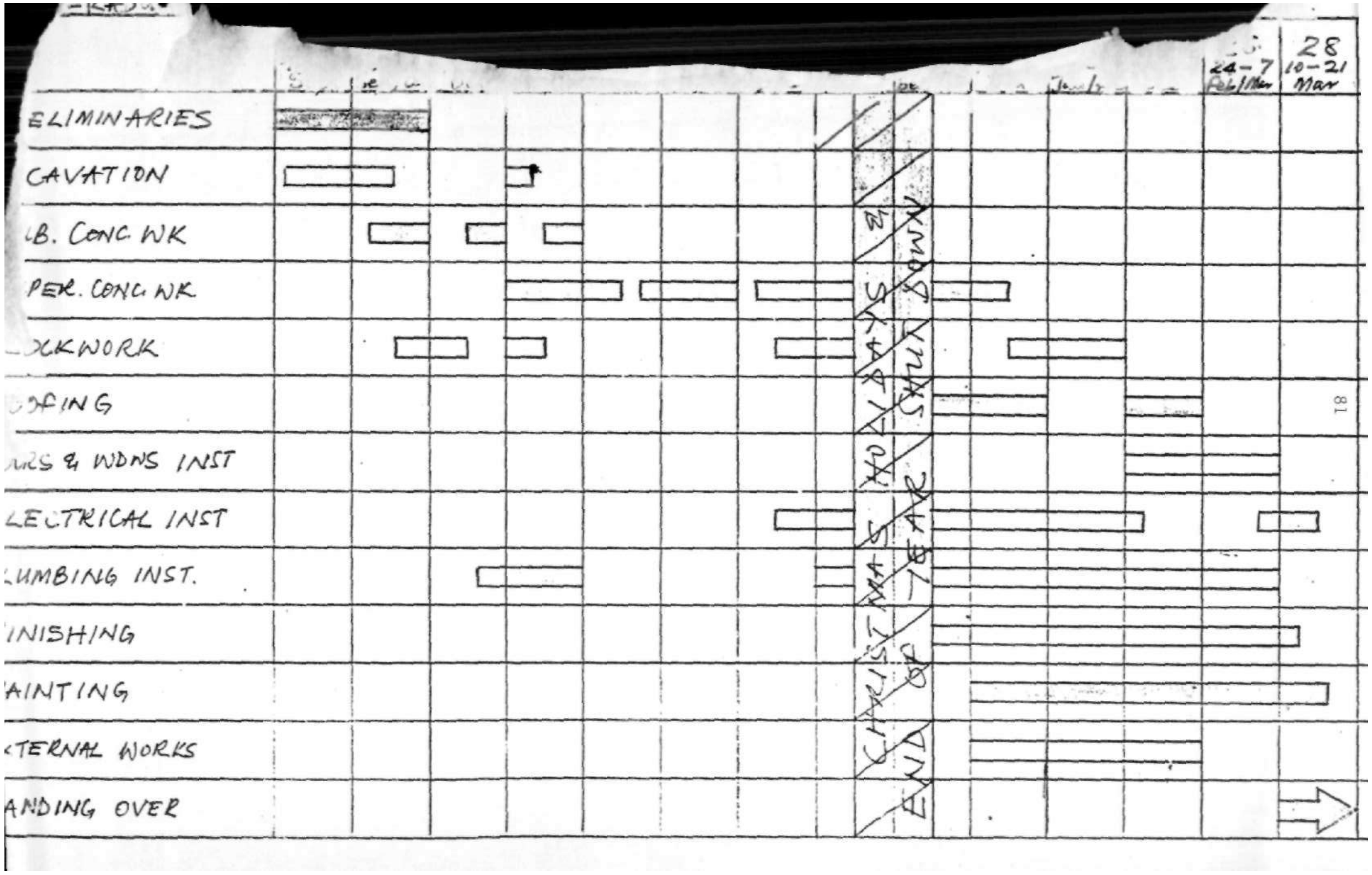
RLS BLOCK OF OFFICES
U - ZARIA

APPENDIX B.

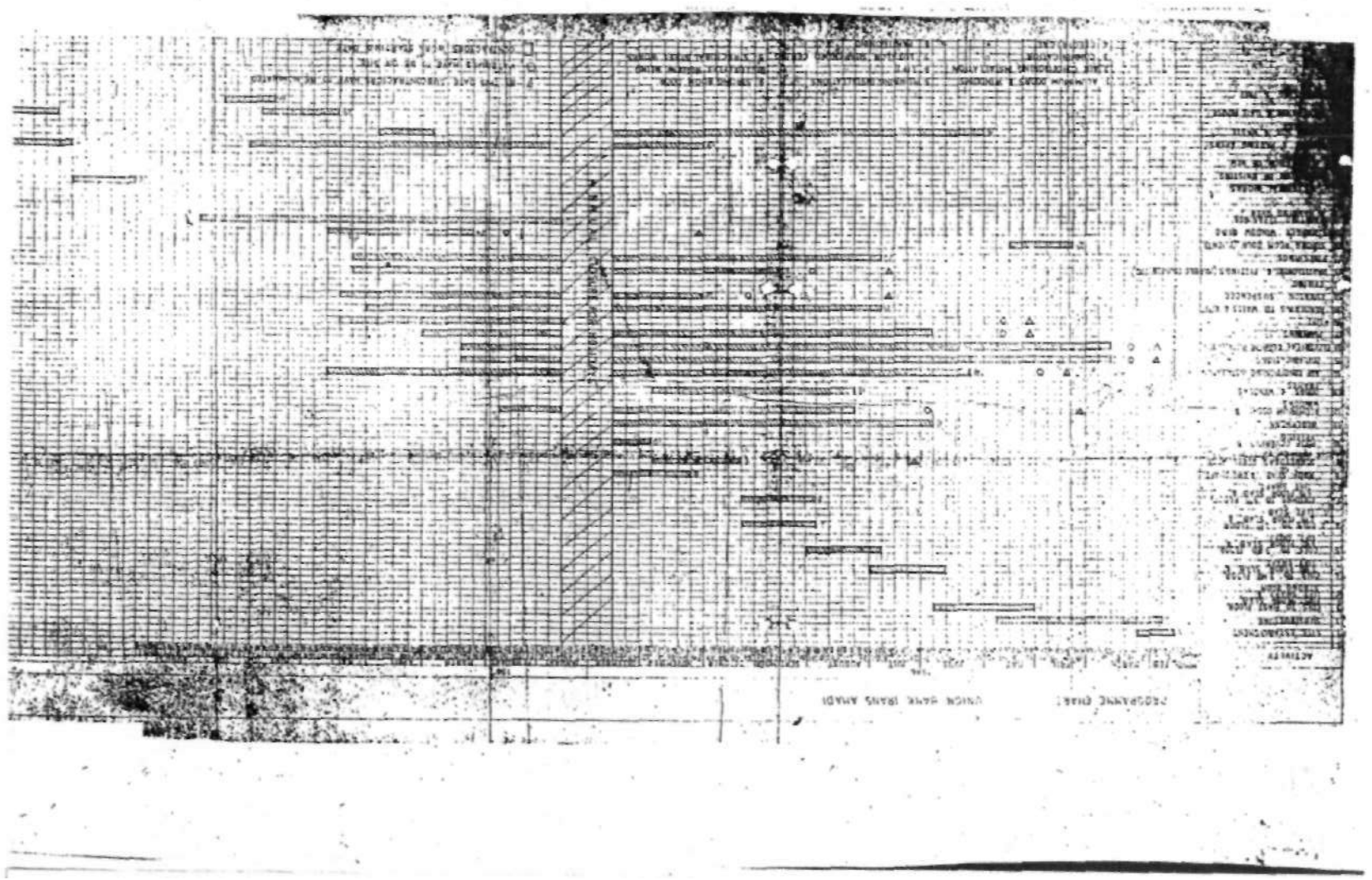
PROJECT DATA

JOB TITLE: BLOCK OF OFFICES
LOCATION: ABU - ZARIA
DAT OF TENDER: 21ST SEPT. 198
DAT OF COMMENCEMENT: 6TH AUG 1984
PROPOSED DATE OF H/OVER: 29 APR L 1985
SITE MANAGER: MR. D. RINDLISBACHER




24-7 Feb/Mar
28 10-21 Mar
ELIMINARIES
CAVATION
LB. CONC WK
PER. CONC WK
CKWORK
OFING
RS & WDWS INST
LECTRICAL INST
UMBING INST.
INISHING
AINTING
TERNAL WORKS
ANDING OVER
WINDOWS
START
CHRISTMAS
END OF YEAR

APPENDIX D



BAR – CHART

JOB : **RENOVATION OF BUILDING**
BANK OF THE NORTH CONTRACT NO

LOCATION **NO 8 AZIKIWE ROAD P/H**
DATE OF TENDER
DATE OF COMMENCEMENT **3/5/87**
DATE OF HANDING OVER
SITE SUPERVISOR **MR. JOHNSON MEKUZ**

		1 4 — 9 MAY	2 11 — 16 MAY	3 18 — 23 MAY	4 25 — 30 MAY	5 1 — 6 JUNE	6 8 — 13 JUNE	7 15 — 20 JUNE	8 22 — 27 JUNE	9 29 — 4 JUNE/JULY	10 6 — 11 JULY	11 13 — 18 JULY
A	PRELIMINARIES											
B	SUPER CONC· WORK											
C	BLOCK WORK											
D	ROOFING											
E	DOORS AND WINDOWS											
F	ELECTRICAL WORKS											
G	PLUMBING											
H	FINISHING											
I	PAINTING											

APPENDIX E.

APPENDIX E.

-83-

PROJECT: BANK OF THE NORTH — DAILY LABOUR TIME CARD — WEATHER: GOOD

DATE: 11/5/87. — *PROJECT NO. — PREPARED: OGAREE F.A.

EMPLOYEE NUMBER	NAME	GRAFT	TIME CLASSIC FICATION	HOUR RATE	COST CODE	TOTAL HOURS	CROSS AMOUNT
	UKELU DICKSON	MASON	ST	8.00		8	₦0.88
			OT	2.00		2	₦0.88
TOTAL HOURS						10	₦0.88
TOTAL COST							₦8.88

PROJECT: BANK OF THE NORTH

DATE: 11/5/87.

DAILY LABOUR TIME CARD

PROJECT NO.

WEATHER: GOOD

PREPARED: OGAREE F.A.

EMPLOYEE NUMBER	NAME	GRAFT	TIME CLASSIC FICATION	HOUR RATE	COST CODE	TOTAL HOURS	CROSS AMOUNT
	MOSES OLUKA	LAB.	ST.	8.00		8	₦0.63
			OT.	2.00		2	0.63
TOTAL HOURS						10	₦0.63
TOTAL COST							₦6.30

PROJECT: BANK OF THE NORTH. DAILY LABOUR TIME CARD WEEK NO:.....5.....
DATE:....11/5/87..... PROJECT NO. PREPARED:.OGAREE F.A.....

EMPLOYEE NUMBER	NAME	GRAFT	TIME CLASSIC FICATION	HOUR RATE	COST CODE	TOTAL HOURS	CROSS AMOUNT
	JOHN NDUKWE	CARPENTER	ST	8.00		8	₦0.88
			OT	2.00		2	₦0.88
TOTAL HOURS						10	₦0.88
TOTAL COST							₦8.80

[redacted]

30/5/87.

WEEKLY LABOUR TIME CARD

CRAFT:

PRESENT:.....

PROJECT:.....

PREPARED BY: OGAREE F.A.

COST CODE	TIME CLASSIFICATION	HOURLY RATE	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT	TOTAL HOURS	TOTAL COST
	ST	₦0.63	8	8	8	8	8	8	42	₦30.24
	OT	₦0.63	2	2	2	2	2	2	12	₦07.56
TOTAL		₦0.63	8	8	8	8	8	8	48	₦30.24
HOURS		₦0.63	2	2	2	2	2	2	12	₦07.56
GROSS AMOUNT										₦37.80
WEATHER GOOD.										

LU DICKSON
NAME OF ...O.: .....
WEEK ENDING: 30/5/87.....

WEEKLY LABOUR TIME CARD
CRAFT:

PRESE...
PROJECT:.....
PREPARED BY: OGA...E F.A.

COST CODE	TIME CLASSIFICATION	HOURLY RATE	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT	TOTAL HOURS	TOTAL COST
	ST	₦0.88	8	8	8	8	8	8	48	₦42.24
	OT	₦0.88	2	2	2	2	2	2	12	₦10.56
TOTAL HOURS	ST	₦0.88	8	8	8	8	8	8	48	₦42.24
	OT	₦0.88	2	2	2	2	2	2	12	₦10.56
GROSS AMOUNT										₦52.80
WEATHER GOOD.										

JKWE .....

WEEK ENDING: 30/5 87 .....

WEEKLY LABOUR TIME [illegible]

CRAFT:

PREPARED BY: OGAREE A.A.

COST CODE	TIME CLASSIFICATION	HOURLY RATE	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT	TOTAL HOURS	TOTAL COST
	ST	₦0.88	8	8	8	8	8	8	48	₦42.24
	OT	₦0.88	2	2	2	2	2	2	12	₦10.56
TOTAL HOURS	ST	₦0.88	8	8	8	8	8	8	48	₦42.24
	OT	₦0.88	2	2	2	2	2	2	12	₦10.56
GROSS AMOUNT										₦52.80
WEATHER GOOD.										

WEEKLY FIELD QUANTITY REPORT

PROJECT: BANK OF THE NORTH PROJECT: .....

WEEK ENDING: 27/6/87 PREPARED BY: OGAREE F.A.....

COST CODE	WORK TYPE	UNIT	TOTAL LAST REPORT	TOTAL THIS WEEK	TOTAL TO DATE
	CONCRETE WORKS	L.M	42		60
	BLOCK WORKS	M^2	170		188.10
	ROOFING	M^2			80.10
	DOORS AND WINDOWS	No		14	14.00

APPENDIX G.

WEEKLY FIELD QUANTITY REPORT

PROJECT: BANK OF THE NORTH

WEEK ENDING: 30/5/87...

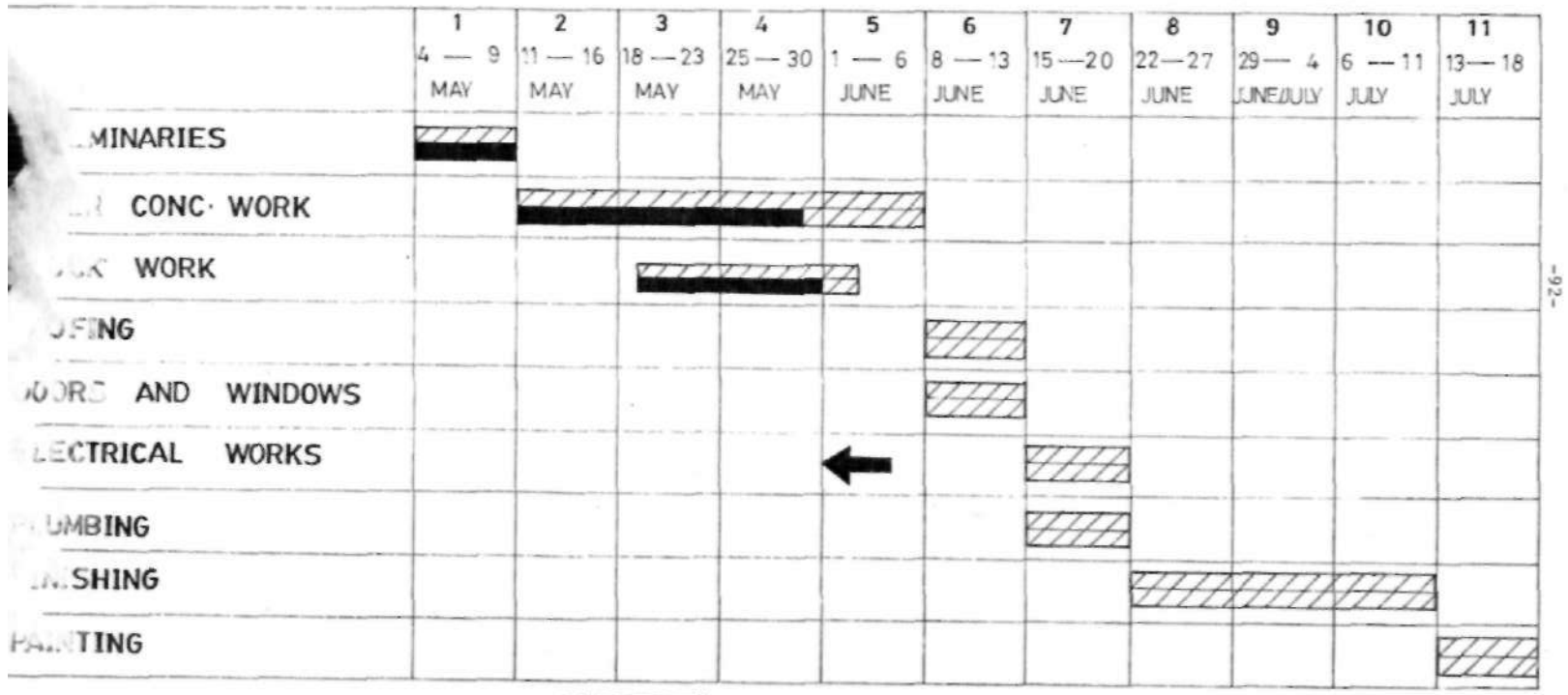
PREPARED BY: OGAREE F.A.

COST CODE	WORK TYPE	UNIT	TOTAL LAST REPORT	TOTAL THIS WEEK	TOTAL TO DATE
	CONCRETE WORKS	L.M		16	42
	BLOCK WORKS	M^2		170	170

BAR CHART

OB : RENOVATION OF BUILDING
BANK OF THE NORTH — CONTRACT NO

LOCATION: NO 8 AZIKIWE ROAD P/H
DATE OF TENDER:
DATE OF COMMENCEMENT: 3/5/87
DATE OF HANDING OVER:
SITE SUPERVISOR: MR. JOHNSON MEKUZ



KEY ⬅ REPORTING AS AT 30th MAY, 1987

APPENDIX H.

APPENDIX H.

BAR – CHART

JOB : RENOVATION OF BUILDING
BANK OF THE NORTH – CONTRACT NO

LOCATION: NO 8 AZIKIWE ROAD P/H
DATE OF TENDER:
DATE OF COMMENCEMENT: 3/5/87
DATE OF HANDING OVER:
SITE SUPERVISOR: MR. JOHNSON MEKUZ

	1 4 — 9 MAY	2 11 — 16 MAY	3 18 — 23 MAY	4 25 — 30 MAY	5 1 — 6 JUNE	6 8 — 13 JUNE	7 15 — 20 JUNE	8 22 — 27 JUNE	9 29 — 4 JUNE/JULY	10 6 — 11 JULY	11 13 — 18 JULY
PRELIMINARIES											
SUPER CONC. WORK											
BLOCK WORK											
ROOFING											
DOORS AND WINDOWS											
ELECTRICAL WORKS											
PLUMBING											
FINISHING											
PAINTING											

KEY ⬅ REPORTING AS AT 27th JUNE, 1987

PROJECT: BANK OF THE NORTH WEEKLY LABOUR COST REPORT PROJECT NO:

PERIOD ENDING: 30/5/1987. PREPARED BY: C E F.A.

COST CODE (1)	WORK TYPE (2)	UNIT (3)	TOTAL QUANTITY BUDGETED (4)	TOTAL QTY. TO DATE (5)	PERCENT COMPLETED (6)	BUDGETED DIRECT LABOUR (7)	BUDGETED LABOUR TO DATE (8)	ACTUAL LABOUR TO DATE (9)	COST DEFFERENCE (10)	DEVIATION (11)
	CONCRETING		60	42	70	724.80	507.36	516.44	9.88	1.018
	BLOCK WORK	M^2	188.10	170	90.38	543.60	491.92	511.92	20.61	1.042
	TOTAL TO DATE									

APPENDIX I

PROJECT: BANK OF THE NORTH
PERIOD ENDING : 30/5/1987.

WEEKLY LABOUR COST REPORT

PROJECT NO:
PREPARED BY: OGAREE F.A.

COST (1)	WORK TYPE (2)	UNIT (3)	QUANTITY BUDGET (4)	QUANTITY THIS WEEK (5)	QUANTITY TO DATE (6)	DIRECT LABOUR COST BUDGET (7)	DIRECT LABOUR COST THIS WEEK (8)	DIRECT LABOUR COST TO DATE (9)	ABOUT UNIT C BUDGET (10)	ABOUT UNIT C THIS WEEK (11)	ABOUT UNIT C TO DATE (12)	TO DATE SAVING (13)	TO DATE LOSS (14)	SAVING (15)	LOSS (16)
	CONCRETING	L.M	60	16	42	724.80	193.28	073.36	12.08	11.33	51644		9.08		12.9
	BLOCK WORK	M²	188.10	90	170	543.60	260.10	491.31	2.89	3.02	51192		20.61		22.80

APPENDIX R.

PROJECT: BANK OF THE NORTH — WEEKLY LABOUR COST REPORT — PROJECT NO:

PERIOD ENDING: 27/6/1987. — PREPARED BY: OGAREE F.A.

COST CODE (1)	WORK TYPE (2)	UNIT (3)	TOTAL QUANTITY BUDGETED (4)	TOTAL QTY. TO DATE (5)	PERCENT COMPLETED (6)	BUDGETED DIRECT LABOUR (7)	BUDGETED LABOUR TO DATE (8)	ACTUAL LABOUR TO DATE (9)	COST DEFFEPENCE (10)	DEVIATION (11)
	CONCRETING	L.M	60	60	100	724.80	724.80	697.64	27.16	0.963
	BLOCK WORK	M^2	188.10	188.10	100	543.60	543.60	602.52	58.92	1.105
	ROOFING	M^2	80	80	100	181.20	181.20	181.20		
	DOORS AND WINDOWS.	No	20	14	70	271.80	190.26	271.80	81.54	1.429
	TOTAL TO DATE									

PROJECT:
PERIOD ENDING :

WEEKLY LABOUR COST REPORT

PROJECT NO:
PREPARED BY:

COST (1)	WORK TYPE (2)	UNIT (3)	QUANTITY			DIRECT LABOUR COST			LABOUR UNIT COST			TO DATE		PROJECTED	
			BUDGET (4)	THIS WEEK (5)	TO DATE (6)	BUDGET (7)	THIS WEEK (8)	TO DATE (9)	BUDGET (10)	THIS WEEK (11)	TO DATE (12)	SAVING (13)	LOSS (14)	SAVING (15)	LOSS (16)
	CONCRETING	L.M	60		60	724.80		724.80	12.08		59754	27.16		27.16	
	BLOCK WORK	M^2	188.10		188.10	543.60		543.60	12.89		60252		5892		58.92
	ROOFING DOORS AND WINDOWS.	NO	20	14		14	27180	190.26	190.26	13.59	19.41		81.54		11642

KASHIF
AHMAD
ZARIA.