COMPUTERISATION OF COST COMPARISION OF BUILDING MATERIALS / EMPHASIS ON CEMENT AND CLAY

BY

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PGD/MCS/2000/2001/1039

A PROJECT SUBMITTED TO THE DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD.

OF

POST GRADUATE DIPLOMA IN COMUPTER SCIENCE
THE FEDERAL UNIVERSITY OF TECHNOLOGY MINNA, NIGER STATE.

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APPROVAL PAGE

This project has been read and approved as meeting the partial requirement for the award of Postgraduate Diploma in Computer Science of the Diploma in Computer Science of the Department Mathematics and Computer Science, Federal University of Technology, Minna.

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BADMUS P. O.
RESEARCH SUPERVISOR

DATE

....

EZEAKO L. N

HEAD OF DEPARTMENT

DATE

....

EXTERNAL EXAMINER

DATE

DEDICATION

... .to RICHARD ADERHA AND EMARIETA.

ACKNOWLEDGEMENT

There has been only one set of footsteps in the sands behind me. Thank you God Almighty for carrying me all this while. My heart felt gratitude goes to my project supervisor Mr. Badamus P.R. without whose patient attention and correction this work have remained idea. I express my gratitude to the head of department Mr. Ezeako L.N.

My special thanks goes to all the lecturers and staff of the department of mathematics and computer for their unqualifiable help and contributions.

My parents, brother and sisters for all their encouragement, I say thank you. To my very good friends Chioma, Steve, Kola, Samuel .J, Samson, Adams, Bishop, Romanus and so many others who helped grately in making this program a success, I say thank you.

ABSTRACT

Computerized cost comparison of alternative building materials in the context of this research is the generations of cost estimates as an approach to the least expensive way of putting up a building, specifically in making a choice between clay and cement products. The program is so designed so the user only has to supply data demanded in an interactive form, the computer then processes and outputs the cost estimates.

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CHAPTER ONE

PRELIMINARIES

1.0 INTRODUCTION

The science and practice of construction is nearly as old as man himself, the social and economic significance of the built environment in the life of our country has always been considerable. Society needs schools, hospitals, shops, offices, factories, residential accommodations to mention a few. Residential accommodation is in gross short supply in most of the cities in the country. This can easily be attributed to the high cost of imputes needed to provide housing.

Nigeria is however blessed with a wide variety of building materials. A systematic use of some these materials can reduce cost of construction considerably. A very good example can be found in the use of clay products e.g. bricks, clay tiles, hollow pots etc and materials from cement e.g sanderete, concrete etc.

In the construction of houses, there for emphasis should be placed on the use of alternative materials for construction. The quantity survey therefore should provide the cost of using these alternative materials in his bill of quantity so the gain of using a particular material can be appreciated. This study is therefore aimed at providing a computerized, rapid means of comparing the cost of building using clay products e.g sandcrete

1.1 COST

The term "cost" has a widely defined meaning. However, the generality accepted definition to the quantity surveyor is "cost in monetary terms, is the actual monetary value of goods and services as at when they are acquired and put to use

or the monetary value of those goods and services at a particular time required to put up a building.

The cost of a building at a particular time, therefore would be the total cost of all inputs (goods and services) required to put up the building. At a later date, the structure can be valued. The new value would among other things include the going monetary value of all inputs and services required in putting up the building minus the value computed as depreciation of the building after a given length of time.

1.1.2 ESTIMATED COST OF BUILDING

A successful building project hinges to a great extent on a realistic cost estimate of building inputs. Providing a client or management with a realistic cost of different alternatives in building will guide them in decision-making. Hence it is important that at whatever stage of work, an estimate of cost is given. It should be as realistic and inclusive as possible at that stage.

Where as estimate must be given at an early stage, the degree of approximation, the range of unknown factors and foreseeable trends must be shown and emphasized throughout the period of design, cost consideration must be kept under continuous review.

A broad and generalized cost of building would include the cost of the following:-

a. Site investigation, demolition, abnormal site works, building external services etc.

b. Furniture and fittings; landscaping sculpture etc.

c. Fees and expenses of design team in respect to A and B.

d. Salaries and expenses of site inspectorate.

e. Site cost.

f. Building finance.

g. Legal and agent fees.

h. Risks and profit and evaluation of other factors affecting the commercial viability.

1.2 OBJECTIVES OF STUDY.

The aim of the study is to find a means of providing fast and reliable cost estimate of putting up a partition using different materials such as sandcrete, bricks, concrete. These cost includes the cost of whatever finishes that may be considered necessary. Such finishes will include whatever form of plaster considered necessary.

1.3 STATEMENT OF THE PROBLEM.

In both small units of structures, such as low cost residential houses and ultra large building complexes, partition play a vital role as they define the boundaries of enclosures within a building.

The sum total cost of partition in a structure compared to the total cost of building varied greatly depending on the number of partitions required. Typically for a small structure such as a bungalow, duplex, blocks of flats etc. the sum of cost of partitions vary between 25-30% of the cost of building.

Partitions are often erected using paper, wood, wood shavings, pulp, plywood, bricks, sandcretes, concrete slabs etc. our concern in this study shall be partitions from sandcrete and bricks. This is so because 95% of buildings in Nigeria use sandcrete or bricks as partition materials.

In providing the cost of using sandcrete or bricks for partitions, we shall take into consideration:-

The sum cost of materials such as

i. Sand

ii. Cement

iii. Sandcrete /Bricks

iv. Labour

1.4 SIGNIFICANCE OF STUDY

A wrong cost estimate such as under costing of even a minor element of building may cause the project to be abandoned for a length of time. This emphasized the fact that the cost of every element of building needs to be properly done to avoid financial vetches. Knowing that a particular element eg, partitions has alternatives and knowing their cost would clearly give the owner, considering his financial stared, the material to use for his partition.

1.5 PARTITION AND DIDDERENT TYPES OF PARTITIONS

Partitions come in a wide range of materials and styles some of the basic materials that have been used for erecting partition includes:-

1. Paper
2. Textiles e.g canvas
3. Plywood
4. Pulp boards
5. Glass
6. Bricks

7. Sandcrete

8. Wood boards etc

TYPES OF PARTITIONS

Partition have often generally been classified under two broad headings, namely

1. Temporary and
2. Permanent partitions

1. Temporary partitions are partitions that are collapse able. Very often they do not remain at a particular spot for a long period such partitions are often made of paper, textiles or light plywood. They are often used in partitioning large commercial halls to accommodate different groups
2. Permanent partitions on the other hand remain in the same place for a long period. They are not collapse able or moveable. They are often the ones found in use in Nigeria and are mostly erected using sandcrete or Bricks.

1.6 SCOPE

A wide range of materials and services necessarily go into a building project. However in this work, computerization of cost comparison of building materials (case study of clay and cement products) we shall be restricted to comparing the cost of using bricks or sandcrete as partition materials as they are the most widely used materials for putting up partitions in housing project across the country.

Partition are of great interest because they effectively help in putting to god use the floor space available in a structure, from an economic view point, health, technical etc. in small units of houses, they even act as structural elements. So applying partitions properly can reduce cost, result in economic use of space and provide adequate enclosures in a housel building

CHAPTER TWO

2.0 LITERATURE REVIEW

Long before quantity surveying developed unto a separate field of study or subject, man had always tried to answer the question of how many men, material and time to spend on a piece of work. This can be seen from writings or drawings on the alls of caves, tablets and ancient manuscripts from Alexandrian, Egyptian and roman times incidentally a slash was used to represent a man in Egyptian and Roman times when making request for men from officials concerned sates Louise von steiger in his monumental work QUANTITY SURVEYING THROUGH TIME. He further stated that quantity surveying has always demanded elaborated attention for every details of the job to be done so every details of quantity can be considered. It is clear from above that quantity surveying is an aspect of mankind memorial and continuous struggle for the completely mastering of the universe and his environment. He has always seeked to conquer to know and understand principles and not to be caught unawares.

The entrance into the computer age marks a milestone in this journey. This resulted from improved knowledge in technology. It is now a vogue to apply the computer in almost any venture; be it industrials, commerce, defence, science and technology. So rampart is its use that Augustus P.J wrote, "With this varied applications of the computer, especially in advanced modern societies, it has become glaringly manifest that the computer machine has become a necessary tool for societal progress and development".

The inherent advantage in the use of the computer is its speed in processing large volumes of data and presenting the same as information in large quantities with

this advantage, one could conveniently use it in areas of demographic interests as so as done in the 1991 census by the National Population Commission. In recent times, J.A.M.B, 2000, has upgraded it computerized candidates registration system in a bid to identify strictly who is a Nigerian, make future censuses easier and reduce the bottle necks encountered during voting, the federal government is pushing to introduce the national identity card scheme which is of cause computer aided.

Since eighties, many have seek to apply the computer to quantity surveying. There have been a great degree of success hence the availability of software like (C.T.O Computer tided taking off) by ELSE COMPUTING, a UK based firm and back at home, we have software like VECTOR 2000 marketed by the NIGERIAN INSTITUTE OF QUANTITY SURVEYORS. These are very indebt software with graphic abilities. Despite their availability, they are used by very few quantity surveyors\. The reason put forward vary from technical to financial.

2.1 FEASIBILITY STUDY

In carrying out the feasibility study, an examination was made of the quantity surveyor, the nature of his work and a meeting point was established between the quantity sureyor and the computer.

2.1.1 THE QUANTITY SURVEYOR

By training the quantity surveyor is most concerned with quantities of good and services. He is equipped with some elementary and essential knowledge and practice of architecture, engineering designs, material science, economics of project management and computer science. Professionally he deals with measurement of

quantities by use of recognized and accepted methods of measurement. The quantities he measures includes some of the following:-

1. Volume of materials required
2. Volume of work to be done
3. Volume of labour required
4. The financial implications of any of the above items

In carrying out his work, he deals with professionals from varied disciplines making it mandatory for the quantity surveyor to posses' good communication skills, interpersonal discipline and a high level of public relation awareness.

2.1.2 THE ROLE OF THE QUANTITY SURVEYOR IN A BUILDING PROJECT

The services of the quantity surveyor is require right from the conceptual stage of any project i.e even before other professionals are consulted. He then gives a rough estimate for an all-inclusive cost of the project.

At the design stage the quantity surveyor liaises with the designers, the client and all other professionals, always bearing in mind the cost of whatever design alternative is adopted form accepted designs, he will then be required to produce build of quantities which will include any or all of the following:

5. Volume of materials required
6. Volume of work to be done
7. Volume of labour
8. Estimated cost of all materials and services required.

The quantity surveyor is very often consulted or employed out rightly in other spheres e.g he may be required to manager a project, schedule or plant a project in phases considering all necessary factors; plan a schedule of payment for jobs done.

2.1.3 MEETING POINT BETWEEN THE QUANTITY SURVEYOR AND THE COMPUTER

The myriad of data to be collected and volumes to be computed with attached financial values and other considerations, saddles the quantity surveyor with a lot of work in computations and conversions. A slights lack of concentration can result in errors with grievous consequences. The existing system where everything is done manually doe not allow for flexibility to accommodate changes or respond to client quarries rapidly and convincingly and efficiently. There surveyor is unable to get his work done in good time, gives a wrong and expensive advise, errors are found in his computations.

This is where the computer comes into play with its flexibility, speed, accuracy, and efficiency. With the appropriate software, the computer becomes a veritable tool for the quantity surveyor to ply his trade.

2.1.4 BENEFITS OF THE COMPUTER TO THE QUANTITY SURVEYOR

After all field measurements have been taken or with he aided of a computer design, the quantity surveyor can come to the cool of his office or any suitable place with his laptop or with the right equipment call and interact with the computer in his office and get his work done at computer speed. He gets a lot more work processed in a flexible and efficient manner thereby winning client confidence and satisfaction.

2.1.5 BENEFITS OF COMPUTERIZED COSTING IN A HOUSING PROJECT

A computerized costing system in a project provide some of the following advantages:

1. Eliminate excessive use of paper
2. Increase the volume of variables of data to be considered.
3. Increase the ease with which costing is done
4. Increase efficiency and accuracy of processing storage and retrieval.
5. Increase efficiency and accuracy of data
6. Increase data and result integrity
7. Flexible operation

2.1.6 TECHNICAL FEASIBILITY

Computerized cost comparison is technically feasible because most quantity surveyors have an average knowledge of computers. Hardware requirements would depend on the nature or dept of computerization. Training on particular software use will be required and is easily available.

2.1.7 FINANCIAL FEASIBILITY

The cost of implementing computerized cost comparison would be reasonable and affordable as there is a wide range in the chaise of depth of computerization. Also in many firms some of the required equipment are already available as office equipments.

CHAPTER THREE

SYSTEM ANALYSIS AND DESIGN

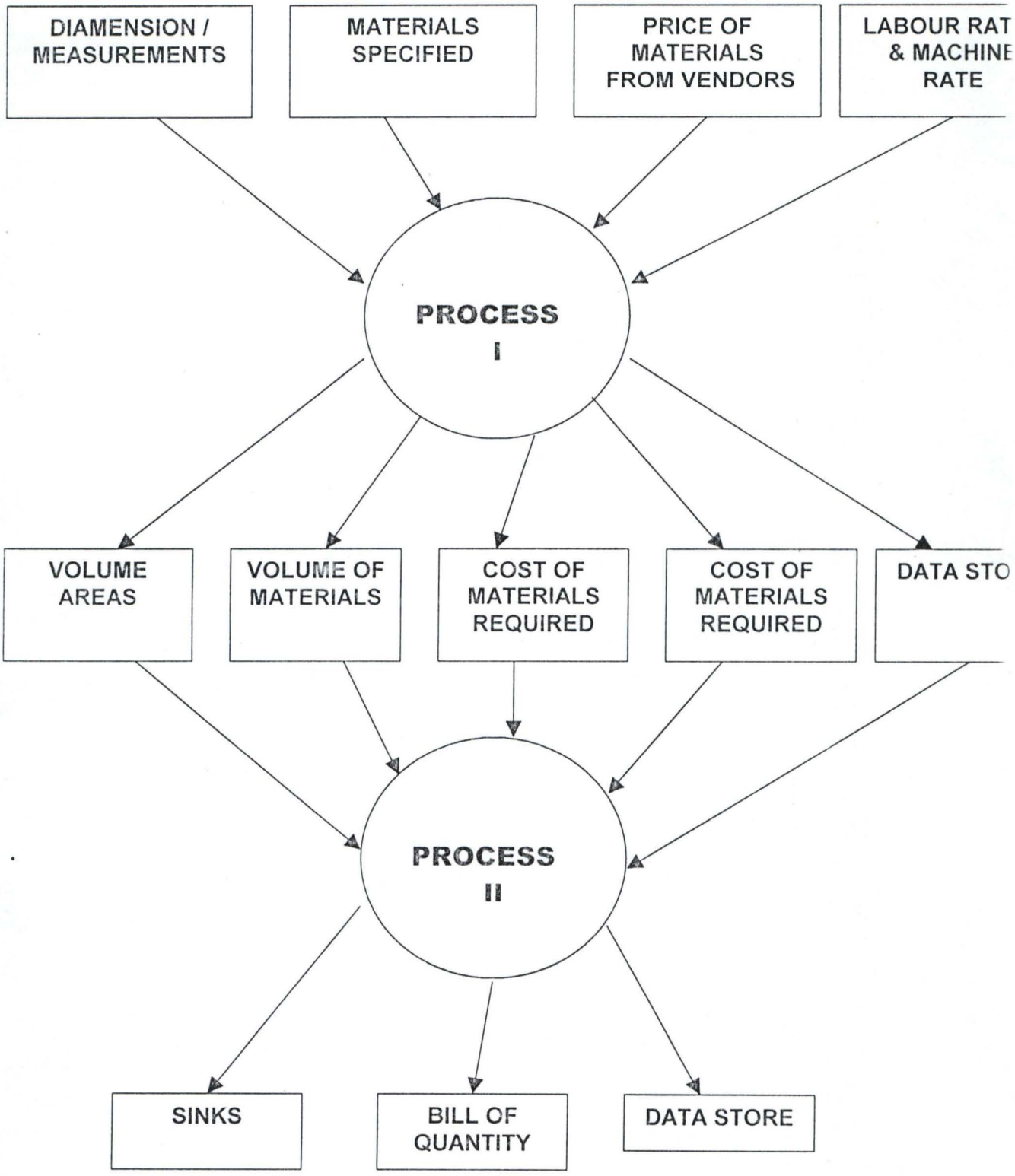
3.0 ANALYSIS OF EXISTING SYSTEM.

All the work done in the existing system is manual. It consists of :-

1. Taking dimensions from drawings or the field.
2. Dimensions are then used to compute areas and values.
3. Type of materials to be used as specified by designer is noted.
4. Volumes of these materials are calculated.
5. The prices of these materials are obtained from respective vendors.
6. Cost of labour and machine rates are obtained from agents concerned.
7. The costs of volume of materials needed are computed.
8. The cost of using these materials is computed.
9. All other necessary expenses are added to make a bill of quantities.

3.0.2 WORK FLOW I N THE EXISTING SYSTEM.

In practice in the existing system, a surveyor will take measurement from the field or drawings. These measurements are then used to compute volumes and areas. The cost of specified materials is determined. The cost of all necessary services required to use these materials is added to make up an estimate of the cost of using these materials for building. Schematically, the workflow can be shown schematically as in the Yourdon's diagram below.



3.0.2 FLEXIBILITY.

Not much flexibility can be said to exist in the existing system. This can be seen from the fact that most surveyors in general abhor changes in design or materials midway into their work because these changes would make all or some

previous computations useless. The only way to respond to such changes therefore would be to cancel previous computations and start a fresh set of calculations. Because of this slow flexibility responding to changes by clients or designers is somewhat slow and difficult.

3.0.3. ECONOMY

In a good-sized project, many hands would be required for various necessary measurements and computations. A lot of working hours are necessary for these computations making the process expensive and cumbersome. It is an expensive process that could be made cheaper.

3.0.4. RELIABILITY.

Despite the many hours spent in checking computations, there is no absolute certainty of computations being without error. Given a large volume of work to be done in a rather limited time, the likelihood of an error from fatigue comes to play. Even after several checking errors are often still undetected because of the drudgery of the work.

3.0.5 PROBLEM IDENTIFICATION/DEFINITION.

Because of the cumbersome nature of the work detail of a Quantity Surveyor, it is not very likely that he would undertake to survey the volume and cost of using alternative materials at no extra charge to the client. He cannot be blamed for the extra charges either because it is clearly a lot of work. The underlying nature of the problem therefore is the large volume of work necessary to be done if the cost of using alternative materials is to be computed for a job.

3.1 DESIGNING OF A NEW SYSTEM.

From all that has been seen in the old system, which is basically manual, some two new system alternatives can be designed.

1. A semi computerized system.
2. A fully computerized system.

3.1.1 SEMI COMPUTERIZED.

Here dimensions are taken from drawings or field, manually, prices of materials required are sort from vendors, labour and machine rates are acquired from concerned agencies, all these are then input into the computer with an appropriate software. The computer will then output the volume of materials, labour and machine costs and the total cost of using these materials. The quantity surveyor can therefore find the cost of using alternative materials by simply referring to the appropriate section of the software. This way he can quickly and with ease respond to changes and quarries from clients.

The semi-computerized system can be divided into two sections.

1. Manual section and
2. Computerized section.

The manual section would be where dimensions are taken, prices of materials are sort, labour and machine cost are also sort, these are then input into the computer for processing.

The computerized section comes into play after all these data has been supplied after processing the computer would output.

1. Volume of materials required.
2. The cost of labour required.

3. The cost of materials required.
4. The cost of using any specified alternative materials.
5. The total estimated cost of putting up a wall using any specified material.

3.1.2 THE COMPUTERIZED SYSTEM.

In this system, other related spheres have been fully computerized. So all designs are done on a computer such that the quantity surveyor does not need to take any dimension manually. The computer, with the appropriate software lifts the dimensions from the designs along with the specified materials. Other data such as labour & machine rates, material cost would be only one supplied from an external sources.

Another version of the fully computerized system is given manual drawings, with the right equipment, the quantity surveyor can scan the drawings digitally. From the scan signal is then stored and processed by a computer with appropriate software. Through the software the computer can lift required dimensions for its computations.

The main advantage of the fully computerized system is that every process is done at computer speed and chances of errors because of manual processes are eliminated or reduced to the minimum.

However, some very serious draw backs are:-

1. Such a fully computerized system would need elaborate and expensive software.
2. It requires large random access memory.
3. It also requires large hard disk capacity.
4. Requires expensive accessories e.g. scanners.

5. It requires that other sphere such as Architectural designs or engineering designs be done on a computer. As at now, such work is still largely done using manual means.

6. Keyboard and screens with high graphic capabilities.

3.2 RECOMMENDATION.

Because of the following reasons, the semi-computerized system is recommended.

1. The fully computerized system can only be acquired at a great cost in terms of

   (i). Computer.

   (ii) Computer Accessories

2. Because most designs are still done largely on paper transferring such designs into the computer would require elaborate scanning equipment.

3. The semi computerized system works easily with the existing system in that it requires only being supplied dimensions of walls and materials required only.

4. The semi-computerized system requires less sophisticated software.

5. The semi-computerized system would also require less RAM and Hard-Disk capacity.

6. The semi-computerized system would be cheaper to acquire.

3.2.1 SYSTEM REQUIREMENTS.

For this semi computerized system the following are the essential requirements:-

1. System software.
2. Suitable application software.
3. Random Access Memory 32 MB
4. Hard Disk capacity 4.5 GB
5. V. D. U Enhanced Graphic Adaptor (EGA).
6. Floppy Disk Capacity 3.5"
7. C. P. U. clock speed 350 MHz

3.2.2 COST OF THE NEW SYSTEM.

Below is the cost of acquiring and installing a semi computerized system.

Software Cost

1.	Operating System Software (e.g. Windows 2000)	
	Application Software	20,000

HARDWARE COST

Desktop Computer		100,000.00
3.	Printer (DeskJet 1120c)	55,000.00
4.	Uninterrupted power supply system	20,000.00
5.	Voltage stabilizer	25,000.00
6.	Installation cost	20,000.00
7.	Miscellaneous expenses	50,000.00
8.	Operational Cost	25,000.000
	TOTAL	**N**

3.2.3 BENEFITS OF THE COMPUTERISED SYSTEM.

The benefit of this new system to the quantity surveyor is many fold.

1. It does a lot more work in less time.
2. The flexibility of the system allows it to respond to changes in design and materials to be used without doing a lot of work.
3. The work is neatly and accurately presented.
4. High degree of efficiency.
5. Reduced cost of cost estimation.

CHAPTER FOUR

4.0 CHOICE OF PROGRAMMING LANGUAGE

QUICK BASIC, which is a variant of BASIC, was chosen for programming because of its interactive nature. Errors can easily be detected and corrected. QBASIC has an editor that helps in debugging software, running a program and managing files i.e opening, closing, printing, saving etc of files.

The QBASIC Program is composed of several line states or lines of coding. Each execution of the program depends on the line numbers e.g line 30 is executed before line 35. It is recommended for line numbers to be sequential with some numbers to be sequential with some numbers skipped to permit the insertions of new lines at a later date e.g 10, 20, 30, 40 etc.

Comments about the program are included using the REM statements e.g included using REM statement e.g 10 REM THIS PROGRAM COMPARE THE COST FO REM PUTTING UP A WALL USING GRICK OR REM SANDCRETE.

The operational characteristics of QBASIC includes:

1. **DATA:** All numeric data are treated as floating point numbers. It also provides for alphanumeric data.
2. **VARIABLES**: These represent memory locations that assume different values during the execution of a program
3. **COMPUTATIONAL AND MANIPULATIONAL FACILITIES**
    - These are provided by assignment statement\s of which there are two types:

i. Arithmetic assignment statement

ii. Character assignment is written as n LET v = e where

n is line number

v is a numeric variable

e is an arithmetic expression

The arithmetic expressions accepts the following operators:

BASIC SYMBOL	MEANING
+	ADDITION
-	SUBRACTION
x	MULTIPLICATION
/	DIVISION
∧ or ↑ * *	EXPONENTIATION

DESCRIPTION OF THE PROGRAM

The program seeks rapidly to compare the cost of putting up a wall using sandcrete or bricks. In so doing it computers the volume of materials required, the cost of materials and labour services and presents the total cost as the estimated cost.

Schematically the program can be represented by a flow chart as in figure 1.

At the start of the program, it requires continue work or exit. If the enters exit brick a sandcrete to continue. The program the request data for sandcrete or bricks depending on choice. It gives the operation enhance to quite or print reports. If he chooses exit the program is terminated if he chooses reports.

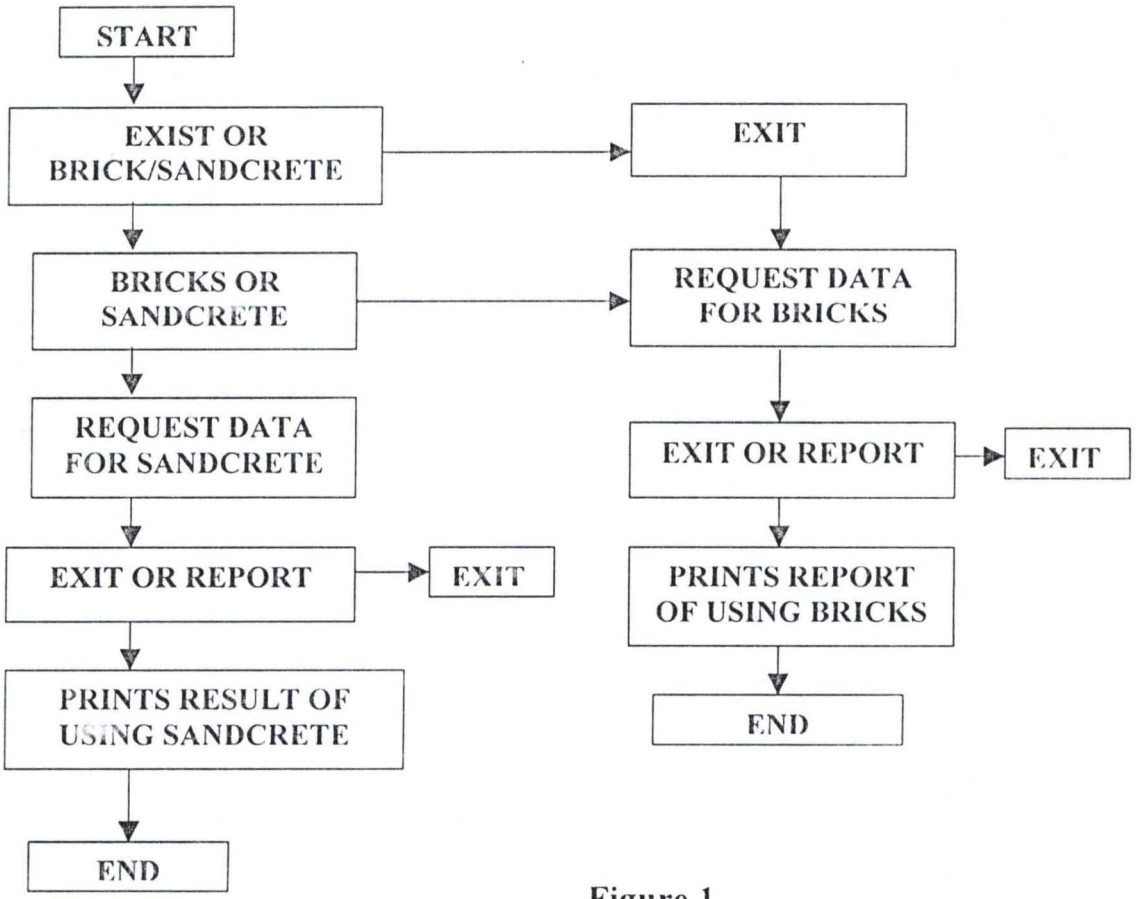


Figure 1

The program prints reports of using sandcrete or brick. The program then ends.

INPUT SPECIFICATION

All sizes of bricks or sandcrete would be inches e.g 6 inches till costs would be Naira and kobo e.g N15.50k would be entered as 15.50.

All volumes would be in urbic metre eg 19.70m^3 or 27.00m^3

All surface areas would be in square metres e.g 12.35m^2 or 16.00m^2 till lengths measured in metres eg 17.00m or 21.19m

Impute would by keyboard.

OUTPUT SPECIFICATION

Out put shall be as above e.g

Volumes in cubic metre

Areas in square metre

Estimated costs in Naira and kobo as stated in impute specifications. Out would be soft or hand copy depending on choice.

4.2 CONSERVATION / CHANGEOVER

The direct changeover methods is advised because it is least expensive it means replacing the old system with the new in one swoop in a bold. I t is advise that all apparatus and paraphernalia of the old system be held in a beyond incase of any emergency.

4.3 MAINTANANCE

Some of the following precautions should be taken when using the software.

1. A soft copy of the software should be kept in a diskette.
2. All computer laboratory rules and practices should be observed
3. Regular checks by running the same data through the old manual and the system.
4. Rate of process should also be checked constantly.
5. Only trained personnel should allowed access to the system
6. Software except by qualified persons.

CHAPTER FIVE

5.0 SUMMARY.

In writing this project, the obvious on silent reasons mitigating against computerization of cost comparison were examined and solutions were proffered. Some of the reasons were:-

1. Non-computerization of other spheres such as Architectural and Engineering designs.
2. High cost of application softwares in the fields of quantity survey.
3. High cost of certain computer accessories such as digitizers.
4. The nature and scope of work involved in estimating cost of building and the nature of personnel involved in costing was also examined to ascertain that indeed the computer is a tool that he requires to ply his trade efficiently.

The reason why despite the availability of some softwares from within and outside the country, they are still not largely used was examined and solutions were proffered.

5.1 RECOMMENDATIONS.

It is recommended that this software be further worked on so that other materials with their close substitutes if any be added. This way the software can be built up to be an all-encompassing toll in cost of building estimation.

5.2 CONCLUSION.

The cost of not properly and completely costing a building project is awesome. Without proper costing, there can be no proper planning and execution and abandoned projects will continue to litter our environment. An application

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COST COMPARISON OF BUILDING MATERIALS

A COMPUTER APPROACH

PROGRAM MAIN-MENU

---

1. DATA ENTRY MENU
2. COMPUTATION MENU
3. REPORT MENU
4. QUIT

Enter your choice...?

Developed By: OGBE I. PIUS (PGD/MCS/2000/2001/1039)

COST COMPARISON OF BUILDING MATERIALS

A COMPUTER APPROACH

DATA ENTRY MENU

1. Sandcrete
2. Bricks
3. Quit.

Enter your choice...?

Developed By: OGBE I. PIUS (PGD/MCS/2000/2001/1039)

COST COMPARISON OF BUILDING MATERIALS

A COMPUTER APPROACH

REPORT MENU

1. Sandcrete Report
2. Bricks Report
3. Quit.

Enter your choice...?

Developed By: OGBE I. PIUS (PGD/MCS/2000/2001/1039)

COST COMPARISON OF BUILDING MATERIALS
BRICKS REPORT

DATE :04-09-2002

LENGTH	:	10
HEIGHT	:	15
AREA OF OPENINGs	:	40
W/AREA	:	110
QTY OF BRICKS	:	1100
QTY OF MORTAR	:	27.5
COST OF BRICKS	:	55000
COST OF MORTAR	:	8800
COST OF LAYING	:	16500
TOTAL COST	:	80300

END OF REPORT....

COST COMPARISON OF BUILDING MATERIALS
SANDCRETE REPORT

DATE :04-09-2002

LENGTH	:	10
HEIGHT	:	15
OPENINGS AREA	:	40
AREA OF WALL	:	110
QTY OF BLOCKS	:	1100
QTY OF MORTAR	:	27.5
COST OF BLOCKS	:	44000
COST OF MORTAR	:	8800
COST OF LAYING	:	11000
QTY OF PLASTER	:	44
COST OF PLASTER	:	45320
LABOUR COST OF PLASTER	:	44
QTY OF PAINT	:	27.5
COST OF PAINT	:	26125
LABOUR COST OF PAINT	:	13200
TOTAL COST	:	148489

END OF REPORT....

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'-------------------------------------------------
REM Program Comparison of Building Materials
REM [Emphasis on Clay and Cement Products]
REM Written By: OGBE I. PIUS
REM Reg.No: PGD/MCS/2000/2001/1039
REM In partial fulfillment for the award of
REM Postgraduate Diploma in Maths/Computer Science
'-------------------------------------------------

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TITLE2$ = "                  A COMPUTER APPROACH"
TITLE4$ = " "
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'-----------------------------------------------
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REM BRICKS REPORT MODULE

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        OPEN "BRICKS.OUT" FOR OUTPUT AS #2
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  LOCATE 3, 10: PRINT #2, "-----------------------------------------------
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  LOCATE 6, 10: PRINT #2, "HEIGHT           : "; WH
  LOCATE 7, 10: PRINT #2, "AREA OF OPENINGs: "; AO
  LOCATE 8, 10: PRINT #2, "W/AREA           : "; AW
  LOCATE 9, 10: PRINT #2, "QTY OF BRICKS    : "; QOB
  LOCATE 10, 10: PRINT #2, "QTY OF MORTAR    : "; QOM
  LOCATE 11, 10: PRINT #2, "COST OF BRICKS   : "; COB
  LOCATE 12, 10: PRINT #2, "COST OF MORTAR   : "; CMT
  LOCATE 13, 10: PRINT #2, "COST OF LAYING   : "; COL
  LOCATE 14, 10: PRINT #2, "TOTAL COST       : "; TCB

  INPUT #1, WL, WH, AO, AW, QOB, QOM, COB, CMT, COL, TCB

  LOCATE 15, 1: PRINT #2, "-----------------------------------------------
----------------"
  COL% = 1: ROW% = 6

  'LOCATE ROW%, 1: PRINT #2, WL
  'LOCATE ROW%, 10: PRINT #2, WH
  'LOCATE ROW%, 20: PRINT #2, AW
  'LOCATE ROW%, 26: PRINT #2, QOB
  'LOCATE ROW%, 36: PRINT #2, QOM
  'LOCATE ROW%, 46: PRINT #2, COB
  'LOCATE ROW%, 56: PRINT #2, CMT
  'LOCATE ROW%, 66: PRINT #2, COL
  'LOCATE ROW%, 73: PRINT #2, TCB
 ' ROW% = ROW% + 1

'LOCATE ROW%, 1: PRINT #2, "-----------------------------------------------
----------------"
'ROW% = ROW% + 1
LOCATE 16, 10: PRINT #2, "END OF REPORT...."
CLS
LOCATE 12, 20: PRINT "Check file [BRICKS.OUT] for results"
LOCATE 14, 20: PRINT "Press any key when ready..."
```

```
SLEEP
CLOSE
GOTO REPORTMENU
'-------------------------------------------


SANDREP:
REM PRINT SANDCRETE REPORT MODULE
            GTOTAL% = 0
         TITLE3$ = "                        SANDCRETE REPORT"
        OPEN "SANDCRET.TMP" FOR INPUT AS #1
        OPEN "SANDCRET.OUT" FOR OUTPUT AS #2
CLS
INPUT #1, WL, WH, AO, AW, QOB, QOM, COB, CMT, COL, QOP, COP, LCOP, QPT,
CPT, LPT, TCS
  LOCATE 1, 10: PRINT #2, TITLE1$
  LOCATE 2, 20: PRINT #2, TITLE3$
  LOCATE 2, 60: PRINT #2, "DATE :"; DATE$
  LOCATE 3, 1: PRINT #2, "-------------------------------------------------
------"
  LOCATE 4, 10: PRINT #2, "LENGTH                  :  "; WL
  LOCATE 5, 10: PRINT #2, "HEIGHT                  : "; WH
  LOCATE 6, 10: PRINT #2, "OPENINGS AREA           : "; AO
  LOCATE 7, 10: PRINT #2, "AREA OF WALL            : "; AW
  LOCATE 8, 10: PRINT #2, "QTY OF BLOCKS           : "; QOB
  LOCATE 9, 10: PRINT #2, "QTY OF MORTAR           : "; QOM
  LOCATE 10, 10: PRINT #2, "COST OF BLOCKS          : "; COB
  LOCATE 11, 10: PRINT #2, "COST OF MORTAR          : "; CMT
  LOCATE 12, 10: PRINT #2, "COST OF LAYING          : "; COL
  LOCATE 13, 10: PRINT #2, "QTY OF PLASTER          : "; QOP
  LOCATE 14, 10: PRINT #2, "COST OF PLASTER         : "; COP
  LOCATE 15, 10: PRINT #2, "LABOUR COST OF PLASTER: "; LCOP
  LOCATE 16, 10: PRINT #2, "QTY OF PAINT            : "; QPT
  LOCATE 17, 10: PRINT #2, "COST OF PAINT           : "; CPT
  LOCATE 18, 10: PRINT #2, "LABOUR COST OF PAINT  : "; LPT
  LOCATE 19, 1: PRINT #2, "-------------------------------------------------
------"
  LOCATE 20, 10: PRINT #2, "TOTAL COST              : "; TCS
        LOCATE 21, 10: PRINT #2, "END OF REPORT...."
CLS
LOCATE 12, 20: PRINT "Check report file [SANDCRET.OUT] for results"
LOCATE 14, 20: PRINT "Press any key when ready..."
SLEEP
CLOSE
'-------------------------------------------

GOTO REPORTMENU
'-------------------------------------------
BRICKS:
REM NEW BRICKS DATA MODULE
        TITLE3$ = "                    ENTERING BRICKS DATA"
        OPEN "BRICKS.DAT" FOR OUTPUT AS #1
CLS
LOCATE 1, 20: PRINT TITLE1$
LOCATE 2, 20: PRINT TITLE2$
LOCATE 3, 20: PRINT TITLE3$
FOR X = 10 TO 70: LOCATE 4, X: PRINT CHR$(196): NEXT
FOR X = 10 TO 70: LOCATE 22, X: PRINT CHR$(196): NEXT
LOCATE 5, 20: INPUT "BRICK SIZE(INCHES)                    :"; BSIZE
LOCATE 6, 20: INPUT "UNIT COST OF BRICKS                   :"; UCOST
LOCATE 7, 20: INPUT "UNIT COST OF LAYING                   :"; UCOL
```

```
LOCATE 8, 20: INPUT "NO OF BRICKS PER SQR METRE          :"; NOB
LOCATE 9, 20: INPUT "CUBIC VOLUME OF MORTAR PER SQR METRE:"; VOM
LOCATE 10, 20: INPUT "CUBIC COST OF MORTAR                :"; CCOM
LOCATE 23, 20: INPUT "SAVE THE ABOVE DATA? (Y/N)"; YN$
IF UCASE$(YN$) = "Y" THEN
WRITE #1, BSIZE, UCOST, UCOL, NOB, VOM, CCOM
END IF
CLOSE
GOTO DATAMENU
'-------------------------------------

SAND:
REM NEW SANDCRETE DATA MODULE
        TITLE3$ = "                ENTERING SANCRETE DATA"
        OPEN "SANDCRET.DAT" FOR OUTPUT AS #1
CLS
LOCATE 1, 20: PRINT TITLE1$
LOCATE 2, 20: PRINT TITLE2$
LOCATE 3, 20: PRINT TITLE3$
FOR X = 10 TO 70: LOCATE 4, X: PRINT CHR$(196): NEXT
FOR X = 10 TO 70: LOCATE 22, X: PRINT CHR$(196): NEXT
LOCATE 5, 20: INPUT "SANDCRETE SIZE(INCHES)              :"; SSIZE
LOCATE 6, 20: INPUT "UNIT COST OF PURCHASE               :"; UCOST
LOCATE 7, 20: INPUT "UNIT COST OF LAYING                 :"; UCOL
LOCATE 8, 20: INPUT "NO OF SANDCRETE PER SQR METRE       :"; NOS
LOCATE 9, 20: INPUT "CUBIC VOLUME OF MORTAR PER SQR METRE:"; VOM
LOCATE 10, 20: INPUT "CUBIC COST OF MORTAR                :"; CCOM
LOCATE 11, 20: PRINT "PLASTER WORK"
LOCATE 12, 20: INPUT "CUBIC COST OF PLASTER                :"; CCOP
LOCATE 13, 20: INPUT "CUBIC VOL.OF PLASTER PER SQR SURFACE :"; CVOP
LOCATE 14, 20: INPUT "LABOUR COST OF WORK PER SQR METRE    :"; LAB
LOCATE 15, 20: PRINT "PAINT WORK"
LOCATE 16, 20: INPUT "COST OF LABOUR PER SQR METRE         :"; PLAB
LOCATE 17, 20: INPUT "CUBIC VOLUME OF PAINT PER SQR METRE  :"; PVOL
LOCATE 18, 20: INPUT "CUBIC COST OF PAINT                  :"; PCOST
LOCATE 19, 20: INPUT "COST OF PAINT WORK PER SQR METRE     :"; PWORK
CPW = CCOP + LAB
LOCATE 23, 20: INPUT "SAVE THE ABOVE DATA? (Y/N)"; YN$
IF UCASE$(YN$) = "Y" THEN
WRITE #1, SSIZE, UCOST, UCOL, NOS, VOM, CCOM, CCOP, CVOP, LAB, PLAB, PVOL,
PCOST, PWORK, CPW
END IF
CLOSE
GOTO DATAMENU
'-------------------------------------
pwd:
OPEN "pas.fil" FOR INPUT AS #1
INPUT #1, pw$: CLOSE #1
100
CLS : LOCATE 12, 20: PRINT "Enter password"
COLOR 4, 4
LOCATE 12, 35: INPUT p$:   COLOR 19, 0
IF UCASE$(p$) <> pw$ THEN
        LOCATE 14, 20: PRINT "Invalid Password, press any key..."
        SLEEP: LOCATE 14, 20: PRINT SPC(40);
        COLOR 7, 0: GOTO 100
END IF
GOTO mmn
'-----------------------------------

'-----------------------------------
```

```
REM SPECIFY WALL SECTIONS PROGRAM MODULE
SPECIFY:
        TITLE3$ = "    SPECIFYING SECTIONS SIZE"
        OPEN "SECTION.DAT" FOR OUTPUT AS #1
CLS
LOCATE 1, 20: PRINT TITLE1$
LOCATE 2, 20: PRINT TITLE2$
LOCATE 3, 25: PRINT TITLE3$
FOR X = 10 TO 70: LOCATE 4, X: PRINT CHR$(196): NEXT
FOR X = 10 TO 70: LOCATE 22, X: PRINT CHR$(196): NEXT
LOCATE 5, 20: PRINT "Enter sections data as follows:-"

LOCATE 9, 20: INPUT "SECTIONS' HEIGHT       :"; WH
LOCATE 10, 20: INPUT "SECTIONS' LENGTH       :"; WL
LOCATE 11, 20: INPUT "TOTAL AREA OF OPENINGS :"; AO
AW = (WH * WL) - AO
LOCATE 23, 20: INPUT "SAVE THE ABOVE DATA? (Y/N)"; YN$
IF UCASE$(YN$) = "Y" THEN
WRITE #1, WH, WL, AO, AW
END IF
CLOSE #1
GOTO COMPMENU

'-------------------------------------
REM COMPUTATION PROGRAM MODULE
COMPUTE:
CLS
LOCATE 10, 20: PRINT "PLS. WAIT...  COMPUTING!"
        OPEN "SANDCRET.DAT" FOR INPUT AS #1
        OPEN "BRICKS.DAT" FOR INPUT AS #2
        OPEN "SECTION.DAT" FOR INPUT AS #3
        OPEN "SANDCRET.TMP" FOR OUTPUT AS #4
        OPEN "BRICKS.TMP" FOR OUTPUT AS #5

        INPUT #3, WH, WL, AO, AW
     '--------- BRICKS
        INPUT #2, BSIZE, UCOST, NOB, VOM, CCOM, UCOL
        QOB = NOB * AW
        QOM = VOM * AW
        COB = UCOST * QOB
        CMT = CCOM * QOM
        COL = UCOL * QOB
        TCB = COB + CMT + COL
        WRITE #5, WL, WH, AO, AW, QOB, QOM, COB, CMT, COL, TCB

     '--------- SANDCRETE
        INPUT #1, SSIZE, UCOST, UCOL, NOS, VOM, CCOM, CCOP, CVOP, LAB,
PLAB, PVOL, PCOST, PWORK, CPW
        QOB = NOS * AW
        QOM = VOM * AW
        COB = UCOST * QOB
        CMT = CCOM * QOM
        COL = UCOL * QOB
        QOP = CCOM * AW
        COP = CCOP * QOP
        LCOP = CVOP * AW
        QPT = PVOL * AW
        CPT = PCOST * QOP
        LPT = PWORK * AW
        TCS = COB + CMT + COL + COP + LCOP + CPT + LPT
       '
```

```
        WRITE #4, WL, WH, AO, AW, QOB, QOM, COB, CMT, COL, QOP, COP, LCOP,
QPT, CPT, LPT, TCS

        LOCATE 10, 10: PRINT "COMPUTATION IS SUCCESSFUL, PRESS ANY KEY."
        SLEEP: CLOSE : GOTO COMPMENU

'---------------------------------------
REM REPORT MENU
REPORTMENU:
CLS
LOCATE 4, 15: PRINT TITLE1$
LOCATE 5, 15: PRINT TITLE4$
LOCATE 6, 15: PRINT TITLE2$
LOCATE 8, 30: PRINT "     REPORT MENU"
COLOR 2
LOCATE 11, 29: PRINT "1"
COLOR 7
LOCATE 11, 30: PRINT ".  Sandcrete Report"
COLOR 2
LOCATE 12, 29: PRINT "2"
COLOR 7
LOCATE 12, 30: PRINT ".  Bricks Report"
COLOR 2
LOCATE 13, 29: PRINT "3"
COLOR 7
LOCATE 13, 30: PRINT ".  Quit."
LOCATE 4, 10: FOR X = 10 TO 70: LOCATE 9, X: PRINT CHR$(196): NEXT
FOR X = 10 TO 70: LOCATE 3, X: PRINT CHR$(220): NEXT
FOR X = 10 TO 70: LOCATE 17, X: PRINT CHR$(220): NEXT
COLOR 11
LOCATE 23, 17: PRINT "Developed By: OGBE I. PIUS (PGD/MCS/2000/2001/1039)"
COLOR 14
LOCATE 18, 25: INPUT "Enter your choice..."; C%
COLOR 7
IF C% < 1 OR C% > 3 THEN
        LOCATE 21, 20: PRINT "Invalid Number ! Press any key..."
        SLEEP: GOTO REPORTMENU
END IF
IF C% = 3 THEN
        GOTO mmn
END IF
IF C% = 1 THEN GOTO SANDREP
IF C% = 2 THEN GOTO BRICKSREP
'-------------------------------------------

'---------------------------------------
REM COMPUTATION MENU
COMPMENU:
CLS
LOCATE 4, 15: PRINT TITLE1$
LOCATE 5, 15: PRINT TITLE4$
LOCATE 6, 15: PRINT TITLE2$
LOCATE 8, 24: PRINT "          COMPUTATION MENU"
COLOR 2
LOCATE 11, 29: PRINT "1"
COLOR 7
LOCATE 11, 30: PRINT ".  Specify Sections Dimension"
COLOR 2
LOCATE 12, 29: PRINT "2"
COLOR 7
LOCATE 12, 30: PRINT ".  Compute for Sandcrete/Bricks"
```

```
COLOR 2
LOCATE 13, 29: PRINT "3"
COLOR 7
LOCATE 13, 30: PRINT ".  Quit."
LOCATE 4, 10: FOR X = 10 TO 70: LOCATE 9, X: PRINT CHR$(196): NEXT
FOR X = 10 TO 70: LOCATE 3, X: PRINT CHR$(220): NEXT
FOR X = 10 TO 70: LOCATE 17, X: PRINT CHR$(220): NEXT
COLOR 11
LOCATE 23, 17: PRINT "Developed By: OGBE I. PIUS (PGD/MCS/2000/2001/1039)'
COLOR 14
LOCATE 18, 30: INPUT "Enter your choice..."; C%
COLOR 7
IF C% < 1 OR C% > 3 THEN
        LOCATE 21, 20: PRINT "Invalid Number ! Press any key..."
        SLEEP: GOTO COMPMENU
END IF
IF C% = 3 THEN
        GOTO mmn
END IF
IF C% = 1 THEN GOTO SPECIFY
IF C% = 2 THEN GOTO COMPUTE
'-----------------------------------------

REM DATA ENTRY MENU
DATAMENU:
CLS
LOCATE 4, 15: PRINT TITLE1$
LOCATE 5, 15: PRINT TITLE4$
LOCATE 6, 13: PRINT TITLE2$
LOCATE 8, 30: PRINT "  DATA ENTRY MENU"
COLOR 2
LOCATE 11, 29: PRINT "1"
COLOR 7
LOCATE 11, 30: PRINT ".  Sandcrete"
COLOR 2
LOCATE 13, 29: PRINT "2"
COLOR 7
LOCATE 13, 30: PRINT ".  Bricks"
COLOR 2
LOCATE 15, 29: PRINT "3"
COLOR 7
LOCATE 15, 30: PRINT ".  Quit."
LOCATE 4, 10: FOR X = 10 TO 70: LOCATE 9, X: PRINT CHR$(196): NEXT
FOR X = 10 TO 70: LOCATE 3, X: PRINT CHR$(220): NEXT
FOR X = 10 TO 70: LOCATE 19, X: PRINT CHR$(220): NEXT
COLOR 11
LOCATE 23, 17: PRINT "Developed By: OGBE I. PIUS (PGD/MCS/2000/2001/1039)"
COLOR 14
LOCATE 18, 30: INPUT "Enter your choice..."; C%
COLOR 7
IF C% < 1 OR C% > 3 THEN
        LOCATE 21, 20: PRINT "Invalid Number ! Press any key..."
        SLEEP: GOTO DATAMENU
END IF
IF C% = 3 THEN
        GOTO mmn
END IF
IF C% = 1 THEN GOTO SAND
IF C% = 2 THEN GOTO BRICKS

'-----------------------------------
```