

**COMPUTER APPROACH TO QUALITY CONTROL AND MATERIAL**

**ANALYSIS FOR IBTC CONSTRUCTION MANAGEMENT, LAGOS**

**BY**

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## **DEDICATION**

This project is dedicated to God and His Son Jesus Christ, the Great system Designers and Analysts of the whole universe.

## ABSTRACT

Good quality product is appreciated long after the cost is forgotten. First, this is not a project on how to be a control manager or material analyst. Rather, it is a guide to quality awareness and to where controls are located. It attempts to minimize human error in quality control and material analysis.

The project also provides guidelines on what questions architects should ask builders/contractors on material usage and help to monitor their efforts. Thus, quality is the greatest life wire of building construction, if Architecture is accepted as a loud expression of a people's culture and technological development.

THEORY: Right material + Control = Quality Product

The language used in designing this program is visual fox pro 6.0 due to its data base management system. It is 4th generation language which enable the user easy manipulation string. Also, allows easy store of large row data.

## CERTIFICATION/APPROVAL

I certify that this work was carried out by ADAMU RICHARD KOLADE of the Department of Maths/  
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Special thanks also goes to the following people the lecturers in the Department of Maths/computer; Engineer Martin Dada, Project Manager IBTIC construction, Mr Akpan George for his advice and moral support, Mrs Kikekolade, my wife who has continuously prayed for me and last but not the least, my Detractors who have made me mpre determined now than ever before to succeed in this noble field. May God bless you all (Amen)

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## CHAPTER ONE

- 1.1 **DEFINITION:** Quality Assurance (QA) or control is defined as a planned set of actions and activities that will provide confidence that the product meets the established technical standards and gives the results and performance intended.
- 1.2 **INTRODUCTION OF THE PROJECT:** Environmental science is particularly suitable for computerization due to the large number of calculations involved. The development of appropriate computer programs will relieve the designer or builder of cumbersome manipulations and enable him concentrate on quantitative analysis and other design (construction) factors. Thus, computer is a powerful tool that relieves builder of difficult and error prone calculations. A good quality product does meet the users requirement to his satisfaction, which increases with time.
- 1.3 **OBJECTIVE OF THE PROJECT:** If this system is put into proper use with controls, it will detect the: (1) DETECT THE EXISTENCE OF ERRORS  
(2) LOCATE ERRORS  
(3) CORRECT ERRORS.

The object of the control system is therefore to minimize errors, by self regulation where possible, otherwise by continually measuring the operations and issuing the necessary instructions for corrective action to be taken. Since the corrective action to be taken it can be done by the computer, electronic speed is being achieved. Hence, is to eliminate to the minimal Human error in material and quality control.

1.4 **SCOPE OF THE PROJECT:** In order to produce a high - quality product, it is essential from the outset that the system is to be designed with the conscious, need for quality (The system component part are to be decomposed based on a formal structured designed methodology). However, it is difficult to define a quantitative measurement of quality, but unless some attempt is made to do so, quality that we can use has been defined as "THE NO. OF FAULTS IDENTIFIED PER THOUSAND LINES OF EXECUTIVE CODES DECIPHERED"

1.5 Early approach to Quality Control page and Material Analysis in LBTC Construction.

Studying the existing system, it shall be expanded under the following areas:

- Present procedures
- Present information flows
- Present methods of work
- Present data transactions and file volume.

1.2.1 **PRESENT PROCEDURES:** Many of the present site office workers have not received formal education on record keeping. Beside the administration supervision is not separated from construction supervision. Above, all these, key site workers (supervisors and foremen) are not able to enforce desired quality control on the unstable site workers who come weekly from the District Churches to work (Direct Labour System). No stable and permanent site office staff.

1.2.2 **PRESENT INFORMATION FLOWS:** There is not proper handing over of the already set quality standard by the outgoing worker to the incoming one. Only few people in the leadership room are aware of the need for quality control and material analysis.

Data/information are not securely kept in any data bank. Printed data are kept on file which are stocked on the open shelves.

1.2.3 **PRESENT METHODS OF WORKS:** Various workshops on how to handle tools, materials, information are rarely held. At present work carried out are based not on the known international standard, but on the exposure of the sectional heads. Real life data often contain mixtures of types of data which makes the choice of analysis somewhat arbitrary.

1.2.4 **PRESENT DATA TRANSACTIONS & FILE VOLUME:** There is time wasting in searching for data and information from the stocked files. Large space is required to store the existing files.

A high flexibility and a great transparency of the production process is achieved with these systems.

1.2.5 **LIMITATION OF THE PROJECT:** It must be admitted that implementing the suggested steps necessary to ensure a good - quality system could incur greater development costs and delay delivery dates.

However, with experience or time and practice, these steps will become second nature and a normal part of the development. Delay in delivery date must not over-rule the longer term benefits of this system.

**THE COMPUTER SYSTEM**

Computer is a device made up of a combination of electronic and electromechanical components. It is often referred to as hardware. A computer system is a combination of about five or six elements:

- (i) Hardware
- (ii) Software
- (iii) People (user)
- (iv) Procedures
- (v) Data/Information and Connectivity.

Software is the term used to describe the instructions that tell the hardware how to perform a task; without software instructions, the hardware doesn't know what to do. People operate the computer hardware; they create the computer software instructions and respond to the procedures that those instructions present.

The purpose of a computer system is to convert data into information. Data is raw, unevaluated facts and figures, concepts, or instructions. This raw material is processed into useful information. In other words, information is the product of data processing. This processing includes refining, summarizing, categorizing, and otherwise manipulating the data into a useful form for decision making.

However, people "capture" data by reading, listening, or seeing. Then they record the data on a document.

The computer model receives data and programs through the input units (keyboard, mouse, scanner, phone etc).

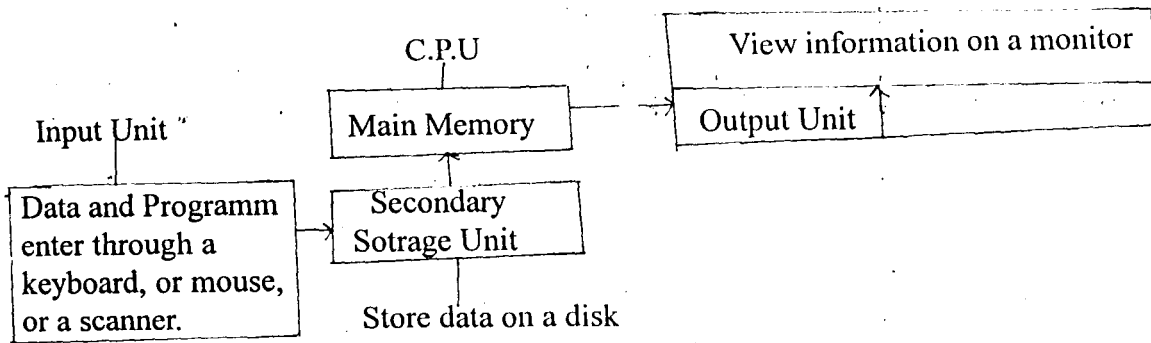
## 1.4 CHOICE OF THE COMPUTER

The choice of the computer hardware system in information technology is needed to be considered as determined by the following several factors.

- (a) The type of CPU e.g. microprocessors
- (b) The amount of main memory the CPU can use to support programmes
- (c) The capacity of the storage devices
- (d) The speed of the output devices
- (e) The processing speed in millions of instructions per second (MIPS)
- (f) The number of users that can access the computer at one time (simultaneously)
- (g) The cost of the computer system.

These basic factors have not helped a little way in designing a computer system for IBTC construction, Lagos Headquarters.

## A COMPUTER MODEL



### 1.5. THE COMPUTER SYSTEM

In a computer model Data and Programms are fed into the computer (Hardwares) via the input unit which are proceeed at the cental processing unit to be store as information (result) in the secondary storage unit or vieweð on the output unit (mornitor) as shown in the figure below. above

In this project a computer system is designed to help the organization to reach its objective by:

- (a) Improving the organisation information resources and as a consequence facilitating management functions and actions.
- (b) Identifying opportunity to improve the mix (quality and quantity of materials usage) of the resources needed.
- (c) Encouraging more efficient pattern for the organisation processisng operations.
- (d) testing alternating for opportunity that may result in new and beneficial organisation objectives.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

The main driving force is the general belief the "GOOD QUALITY PRODUCT is appreciated LONG after the cost is forgotten.

Quality is defined as an analysed balance between initial construction model and life-cycle edifix. Architect, then by their very nature, spend most of their time on design analysis and little of their time on quality control and materials analysis.

#### **QUALITY VALUE**

Buildings can be said to have three broad levels of quality in materials and equipment:

- (i) Low
- (ii) Average and (iii) High.

It is the owner's prerogative to set the level of quality wanted in a building and to insist on having that level at the lowest possible cost.

An Elijah can call for mable in the church, and Mohammed can call for concrete block in a Mosque. Quality of materials, however, has nothing to do with quality of design. Thus, an outstanding design can be achieved with concrete block, and poor design can be im mortalized in marble.

2.1 The IBTC construction was established early nineties by the Deeper Christian Life Ministry to handle major construction (Building, furniture, Road etc) works within the church system. This has led to the construction of many Hostels, Auditoria, Resurants, Kitchen Camp-ground etc. The population of the church which range between eighty to hundred thousand at the Head-quarter (Lagos) encourage the direct labour system adopted by the organization.

However, the goal of putting up structure to meet the vision of the Pastor (Overseer) has not been satisfactory met, due to some poor analysis of materials used and quality achieve, and this will serve as basis for this project (COMPUTER APPROACH TO QUALITY CONTROL AND MATERIAL ANALYSIS IN CONSTRUCTION MANAGEMENT).

### 2.1.2 MATERIAL ANALYSIS:

Water is an essential material (resource) needed to build up an healthy and comfortable environment for man to dwell. As you will agree with me the Architect provides such environment for man.

Therefore, the quantity and the quality of these materials supplied have been analysed by the United State Environmental Protection Agency (EPA). The common figures for residential water consumption is susally given as 50 to 60 Gallons per day per person. also, the EPA recognizes several categories:

Building Type	Range	Average
1. Single Family Dwelling	50 - 75	62.5 Gallons
2. Multiple - Family Apartments	40 - 49	44.5 Gallons
3. Luxuary Dwelling	100 - 150	125 Gallons
5. Fire Protection (for fire fighting)	3 1/4 per. min. or 200 Gallongs per hrs.	200 Gallons per hrs.

It is now made possible to analyse the quantity and quality of water needed in a dweilling area, comprises two or more categories of the residential area as analysed above.

#### SPECIMEN ONE:

Write a program to calculate the total quantity of water to be supplied to 60 flates of single family dwelling, 45 flats of multiple family appartment, and 15 flats of Luxing dwelling.

## 2.1 CASE SECTION

### 2.1.1 CONCRETE MIXES

The following ratio of cement, sand and granite or washed gravel are know

1:1:2; 1:1 1/2:3; 1:2:4;  
1:2 1/2:5; and 1:3:6 and 1:4:8

Concrete of a given strength is identified by its grade. Thus grade 25 concrete which we use in building works has crushing strength of 25 N/mm<sup>2</sup>.

### 2.1.2 MIX PROPORTIONS REQUIRED TO MAKE ONE CUBIC METRE (1M<sup>3</sup>) OF CONCRETE OF VARIOUS GRADES USING IRREGULAR AGGREGATES (e.g. GRANITE CHIPPINGS)

	1:1:2	1:1 1/2:3	1:2:4	1:2 1/2:5	1:3:6	1:4:8
	BY VOL.	BY VOL.	BY VOL.	BY VOL.	BY VOL.	BY VOL.
Portland Cement	11	8	6	5	4	3
(Bags)						
Fine Agg. (m <sup>3</sup> ) (Shap Sand)	0.38	0.41	0.43	0.44	0.45	0.46
Coarse Agg. (m <sup>3</sup> ) (Gravels or Granite)	0.75	0.82	0.86	0.88	0.90	0.92

### 2.1.3 TESTING OF CONCRETE FOR WORKABILITY (QUALITY AND MATERIAL ANALYSIS)

To test the concrete and ascertain the strength, a cube of 15cm should be produced and cured (submerged in water) for 28 days and then tested. The test could be carried out also at the nearest tertiary institution that has the facilities.

In this direct labour system, the test is more important before the actual construction work though samples should also be taken during the works. Also, slump test should be carried out at the mixing point to determine the workability of the concrete.

The mixing, placing, compaction and curing of the concrete should be well supervised. The surface of concrete should be kept wet for at least 7 days.

The following value of slump is specified:

(i)	Reinforced slab and beams	50 - 125mm
(ii)	Columns	75 - 125mm
(iii)	Foundations	50 - 100mm
(iv)	Vibrated Concrete	12 - 25mm

This presentation give details of supervision that a civil/structural Engineer should gie in construction of reinfoced concrete components of chuch building. The goal is to have buildings that are structurally safe and economically built.

It is achnowledge that some localities may not have Engineers who are experinced enough to undertake all the analysis (responsibilities) highlighted in this paper but it is believed that the guidelines given in this project will help the members in the building profession to sere the church better.



## **CHAPTER THREE**

### **SYSTEM ANALYSIS**

#### **3.1 ANALYSIS OF THE CURRENT SYSTEM**

In the current system of the IBTC construction management, the Direct labour system is employed, using Deeper Life Bible Church members, to carry out the major construction works on her sites.

Due to lack of proper monitoring and enough orientation on the site, materials are been wasted and quality control is very low. Information flow is very poor since there is no stable site clerk; stocks of files occupy large space which do not give room to easy sorting.

#### **3.2 FEASIBILITY STUDIES:**

There is need to examine closely the possibility of going into computer sation of information flow of IBTC construction. This can be viewed, bearing in mind the financial implications without bias.

It will save the user many months of efforts and financial waste.

The feasibility of the project are to be considered under three subheading:

- (a) Operational Feasibility (OF)
- (b) Technical Feasibility (TF)
- (c) and Economic Feasibility (EF)

**3.2.1 OPERATIONAL:** The new system is simple enough to be used by the site supervisors, clerk of works, and the common people on site, since almost every worker through formal education. Besides, all complex computations have been built into the system.

**3.2.2 TECHNICAL FEASIBILITY:** This is to prove the availability of the needed technology. an average school holders, which made up the bulk of people on site, can easily learn the new Technology. The computer components/system can be purchased without much pain by the management, since this will aid the organisation to meet the target of millions worth project they carry out from time to time. an analyst may be employed to train the personnel within two to four weeks.

**3.2.3 ECONOMIC FEASIBILITY:** There will be need to purchase printer (Laser Jet 6L), 15" SUGA colour Monitor, etc.

### 3.7 DEFINITION OF TERMS USE IN THIS PROJECT:

A System  
A Program  
A Subprogram  
An Algorithm  
A Pseudocodes  
A Flowchart

A system is defined as an entity that is composed of subsystems and that has a common purpose and known boundaries. Thus, a set of interacting - elements responding to input to produce out.

A program is an Algorithm (set of instructions) specifically expressed in a High Level LANGUAGE capable of execution on a computer.

A subprogram is a complete and independent program which can be used (invoked or called) by the main program or other subprograms. Such as subroutine, function and procedure.

An Algorithm is a procedure for solving a problem in a finite number of steps. In other words, it is a finite set of instructions for carrying out a specific task. Every computer program is an algorithm.

Generally, algorithms are expressed in pseudocodes not suitable for execution by computer.

A pseudocode is a logical representation of an Algorithm, using third generation language styles such as Do, WHILE, IF... THE ... ELSE. These are structured English which are not executable by computer.

A flowchart.

## **THE SYSTEM DEVELOPMENT PROCESS:**

This is a process whereby the IBTC construction work-methods and procedures are simplified and improved.

thus, the flow of information in a Direct Labour system to achieve a desired Quality Control is considered below.

- A. **PROBLEM:** There is no proper documentation of correct **FEEDBACK** (positive or negative) to increase effort, correct or guide activities with achieving the goals at the time lag. The direct labour force are not ready-made tools to handle the technical organisational structure of the project office which ought to serve as information centre for the construction field. Hence the quality of workdone in relation to material usage is very low.
- B. **FEASIBILITY STUDY:** This project can be pushed with a little effort on the side of project supervisors and the project manager to learn the proposed system (computer system).

### **3.3 SYSTEM DESIGN AND BOUNDARIES:**

In view of the problem expressed. I hereby develop objectives for my proposed system with the following number of possible alternative designs. Combinations of manual and computerized elements on site.

The scope of activities to be supported by this system include computation of calculations involve concrete mixing, painting of an area, quantity of water supply, or material needed to carry out specific works. Just as an Architect works with building materials and user's needs for space: I examines decisions and information flows of the organisation for the design of this system.

In practise of management, the five phased decision sequence are followed:

- a) Defining the problem
- b) Analysing the problem
- c) Developing Alternative Solutions
- d) Deciding on best solution
- e) Conveying decisions into effective actions.

### **3.4 GOOD CONTROL**

#### **TAYLOR IN SUPPORT OF NARROW SPAN OF MANAGEMENT STATES**

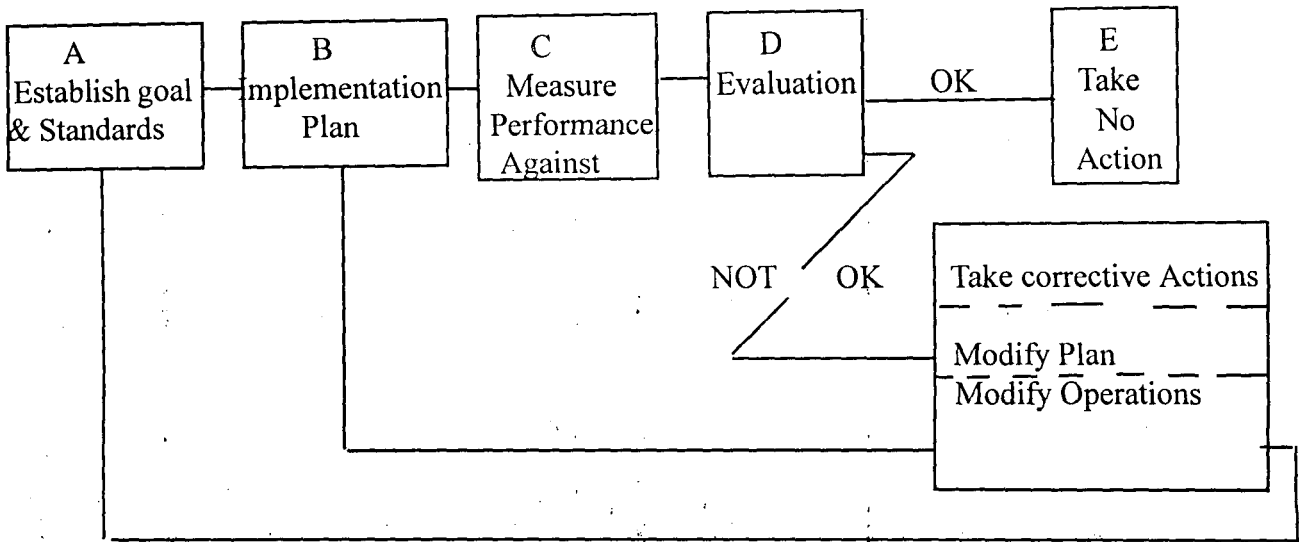
##### **THAT:**

“Whatever his rank, a man has only to command a very small number of direct subordinate, usually less than 6, except that a foreman, who is dealing with quite a simple operation, is in direct command of 20 or 30 men”.

**L URWICK STATED THAT:** No superior can supervise directly the work of more than five or at the most, 6 subordinates whose work interlocks.

## THE CONTROL CIRCLE

This include: (1) Planning (2) Execution and (3) Control Circle.



## THE CONTROL CIRCLE DIAGRAM.

Cont starts from the execution phase. This aims at measuring performance and evaluating it to determine if action is required.

## QUALITIES OF A GOOD TEST

An acceptable quality control in construction management should pass successfully, through a good test. Here are some of the qualities of a Good Test.

1. **VALIDITY:** If it measures accurately what it was designed to measure. Thus, a valid test is one that measures what is capable of being used to predict success.
2. **RELIABILITY:** If it is consistent in its measuring ability and results. A test taken now may be repeated a few weeks after, without varied scores.

However, tests are only an aid to selection and should not be main criteria for selection. This application package processes data in the material date of supply file and generates an output statement that shows how reliable a material has been since the time of its supply or use. This test should be carried out before one goes ahead to generate the material poor Quality History and usage record. The test is also determine performance level.

## A TYPICAL RELIABILITY TEST, IS AS FOLLOWS:

“Material Performance is Excellence”

“Material Performance is Good”

“Material Performance is Fairly Good”

“Material Performance is Poor”.

### 3.7 COST AND BENEFITS:

The cost and the benefits of computerization cannot be over emphasised but will be appreciated after going through the following analysis.

#### 3.6.1 OPERATIONAL COST:

The Operational Costs include the cost of Hardware, Personnel Package, System Software, installation and Implementation Costs, which fall within the range of two hundred thousand naira, depending on the bagaining power.

#### 3.6.2 DEVELOPMENTAL COST:

The development costs include the cost of purchasing and services, these include:

Stabilizer, UPS, Air Conditioners, Operators, System Analyst for about three (3) weeks at N5000 per week, stationery, Diskets, Accommodation, Maintenance and the Miscellanious.

#### 3.6.3 BENEFITS:

The impact of computers will be felt on the individual and the organization at large.

- INDIVIDUAL:**
- 1) Reduction in the clerical personnel
  - 2) Greater effectiveness
  - 3) Mutual dependence between the computer department and user department.
  - 4) Better evaluation of self, to appraise one contribution in terms of the standard set.

- ORGANIZATION:**
- 1) Allow manager's to centralize their information.
  - 2) Force planning with corrective actions, including management to review her plan.
  - 3) Simple for an average worker to understand and carry out, without much expalnation.
  - 4) Reduce duplication of information.
  - 5) Automatic, facilitating quick access to information.
  - 6) Trends and status (Graphical Method of presentation is made possible.
  - 7) Easy adjustment to meet changing circumstances in organizational operation, due to its flexibility.

- 8) Management by Exception, that will help to detect variation with ease and promptness. Hence, only situations requiring corrective action are brought to the attention of management.
- 9) Higher Quality Product with lesser waste.
- 10) Better judgment and services (shorter waiting time to collect information)

## ANALYSING PROBLEM

Even though a computer can do many tasks, there are some it cannot help solve must be broken down into human tasks and computer tasks.

### CASE SELECTION:

#### PROBLEM ONE:

The problem is to paint the walls of a room. A first analysis gives the following list of tasks.

- 1.1 Decide what colour to paint the walls.
- 1.2 Find out how much paint is needed.
- 1.3 Buy the required amount of paints.
- 1.4 Paint the room.

There are many things to consider under task 1.1. Different people would consider different things in making their decisions. However, most people would not use a computer to help choose paint colours (although a computer can be programmed to give the programmer's opinions on what colours to use in different rooms of a house).

Tasks 1.2 and 1.3 seem to be the ones with which the computer might be the most help.

Unfortunately, the computer cannot paint the room (task 1.4)

Now these tasks in 1.2 and 1.3 should be analyzed in more detail. (Human tasks should also be analyzed in more detail if instructions on to do them are needed. However, right now we are interested the computer tasks)

### SECOND ANALYSIS

- Task 1.2: Find out how much paint is needed.
- 2.1 Find the total area of the walls in each room.
  - 2.2 Find out how much wall are each gallon of paint will cover.
  - 2.3 Use the results of tasks 2.1 and 2.2 to find out how many gallons of paint are needed for each room.

- Task 1.3: Buy the required amount of paint
- 2.4 Find out how much the paint will cost.
  - 2.5 Get the money and make the purchase.
  - 2.6 Transport the paint or have it delivered.

Tasks 2.5 and 2.6 do not appear suitable for a computer, so the remaining four tasks should now be analyzed further.

However, we can begin to determine which tasks the computer can do.

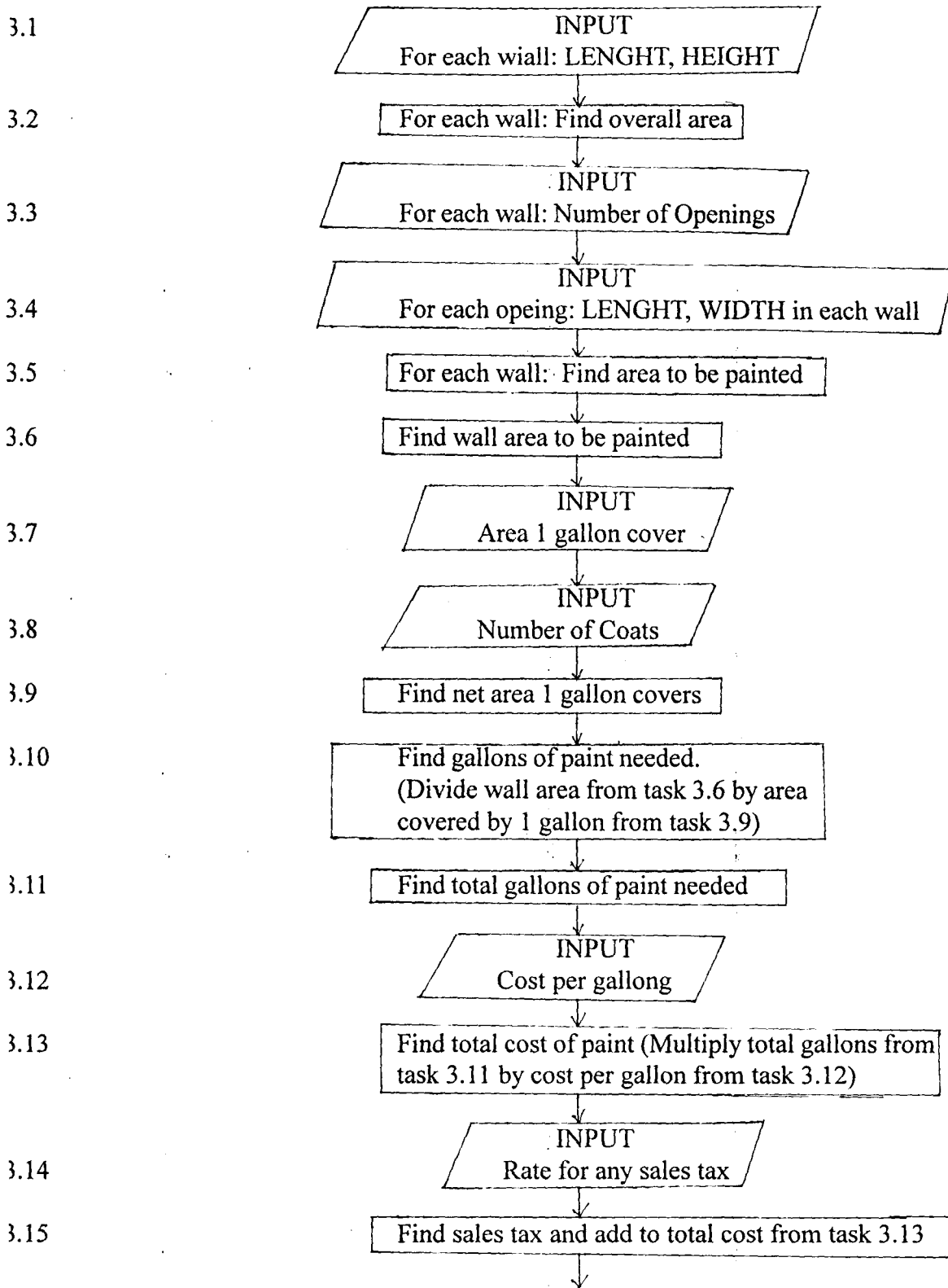
		COMPUTERS ROLE
Task 2.1	Find the total area of the wall in each room.	
	3.1 Measure the length and height of each wall. (Assume the room and walls are rectangular)	ACCEPT INPUT
	3.2 For each wall, find the overall area.	DO COMPUTRATION
	3.3 count the number of openings in each wall	ACCEPT INPUT
	3.4 measure length and hieght of each opening (Assume each opening is rectangular).	ACCEPT INPUT
	3.5 For each wall, calculate the area to be painted, allowing for any openings	DO COMPUTRATION
	3.6 Find the wall area to be painted	DO COMPUTRATION
Task 2.2	Find out how much wall are each gallon of paint will cover.	
	3.7 Find out from the manufacturer and/or retailer how much area each gallon will cover and how coats are needed.	ACCEPT INPUT
	3.8 Decide how many coats of paint you will use in each room.	ACCEPT INPUT
	3.9 Use results of tasks 3.7 and 3.8 to find wall area each gallon of paint will cover.	DO COMPUTRATION
Task 2.3	Use the results of taks 2.1 and 2.2 to find out how many gallong of paint are needed for each room.	
	3.10 Divide wall area to be painted (from task 3.6) by total wall area each gallon will cover (from taks 3.9) to find out how many gallons are needed.	DO COMPUTRATION
Task 2.4	Find out how much the paint will cost.	
	3.11 Find total number of gallons needed.	DO COMPUTRATION
	3.12 Find how much a gollon of paint costs.	ACCEPT INPUT
	3.13 Multiply result of task 3.11 by result of taks 3.12 to find total cost of paint	DO COMPUTRATION
	3.14 Find the rate for any sales tas	ACCEPT INPUT
	3.15 Find the sales tax and add it to the cost found in task 3.13	DO COMPUTRATION



We now have separated the original problem into two sets of tasks - the human tasks and the computer tasks. The computer tasks must be analyzed even further before a program can be written.

EXAMPLE 4

The computer tasks are analyzed further by the following flowchart of tasks 3.1 through 3.15.



The steps may not be very detailed. There are no steps for output and computations. However, the original problem, which was to paint the walls of a room, has been broken down into human tasks and computer tasks, and the computer tasks are well on their way to becoming a program.

### THE FINAL ANALYSIS

Now, it would be possible to write a program using the analysis in the above section. The program would probably need a lot of debugging. additional flowcharts are used to show how the analysis of the problem might continue.

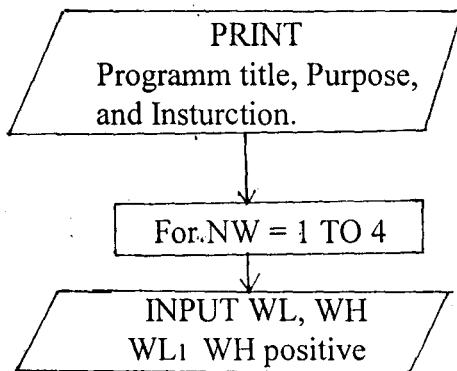
To avoid confusion later, variables are chosen for the program. a list of variables and their meanings as chosen are kept. also, variables that remind the user their meanings are used. One and two character variables are used in this analysis because they are allowed in all versions of BASIC.

### COMPUTER PROGRAMMING:

(The right-hand column in the following programs tells the meaning of each variable and lists other reminders)

#### ANALYSIS 1

This includes an analysis of task 3.1 in the above.



Rectangular room, walls, openings; use same units of measurement throughout. e.g MM or M.

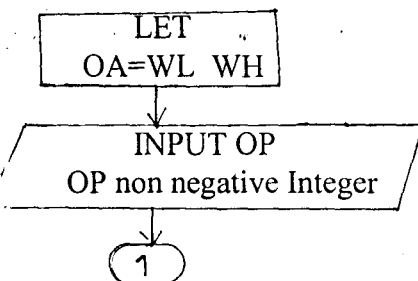
For wall number NW tell user to enter wall length and wall Height

Notice that "for eahc" in the original flowchart on fore page is repalced with a loop.

The next step in the flowchart syas "For each wall find overall area" FIND is not a keyword in BASIC, so this step needs more analysis.

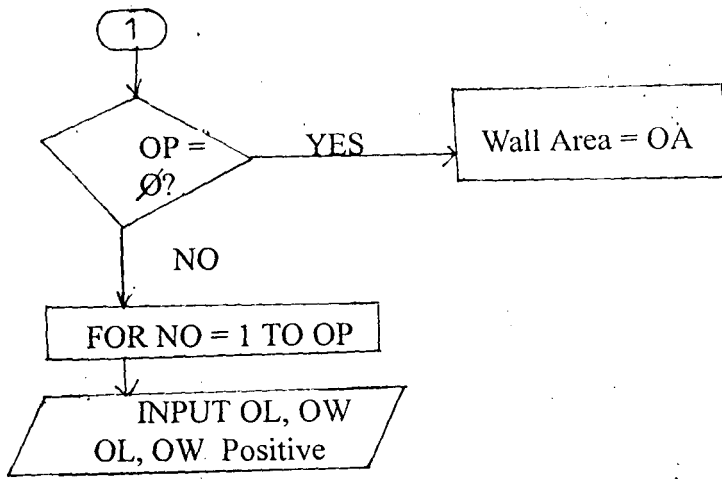
"For each wall" indicates that we are still in the FOR NW loop. the overall area of a rectangular wall can be foundm by multiplying the length by the height.

#### ANALYSIS II



Find overall wall Area.

Tell user to enter number of openings.



(will branch to a line not yet flowcharted)

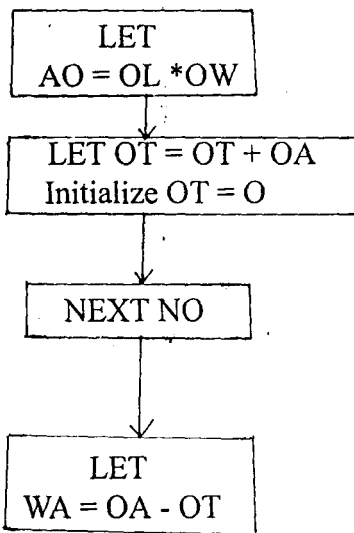
For opening number NO, tell user to enter Opening Length and Opening Width.

The number of times the FOR NO loop should be executed depends on the value of OP, which will be supplied as input.

To find the area to be painted, subtract the total area of the openings in the wall from the overall area of the wall. Since the total area of all openings in the wall is needed, keep a "running total". That is, start with zero and add the area of each opening as it is found. Then close the FOR NO loop.

### ANALYSIS III

This is an analysis of taks 3.5



Find Area of this Opening.

Find running total for Opening area initialize OT for each wall.

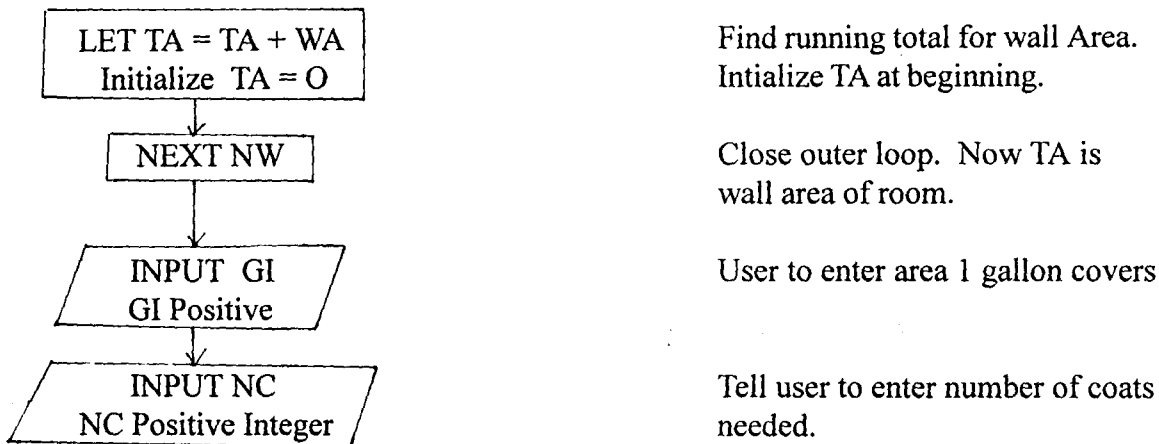
Close inner loop. Now OT is OT is total wall.

Find wall area to be painted.

The next step in the flowchart says "Find wall area to be painted" To find the total wall area in a room, add the areas of all the walls. Agains, start with zero and add each wall area as it is found. Then close the FOR NW loop.

#### ANALYSIS IV

This is an analysis of tasks 3.6, 3.7, and 3.8



The next step says to “find net area a gallon covers”. but does not tell how to do it. The net area 1 gallon covers is found by dividing  $G1$  by  $NC$ . (For example, if 1 gallon will cover 100 square units with one coat, it will only cover  $100/2$  or 50 square units with two coats).

#### ANALYSIS V

This is an analysis of tasks 3.9 and 3.10



If the paint can only be purchased in gallons, and if  $GP$  is not an integer, then  $GP$  needs to be rounded up to the next gallon before going on.

For example, if it takes 3.7 gallons of paint a room, you must buy 4 gallons.

To round any number  $N$  up to the next integer, use the following statement.

$$\text{Let } N = \text{INT}(N) + 1$$

Finally, the ‘find’ steps need more detail, as analysed in this room-painting problem.

## CHAPTER FOUR

### 4.1 MENU STRUCTURE:

Seven menus are used in the course of writing this system for accessibility into each module. Each menu is sub-divided as described below.

4.1.1 **MAIN MENU:** This will provide the user access to the quality control and material analysis Data Files. It is the entrance to any other menu known in this program.

#### MAIN MENU

CODE	TASK
1.	ADDING RECORD
2.	MODIFYING RECORD
3.	EDITING RECORD
4.	UPDATING FILES
5.	ARK REPORTY
6.	HELP
0.	QUIT

Entering the numbers in the MAIN MENU allows the user to carry out the caeresponding operation as shown below:

- 1. = Add new records to the supplier Data File
- 2. = Modifies records in the file
- 3. = Edits record of materials in the main Data file
- 4. = Updates the contents of the file
- 5. = Leads to the sub-menu
- 6. = Lists the functions of the routine in this menu
- 0 = Quits

4.1.2 **SUB-MENU:** This provides access to all the remaining menus used in this program. See below.

#### SUB-MENU

TASK CODE	TASK
1.	PERFORMANCE - MENU
2.	REPORTS - MENU
3.	PROJECT - MENU
4.	ARTISANS - MENU
5.	INVENTORY - MENU
6.	HELP - MENU
0.	QUIT

Entering any of the task code numbers in the sub-menu gives the user access to the corresponding menu as shown below:

- 1. = Leads to PERFORMANCE - MENU
- 2. = Leads to REPORTS - MENU
- 3. = Leads to PROJECTS - MENU
- 4. = Leads to ARTISAN - MENU
- 5. = Leads to INVENTORY - MENU
- 6. = Leads to HELOP - MENU
- 0. = QUILTS THE SUB - MENU

4.1.3 = **PERFORMANCE - MENU:** Through this menu the user can perform all operations relating to entering, editing, and deleting records in the quality performance file, as shown below:

PERFORMANCE - MENU	
TASK CODE	TASK
1.	ENTER NEW RECORD
2.	UPDATE RECORDS
3.	SHOW Q/P
4.	EDIT RECORDS
0.	QUIT

Inputting the numbers in the PERFORMANCE - MENU allows the user to carry out the corresponding operations. This is shown below:

- 1. = Enters new record into the quality performance file
- 2. = Updates records in the file
- 3. = Displays the performance record in the file
- 4. = Edit records in the file
- 0. = Quits Performance - Menu

4.1.4 **REPORTS - MENU:** This menu is used to generate different kind of reports that is used in monitoring the use of materials on site.

REPORT MENU	
TASK CODE	TASK
1.	RESPONSE TIME
2.	DOWN TIME
3.	RELIABILITY TEST
0.	QUIT

Inputing and of these numbers causes the corresponding operation.

- 1. = Draws response time chart
- 2. = Draws down time chart
- 3. = Carries out reliability test on a particular specimen (cube, rod)
- 4. = Draws general defects on the sturcture
- 0. = Quits REP - MENU.

4.1.5 **PROJECTS - MENU:** This menu is to generating Annual Project Execution for IBTC construction.

PROJECTS - MENU	
TASK CODE	TASK
1.	ENTER DATE
2.	MODIFY DATA
3.	DELETE DATE
4.	TARGET
0.	QUIT

Inputing any of these task code under PROJECTS - MENU cause the corresponding operation.

- 1. = Entering the date the project begin into the project no file
- 2. = Modifying the date in the file
- 3. = Deleting the date from the file
- 4. = Generating the target for all project
- 0. = Quit project - menu.

4.1.7 **INVENTORY - MENU:** This helps in the inventory management control of material usage to place order before the last stock is used. Is shown below:

INV - MENU	
TASK CODE	TASK
1.	ADD MATERIALS
2.	EDIT MATERIALS
3.	DELETE MATERIALS
4.	VIEW
5.	UNDER STOCKED
6.	FORCE CASTING
7.	OUTPUT REPORT
0.	QUIT

Entering any of the task code in the inventory menu casues the corresponding operation, as shown.

- 1. = Adds record of materials to the In V. Data fil
- 2. = Edits record of mat. in the In V. Data
- 3. = Deletes records of mat. from the In V Data file
- 4. = View records in the file
- 5. = Generates the list of under-stocked mat
- 6. = Makes forecast on the quantity of each material that will be needed in a month
- 7. = Prints the content of the file
- 0. = quits the inventory menu.

4.1.7 ARTISANS - MENU: This will generate the categories workers on site, that will be used to monitoring the movement of workers to and from.

ARYISANS - MENU	
TASK CODE	TASK
1.	ENTEROLD
2.	ENTER NEW
3.	ADD STATUS
4.	ENTER DISTRICTS
5.	SHOW WAGES
0.	QUIT

Entering any of the task code no, in the Artisans - menu gives the user access to the correspond- ing menu as shown above.

- 1. = Leads to Old workers
- 2. = Leaders to New workers
- 3. = Adds their trade and professional status
- 4. = Leads to the name of the District church location`
- 5. = Shows the individual wages
- 0. = Quits.

4.1.8 HELP - MENU: This provides the user with a exact function of each of the options in the menus with the exception of the amin menu.



HELP - MENU	
TASK CODE	TASK
1.	HELP: PERF - MENU
2.	HELP:REP - MENU
3.	HELP: PROJ - MENU
4.	HELP: ART - MENU
5.	HELP: IWU - MENU
6.	ABOUT: CAQCMA
0.	QUIT

FIG. 4.8

Entering any of the numbers leads to the corresponding Help as shown above.

- 1. = Provides the user with the functions of all options in PERF - MENU
- 2. = Options in REPORTS - MENU
- 3. = Options in PROJECT - MENU
- 4. = Options in ARTISANS - MENU
- 5. = Options in INVENTORY MENU
- 6. = Provides the user with a summary of the aim of this package
- 0. = Quits HELP - MENU.

### 4.3 IMPLEMENTATION

Implementation involves applying the programs to solve the problem it is meant to solve. This involves process of coding, testing with live and artificial data and documenting program; training of the users and operation personnels.

A computer system of the following configuration should be made available before this application program can be implemented:

#### 100mHz PENTIUM

- 2.1 GIGABYTE HARD DISK
- 1.6 MEGABYTE RAM
- 15" NAVY BLUE COLOUR MONITOR

#### LASER JET 6C (medium size printer)

The executable file version of this software is to be copied onto the Hards Disck, after creating a directory with the name CAQCMA (computer approach to Quality Control and material Analysis). the software copied and the file generated are under the same directory.

### 4.4 TEST RUNNING THE SYSTEM

There is need to test-run the software with either artificial or live data. However, live data in the environment in which it is going to function is used in my course of writing the program. The software can be tested in modules or as a single package as done.

#### 4.5 TRAINING

The user may be someone who has been doing this same work, but manually. This will be made easy by the various Help Files that describes the functions of the difference routines in each manu. It is always better to train more than a person by me or any programmer/analyst.

#### 4.6 CHANGE OVER PROCEDURE

The change over from the old to the new can be done by adopting pilot running where the data from one or more previous periods for the whole or part of the system is run on the new system after results have been obtained from the old system, and the new results are compared with the old. This is not as disruptive as paralld operation. The results of these modules are observed. These are the modules:

- |                             |                         |
|-----------------------------|-------------------------|
| 1. Response Time            | 2. Down Time            |
| 3. Reliability Test         | 4. Low quality material |
| 5. Completion Date (target) | 6. Genetal Defect       |
| 7. Under - Stocked mat      | 8. awaiting Materials   |
| 9. Forecasting              | 10. Output Reports.     |

## CHAPTER FIVE

### 5.1 OBSERVATION:

It is possible to analyse the output displayed on the monitor, and make it error-free before the final results are printed out in a hardcopy. This same project can be adopted in any other field that give Quality Outputs and premium. The program also can with minor adjustments be made to accommodate other aspects of construction not mentioned in this project.

### 5.2 RECOMMENDATION

In view of all I have been able to write and analysed so far, I hereby recommend that IBTC construction, my case study, should install this application system in the computer system for the arrangement of information flows. conducive atmosphere should be created to work with this new system and more stable office workers are also to be encouraged to master the system effectively.

### 5.3 CONCLUSION

Computer science is concerned with the technique of information processing than with the technical details of the machines that carry out that process. With this system in place there will be improved and greater efficiency, Higher Quality Products, Better judgement on site as Quality Tests are being carried out and better management planning function and control. This will also reduce material wastage. Truly, computer system is the answer to most problems of man..

Hence, the workability (the degree of control) of concrete mix depends mainly on the volume of the cement used, if other conditions remain constant. It is noted that the strength of concrete with decreased proportionally, to the volume cement

## REFERENCE/BIBLOGRAPHY

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5. **NANTOH, N.M.** (1988) Introduction to Cement Composites” Vol. 1,3 Edition. Nayokan Publishing Inc. Yaounde, PP125
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# BAG REQUIRED

08/30/00

Ratio	Cement(m2)	Sand(m2)	Coarse(m2)	Cementbag	sand bag	Coarse bag	Cementbgwaste	Sandbgwaste	Coarsebgwas
1:1:2	14.405	14.405	28.810	414.8640	414.8640	829.7280	601.55280	601.55280	1203.10560
1:1.5:3	10.476	15.715	31.429	301.7193	452.5789	905.1578	437.49295	656.23942	1312.47884
1:2:4	8.231	16.463	32.926	237.0651	474.1303	948.2606	343.74446	687.48891	1374.97783
1:2.5:5	6.779	16.947	33.894	195.2301	488.0753	976.1506	283.08367	707.70918	1415.41835
1:3:6	5.762	17.286	34.572	165.9456	497.8368	995.6736	240.62112	721.86336	1443.72672
1:4:8	4.432	17.729	35.458	127.6505	510.6018	1021.2037	185.09317	740.37268	1480.74535

# AMOUNT FOR ONE CUBE CONCRETE<150MM THICK>

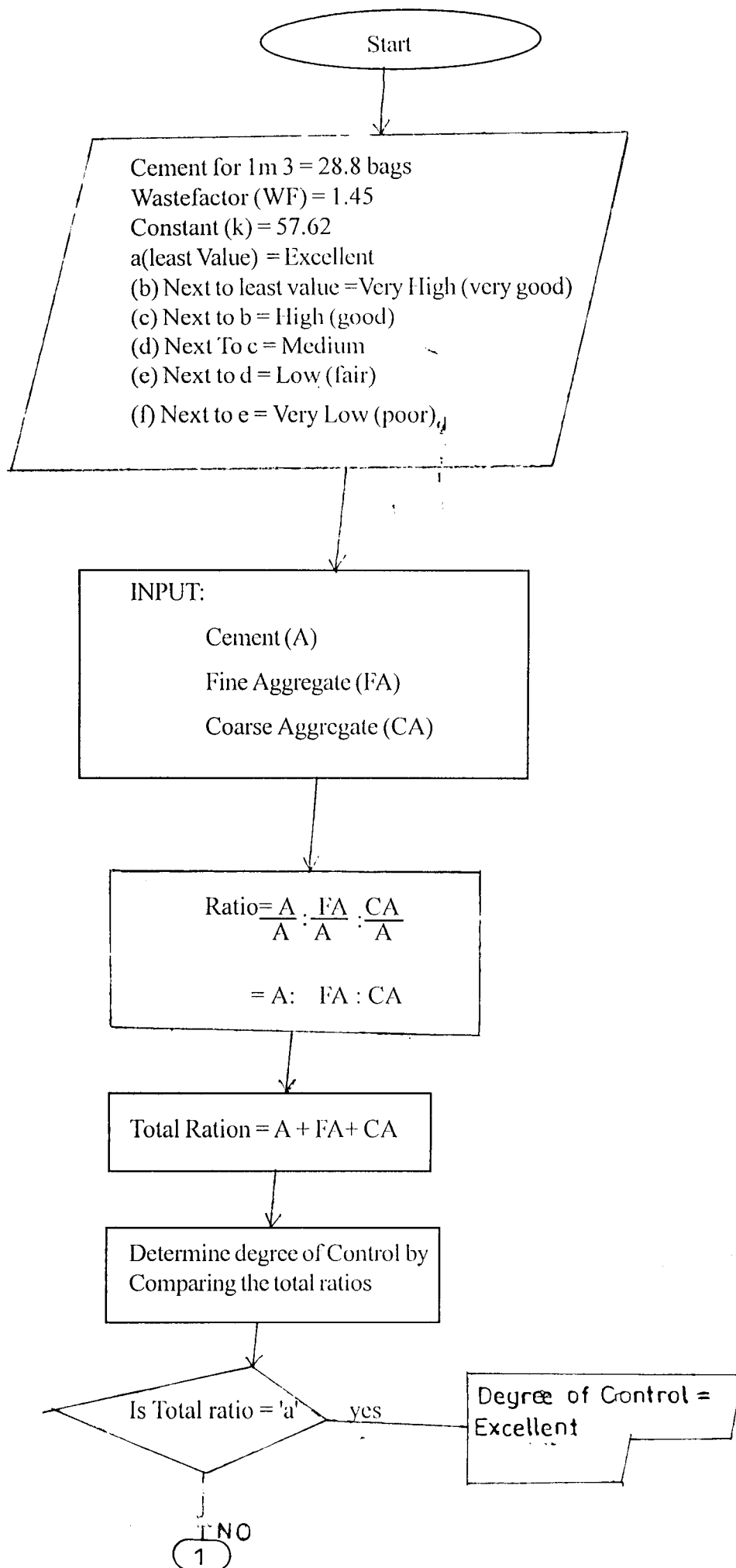
08/30/00

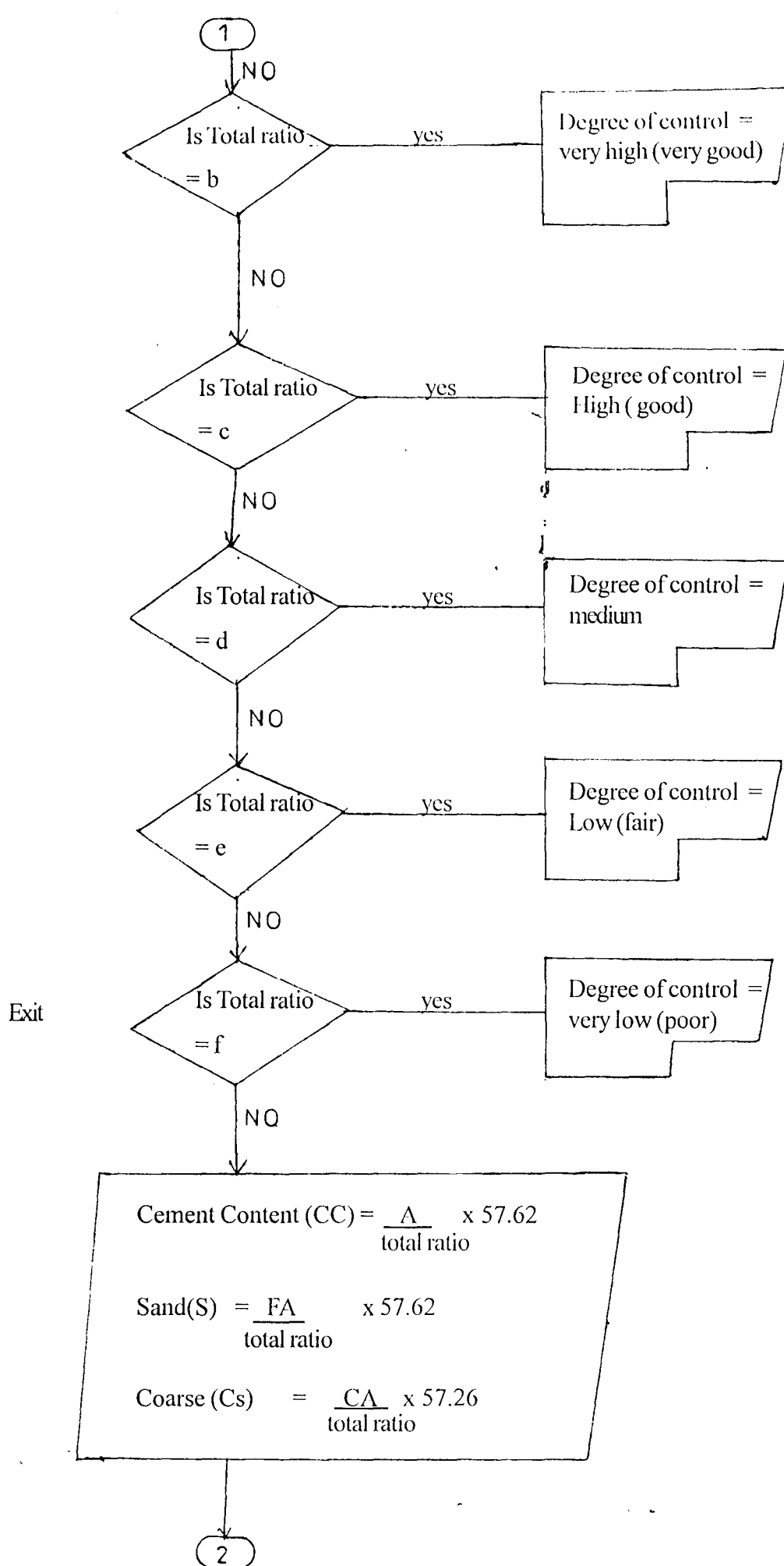
Cement<Kg>	Fine Aggregate	Coarse Aggregate	Mix by Weight <Ratio>	Degree of control	Suitable use of concrete
2.500	2.500	5.000	1:1:2	EXCELLCENT	for hand placing and compaction in congested reinforcement
2.000	3.000	6.000	1:1.5:3	VERY HIGH<VERY GOOD>	Ditto
1.500	3.000	6.000	1:2:4	HIGH<GOOD>	for hand placing and compaction without congested reinforcement or in heavily reinforced sections with vibration
1.200	3.000	6.000	1:2.5:5	MEDIUM<MODERATE>	for simple reinforced sections with normal vibration, or mass concrete without vibration
1.000	3.000	6.000	1:3:6	LOW<FAIR>	for simple reinforced sections with intensive vibration or mass concrete with normal vibration.
0.750	3.000	6.000	1:4:8	VERY LOW<POOR>	for foundation or footing blinding

Remark

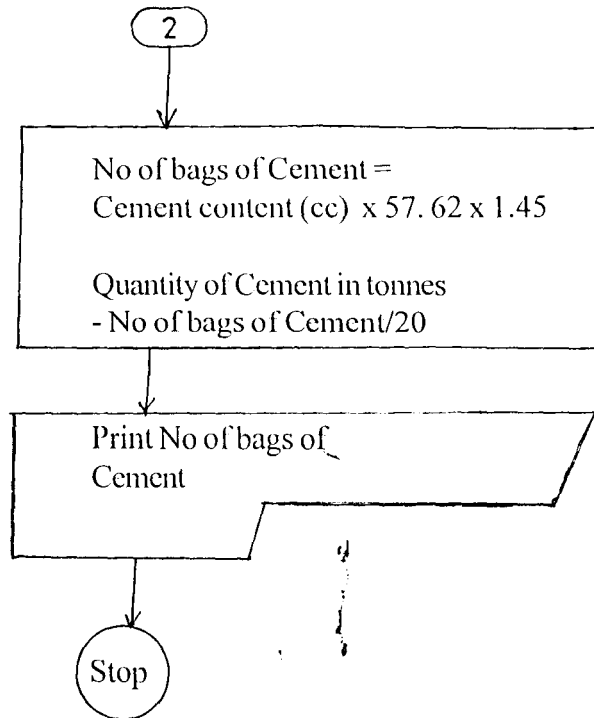
601.55280

1203.1056









## FLOW CHARTS DIAGRAM

\*\*\*!!! The value of all ratios should be to one decimal place  
\*! calculate the ratio of the cement, fine aggregate, coarse aggregate

SET DECIMALS TO 1

SET FIXED ON

CLEAR

xfine=This.Parent.Parent.colfine.txtfine.value

xcement=This.Parent.Parent.colcement.txtcement.value

xcoarse=This.Parent.Parent.colcoarse.txtcoarse.value

\_xcement=round(xcement/xcement, 2)

\_fine=round(xfine/xcement, 2)

\_coarse=round(xcoarse/xcement, 2)

This.value=alltrim(str(\_xcement)) + ':' + alltrim(str(\_fine)) + ':' +  
alltrim(str(\_coarse))

SET FIXED OFF

SET DECIMALS TO 2

\*!!The program brings out the ratios in the character expression and makes them  
\*!!numeric, adds all the three ratios brought out  
\*!!calculates the area, and the number of bags required, also calculates the no of  
\*!!bags required when waste factor is considered.

STORE LEN(ALLTRIM(t\_ratio)) TO t\_length

DO CASE

    CASE t\_length=9

        t\_length1=LEFT(ALLTRIM(t\_ratio),8)

        t\_length11=LEFT(ALLTRIM(t\_ratio),7)

        t\_length111=LEFT(ALLTRIM(t\_ratio),5)

        t\_length1v=LEFT(ALLTRIM(t\_ratio),4)

        t\_lengthv=LEFT(ALLTRIM(t\_ratio),3)

        xthrid=RIGHT(ALLTRIM(t\_lengthv),1)

        xdot=RIGHT(ALLTRIM(t\_length1v),1)

        xfifth=RIGHT(ALLTRIM(t\_length111),1)

        xninth=RIGHT(ALLTRIM(t\_ratio),1)

        xdot2=RIGHT(ALLTRIM(t\_length1),1)

        xseven=RIGHT(ALLTRIM(t\_length11),1)

        \*.individual ratios

        ratio1=LEFT(ALLTRIM(t\_ratio),1)

        ratio2=ALLTRIM(xthrid)+ALLTRIM(xdot)+ALLTRIM(xfifth)

        ratio3=ALLTRIM(xseven)+ALLTRIM(xdot2)+ALLTRIM(xninth)

        \*                addition of ratio

        total1=VAL(ratio1)+VAL(ratio2)+VAL(ratio3)

    THIS.VALUE=VAL(ratio1)/total1\*57.62

THIS.PARENT.PARENT.colсанд.txtсанд.VALUE=VAL(ratio2)/total1\*57.62  
 THIS.PARENT.PARENT.colcoarse.txtcoarse.VALUE=VAL(ratio3)/total1\*57.62  
 THIS.PARENT.PARENT.colbgcement.txtbgcement.VALUE=THIS.VALUE\*THIS  
 FORM.txtcementbg.VALUE  
 THIS.PARENT.PARENT.colbgsand.txtbgsand.VALUE=THIS.PARENT.PARENT.  
 colsанд.txtсанд.VALUE\*THISFORM.txtсандbg.VALUE  
 THIS.PARENT.PARENT.colbgcoarse.txtbgcoarse.VALUE=THIS.PARENT.PARE  
 NT.colcoarse.txtcoarse.VALUE\*THISFORM.txtcoarsebg.VALUE

THIS.PARENT.PARENT.colcoarse\_bagwas.txtcoarse\_bagwas.VALUE=THIS.PAR  
 ENT.PARENT.colbgcoarse.txtbgcoarse.VALUE\*ThisForm.txtwaste.value

THIS.PARENT.PARENT.colcement\_bagwat.txtcement\_bagwat.VALUE=THIS.PA  
 RENT.PARENT.colbgcement.txtbgcement.VALUE\*ThisForm.txtwaste.value

THIS.PARENT.PARENT.colsанд\_bagwas.txtсанд\_bagwas.VALUE=THIS.PAREN  
 T.PARENT.colbgsand.txtbgsand.VALUE\*ThisForm.txtwaste.value

CASE t\_length=7 AND SUBSTR(ALLTRIM(t\_ratio), 6)=':'

xseven2=RIGHT(ALLTRIM(t\_ratio),1)

t\_length1=LEFT(ALLTRIM(t\_ratio),3)

t\_length11=LEFT(ALLTRIM(t\_ratio),4)

t\_length111=LEFT(ALLTRIM(t\_ratio),5)

xthrid2=RIGHT(ALLTRIM(t\_length1),1)

xdot3=RIGHT(ALLTRIM(t\_length11),1)

xfifth2=RIGHT(ALLTRIM(t\_length111),1)

\*individual ratios

ratio1=LEFT(ALLTRIM(t\_ratio),1)

ratio2=ALLTRIM(xthrid2)+ALLTRIM(xdot3)+ALLTRIM(xfifth2)

ratio3=ALLTRIM(xseven2)

\* addition of ratio

total1=VAL(ratio1)+VAL(ratio2)+VAL(ratio3)

THIS.VALUE=VAL(ratio1)/total1\*57.62

THIS.PARENT.PARENT.colsанд.txtсанд.VALUE=VAL(ratio2)/total1\*57.62  
 THIS.PARENT.PARENT.colcoarse.txtcoarse.VALUE=VAL(ratio3)/total1\*57.62  
 THIS.PARENT.PARENT.colbgcement.txtbgcement.VALUE=THIS.VALUE\*THIS  
 FORM.txtcementbg.VALUE

THIS.PARENT.PARENT.colbgsand.txtbgsand.VALUE=THIS.PARENT.PARENT.  
 colsанд.txtсанд.VALUE\*THISFORM.txtсандbg.VALUE

**THIS.PARENT.PARENT.colbgcoarse.txtbgcoarse.VALUE=THIS.PARENT.PARENT.colcoarse.txtcoarse.VALUE\*THISFORM.txtcoarsebg.VALUE**

**THIS.PARENT.PARENT.colcoarse\_bagwas.txtcoarse\_bagwas.VALUE=THIS.PARENT.PARENT.colbgcoarse.txtbgcoarse.VALUE\*ThisForm.txtwaste.value**

**THIS.PARENT.PARENT.colcement\_bagwat.txtcement\_bagwat.VALUE=THIS.PARENT.PARENT.colbgcement.txtbgcement.VALUE\*ThisForm.txtwaste.value**

**THIS.PARENT.PARENT.colsand\_bagwas.txtsand\_bagwas.VALUE=THIS.PARENT.PARENT.colbgsand.txtbgsand.VALUE\*ThisForm.txtwaste.value**

**CASE t\_length=7 AND SUBSTR(ALLTRIM(t\_ratio), 4)=':'**

**t\_length1=LEFT(ALLTRIM(t\_ratio),6)**

**t\_length11=LEFT(ALLTRIM(t\_ratio),5)**

**t\_length111=LEFT(ALLTRIM(t\_ratio),3)**

**xseven3=RIGHT(ALLTRIM(t\_ratio),1)**

**xdot4=RIGHT(ALLTRIM(t\_length1),1)**

**xfifth3=RIGHT(ALLTRIM(t\_length11),1)**

**\*individual ratios**

**ratio1=LEFT(t\_ratio,1)**

**ratio2=RIGHT(ALLTRIM(t\_length111),1)**

**ratio3=ALLTRIM(xfifth3)+ALLTRIM(xdot4)+ALLTRIM(xseven3)**

**\* addition of ratio**

**total1=VAL(ratio1)+VAL(ratio2)+VAL(ratio3)**

**THIS.VALUE=VAL(ratio1)/total1\*57.62**

**THIS.PARENT.PARENT.colsand.txtsand.VALUE=VAL(ratio2)/total1\*57.62**

**THIS.PARENT.PARENT.colcoarse.txtcoarse.VALUE=VAL(ratio3)/total1\*57.62**

**THIS.PARENT.PARENT.colbgcement.txtbgcement.VALUE=THIS.VALUE\*THISFORM.txtcementbg.VALUE**

**THIS.PARENT.PARENT.colbgsand.txtbgsand.VALUE=THIS.PARENT.PARENT.colsand.txtsand.VALUE\*THISFORM.txtsandbg.VALUE**

**THIS.PARENT.PARENT.colbgcoarse.txtbgcoarse.VALUE=THIS.PARENT.PARENT.colcoarse.txtcoarse.VALUE\*THISFORM.txtcoarsebg.VALUE**

**THIS.PARENT.PARENT.colcoarse\_bagwas.txtcoarse\_bagwas.VALUE=THIS.PARENT.PARENT.colbgcoarse.txtbgcoarse.VALUE\*ThisForm.txtwaste.value**

**THIS.PARENT.PARENT.colcement\_bagwat.txtcement\_bagwat.VALUE=THIS.PARENT.PARENT.colbgcement.txtbgcement.VALUE\*ThisForm.txtwaste.value**

**THIS.PARENT.PARENT.colsand\_bagwas.txtsand\_bagwas.VALUE=THIS.PARENT.PARENT.colbgsand.txtbgsand.VALUE\*ThisForm.txtwaste.value**

**CASE t\_length=5**

**xthrid3=LEFT(ALLTRIM(t\_ratio),3)**

**xfifth4=RIGHT(ALLTRIM(t\_ratio),1)**

**\*individual ratios**

**ratio1=LEFT(ALLTRIM(t\_ratio),1)**

**ratio2=SUBSTR(ALLTRIM(t\_ratio),3)**

**ratio3=SUBSTR(ALLTRIM(t\_ratio),5)**

**\*                  addition of ratio**

**total1=VAL(ratio1)+VAL(ratio2)+VAL(ratio3)**

**THIS.VALUE=VAL(ratio1)/total1\*57.62**

**THIS.PARENT.PARENT.colsand.txtsand.VALUE=VAL(ratio2)/total1\*57.62**

**THIS.PARENT.PARENT.colcoarse.txtcoarse.VALUE=VAL(ratio3)/total1\*57.62**

**THIS.PARENT.PARENT.colbgcement.txtbgcement.VALUE=THIS.VALUE\*THISFORM.txtcementbg.VALUE**

**THIS.PARENT.PARENT.colbgsand.txtbgsand.VALUE=THIS.PARENT.PARENT.colsand.txtsand.VALUE\*THISFORM.txtsandbg.VALUE**

**THIS.PARENT.PARENT.colbgcoarse.txtbgcoarse.VALUE=THIS.PARENT.PARENT.colcoarse.txtcoarse.VALUE\*THISFORM.txtcoarsebg.VALUE**

**THIS.PARENT.PARENT.colcoarse\_bagwas.txtcoarse\_bagwas.VALUE=THIS.PARENT.PARENT.colbgcoarse.txtbgcoarse.VALUE\*ThisForm.txtwaste.value**

**THIS.PARENT.PARENT.colcement\_bagwat.txtcement\_bagwat.VALUE=THIS.PARENT.PARENT.colbgcement.txtbgcement.VALUE\*ThisForm.txtwaste.value**

**THIS.PARENT.PARENT.colsand\_bagwas.txtsand\_bagwas.VALUE=THIS.PARENT.PARENT.colbgsand.txtbgsand.VALUE\*ThisForm.txtwaste.value**

**ENDCASE**

**\*\*This program generates a query to carry the ratio calculated to the grid box so  
\*\*The number of bags can be calculated.  
\*\* and copys the result of the query to a table which is used in building the grid box**

```
SET SAFE OFF  
DO AGGREGATE.QPR  
IF USED('BAG_REQUIRED')  
SELE BAG_REQUIRED  
ELSE  
SELE 0  
USE BAG_REQUIRED  
ENDIF  
APPEND FROM TBAG  
SET SAFE ON  
ThisForm.Grid2.REFRESH
```

**\*\*Prints the report form of the bag required for the ratios**

```
REPORT FORM bag_required to printer
```

**\*\*Prints the report form of the ratios calculated**

```
REPORT FORM AGGREGATE to printer
```