SAFETY POLICY FOR MEDIUM SIZED CONSTRUCTION FIRMS: FORMULATION AND IMPLEMENTATION

BY

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DECLARATION

I hereby declare that this thesis has been prepared by me and that it is a record of my own research work. That to the best of my knowledge it has neither been undertaken nor presented in any previous application for a higher degree.

All quotations are specifically acknowledged by means of reference.

Signed...............

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CERTIFICATION

We certify that we have read the thesis entitled Safety Policy for Medium Sized Construction Firms: Formulation and Implementation by Ali Alhaji Adam and in our opinion confirms to acceptable standard of scholarly presentation and meets the regulation governing the award of the master of Science in construction management of Ahmadu Bello University Zaria

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Mr. I. Mbamali Co-Supervisor	------------------ Date
-------------------- Dean, Postgraduate School	------------------ Date

DEDICATION

This thesis is dedicated to my late Father,
Alhaji Adam Mustafa and my late Brother
Arc. Baba Gana Adam, (M.Sc)

INSPIRATION

Nothing in the World can take the
place of persistence
Talent will not; nothing is more common
than unsuccessful men with talent
Genius will not; unrewarded genius is
almost a proverb.
Education will not ; the world is full
of educated derelicts.
Persistence and determination alone
are omnipotent.

Calvin Coolidge

ACKNOWLEDGEMENTS

This thesis could not have been carried out without the help of many individuals and organisations. For reason of space, I cannot mention them, but I should like to thank them all none the less, particularly my supervisors Messers Z. J. Sikora and I. Mbamali.

ABSTRACT

Minimizing accidents and saving lives is not only important for the effective operation of construction firms but also to the nation in general.

This research work is generally aimed at investigating the existing practice on formulation and implementation of safety policy by medium sized construction firms so as to identify the problems with the practice and suggest ways of improving it .

In pursuing this aim the work focuses on ways of safety policy formulation and implementation through setting up an organisation for safety, safety education, and training, project planning, site layout planning and drawing up of safety checklist and standard for construction sites.

The methodology used for this work is by reviewing literature on the subject and investigation of practice on the formulation and implementation of safety policy by medium sized construction firms through oral interviews, and questionnaires.

Analysis of the investigation is made so as

to reveal problems with the practice.

The findings made are that the formulation and implementation of safety policy is associated with many problems/ such as lack of effective method of formulation, distribution, publicity, review of safety policy, non existence of proper organisation for safety, non existentce effective training and education programme etc.

The work includes proposals for improvement which is hoped will be of immense benefit to medium sized construction firms in Nigeria.

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CHAPTER ONE - INTRODUCTION

The Nature of Construction Industry.

The construction industry is one of the largest sector of the Nigerian economy. It comprises of small, medium and large contracting organisations, government and semi-government agencies. It includes professional groups such as Quantity Surveyors, Architects, Civil Engineers etc. There are also the manufacturers, suppliers and vendors of construction materials.

The medium sized construction firms have been given various definitions. These definitions are in terms of numbers of employees and includes.

(i) 50-250 employees (Abubakar 1984 P.12)

(ii) 10-25 number of office / administrative staff with corresponding growth in the external labour force (Upson 1987 P.8)

(iii) 8-600 employees (Wahab 1992, P.11)

(iv) 50-300 operatives (seelay 1984 P.5)

Summing up the above definitions the medium sized construction firm is the firm that has 10-600 employees including10-25 administrative/ office (Permanent) staff.

The process of construction is described by Halpin and Woodhead (1980 PP 1-2) as the creative effort that converts the four m's of construction - manpower, material,machine and money into a constructed facility by fabrication and field erection at specified location of specially designed facilities defined by the owner. This involves varieties and sequences of construction operation and activity done through dynamic movement of men and equipment in a construction site.

The industry therefore like any other industry is involved in producing a unique product, but its environment is not like other industries where there is mass production or controlled manufacturing, rather it is field oriented.

Some particular aspects of the working environment of construction industry as identified by Arscott (1980 P. 352) includes:-

(i) A relatively mobile force.

(ii) An employment of casual labour (who has no education).

(iii) A day to day change in the working environment.

(iv) weather conditions.

(v) Communication problem in a widespread site

(vi) The inherent traits in some construction workers to take undue risk.

(vii) The training of a mobile labour force.

(viii) Short duration work and the tendency in such cases to ignore safe practices.

These and other factors makes the construction environment complex and hence effective control is not achieved easily. Because of these factors, the nature of the construction activity brings a lot of risk to the workers particularly those actively involved - on the construction site. -

This is true as Bar - Hillel (1978 P. 18) remarked that the risk of death for a construction worker is four times greater than a factory operative 20 times greater if he is a steel erector and seventy times if he is a demolition worker. The result of any accident even minor one affects not only the firm but also the nation. It may result in: (Armstrong 1980 P.59)

(i) Physical disability (employee)

(ii) Loss of earning to employee

(iii) Loss of confidence and morale (among workers).

(iv) Loss of working ability and reduced output (by employee)

(v) Wasted wages to employer.

(vi) Supervision and administration loss.

(vii) Plant cost.

(viii) Insurance premium.

These are some of the results of an accident.

1.2.0 Need for the study

In Nigeria today accidents occur on construction sites. A preliminary survey conducted on 30 construction sites revealed that accidents occur at a weekly average of 5 times per site. These accidents ranges from mild to severe injuries.

There is therefore the most urgent need to find ways of minimizing accidents in the construction industry.

Accidents are caused, they do not happen (De Reamer 1980 P.52). Its occurrence has been linked to the failure within an organisation. This is affirmed by Ferry (1978 P.180) who states some views on accidents as expressed by authorities on safety. These includes:

(i) Except for acts of God, every accident no matter how minor is a failure in an organisation

(ii) Accident have a significance beyond themselves they are always symptomatic of disorder in a particular dynamic system

If accident occurrence are to be minimized, it is necessary, from the foregoing, to study the existing practice and identify its problem. This can be achieved by studying the formulation and implementation of safety policy of firms. The policy is to be considered because it defines the step by step organizational plan for making working place safe, defines scope for discretion, authority etc as regards safety .

1.3.0 AIM

The aim of this thesis is to study the existing practice on the formulation and implementation of safety policy by construction firms in order to identify problems with the practice and suggest ways of improving it.

1.4.0. OBJECTIVES

In order to achieve the aim the work

(1) Focuses on ways in which safety policy is formulated and implemented.

(2) Evaluates the existing practice on the formulation and implementation of safety policy by medium sized construction firms, in relation to the literature reviewed to identify problems with the practice, and

(3) Suggest ways of improving it.

1.5.0 SCOPE AND LIMITATION

This work is limited to medium sized construction firms. It is not set to create a new model but evaluates the practice so as to identify its problems and suggest solutions. The study will focus on ways of formulation and implementation of safety policy in the construction industry and recommendations made are also limited to the same industry.

1.6.0 METHODOLOGY

To achieve the aims stated the methodology adopted for this thesis is -

(a) The review of literature on the formulation and implementation of safety policy in texts, books, magazines, articles, newspapers, and other related publications.

(b) The current practice is investigated through questionnaire and oral interviews.

(c) The data collected on the practice is analysed by descriptive method and related to the literature reviewed to identify problems with the practice and suggest solutions accordingly.

CHAPTER TWO

LITERATURE REVIEW

2.1.0 INTRODUCTION

This chapter reviews the existing literature on the formulation and implementation of safety policy. This is to provide the necessary foundation that would enhance the accomplishment of the aim and objectives and serve as a theoretical framework for the practical evaluation.

The related literature will be examined under the following headings.

(1) Safety policy formulation

(2) Implementation of the safety policy through -

- (a) Organisation for Safety
- (b) Safe Site Layout Planning
- (c) Planning of Work Safely (through Network Analysis and Method Statement).
- (d) Drawing up of Safety Checklist and Standard for Construction Site
- (e) Training and Education Employees on Safety.

SAFETY POLICY FORMULATION

2.2.1 DEFINITIONS

The concept of safety in a construction organisation generally revolves around accident prevention and protection of employees. The dictionary defines safety as safe from danger and safe is further defined as :

(a) Free from, protected from danger

(b) Not causing or likely to do harm or danger .

(c) Unable or unlikely to do harm or danger

(d) Not causing or likely to do harm or danger and

(e) Giving security.

A policy is further defined as a course of action, guiding principle or procedure considered to be expedient, prudent or advantageous.

Safety policy from the two definitions above can be defined as a course of action laid down by firms which serves as a guiding principle and procedure on safety to be followed when planning and executing work so as to achieve safe working condition as well as ensure the safe conduct of workers.

A safety policy according to Peterson (1978 Pp.33-34) should do three things:-

(i) It should affirm long - range purpose

(ii) It should commit management at all level to reaffirm and reinforce this purpose in daily decision.

(iii) It should indicate the scope left for discretion and decision by lower levels management.

These statements indicates that the safety policy is to guide the management in the day to day decision and identifies the authority and responsibility as regards safety.

The safety policy should indicate the management's acceptance of responsibility for accident prevention within the firm. This affirmed by Arscott (1980 P.152) stating that safety policy is -

(i) Declaration of intent of the management to promote safety.

(ii) A definition of means by which the intent is to be realised.

(iii) A statement of guidelines that should be followed by management and work people in implementing the policy.

2.2.2 FORMULATION OF SAFETY POLICY

The formulation of safety policy unlike other policies of firms, will involve the full participation of all the categories of workers.

This ensures the acceptance of the policy by all the employees of the firm and their adequate contributions.

For the formulation to be effective the basis to be used should be:-

(a) Heinrich's morals on accident prevention

(b) Safety Regulations provisions

(c) Existing practice on safety and accident records.

A. HEINRICH'S MORALS

Heinrich (1934 P.56) postulated two morals on accident prevention. These morals may form the basis of the policy formulation. These are :-

Moral 1:- prevent the accident and there can be no injuries.

Moral 2:- prevent the unsafe practice and unsafe condition and there can neither be accident nor injuries.

B. SAFETY REGULATIONS

The formulation process should further be guided by the provisions of the Nigerian Factory Act 1955. This Act imposes obligation on the employer with regards to the safety of his workers. The Act lays particular emphasis on the duties of the employer as regards -

(a) Fencing of work areas.(section 20 -24).

(b) Hoists, lifts etc to be of good mechanical construction, sound material (s 20 and s.30).

(c) Premises and access there to (section 33) which provides for safe access to and from place of work.

(d) Protective equipment and appliances (section 52) which states the necessity for the provision of these items.

C. EXISTING PRACTICE ON SAFETY AND ACCIDENT RECORDS

The analysis of the firm's present situation is necessary when formulating the safety policy because it identifies the firm's extent of safety practices, pit falls etc. The items to be analysed includes (Arscott 1980 P.250).

1). Policy - whether there is a written policy statement supported by organisation and arrangement for its implementation, made known to all employees

2). Standard / Operating Procedures:- Whether there is the general procedure and standard for safe practices and items covered.

3). Direct Management Involvement:- Whether the management follows up safety matters and holds supervisors accountable for corrective action and reviews records on accident and injuries and generally give priority to safety matters .

4). Safety Education:- Whether there is an educational programme regarding safety, conducted to all work people.

5). Training:- Whether the management trains work people effectively.

6). Whether it promotes safety through publicity and propaganda.

The analysis of the above factors gives the firms present position on safety.

D. ACCIDENT RECORDS

Accident records reports accidents that are considered dangerous (Armstrong 1980 P.51). It analyses the detail of the accident i.e. who was injured when the accident happen, when it occured, etc. The record is prepared after careful investigation. Such investigation according to Anton (1978 Pp.3-4)

1). Determines the surface causes and the underlying causes of accident.

2). Evaluates the supervisors ability to prevent accident.

The accident record further spells out needed corrective action and where appropriate, suggest changes in management system i.e. policy (DeReamer 1980 P.195). This will assist in formulation of a company policy as the recommendation in such record will assist by inclusion of some important measures left out in the policy.

After obtaining the firm's present position on safety, and review the accident records,the management appoints a special working party consisting of representatives of management, foremen and work people. This working party will make a draft safety policy for the firm. They are also responsible for the analysis of the firm's present position (at the start of the formulation process).

The draft policy is submitted to the board through the Chief Executive for approval. This draft is carefully scrutinised and debated on the various issues raised in the draft policy. When every item has been agreed upon, the safety policy is endorsed by the chief executive on behalf of the board and communicated to all categories of employees.

The communication of the policy to all categories of employees is necessary because according to Peterson (1980 P.35), the safety policy must be written and well publicised that the worker on the line or on the construction job will know the management's desire concerning safety.

2.2.3 WHAT SHOULD BE INCLUDED IN SAFETY POLICY.

The items included in a safety policy may vary from firm to firm. This is true as Peterson (1980 P.35) states that the policy of various organisation will include either intentionally or inadvertently some procedures, some philosophy and perhaps even some rules with that expression of management's will. The policy may differ in content and vary considerably in style, but no one policy is wrong or right, rather it is assumed that each is right for the organisation it serves.

Peterson further outlined what most management procedures on safety may include.

1. Management's intent. What does management want?
2. Scope of activities covered. Does the policy pertain only to on-the-job safety? Does it cover off-the-job safety also.
3. Responsibilities, who is responsible for what ?
4. Accountability, when and how is it fixed ?
5. Staff safety assistance ? If there is staff safety, how ? does it fit into the organisation.? what should it do ?
6. Safety committee. Will there be safety committees? what will they do ? why do they exist ?.
7. Authority, who has it and how much ?.
8. Standard, what rules will the company abide by?.
9. To be effective the policy must be signed by the management.

2.3.0 METHODS OFIMPLEMENTATION OF SAFETY POLICY

The safety policy formulated will be a mere sheet of paper without implementation. The policy must be put into action in order to achieve the desired results. For the implementation, the safety policy is to be considered as a spring board for action.

The implementation of the policy can be done by giving consideration to safety through defining responsibilities for safety, in actual execution of work on site, when instructing operatives etc. In order for this to be possible, the actual technology of construction , the behaviour of work people, sequence of operations, types of plants to be used etc, must be carefully analysed and understood.

The main aim of the implementation is to achieve safe working condition and ensure workers act in safe way. For this to be possible implementation can be achieved through -

(i) Setting up safety organisation

(ii) Safe site layout planning

(iii) Project planning (Network analysis and method statement)

(iv) Safety education and training

(v) Developing a safety checklist/ standard for site.

Each of this is discussed in detail.

2.3.1 ORGANISATION FOR SAFETY

The safety policy formulated becomes part of the managements overall organisational plan to achieve a safe work environment and workers act in a safe way. For this to be possible the first step in the implementation process is to set up an organisation for safety and the various responsibilities and provide necessary resources to back it. This is done by determining what safety management team position must be created, defining duties and responsibilities for safety, at each position and their relationship. The lines through which authority, communication and responsibility flows is further identified. This ensures quick decision making on problems relating to safety.

It is important that the responsibility for safety given to various staff is commensurate with their authority. The following are duties and roles of various categories of staff in a medium sized construction firms, as regards safety -

A. THE BOARD:

The board according to Arscott (1980 Pp.174-175) elected by stock holders in some firms or may be one person as in entrepreneur organisation. The board provides leadership and makes major decision in the organisation. The major role of the board as regard safety includes:-

(i) Promulgation of the safety policy of the firm.

(ii) Setting overall standards on safety

(iii) Monitoring safety performance and correction of unsatisfactory ones.

(iv) Allocates necessary funds and resources and ensure that adequate allowance is made when preparing estimates for budget for the provision of staff safety equipment, facility, to meet the firm's safety requirements.

(v) Set up safety committee or working party to draft policy, investigate particular problem etc.

(vi) Reports to the share holders on results achieve on safety.

The responsibility for safety of the organisation is delegated to an individual director at board level. This director should creates, maintain, and supervise the firms safety. Though much of his work is delegated to subordinates, his ultimate duty is to report to the board and to ensure that all the board's decisions are communicated to the staff. The director in charge of safety appoints any other subordinate he needs to coordinate and implement the firm's safety policy or employ a safety officer for the firm.

B. <u>SAFETY OFFICER/ADVISER/COORDINATOR</u>

In medium sized construction firms, a safety officer is employed on a full time or part time basis depending on the firm's need and volume of activity.The responsibilities of the safety officer according to Armstrong (1980 Pp.30-31) includes:

(i) Advise on how injury or hazards to personnel can be kept to a minimum.

(ii) Advise on all legal changes on developments and recommend precautions to be taken.

(iii) Warn about probable hazards on new contracts.

(iv) Distribute literature and information regarding clothing and equipment.

(v) Inspect site with the site team leader and produce relevant submission.

(vi) Obtains, and displays relevant and required statutory documents and see that the contents are observed.

(vii) Create a good post and procedure for each site.

(viii) Promote safety - conscious attitude throughout the firm and compare his firm's statistic with others.

(ix) Record accident and ensure dangerous occurrence are kept minimum.

C. MANAGEMENT

The management includes all level (of staff) above foremen (Ferry 1981 P.181). Their major role includes:-

(i) Recommend to the board the practice of safety and any change in the existing practice.

(ii) Interpretation of the policy formulated and ensures that it is fully understood and effectively implemented.

(iii) Improve performance through inspection and review of performance of work.

(iv) Define , monitor and supervise work and maintain their interest on safety.

(v) Participate in the accident investigation.

(vi) Take necessary corrective action to circumstances which resulted in an accident

(vii) Encourage external liaison with other safety organisations.

(viii) Ensures that subcontractors on site are fully aware of their responsibility and are instructed to confirm with the requirements of safety policy.

(ix) Assist safety officer in carrying out his duties and arrange acceptable expenditure on safety need,as requested by the safety officer.

(x) Keep all safe practice in mind while tendering planning and building.

D. GENERAL FOREMAN / TRADES FOREMAN / GANGER

The implementation of safety policy very much depend on the foremen because they are anchorage of the operatives and ensures that a balance of high out put and quality, low cost and safe system at work. In addition the foreman is expected to execute fundamentals of the safety policy. This is achieved according to Armstrong (1980 P.32) by

(i) Incorporating the needs of safety with all instructions about work.

(ii) Discouraging any bad practices, rebuke any operatives putting themselves at risk, create good safety procedures and command all proper safety activities.

(iii) Ensuring that new employees especially apprentices and trainees, take adequate precautions by providing all knowledge to them and explaining their legal and moral obligations.

(iv) Restraining all operatives, both directly employed and subcontractors' employees, from taking any risk .

(v) Understanding all relevant legislation and implement it at the place of work.

(vi) Reporting any defect, in plant, machinery, equipment or apparatus to supervisors.

(vii) Cooperating with visiting safety adviser (if any) and share responsibility with both supervisors and subordinates to create good safety practices for mutual advantage.

(ix) Setting a good example to others and see that all practicable precaution are adhered to.

E. <u>OPERATIVES</u>

Operatives or Labourer are those that actually carry out the various activities on site. They give their time , experience and knowledge to the best of their ability in return for pay. (Armstrong 1980 P.33). The safety responsibilities of operatives includes (Armstrong 1980 P.33) :

(i) Avoid action that may reduce the protection of himself or any adjacent worker/or workers.

(ii) Use all suitable tools, equipment and apparatus for the job, including protective equipments and clothes - and maintain it in good working condition .

(iii) Take full and proper advantage of all facilities and equipments provided for safe use.

(iv) Report to superior any defective equipments or apparatus that may be a safety risk.

(v) Guide and encourage all new employees, to be safe and make them aware of any particular hazards .

(vi) Develop a personal interest in safety and offer any suggestions to reduce risk at work.

2.3.2 ORGANISATIONAL STRUCTURE FOR SAFETY

After defining the roles and duties of various categories of the staff, it is i important to show the relationship between them through an organisational structure. This shows the various responsibilities between various staff and line of communication as regards safety. The line of responsibility should be clear and unbroken from the Managing director or Chief Executive, through in - line management down to operatives .

The National Federation of Building Trades Employers developed an organisational structure for medium sized construction firm showing the lines of responsibility and communication for safety. The Organisational Structure is shown in Fig. 2.1.

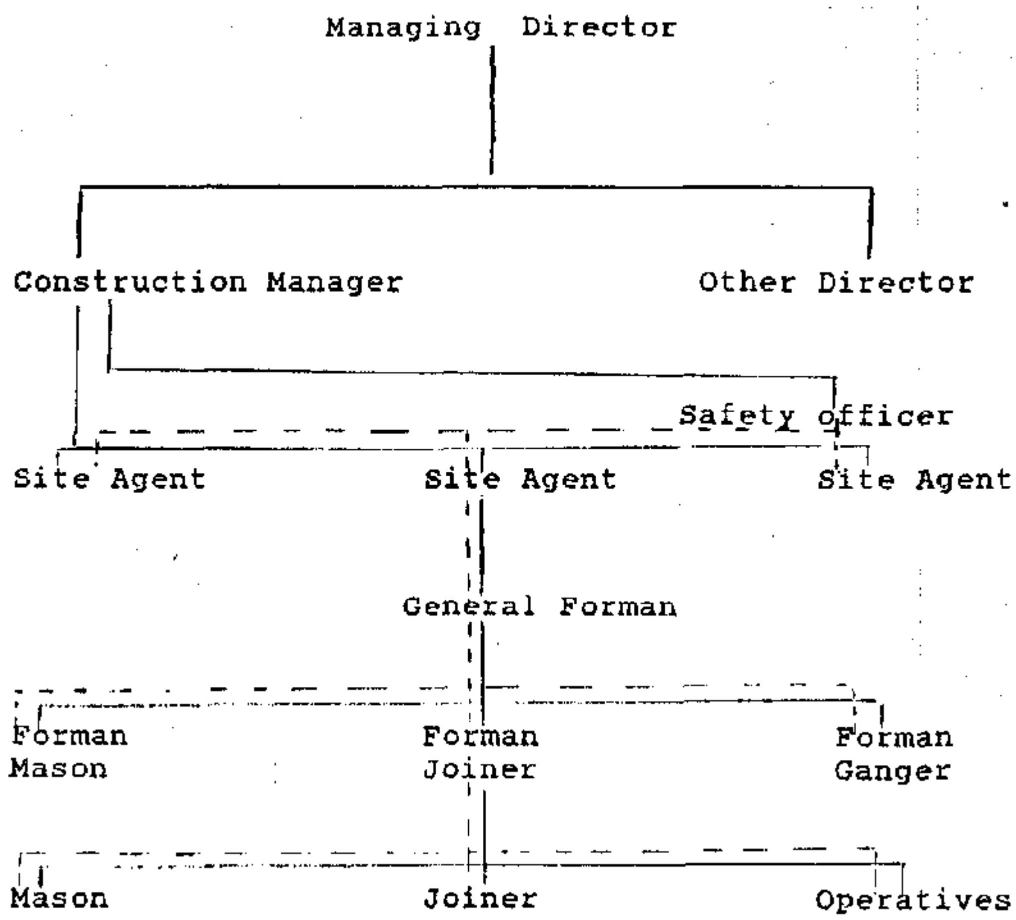


FIG. 2.1 Safety Organisational Structure for Medium Sized Construction Firm.

Source :Occupational Health and safety management Chissick and Derricot P. 383.

The organisational structure diagram in Figure 2.1 shows the relationship between safety officer (adviser) and other staff. The unbroken lines indicates the line of responsibility and the broken lines shows the line of communication. The relationship between the safety officer /advisers and other staff is that of communication while to the Construction Manager is that of responsibility. The line of communication includes no any authority other than advising other staff. The communication on safety is explained below.

2.3.3 SAFETY COMMUNICATIONS

Plunkett (1975 P. 49) defined communication as transmission of information and understanding one another through the use of common language either written or spoken. Safety communication therefore involves the exchange and sharing of ideas on safety. The existence of safety communication is necessary for the effective implementation of the policy. This will enable the giving of orders, instructions, information on safety to employees and other work people.

Plunkett (1975 P.50) further went on to show that communication in an organisation flows in four directions, up, down, left and right. The diagram in Fig.2.2 illustrates this principle.

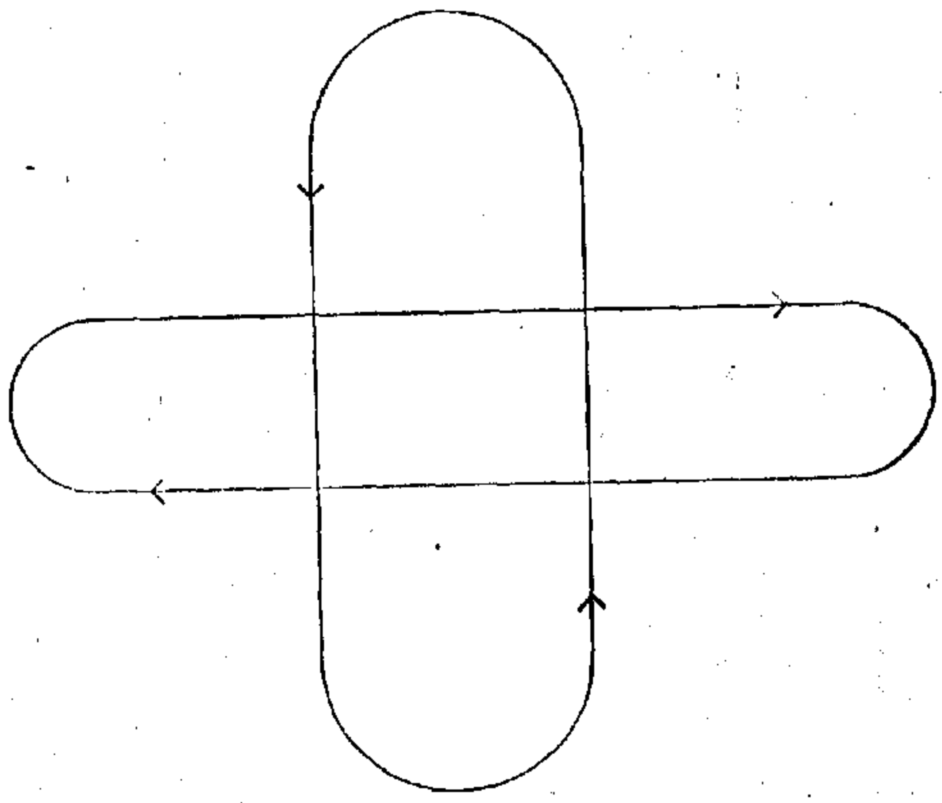


FIG : 2.2 The Four Directions of Communication

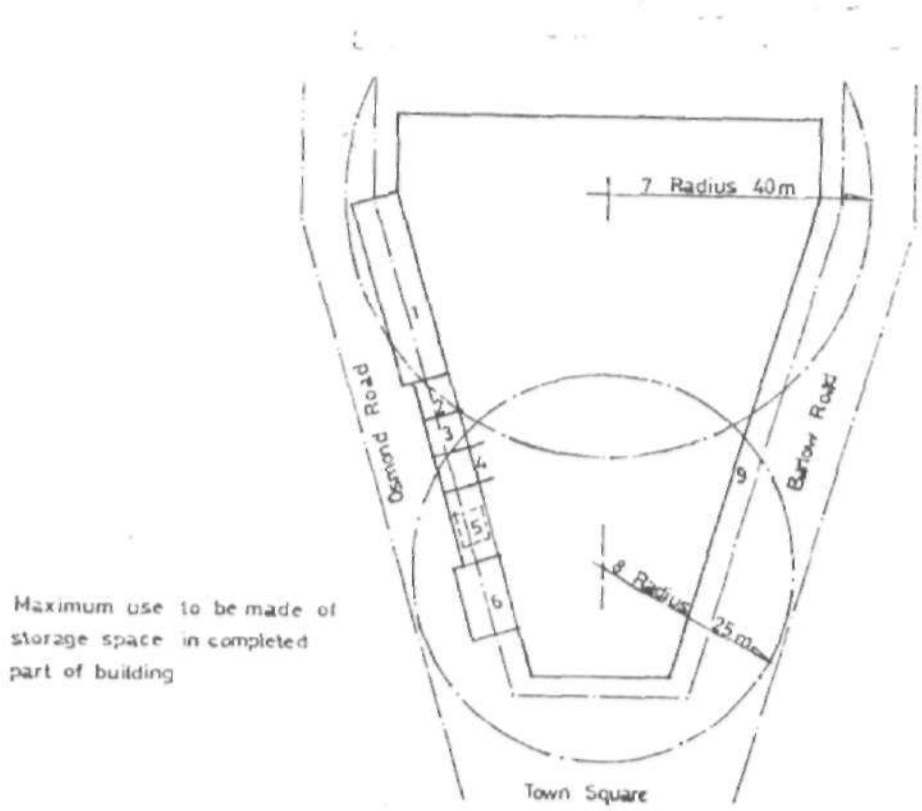
Source : Supervision; Direction of people at work: Plunket, W.R. P.50

2.4.0 IMPLEMENTING SAFETY POLICY THROUGH SAFE SITE LAY OUT PLANNING

The safety policy defined as earlier stated ensures that the employees work under safe condition (environment). The site layout for a project entails careful planning of the environment within which the construction activity takes place. This include the arrangement of temporary structures and location of plants. Through this the environment which influence the daily operation is being controlled. The major items which will be considered to achieve this objective are planning on site of:-

(i) Temporary services
(ii) Site Offices
(iii) Plant location
(iv) Material storage
(v) Accommodation, Service Buildings
(vi) Access Road
(vii) fencing
(viii) Car parks

Fig. (2.3 & 2.4) are examples of a site layout plan for a construction site. Each of the above items mention is now considered .



1. Office accomodation on gantry
2. Refuse chute area
3. Pèatform host and access
4. Unloading area
5. Small pale host located
6. Storage gantry on first floor
7. Tower crane location
8. Tower crane location
9. External scaffold and hoarding.

FIG. 2.3 Site Layout Plan For 2 Storey Building

Source: Contract Planning and Contractual Procedure by Cooke B P. 95

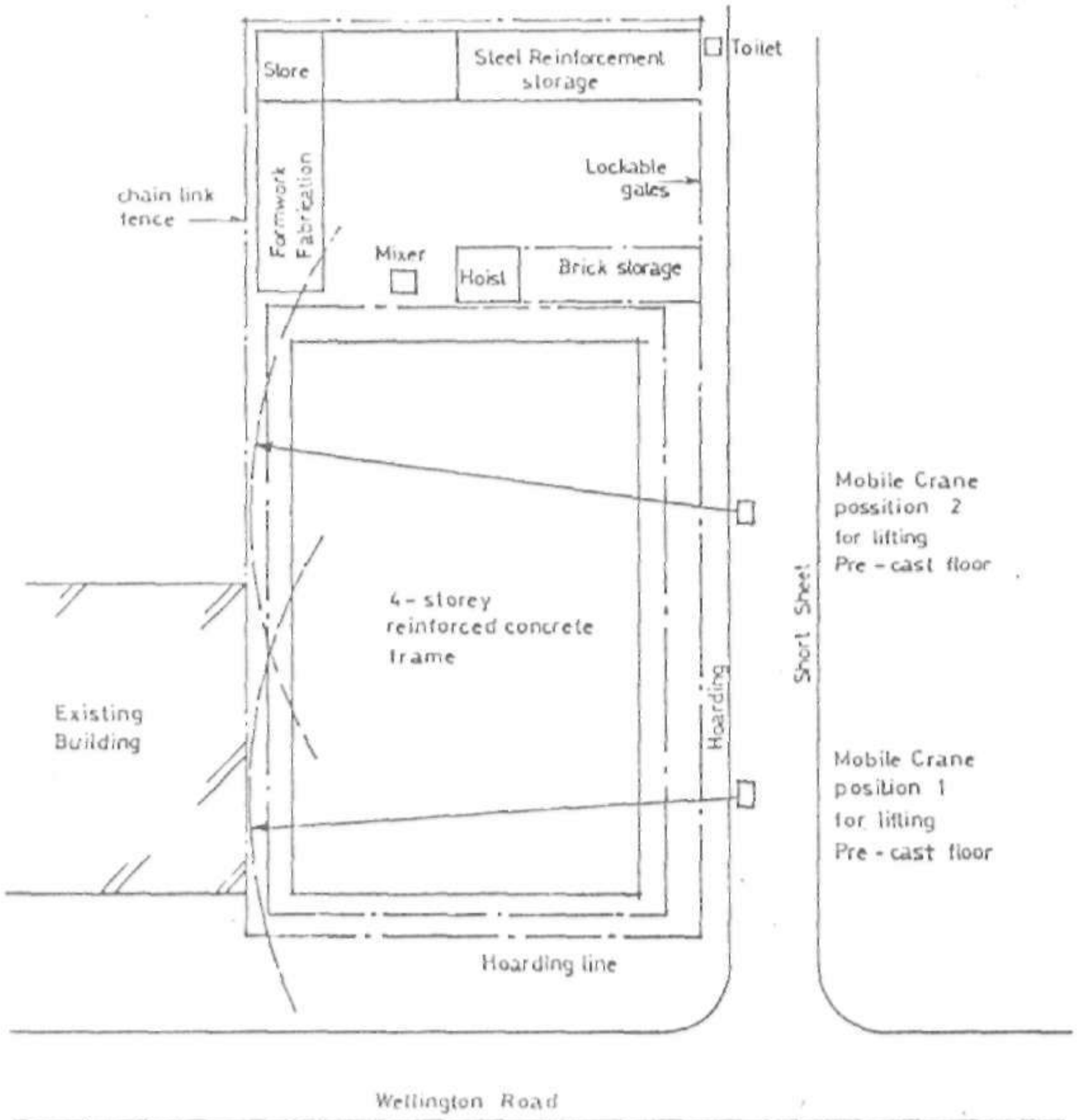


FIG. 2.4: Site layout plan - 4 storey Reinforced Concrete frame Structure

Source: Contract planning and contractual Procedure By Cooke, B. P.94

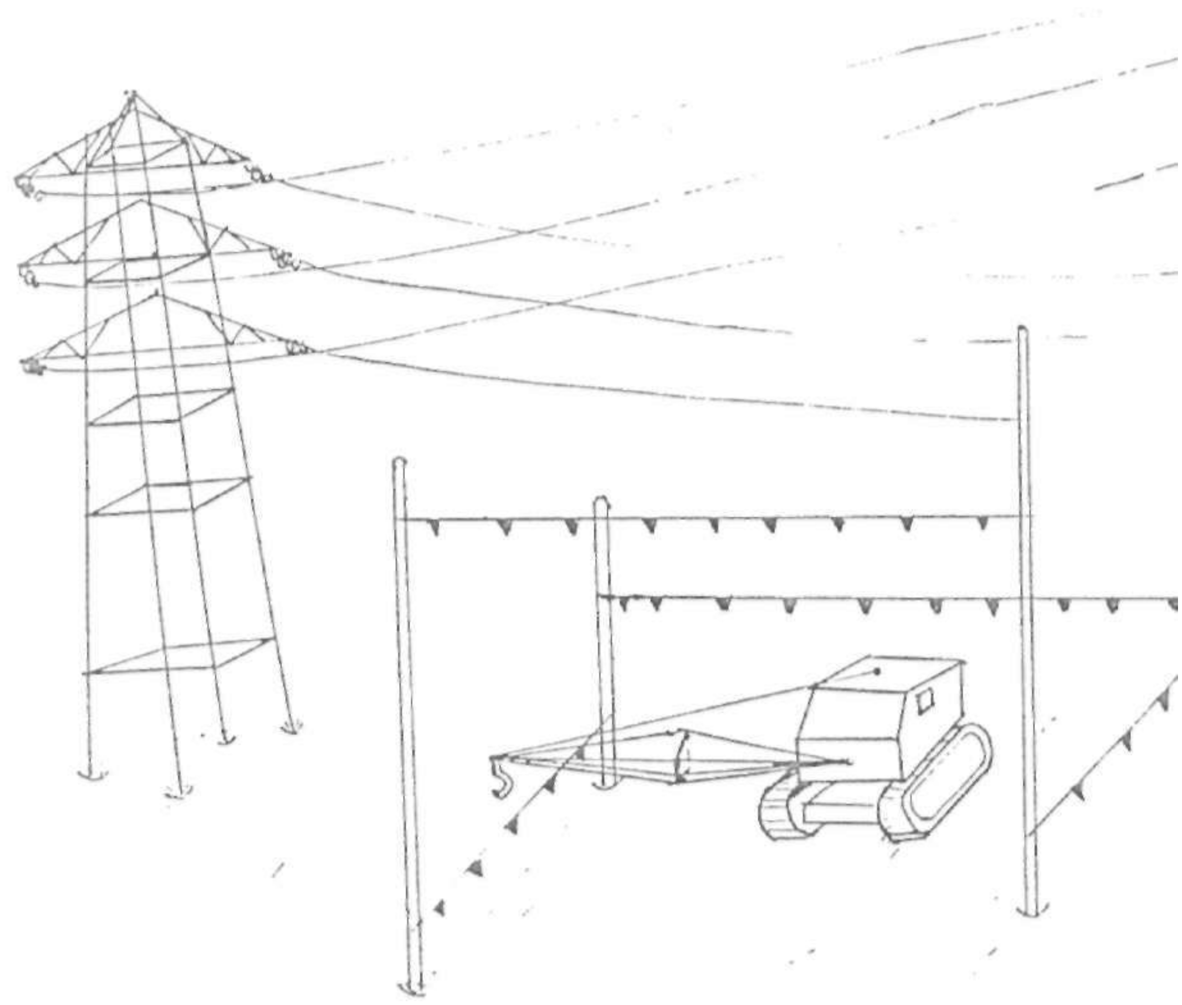


FIG.2.5A Prevention of danger from overlead power lines
Source: Fundamentals of Construction Safety
By Armstrong, P.T. P.133

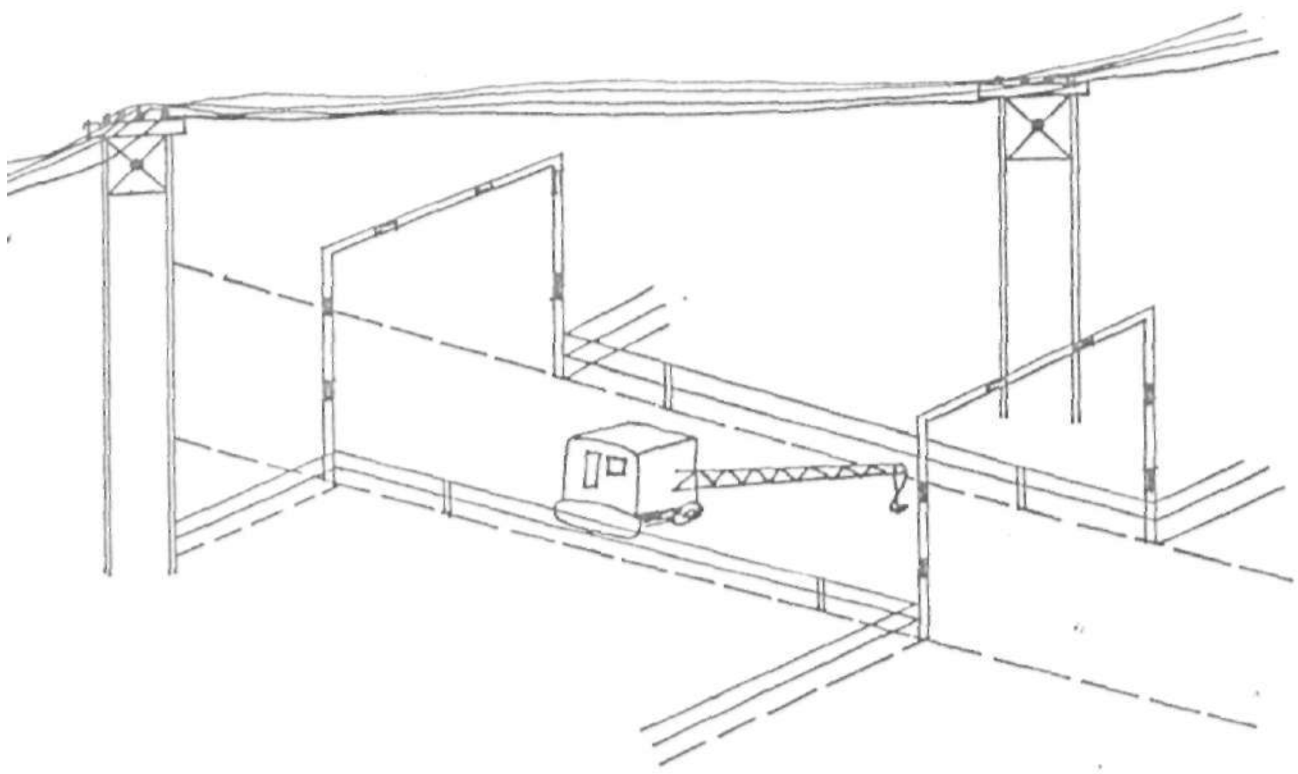


FIG.2.5B Prevention of danger from overhead power lines
Source: An Employers Guide to Health and Safety Management
By Arscott,P.375

2.4.1 LOCATION OF SITE SERVICES

The site services includes telephones, sanitary services, water and electricity. Among these, electricity brings most hazards. The routing of overhead and underground cable must be carefully made to avoid interference with site operations. Overhead lines are routed in areas where there is no interference with cranes, scaffolds etc. Where there is an overhead power lines crossing the site, the problem must be marked to show the location of the power lines and minimum head room. This is achieved by the use of temporary goal - post or blumping flags to ensure safe site transport of cranes etc. (Armstrong 1980 P.132) .Figure 2.7 shows the illustration of this principle.

2.4.2 SITE OFFICE LOCATION

This is the place where the site is being controlled. It has greater number of visitors from public. The location is to be made in a place overlooking the work area and access road- and is to have short, direct convenient route from the main entrance for safety.

2.4.2 PLANTS LOCATION

The location of cranes is made in such a way that there is enough space allowed for its operating radius. This is done by considering the structures around and activities carried out. Sufficient gap is allowed where the machine plant swings or moves. Location for hardstanding is also considered where lifting operations take place to avoid sinking, overturns. Fig 2.6. shows the location of plant in relation to structures.

Furthermore the records of accidents due to location of machines are assessed to avoid repeating of such accidents.

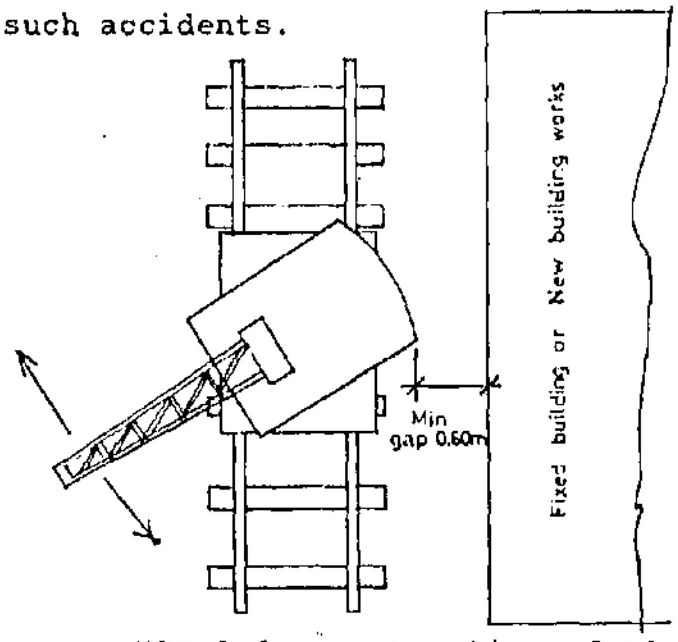


FIG 2.6 - Location of Plant in relation to structure on site.

SOURCE: FUNDAMENTAL OF CONSTRUCTION SAFETY, P. T. ARMSTRONG, P.173

2.4.4. MATERIAL STORAGE AREA LOCATION

The storage area on site is located in an area where it offers maximum accident prevention. Such area may be the one that -

(i) Has shortest distance with work place

(ii) Offer minimum handling of materials before it is brought to workplace

(iii) Does not obstruct access to work

(iv) Area has a firm site.

(v) Is away from factors that will lead to fire out break for flammable material

(vi) Has an easy access.

2.4.5 LOCATION OF ACCOMMODATION, CANTEENS, WORKSHOP

The location of these structures should be made at the boundary and away from internal traffic and work areas.

2.4.6 LOCATION OF ACCESS ROAD

Temporary roads for movement of plants, vehicles is to be located in such a way that there is a minimum interference with employees crossing to and from work areas.

A one way traffic system with entrance and exit may be adopted when the site is fairly large.

2.4.7 FENCING

Fencing is to be considered in order to minimize trespassers who may tamper with plants and machines, storing etc, which may be hazardous to both work people and the person tampering.

2.4.8 CARPARK LOCATION

Carparks for staff and other people coming to the site is to be located outside the fenced area in order to minimize site accidents.

2.5.0 IMPLEMENTATION OF SAFETY POLICY THROUGH PROJECT PLANNING (Network Analysis and Method Statement)

The implementation of the safety policy can be made in project planning by considering safety when planning the sequence of each activity. This is important because Arscott (1980 P.353) is of the opinion that "if accident prevention is to become a reality on site the concept of 'making it' comes first", that is the accident prevention must start at the planning stage.

Since the major objective of project planning according to Halpin and Woodhead (1980 P.293) is the "prescribing and field attainment of an orderly progression within the budget and time toward the completion of the project facilities" safety policy implementation can fully be achieved by arranging activities in progression with safety in mind.

Another aspect of project planning which will be used in the implementation of safety policy is the method statement.

These two aspects are treated in details.

2.5.1 NETWORK ANALYSIS

The network analysis is used in the programme evaluation review and techniques (PERT) and critical path method (CPM) of project planning.

In order to incorporate safety into the work sequence when preparing network diagrams, the following steps are considered.

(i) Break down the project into separate activity and operation necessary, detailing the hazards involved.
This break down list the trades, plants, location etc

(ii) Determine the relation between different activities and their safety requirement. This may be obtained according to Halpin and Woodhead (1980 P.303) by noting which activity-

(a) precedes another

(b) follow another

(c) occurs concurrently.

Using the above, the network diagram is drawn.

The final network will consist of branching activities, intermingling of chains. This is drawn through trial and error until all the safety factor are considered.

The possible hazards which are considered when arranging activities in network diagram includes (Anton 1979 P.8)

(i) Struck by :- includes blow, impact from a moving object e.g. falling rocks, crane chain.

(ii) Struck against :- injury which may be incurred when a person walks into a solid object moving or stationary e.g. walking into a moving truck.

(iii) Caught in an or between e. g. catching a foot in a floor grate or a wire mesh screen etc.

(iv) Falls from abov·· :- e.g. falls from ladder, or from one floor to another below

(v) Falls at ground level or falls on the same level e.g. tripping while walking

(vi) Strain or over exertion resulting from pulls or pushes.

(vii) Electrical contact : injury which results from some of contact with an electrical current or any electrically charged equipment.

After identifying these hazards the network diagram is drawn . The diagram will consist of arrows and nodes. In the arrow diagram according to Halpin and Woodhead (1980 PP.300-301) -

(i) Each line or arrow represents an activity and the relation between one arrow with another defines the relation between one activity and another.

(ii) The node represents an events

(iii) The descriptive label and alphabetical tags are used to identify activities.

The Net work diagram is shown diagramatically below.

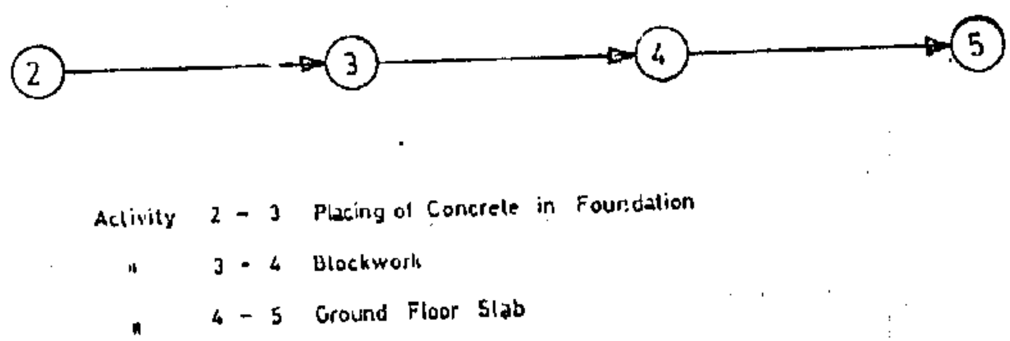


Figure 2.7 - Network diagram

Source:- CONSTRUCTION MANAGEMENT (HALPIN and WOODHEAD) P.302

The network diagram in figure 2.7 shows the sequence of operation of placing concrete, blockwork, ground floor slab. This is defined by:-

Activity 2 - 3 placing of concrete in foundation.

Activity 3 - 4 Blockwork

Activity 4 - 5 Ground floor slab

(iv) The length of the arrow has no significance to the duration of activity but only shows the passage of time in the direction of arrow head.

(v) All activity entering the node has to be completed before the start of all activity leaving the node.

2.5.2 USES OF NETWORK DIAGRAM IN ACCIDENT PREVENTION.

The uses of network diagram in accident prevention can be summarized from above and preceding pages as:

(i) Relevant instructions, on safety to foremen and operatives are given at the start of each activity.

(ii) Clashes of operations which may bring accident will be avoided .

(iii) Proper equipments and other protective clothings are given at the time of the start of activity which requires its usage.

(iv) Plants required for operation will be made available at the right time and removed after finishing the activity. This will avoid obstruction of worker from carrying out other activities.

(v) Systematic undertaking of activity is done and hazards are minimized generally.

2.5.3 METHOD STATEMENT

This is the aspect of planning which generally deals with the method of construction. The method statement according to Cooke (1984 P.24) provides an assessment of construction method and includes ;

(i) Plant requirement for projects

(ii) General information relative to performance.

(iii) Labour output and duration of methods and machines .

(iv) Data relating to construction method

The information contained in the method statement which is used while undertaking the construction process according to Cooke (1984 Pp.25-26) also includes -

(i) Operation or workstage which requires an analysis of plant / method e.g excavation, lifting of pillars, floors, erecting steel

work etc.

(ii) The quantity of work which influences the methods of construction, number of gangs and machines

These content of the method statement may be used in implementing safety policy.

2.5.4 USES OF METHOD STATEMENT IN IMPLEMENTING SAFETY POLICY

1. Safe construction techniques and method of handling of materials can be selected from ranges of competing options when preparing the method statements.

2. Plant requirement for project contained in the method may be used to timely bring and remove plant to site. Also in selecting plants various ranges of option are assessed and the one which offer safety and economy is selected.

3. Data on construction method is used to analyse hazard present in a particular method so that there is adequate provision for equipments,

2.6.0 IMPLEMENTATION OF SAFETY POLICY THROUGH EDUCATION AND TRAINING ON SAFETY

The implementation process through organising, safe site layout design, planning of work and drawing up safety ckeclist deals with the actual nature of the work and its environment in which the work is performed and it also deals with the technical aspect of accident prevention .

The education and training, ILO (1974 P.110) states that it deals with the way in which accident preventive measures are implemented through educational programmes aimed directly at the worker himself.

The education and training which is carried out by management is an important aspect of the implementation of safety policy, because according to De Reamer (1980 P.151), the amount of attention a subordinate will give any one aspect of his work is in direct proportion to the amount of emphasis placed on the aspect of the work by his supervisor (foremen)

2.6.1 EDUCATION

Safety education according to Arscott (1980 P.395) ensures that every one is fully aware of all the hazards they meet at work and the potential consequences of haste,, ill considered or thoughtless action. It makes people behave safely and creates and maintain their interest in safety because according to Mosaku (1984 P.58), safety education deals "with the development of the mind, broadening of ones knowledge and understanding".

The education can be done through -

(a) Posters,

(b) Film shows,

(c) Talks,

(d) Lecture and conferences.

A. POSTERS

Posters are normally printed placard or bill posted to advertise or publicize safety. The education on safety can be achieve by communicating views expressed in posters. These posters are made in such away that it gives a general advice or demonstrate hazards of particular operation. Generally, posters, are made to deprecate bad habits, shows advantage of safe working ,try to influence worker by appealing to his curiosity, humour or affection (ILO 1974 Pp.101-102).

There are two types of posters which is described by ILO (1974 Pp.101-102). These are -

(i) Positive posters shows advantage of caution,

(ii) Negative posters,which shows the consequences of carelessness, aimed at showing risk which might be taken by worker in a realistic way and its possible consequences.

Either of these two posters may be used according to the impression desired to be made on the worker.

B. FILMS

A film is an education method which tells how a particular situation may arise and can be avoided. It tells the story of an accident unlike posters which gives only one impression of the hazard. It educates employees by analysing the technical process often complicated and difficult to explain.

C. TALKS, LECTURES AND CONFERENCES.

This is a method of education for managers and safety advisers. Firms and professional bodies may organise talks, lectures and conferences on safety so as to get an update development on safety and generally discuss problems and solution for particular situations. Firms may organise talks between managers located on various site to discuss the problem they encounter and means to over come these problems Lecture may be used to educate foremen and site workers.

2.6.2 TRAINING

Training is another important aspect of the implementation process. Training is generally carried out on all categories of employees, and done as and when required. It should according to

Mosaku (1984 P.58) deals primarily with the development of skills in performance. This is done through telling employees how to avoid risk, how to work safely and go on practicing until they are conversant with it. The various categories of employees are trained in the following way.

A. <u>New Employees (Induction Training)</u>

New employees are trained on how to avoid accident on site and get acquainted with the firm's safety requirement. This is important because according to DeReamer (1980 P.151) new employees tend to have a much higher accident rate than do regular employees. The training of new employees is generally done on how to avoid unsafe practices, use of protective clothings and safety equipments, the firms safety rules and procedures.

B. <u>Foremen Training</u>

The foremen are trained on the hazard on sites they have to contend with, and develop in them the necessary skill to enable them to train and communicate with people. The hazards which the foremen have to contend with are in areas where safeguard is required, in the work by identifying dangers which is present. The foremen are trained by safety adviser, coordinators and through lectures, and talks with safety experts.

C. <u>On the Job Training for OPeratives.</u>

On the job training through supervision is necessary as the work is carried out. Foremen regularly instruct operatives on how to avoid accident on site. Through this , it enable work people to acquire the habit of thinking and working safely.

D. <u>Safety Coordinator & Management Staff</u>

Where professional safety adviser is not employed, the coordinator of safety in the firm may be trained either within or outside the organisation, through workshops, conferences and courses on safety. The management staff may be trained through the same procedure.

The training of these category of staff includes, thorough study of main areas of operations, work environment, technology of construction and other related aspect of safety. The management staff may also be trained in the same way as the coordinators.

2.7.0 IMPLEMENTATION THROUGH DRAWING UP OF SAFETY CHECKLIST/STANDARD FOR CONSTRUCTION SITE.

The checklist for construction site list the various activities on site which exposes employees to risk and ensures that the activity is being done to required standard.

It also ensures that all structures and the work being carried out are done safely. The checklist which lays down the required standard for site will assist managers and foremen in carrying out inspection and other checks. This is a very important aspect of the implementation process.

Some of the major activities which will be included in the checklist are listed below.

2.7.1 EXCAVATIONS

All excavations are checked to see whether -

1. The timber provided for support sides of trenches is strong enough.
2. The method of putting timber and angle of batter is safe and appropriate.
3. There is a safe access to the excavation and whether inspected daily.
4. Barrier has been placed to prevent person from falling into trenches (Illustration in fig. 2. 13 and 2. 14).
5. Stability of excavation is checked and it's effect on vehicle coming near it and tipping into excavation and stop blocks provided when necessary. (fig 2.13)

Excavation on Stiff fissured clays

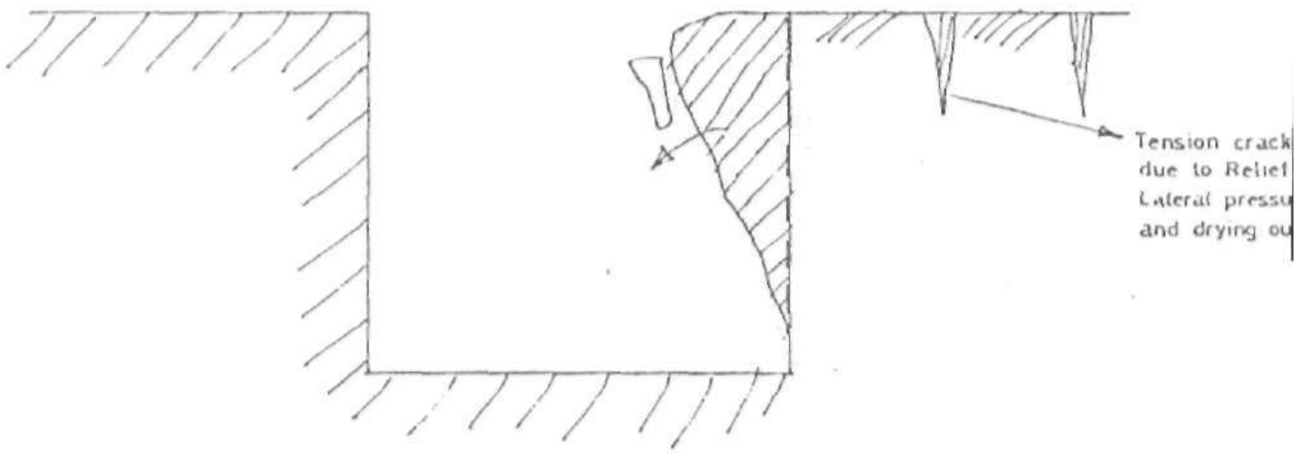


FIG.2.8A: Fall of Trench Sides

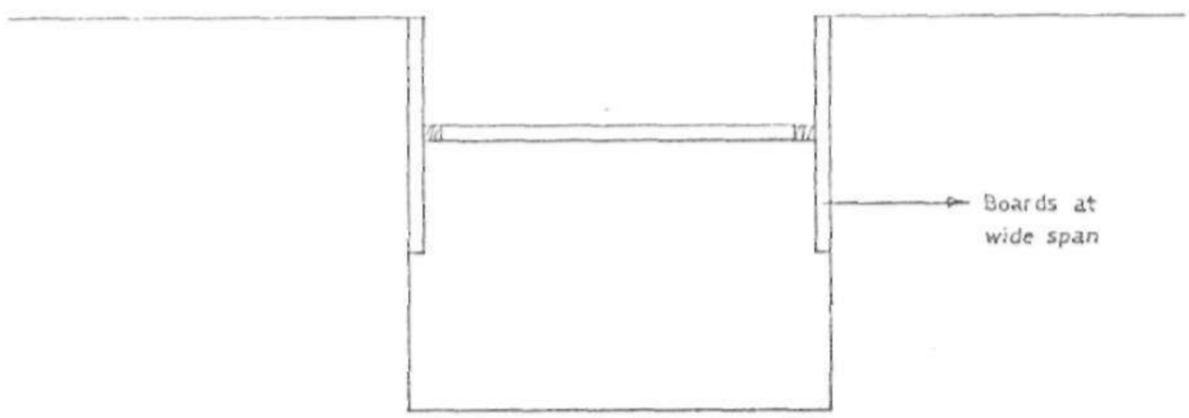


FIG.2.8B: Skeleton timbering:-
Source: Occupational Health and Safety Management chissick and Derricot P.399

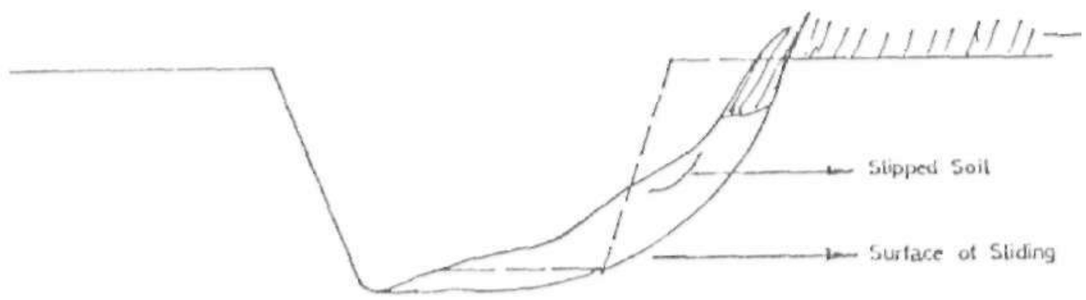
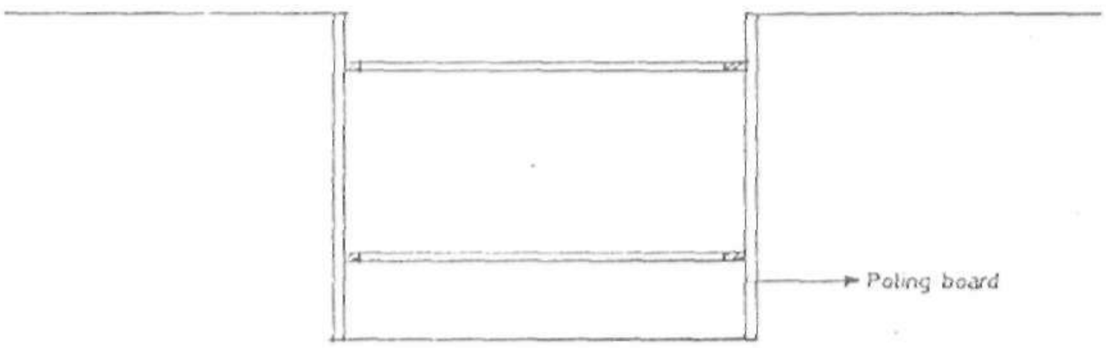


FIG.2.8C: Slip in Soft Clay and Sand



Remedy by close timbering

FIG.2.8D: Excavation in Soft Clay, and Sands.

Source: Occupational Health and Safety Management:

Chissick and Derricot P.398

2.7.2 SAFE ACCESS

The access to workplace is checked whether -

(1) It is provided to all places of work on site. This includes gangways, goodroads, passageways, passagehoist, stair case ladder and scaffold.

(2) All walkway,levels are free from obstruction and edge protection (guardrails, safety rails) are provided where work people are likely to fall from open side.

(3) All holes and openings are covered or fenced off.

(4) Adequate lighting is provided for dark access area.

(5) All scraps materials in access route are gathered and disposed material, are stored in safe location.

(6) Projecting nails on board, planks and timber are removed, hammered in or bent down.

2.7.3 LADDERS

Ladders used are checked whether -

(1) It is in good condition and materials constructed from, are free from defects.

(2) It is securely fixed near the top and bottom and braced where required. (fig 2.11)

(3) Properly positioned for access

(4) It is extended some distance above levels of floor, roof, staging or platform it is leading to - (fig 2.11)

This principle is further illustrated in Appendix C.

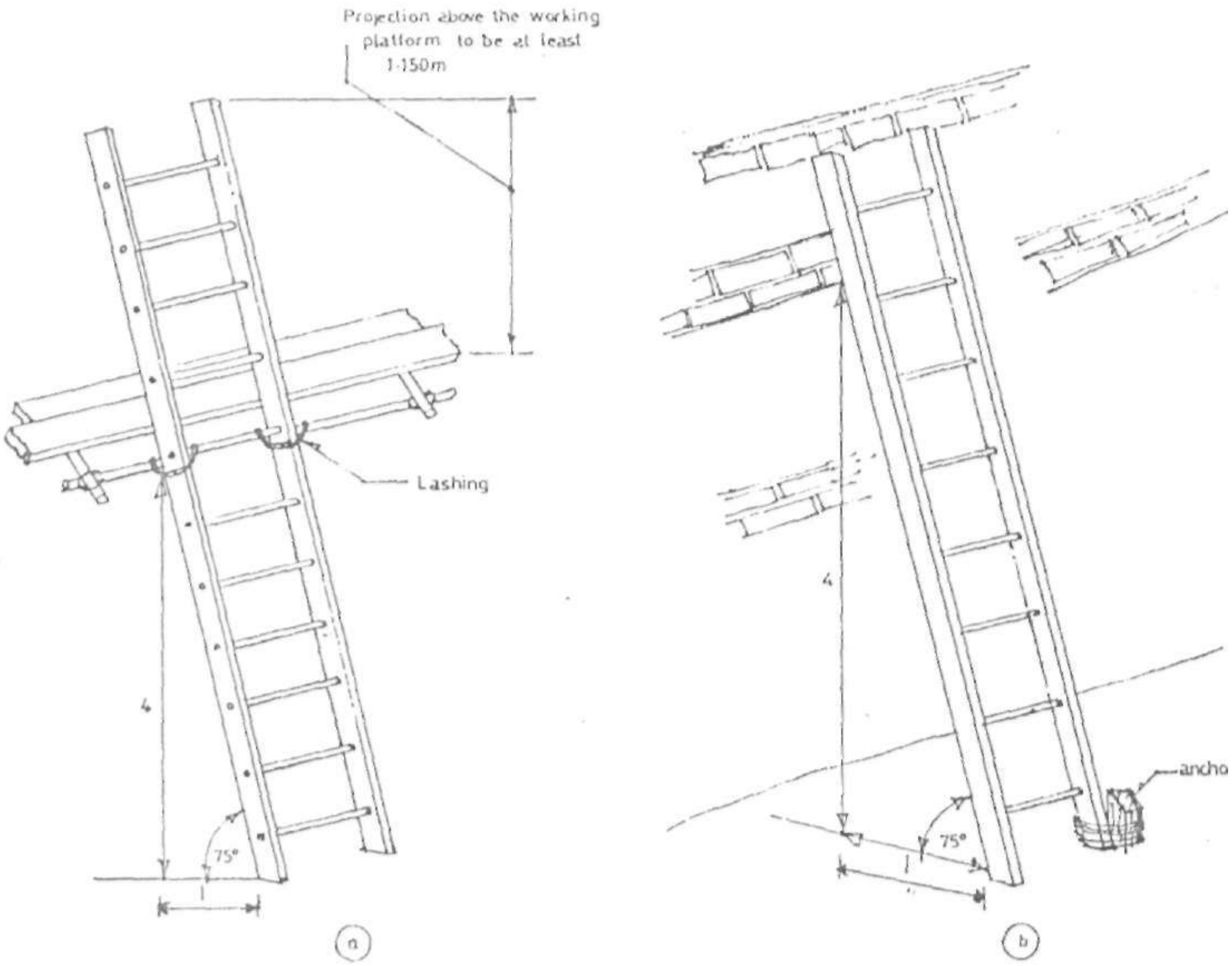


FIG 2.9 Securing Ladder
Source: Fundamentals of Construction Safety: Armstrong P. T P.121

2.7.4. SCAFFOLD

Scaffold are checked whether -

(1) All uprights have been prevented from sinking by providing base plates and collapsing, is prevented by position of ledger, struts, ties, braces and securing to the building. (fig 2.12).

(2) Sufficient boards are provided at working platform in use and that such boards are free from defects and are arranged to avoid trips.

(3) It is constructed to support four times the anticipated working load.

(4) Guard rails and tore rails are provided on ends and open side of all scaffold platform.

(5) Putlogs are secured into Blocwork mortar joints.(fig 2.126)

2.7.5.ROOFWORK

1. Crawling ladder or board are provided on roofs sloping more than 30^0 Or less than 30^0 but separately.

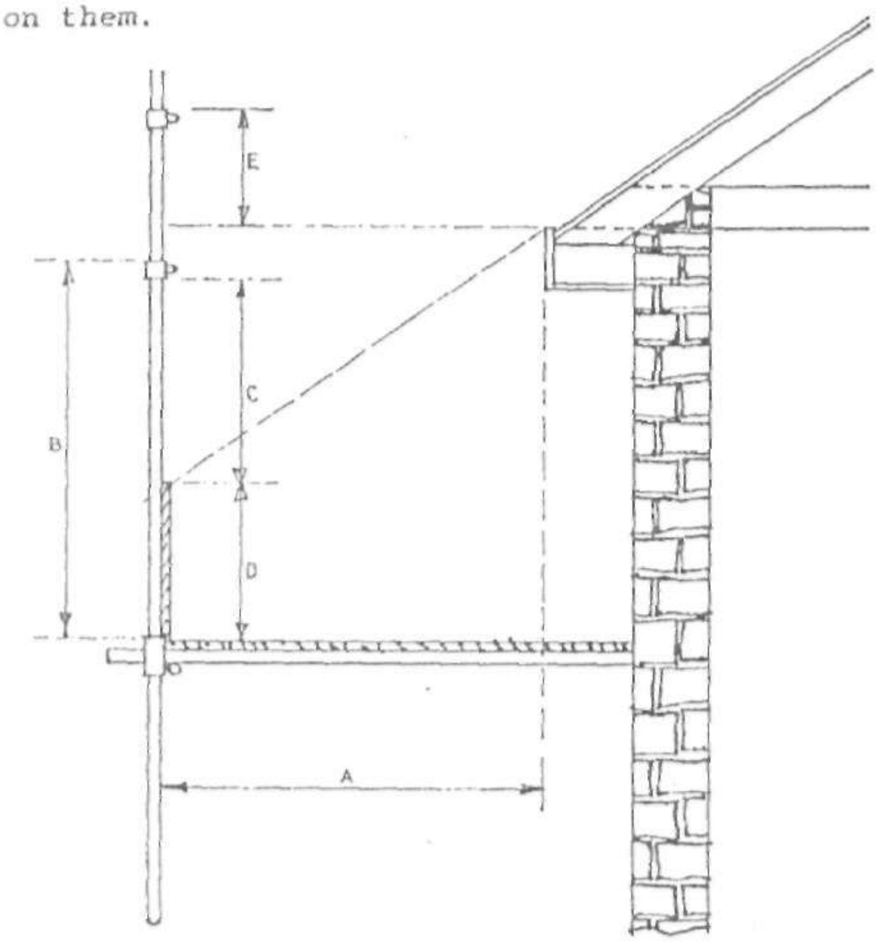
(2) Sufficient edge protection is provided to prevent fall of material or person while working on sloping roof or near edge of flat roof.

(3) Warning notices are posted and crawling board are used by operatives working on or near fragile material, such as sheets, glass or asbestos cement.

(4) All roof lights are properly covered or

provided with barrier.

(5) Enough precautions are taken for operatives working under roof work to prevent debris falling on them.



A – Minimum width 0·640m

B – Between 0·920m and 1·150m high

C – Maximum gap 0·760m

D – Not less than 0·155m high

E – Does not exceed 0·440m and 0·760m between guardrails

FIG. 2: 10a - Scaffold P.107

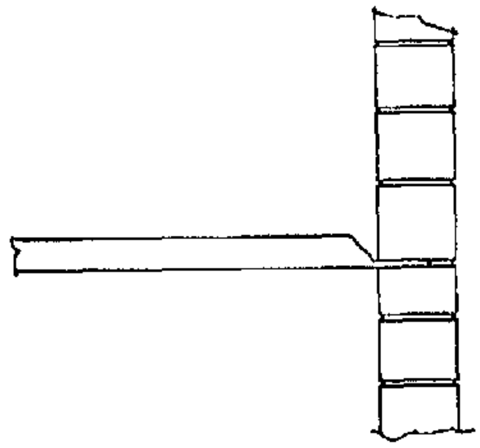


FIG.10B: A Securing a Putlogs Scaffold into Blocwork Mortar Joints
Sources: Fundamentals of Construction Safety. Armstrong P.T. P.111

2.7.6 CRANES AND LIFTING APPLIANCES.

These includes cranes for lifting weights and other funçtional operating mechanism using hydraulics and ropes. They shall be checked whether

1. Operators have been fully trained and is an adult.
2. There is a clear making on controls.
3. The weight to be lifted has been ascertained and cranes are to be filled with an automatic safe load indicator.
4. Cranes has been placed on a solid hard level base.
5. Cranes are regularly maintained.
6. Where available, cranes are fitted with sensors which will either emit an audible warning on entering an electronic field surrounding power lines or will immobilize the crane by breaking preset infra red beam.
7. Chains, and cables which are; defective are

either removed, replaced or repaired.

8. All chains, cables, ropes etc have sufficient strength and are in good condition and size to safely raise, lower or sustain the imposed loads in any point.

9. Tag lines are provided for load which tends to swing or turn during hosting.

2.7.7 PROTECTIVE CLOTHING AND EQUIPMENT

Check whether,

1. Clothing including boots, hats, gloves, goggles face shield and others are provided.

2. Work people use protective clothes where necessary.

3. Work people are fully trained on use of equipment .

4. Protective equipment are in good condition.

2.7.8 SITE TRANSPORT

Check whether,

1. All drivers are adequately trained and instructed on safety.

2. There is a speed limit for driving on site.

3. Vehicles are kept in good repairs especially hand brakes, boot brakes and steering.

4. Loading of vehicle is made in a good way to

avoid falling and person riding is in good position.

5. Holes are covered and warning signs are placed (fig. 2.14)

6. Timber Baulks are provided when tipping or loading vehicle near excavation (fig. 2.13, 2.16)

2.7.9a *ELECTRICITY*

Check whether there is -

1. Sign of damage to portable equipment, outer covering of wire and cables.

2. Proper plugs are provided for connection to power points.

3. Overheads lines are not touched by cranes, trucklift tipper, long or scaffold and temporary goal post are provided (Fig. 2.7).

4. All underground cables in the work area are located marked and enough precautionary measure, are taken to avoid contact.

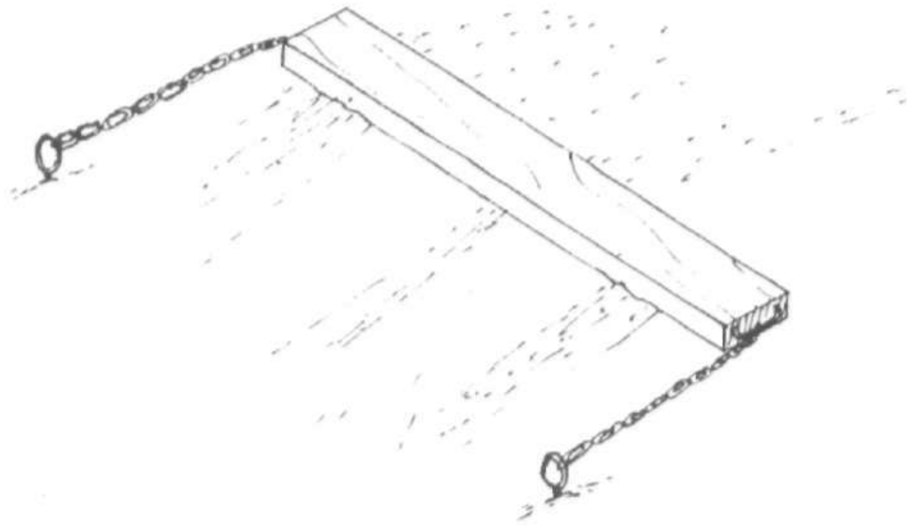


FIG 2.11 Large Timber Baulk Secured to Anchorage Peg.

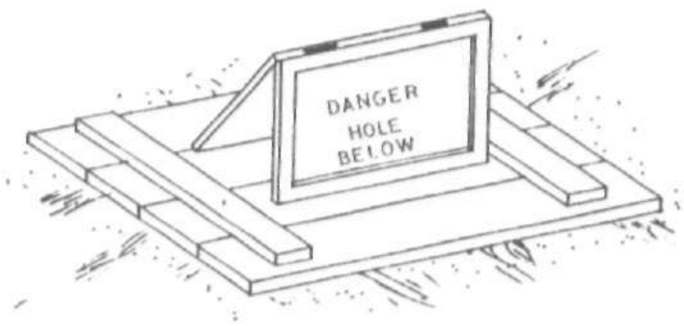


FIG 2.12 Covering Holes. with Timber
Source: Fundamental of Construction safety.
Armstrong P.T. P.130

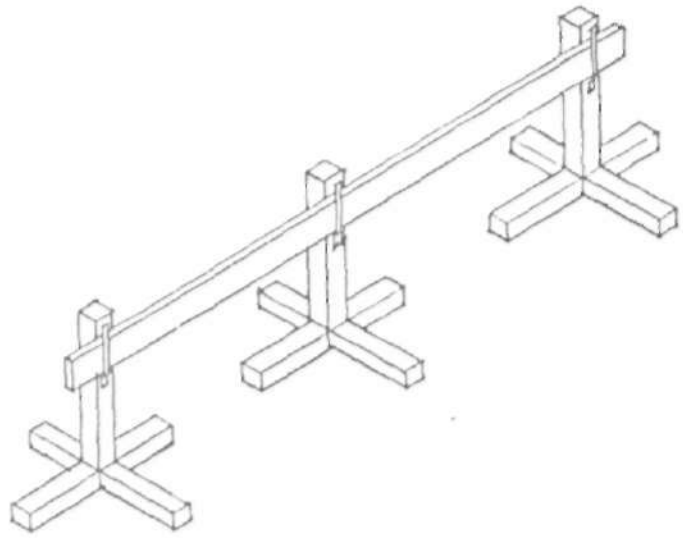


FIG 2.13 Timber Frames and Rib for Fencing off Trenches.

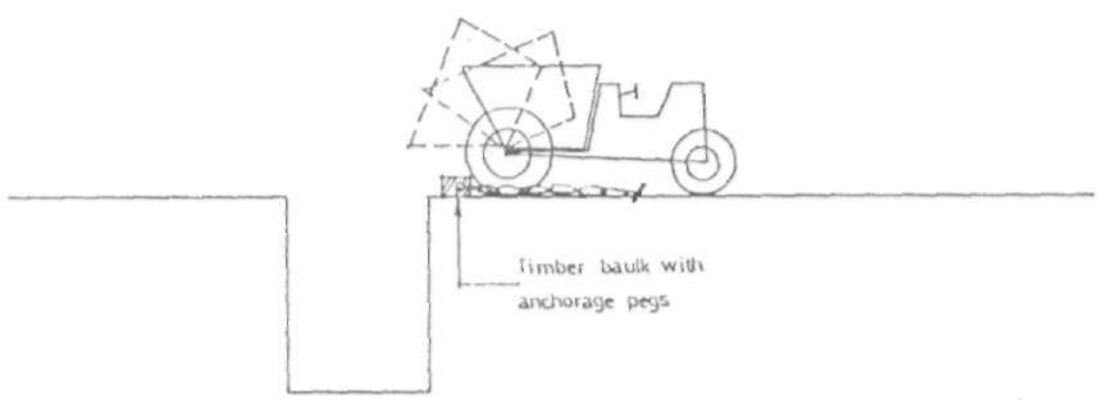


FIG 2.14 Timber Baulk Held by Chains to Prevent Site Vehicles from Falling into Excavation when Tipping.
Source; Fundemantals of Construction Safety
Armstrong, P.T P.130

2.7.9.2 - FLAMMABLE LIQUIDS

Check whether

1. Gas cylinders are in good condition, transported in safe way and kept in safe places (Fig. 2.18 & 2.19)

2. Flammable liquids are kept in safety cans and other good storage containers.

3. Flammable liquids are kept away from where a combination of oxygen and heat exist to avoid fire outbreak (fig. 2.13)

4. Smoking is prohibited in areas where fueling operation and other high fire hazard exist.

5. Amount of flammable liquid are kept to minimum in workplace.

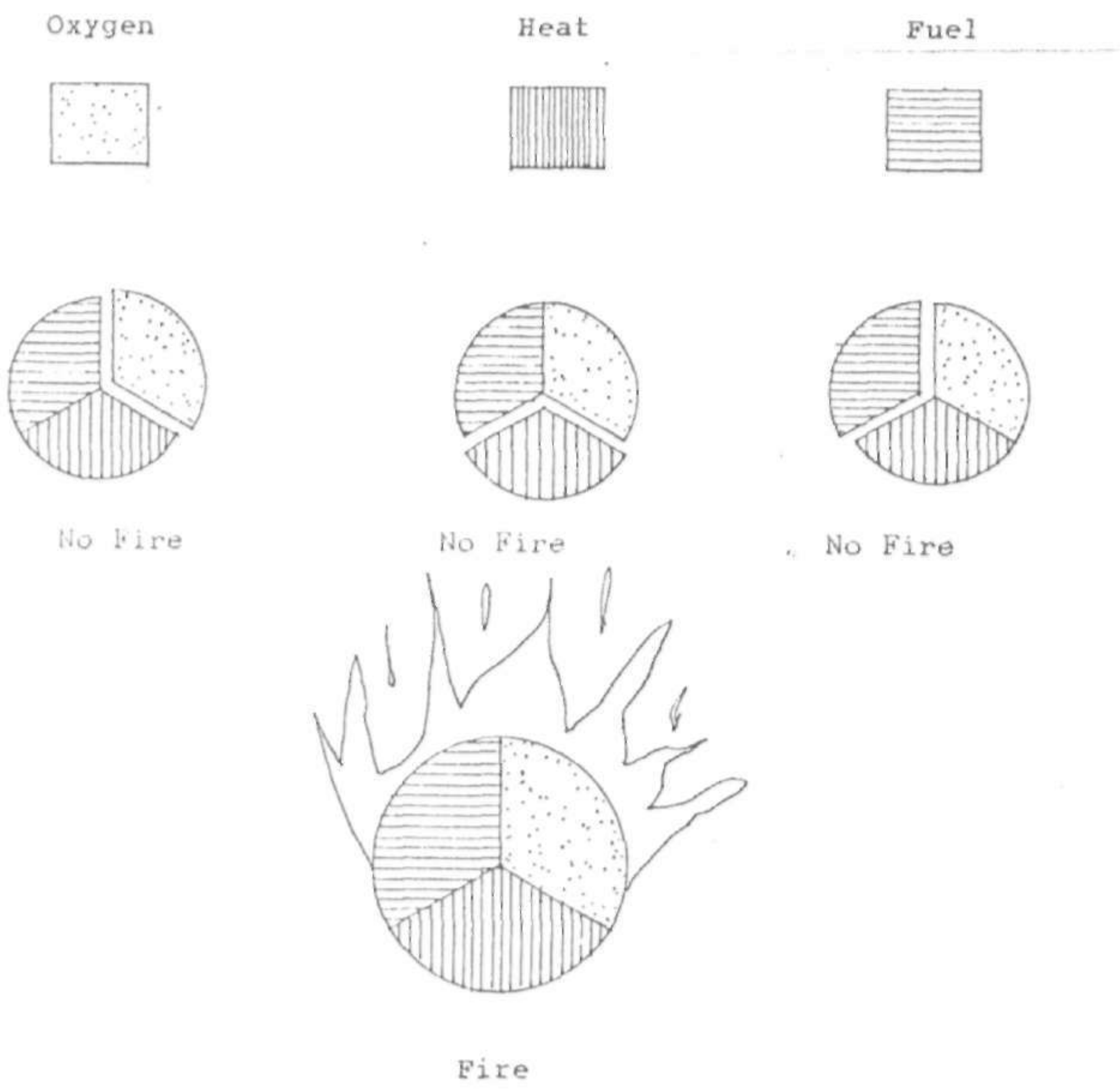


FiG 2.15 How Fire Starts: The Presence of all the 3 Elements Produces a Fire.
Sources : Accident Prevention, ILO P. 34

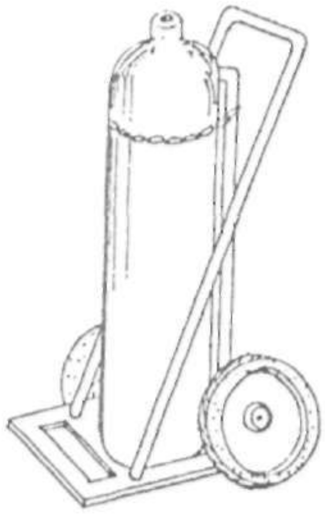


FiG 2.16 Cylinders Secured to Trolley by Chains.

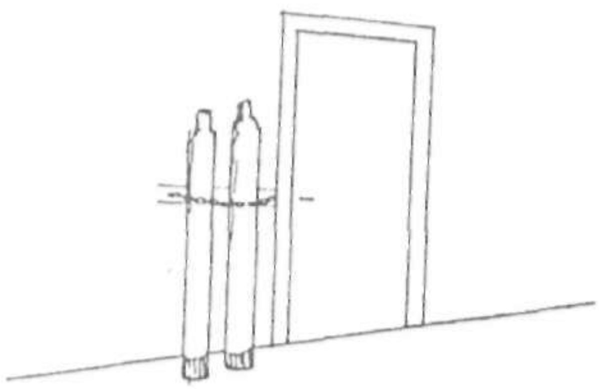


FiG 2.17 Storing of Cylinders
Source : Accident Prevention ILO P.82

CHAPTER THREE
REVIEW OF EXISTING PRACTICE

3.1.0 INTRODUCTION

As it has been mentioned in the methodology of this thesis, investigation will be carried out on the existing practice on the formulation and implementation of safety policy by medium sized construction firms. This is to reveal the model in use, identify the problems and suggest possible solutions.

The first part of this chapter describes the selection of the samples for the investigation, instrumentation and data collection, administration of questionnaire and general brief on area of activity of firms. The second part reports the existing practice.

3.1.1 Sample Selection

To carry out the investigation, eight firms were selected. These firms are currently undertaking multi-million naira projects in various parts of the country. Table 3.19 shows at least 3 locations in different parts of the country where the firms are currently undertaking some projects(including Maiduguri).

TABLE 3.1A LOCATION OF FIRMS AREA OF OPERATION

Firm	A	B	C	D	E	F	G	H
	Kano	Kaduna	Abuja	Abuja	Benin	Kano	Abuja	Kano
	P/H	Abuja	Ilorin	Minna	P/H	Ilorin	Kaduna	Yobe
	Lagos	Lagos	Kaduna	Kaduna	Bauchi	Abuja		Bauchi
							Borno	

The selection of these firms is made because of geographical spread of their activities. This will enable responses obtained to cover various conditions at location of firms activity.

3.1.2 <u>Instrumentation and Data Collection.</u>

The main instrument for conducting the study was questionnaire and oral interviews. This instrument was selected because the study was a descriptive one.

The designing of the questionnaire was made in such a way that relevant points raised in the literature review were used to frame the questions. These questions was to elicit response on the general practice of the firms. The questionnaire was divided into two major sections, and the second section was further subdivided into seven parts and there is a total of 52 questions and statement.

Below are the sections and their contents

Section I - Safety policy formulation

Section II - Implementation of safety policy

i) Organisation for safety
ii) Safe site layout planning
iii) Project Planning:-
iv) Network diagram
v) Method Statement
vi) Education
vii) Training
viii) Safety check list and standard for site

Oral interviews was used to clarify responses made to questionnaires by firms. This is necessary to obtain more explanation.

3.1.3. Administration of Questionnaire and Problems Encountered

The questionnaire was administered to various offices of the construction firms it was all addressed to the chief executive. Difficulties were encountered in getting the chief executives to answer the questionnaires and give oral interviews. Often, the answering of questionnaire and interviews were delegated to one of the senior management staff.

3.1.4 Brief on Firms Area of Activity

The firms selected for the study undertake both civil and building works. Table 3.1b) shows the summary of types of project being handled and date of establishment of the firms investigated.

TABLE 3.1B BRIEF ON FIRMS AREA OF OPERATION (REF. QUESTION-3)

FIRM	A	B	C	D	E	F	G	H
Date of establishment	1975	1976	1988	1978	1963	1974	1978	1964
Types of Projects Handled	water projects	Road Construction Soil Stabilization Building	Building and Civil Engineering	Water treatment Irrigation Building	Roads Building Irrigation	Civil and Building	Water Projects	Building and Civil Engineering

The above table indicates that all the firms undertakes both civil and building works. This ensures adequate representation of the industry's safety.

3.2.0 REPORT ON THE INVESTIGATION OF THE EXISTING PRACTICE

The following section reports the responses to the questionnaires and oral interviews conducted.

3.3.0 SAFETY POLICY FORMULATION

All the firms investigated responded that they have safety policy which are written. A firm granted me an opportunity to look at their policy which basically contains a statement on the firms intention to prevent accident and adopt the provisions made on the factories Act of Nigeria. However permission was not granted for the inclusion of the policy into this thesis.

3.3.1 ENDORSEMENT OF THE SAFETY POLICY

The policies of about 88% of the firm investigated are fully endorsed by either the chief executive or one of its directors. The response of the firm whose policy was not endorsed stated that it is their practice not to have any of their policy endorsed.

3.3.2. PUBLICITY AND DISTRIBUTION

Only 25% of the firms responded in favour of publishing the safety policy and distributing it to all staff in various construction sites. This, they said, is to ensure proper understanding.

While about 63% of the firms responded that their safety policies are being kept in the regional and head offices. Various project managers are informed of the existence of the policy.

The remaining firms indicated that their safety policy is not disclosed fully to certain category of workers due to fear of revolt, for example when a safety item mentioned in the policy is not provided on site.

TABLE 3.2 SUMMARY OF INVESTIGATION ON SAFETY POLICY

Investigation	Response in Favour of Investigation	%
Existence of Safety Policy (Reference Question A-1)	8	100.00
Whether the Policy is written (Reference Question A-2)	8	100.00
Safety Policy is endorsed by chief executive. (Reference Question A-3	7	87.50
Safety Policy is Published and Distributed (Reference Question A-4)	2	25.00

3.3.3. OBJECTIVE OF SAFETY POLICY (REFERENCE QUESTION A-5)

The response of all the firms indicated that the main objective of the safety policy is accident prevention and safe guard of life. This in the opinion of one of the managers is a priority because when accident is prevented a lot of extra expenses are saved.

3.3.4. BASIS FOR FORMULATION OF POLICY

The three major basis used for the formulation of the policy i.e. existing practice on safety of the firm, safety Regulations and accident Record is considered.

However neither of the firms responded on using all the 3 factors as a basis. Below is summary of the responses.

TABLE 3.3 RESPONSES ON BASIS OF FORMULATION OF SAFETY POLICY (REFERENCE QUESTION A-6)

Investigation	Responses in Favour of investigation by Firms	%
Existing practice on Safety & Safety Regulation	5	65.50
Safety Regulations	2	25.00
Accident Records & Safety Regulations	1	12.50%
Existing Practice on Safety Safety Regulation Accident Records	-	0.00

As shown above Firms that do not use accident Record as a basis for formulation indicated that they do not have a formal records on investigation and reports of accident records. Furthermore, those that use safety regulations only indicated that the policy was formed at the establishment of the firm and there is no records on its existing practice as of that time.

3.3.5 RESPONSIBILITY FOR FORMULATION

The responsibility for formulation varies from one firm to another. This is seen from the responses of the firms. Table 3.4 shows the summary of responses on the staff responsible for the Formulation of Safety Policy.

<u>TABLE 3.4. RESPONSIBILITY FOR FORMULATION OF SAFETY POLICY (REFERENCE QUESTION A-7</u>

Firm	Response
A.	Chief executive
B.	Selected Management Staff
C.	Personnel Manager
D.	Project Manager, Contract Manager, Site Manager and Site Engineer
E.	Chief Executive
F.	Site Manager and Site Engineer
G.	Administrative Director
H.	Selected Management Staff

The Personnel Manager of Firm C, Administrative Director of Firm G are charged with the responsibility of personnel management and administration of firms. They do not have a technical background.

The firm where selected management staff are responsible for formulation of the policy indicated that these people are hand-picked both within the technical and administrative section. They work like a committee and submit their recommendations to the chief executive and the board.

3.3.6 REVIEW OF SAFETY POLICY (REFERENCE QUESTION A-8)

The period in which the safety policy is reviewed varies from one firm to another. This is shown in table 3.5.

TABLE 3.5 RESPONSE ON REVIEW OF SAFETY POLICY

Review	No of firms responded in favour	%
Never Reviewed	4	50.00
Quarterly	1	12.50
As and when required	3	37.50

The firms that review their safety policy as and when required further explained that this is done when there is a general change either due to diversification or shrinkage of firm's area of activity and when there is some innovation in the practice of construction technology.

3.4.0 ORGANISATION FOR SAFETY (REFERENCE QUESTION B -1)

All the firms investigated responded that they have an organisation for Safety. This organisation is placed under the responsibility of a Senior Staff. Table 3.6 shows the response on the staff responsible for the firms safety.

TABLE 3.6 RESPONSE ON RESPONSIBILITY FOR FIRM's SAFETY REFERENCE QUESTION B-2)

Firm	Staff Responsible for Safety
A	Chief Executive
B	Site Agent
C	Personnel Manager
D	Site Manager
E	Project Manager
F	Administrative Director
G	Administrative Manager
H	General Manager

The Personnel Manager, Administrative Director and Administrative Manager mentioned in Table 3.6 are charged with personnel management and administration and have no technical training.

3.4.1 SAFETY ADVISERS (REFERENCE QUESTION 3-3)

25% of the firms responded that they have safety adviser who works on consultancy basis. Their major duties include general advice on safety, handling and use of safety equipment.

3.4.2 SAFETY COORDINATOR (REFERENCE QUESTION B-5

About 63% of the firms indicated that they have a coordinator who assist the staff charged with the responsibility of the firms safety.

While 13% indicated that there is no coordinator and opined that it will be a duplication of duty by appointing both the coordinator him and the staff charged with the responsibility of firm's safety.

3.4.3. SAFETY COMMITTEES (REFERENCE QUESTION B-8)

25% of firms investigated responded that they have safety committee. It comprises of selected senior staff and their major responsibility includes informing workers on safety, draft work procedures and recommend issues on safety.

3.5.0. SITE LAYOUT PLANNING

About 99% of the Firms responded positively on the consideration of safety when planning the site layout. The remaining however indicated that project location governs safety because some site are located in remote areas and is not easy to achieve complete safety. The following are the response on the various factors of layout planning.

3.5.1. PLANT LOCATION (REFERENCE QUESTION (2-1)

Some of the factors considered when selecting location for plant is summarized in Table 3.7.

TABLE 3.7. RESPONSE ON FACTORS FOR LOCATING PLANTS

Firm	Factor
A	Well prepared Site
B	Far From area of activity
C	Enough space, accessibility, easy removal of gases
E	Stability of ground, availability of water in case of fire, easy entry and exit
F	Where it can be effectively used
G	Remote Parts of Site
H	Depend the Site

3.5.2 ACCESS ROAD LOCATION (REFERENCE QUESTION C1-2)

Table 3.8. show the summary of safety factors considered when locating access road on site.

3.5.3 - TEMPORARY SERVICE (REFERENCE QUESTION) (2-3)

The general response as regard temporary service is that caution is taken especially where there is an electricity cable that passes over the site to avoid touching by machines, scaffolds.

3.5.4. - MATERIAL STORAGE (REFERENCE QUESTION) (2-4)

The response as regard the material storage areas also indicated that easy access, stable platform separate storage for explosives and inflammable liquids, are considered by firms.

TABLE 3.8 SAFETY FACTORS CONSIDERED FOR ACCESS ROAD

FIRMS	FACTORS
A	Most minimum man-machine interaction
B	Depends on the site
C	Road does not Criss-Cross
D	Least radii of Curvature Sufficient Passage
E	Depends on the Site
F	Void from any obstruction, easy Passage
G	Shortest Distance
H	Depends on Site

3.5.5 SITE OFFICES LOCATION (REFERENCE QUESTION C 2-5

The response on factors considered when locating sites offices indicates about 63% of the firms stated that the location depends on the site.

While- about 43% of the firms stated the maximum safety for member of public and staff are obtained when it is located near the entry.

3.5.6. FENCING (REFERENCE QUESTION C 2-6)

The main consideration by all firms as regard safety is that the fence should exclude all the members, of public and unauthorised person from entering the site.

3.5.7. CAR PARKS LOCATION (REFERENCE QUESTION (C 2-7)

On safety factor considered for car park, 75% of the firms investigated responded that it will be located in area away from area of activity which may be within or outside the site depending on the site the other two firms indicated that the location depends on the site only.

3.5.8 ACCOMMODATION, CANTEEN AND WORKSHOPS (REFERENCE QUESTION (2-8)

The response indicated that such places are located away from area of activity and only provided when there is enough space.

3.6.0. PROJECT PLANNING (NETWORK DIAGRAMS)

All the firms investigated except about 13% undertakes project planning through the use of network diagrams (in programme evaluation and Review technique and critical path method). Consideration is given for safety when undertaking the project planning.

50% of the firms investigated described the various hazards considered (Reference Question D3) when undertaking project planning. Some of the response are as follows.

i) Hazard of excavation

ii) Falling object, mechanical transport and use of explosives

iii) Death by falling electrocution and general accident causes

iv) Collapse of scaffolds and fall of carpenters.

These in their opinion are among the other Hazards considered which are many to list. Those firms that are not specific about the hazards further indicated that accident prevention is considered paramount and all alternatives are explored to avoid hazards.

3.6.1 USES OF NETWORK DIAGRAM IN ACCIDENT PREVENTION (REFERENCE QUESTION D-4)

Response by firms as regard its usage to prevent accident is not adequate. They opined that adequate care is taken when preparing the diagram to prevent accident. This diagram after drawn is used to analyse which activity are critical which starts before the other.

3.6.2 METHOD STATEMENT

The method statement as apart of project planning is used by about 63% of the firms investigated.

The main safety factor which these firms considered when selecting plants for inclusion into the statement includes maneuverability, reliability responsiveness and built in safety devices.

For selecting particular method of construction (Reference Question E3) the firms indicated that it is governed, by the availability of material labour, plant and the general work situation. Whichever method selected, adequate precaution is taken to avoid accidents.

3.7.0 SAFETY EDUCATION

The education programme on safety exist in all the except in about 13% of the Firms investigated. The aim of the education varies from firm to firm. Table 3.7 show the summary of responses on the aims of the safety education.

TABLE 3.9. - RESPONSE ON AIMS OF EDUCATION (REFERENCE QUESTION F-2)

FIRM	AIM
A	Promote safe acts at work
B	Educate workers on safety and safe construction methodology
C	Increase knowledge in First Aid
D	Accident Avoidance
E	-
F	Accident prevention and fire fighting equipment operation
G	Informing worker on prevention and use of safety equipment
H	Keeping workers alive, injury free and teaching of safety procedure.

3.7.1 CATEGORY OF WORKER WHICH UNDERGO SAFETY EDUCATION (REFERENCE QUESTION F-3)

The Table 3.10 shows the summary of response

TABLE 3.10 RESPONSE ON CATEGORY OF WORKERS EDUCATED

Category	Response in Favour	%
All	3	37.50
Operatives	3	37.50
Supervisors Foremen	1	12.50

3.7.2. METHOD OF EDUCATION (REFERENCE QUESTION F-4

The method of education mentioned in the literature review is used by all the firms investigated. The firms in which all categories of workers are educated indicated that they mainly use posters, films, talks, lectures and conferences in educating them. While those that educate site workers use mainly posters, talks and display as their method of education.

However the use of films and posters it was further revealed is not very frequent as the safety films are very expensive to get and posters not easy to come by.

3.7.3 RATE OF CONDUCTING SAFETY EDUCATION (REFERENCE QUESTION F-5)

TABLE 3.11 RATE OF SAFETY EDUCATION

FIRM	RESPONSE
A	As deemed Necessary
B	Yearly
C	-
D	Twice a month
E	Occasionally
F	Periodically
G	Periodically
H	-

3.8.0 SAFETY TRAINING

The safety training of employees is carried out in all firms except B and H. The aim of the training programme varies from one firm to another. (Reference Question G 2). Table 3.12 shows the various aims of the programme.

TABLE 3.12:- AIMS OF SAFETY TRAINING (REFERENCE QUESTION G-2)

FIRM	AIM
A	Train an how to avoid
B	-
C	Improve knowledge of first aid
E	Train on the use of Safety Devices
F	Update and broaden knowledge on the field of safety
G	Train on accident prevention
H	-

3.8.1 CATEGORY OF WORKER TRAINED (REFERENCE QUESTION G-3)

Table 3.13 shows the response on category of worker that undergo safety training on the firms investigated

Table 3.13. CATEGORY OF WORKERS TANNED

Category	Response in favour	%
All	2	25.00
Foremen and Technicians	2	25.00
Operatives	2	25.00

The general response on aspect of safety the workers trained indicated that foremen are trained on supervision oriented safety training, management on drafting - work procedures and policies, analysing safety practice and method of accident prevention. The work people are generally trained on how to avoid unsafe act and condition and use of equipment.

The method used in training includes workshops, seminars, lectures for managers, while demonstrations and displays for foremen and site workers.

3.8.2. <u>INDUCTION TRAINING</u> (REFERENCE QUESTIONs G-4)

About 43% of the firms responded in favour of induction training for new employees. This training is done by attaching the newly employed labourer to an experienced labourer to teach him how to undertake the work safety. However, this is done only to work which is considered risky.

The firms where the induction training is not being conducted opined that since all labourers employed have some knowledge in their respective jobs, therefore the induction training is not necessary.

3.9.0 SAFETY CHECKLIST AND STANDARD FOR SITE (REFERENCE QUESTION G-5

The safety check list is being used in all except about 43% of the firms investigated. However there is no standard checklist prepared but rather an 'ad hoc' checklist is prepared as and when necessary. This 'ad/hoc' checklist is prepared when a site inspection is desired.

However, all the respondents accepted the importance of the checklist in maintaining good safety standard for site.

3.9.1 SITE INSPECTION (REFERENCE QUESTION G-5

Site inspection is conducted in all the firms investigated ,and is conducted by a Senior Management staff. The level of inspection in the opinion of the respondents is satisfactory. However, the frequency ranges from daily to weekly in all the firms.

CHAPTER FOUR

ANALYSIS OF INVESTIGATION ON EXISTING PRACTICE

4.0.0 Introduction

The previous chapter presented the existing practice on the implementation and formulation of safety policy as practiced by some medium sized construction Firms. This chapter relates the existing practice to the literature reviewed in order to identify any differences and discrepancies which may give rise to problems with the practice. This enable suggestions to be made for the betterment of the practice.

4.1.0. SAFETY POLICY FORMULATION

i. Safety Policy

There is no notable differences between the safety policy stated in the literature with the one practiced. The policy in practice contains statements and some contains guidelines, which is the same as the one stated in the literature.

ii. Endorsement of Policy

About 13% of the firms reported that its policy is not being endorsed by either the Board or the chief executive, it has been stated in chapter two that the safety policy unlike other policies requires action from all the categories of workers. In order for this to be successful, safety policy must be endorsed by the Board or chief executive.

iii. Publicity and Distribution

Majority of the firm investigated do not publish and distribute their policy. Since safety within an organisation affects, everybody, all employee must be informed through publishing and distribution. If this is not done the policy will not be effectively communicated.

iv. Objective of Safety Policy

The response of firms on the objective of safety policy is in line with the existing practice. There is no difference with the underline reviewed.

v. Basis For Formulation of Safety Policy

The use of the accident records, reports from the analysis of the existing practice and safety Regulations as a basis for formulation of safety policy ensures adequate inclusion of all accident preventive measures into the policy. All the firms investigated do not use all these three factors due to reasons stated in section 3.3. The omission of any of these factors will lead to the formulation of inadequate policy - because advantage of getting information from each of the factor is not achieved when it is not considered.

vi <u>Responsibility for formulation</u>

The responsibility for formulation of the policy, as reported in some firms, is either with the personnel manager, or administrative director. It has also been indicated that these people do not have a technical background in construction technology. It is apparent that such staff do not have the knowledge of basic construction process regardless of accident prevention. It is therefore not appropriate for firms to give the responsibility of formulation of the policy to these staff.

Furthermore where the responsibility for formulation lies with technical staff the representative of the foremen and operative is not included. This does not ensure adequate contribution from all categories of staff and collective decision making. The advantage of ready acceptance of the policy especially when collectively formulated, is not there as well.

vii. <u>Review of Safety Policy</u>

The practice of not reviewing the safety policy as and when the need arises is detrimental, since it does not update the policy. Safety policies are reviewed when there is an innovation in the construction industry or when the firm diversifies its area of operation, it is therefore not a good practice to review policy quarterly or not to review it at all.

4.20 IMPLEMENTATION OF SAFETY POLICY

i. <u>Organisation for Safety</u>

The overall responsibility for safety in some firms are delegated to either an administrative or personnel manager. It has also been stated that these staff are trained only to do administrative work. Since the firm's safety responsibility entails making recommendations, to the chief executive and board on safety matters and offering suggestion on how to improve firm's safety. Such suggestions and recommendations which may come from an administrative staff will not be as critical and technical as it would be from someone technically versed. Therefore the practice of delegating the firms responsibility of safety to an administrative is detrimental for the effective implementation of the policy.

ii. Safety Adviser/Coordinator

The report indicated the role of the safety adviser is not properly defined. This has been shown in the responses - and firms did not recognise its value. The duties of the coordinator is not properly defined too in firm which reported to have them. The coordinator will assist the management staff responsible especially when the firm operates in very many location, this ensures effective implementation.

iii. Safety Committees

Responses of firms for not having safety committees to make vital decisions on safety shows lack of understanding of its importance. The general advantage of collective decision making and obtaining suggestions from its member is not achieved.

4.3.0 SITE LAYOUT PLANNING

The general response on the site layout

planning by firms shows understanding of the importance attached to safety when making site layout planning.

There is no variation on the response on the various factors of the site layout planning, with the literature review.

4.4.0 <u>Project Planning (Network Diagram)</u>

The response as regards hazards being considered when planning for project using the network diagram is satisfactory.

However lack of use of the network diagrams as an important tool in accident prevention does not ensures full implementation of the policy. The advantages used in section 2.5.2 is not gained. Due to lack of pre-planning, (Network diagram) employees may be asked to perform more hazardous work than would otherwise be necessary.

4.5.0 <u>Method Statement</u>

The report on the investigation reveals that the use method statement as a tool in accident prevention is not being practiced fully as respononded on P. 78.. This was portrayed in the responses. The advantages stated in section 2.5.4 is not gained.

The response on the factors considered in plant selection and particular method of

construction is satisfactory. The response on selection of particular method of construction which is said to be dependent on availability of plant, labour, and material indicates that safety in this case may be compromised, though adequate care is to be taken to avoid accidents. This according to them may be lack of availability of plant for particular method which make the firm to use the alternative method which is considered unsafe.
This is not revealed in the literature review and it is a good point.

However, lack of response as regard the use of the method statement indicates lack of understanding of the user of this statement as a tool in accident prevention especially when the work is being carried out on site. This is a vital means of accident prevention as indicated in the section 2.5.4.

4.6.0 EDUCATION

i. AIM

The response by various firms on the aims of the education on safety is the same as in the literature review and is satisfactory.

ii Category of Workers Educated

The response on the category of workers educated on safety shows that not all the firms investigated educate all categories of workers (i.e. from top management to site workers) on safety. It has been stated in the literature reviewed that the education deals with the development of the mind, broadening of ones knowledge and understanding on safety. To achieve this each and every one must be educated.

iii. Method of Education

Methods of education in various firms shows that there are no variation with the literature reviewed, the responses are satisfactory.

iv. Rate of Conducting Education

The rate of conducting education varies from firm to firm. The education on safety must be conducted as the firm deems it necessary especially when the rate of accident is on the increase. However some firms responded that the rate at which the education is conducted as occasionally, periodical etc. This does not ensures continuous parting of knowledge on safety especially when the rate of accident is on the increases.

4.7.0 TRAINING

Training has been stated in chapter three that it deals with the development of skills in performance and decision making which is an important aspect on accident prevention. However, some firms indicated that they do not have a training programme at all. Since there is constant changes in the construction practices, even an experienced worker has to be trained and is therefore a bad practice for a firms not to have a training programme on safety.

i. AIM

The general aim of all the firm shows that it is the prevention of accident. These responses is satisfactory since this is one of basic aims of the safety policy.

ii. Category of Workers being Trained

Not all firms responded that each category of its worker is being trained. Since training as earlier stated deals with the development of skill in performance and decision making, every category must be trained. This is necessary since the management makes vital decision on safety, foremen train and supervise the workers and the workers do the actual site operations. Lack of proper training will therefore be detrimental for the effective implementation of the safety policy.

iii. Induction Training

The induction training as the responded, is being carried out only in few firms. New employees are prone to accident, training them is very essential especially where the activity is very complex and hazardous. It is therefore not appropriate, not to train new employees at all or not to have a training programme for them.

iv. Aspects of Safety Employees Trained

The various aspect in which the employees are trained by firms investigated is satisfactory and is in line with the literature review.

v. Method of Training

The response on the method of training is satisfactory.

4.8.0 Safety Checklist/Standard for Sites

About 63% of the firms responded that they do not use the checklist at all. Lack of checklist will not only make site inspection difficult but also hinder the setting of standards.

The remaining firms that responded positively indicated that an adhoc list is drawn up The disadvantage of this practice is evident from the fact that it will lead to the omission of some vital factors while drawing up the checklist. This does not ensures adequate checking of activities.

4.9.0. Site Inspection

Major discrepancy evident between the literature reviewed and the existing practice is in the frequency of site inspection. Some firms responded that site inspection is not always carried out especially by a senior management staff. This does not only ensures adequate checking but also creates laxity among foremen to carry out their work generally on site.

CHAPTER FIVE

PROPOSAL FOR IMPROVEMENT OF EXISTING PRACTICE

5.1.0 Introduction

Chapter 4 analysed the existing practice along side the literature reviewed. There are some differences between these two and the problems have been highlighted. These differences noticed makes it necessary to make some proposals which is a modification of the two, to solve, the problems with the practice as well as introduce some aspect into the practice by considering the nature of construction firms in this country and the level of its technological and manpower development.

The following are the proposals for the effective formulation and implementation of safety policy.

5.2.0 Safety Policy

The safety policy for medium size construction firms should contain general statement, methods of its implementation and duties of both employees and employer. An example of such proposed safety policy which in the opinion of the author of this Thesis will be useful for medium sized construction firm is as follows:

General Policy Statement

(a). This firm considers the safety of all its employee at all level as one of its major objectives.

(b) This policy intends to prevent personal injury at all levels and general damage to property.

(c) This firm is responsible for

(i) adoption of the provision of the Nigerian factories act in its operation.

(ii) Training and educating all employees on safety.

(iii) Providing safety clothes, equipment and other safety devices on site to employees

(iv) Providing safe work environment by ensuring effective layout, well defined, safe method of carrying out work through planning.

(d) Employees are requested to cooperate in implementing this policy by:

(i) effectively planning, supervising and executing works on site safely

(ii) using protective equipment at all times when there is the need

(iii) always reporting any unsafe condition on site

(iv) strictly following any laid down rules and procedures on safety

(e) The contracts director is responsible for carrying out and implementing the firms safety policy. The project manager on all sites are to ensure the implementation of the policy.

Signed---------------- Date----------------

Managing Director

The above is a suggested general policy statement which may be adopted by firms. However the policy may be drawn up to suit the particular firm.

(2) The publicity of the policy is to be carried out on site to site basis. The policy is to be distributed to all project sites. The project manager is to distribute the policy to all senior staff on site. The operatives and foremen are gathered and collectively informed of the policy. This is due to the fact these category of people hardly read or write in this country.

(3) The basis for formulation of policy for firms must be based on accident records, existing safety practice of firms. For new firm being established, which may not have an existing practice and

accident records, a survey is to be carried out of other firms which have similar areas of operations. This survey will be used as a basis for formulation of its policy.

Existing firms that do not have accident records may use similar survey of other firm to establish its basis for formulation its policy.

(4) The formulation of policy must be done collectively. The project managers of different sites may conduct interviews and request for memoirs from its staff. Such request for memoires is seen in Appendix D, which may be adopted by firms. The result from interviews and memoires may be used to asses the opinion of every body.

(5) Safety policy is to be reviewed when there are changes in the practice of firm either due to diversification, specialization or innovation in the technology of construction.

5.30 IMPLEMENTATION

5.3.1 Organisation For Safety

(a) The responsibility for the firms safety is to be delegated to the contract director or its equivalent. The disadvantage of delegating such responsibility to non technical staff has been mentioned in the analysis.

(b) Since it has been seen that the use of safety adviser or the safety profession has not developed in the country, project managers are to be delegated the responsibility for coordinating the safety on various sites. These project managers are responsible to the contracts director.

The organisational structure for safety in a medium sized construction firms in Nigeria may look like this.

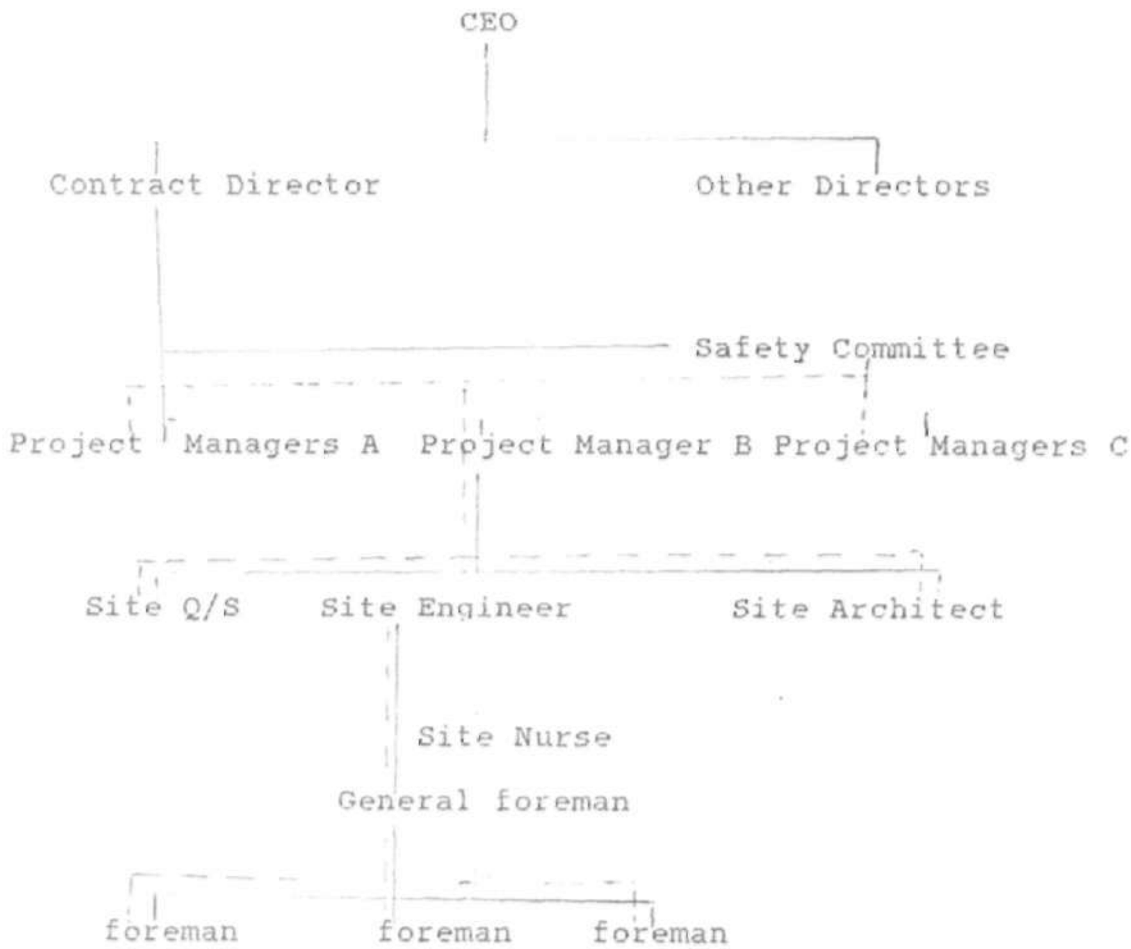


Fig. 5.1 Proposed Organisational Structure For Safety.

The lines in the Organisational Structure diagram are :-

---------------- Line of Communication

---------------- Line of Responsibility

The organisational structure shown in fig 5.1 will be effective for medium sized construction firms. The position of the safety adviser/coordinator will be replaced by a safety committee. This is because the safety profession is not fully developed in this country and the role of the safety coordinator is defined in the various firms. Instead the safety committee will be responsible for general coordination of the firms safety. This committee will comprise of some selected management staff and project managers of different sites. The project managers will be responsible for collecting information on safety on various site for discussion in committee meetings.

The proposed organisational structure shows the lines of communication and that of the responsibility.

5.3.2 SITE LAYOUT PLANNING

Though there is no problem with the existing practice as regards safety factors considered in site layout planning, firms should bear in mind that safety in construction site is necessary and can be achieve by effective site planning.

5.3.3 PROJECT PLANNING (NETWORK ANALYSIS AND METHOD STATEMENT)

The network analysis and the method statement are not being used by most of the firms in accident prevention. Firms should understand the importance of these two aspects and consider it as a vital tool in implementing safety policy and accident prevention. However, as an alternative, where firms do not use these two methods of planning, possible activities which are considered hazardous are used. Necessary training and instruction are made at the start of each of this activity. Further more the list of all the safety clothing, equipments and devices are made together with the activity list. An example of this may be

(1) Goggles used when chipping, riveting, caulking scaling, dry grinding and welding

(2) Shoes - possible injury by nails, crushing of objects

(3) Hard Hats - struck, falling or flying object which may injure the head.

Such list will assist the firm in knowing what is to use when.

5.3.4. SAFETY EDUCATION

Firms are to educate all category of workers.

This can be achieved mainly through displays, conferences and lectures - because of non-availability of posters and film show facilities. Lectures and conferences are to deal with specific aspects of safety which are common to the construction industry and is to be continuous. Safety bodies in Nigeria should endeavour to provide posters and films in local languages.

5.3.5. TRAINING

The training programme for firm is a necessity if accident prevention is to become reality. Firms are to have training programme covering all category of workers.

The induction training of newly employed labourer is to be considered priority.

5.3.6. Safety Checklist/standard for Site

The safety checklist/standard for site is to be drawn up by firms at the inception of every project. These checklist may be reviewed as the work is continued. The main item included may be similar to the one in section 2.7.0. Firms may however draw up such list to suite particular circumstances and projects.

(a) Site Inspection

Site inspection must be part of daily routine on construction sites. It is to be conducted by management staff, preferably the project manager.

Inspection is to be done using the checklist drawn in section 5.3.6. The above proposals are suggestion to some of the problems highlighted. It is to improve the existing practice. This is the aim of the thesis. The proposal is to serve as a guide for firms in formulating and implementing safety policy, this is because various firms have different circumstances to deal in with. The success of these proposals depends largely on the Committment of the employers and the employees of the firm. The commitment made towards a common and defined goal laid down in the safety policy .

5.4.0 RECOMMENDATIONS

The following recommendations are made so as to assist firms in incorporating the various procedures of formulation and implementation of safely policy into their operations at different times.

These recommendations are made with refrence to the time of establishment of the firm, during the life of the firm and at the inception of projects.

5.4.1 AT THE TIME OF THE ESTABLISHMENT OF THE FIRM

The first draft of the safely policy is made at this scage. This is done by taking a survey of the safety practice of existing firms which have similar areas of operation.

The safety training and education for all categories of worker is started at this stage. This is done by sponsoring its management staff for seminars, workshops and short course on safety. The purchase of safety equipment and clothing is made as this stage. Necessary education and training programme is further designed.

5.4.2 During the Life of Firm

The policy drafted at the establishment of the firm is reviewed as the firm grows and area of its operation is diversified. The training and education programme for all categories of worker is continued and then programme is further expanded to accommodate any change in the practice within the industry.

5.4.3 At the Inception of Projects

The precontract period is a crucial stage for safety policy implementation. This is the stage in which most of the planning and vital decision on project are finalized. It is at this period that the contractor develops a close liaison with clients' team. The construction firm at this stage should inform the client's team of its safety programme so as to ensure understanding and corporation, from them. Attention should be given to the following specific areas:

(a) Precontract Planning Meeting

This is the meeting held in the construction firm to announce the award of the contract and to acquaint everybody with the project. Such meeting is usually chaired by the contract director. The construction department is formally given the go ahead to start the work and various document are formerly handed over to this department. The contracts director at this stage is to emphasis the need for safety at every stage of the work.

(b) Arrangement for Commencement of Work

The arrangement for the commencement of work is another stage of the precontract planning. This stage includes;

(i) Organisation for Project

This is the setting up of the organisation for the project. This includes the necessary redeployment of staff from the head office to the project. It is at this stage that various safety responsibility is defined for various staff, what is expected from them e.g. the planning engineer to consider safety when undertaking the planning for project.

(ii) Site Layout Planning

The information available at the pre-tender stage drawings and other information on the site is used to produce the site plan. Necessary safety factors described in chapter two is considered.

(iii) Placing order from Subcontractors and Suppliers.

At this stage, the subcontractors and suppliers are informed of the safety standard they are expected to work with. Any use of special equipments and clothing which the firm thinks will enhance safety standards, are requested to be provided by the subcontracts.

(iv) Programme of Work

At the period of planning the work through which the programme of the work is produced, various safety factors are considered especially when the network diagram technique is used. The step by step procedure described in chapter two will be used.

(c) Commencement of Operation on Site

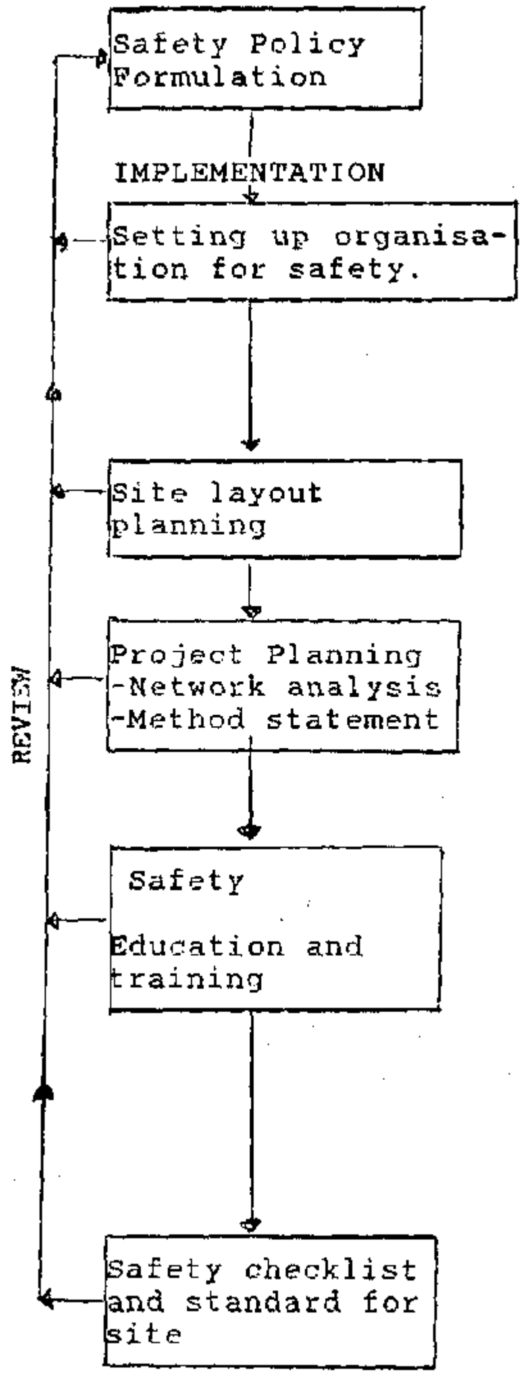
After setting up the organisational structure, completing the programme etc, and before the commencement of operation on site, the training and education of the worker is started. The workers especially the operatives are informed of the safety policy what the firm will provide and what is expected from them by the project manager.

The safety checklist of various activity is prepared at this stage to cover the major site operations.

The above recommendation will assist in guiding medium sized construction firms in the effective formulation and implementation of safety policy.

The flow chart in Fig. 5.2 summarises the various aspects of formulation and implementation of safety policy in relation to the period it is being carried out

Aspect



Period

Done at the time of establishing the firm and reviewed regularly

It is set up together with the firm's general organisation. The safety organisation for project may be set up at its period of inception

At the commencement of project before the actual work is started on site

Done when preparing programme of work

Continuous process right from the time of establishing the firm Done intensively at the commencement of project and continued through out its duration.

Drawn up at inception of firm and for various project sites,at commence-ment of project and while the work is on progress.

Fig. 5.2 Flow chart on various aspect of formulation implementation and period being carried out.

CHAPTER SIX

CONCLUSION

6.1.0. CONCLUSION

From the analysis in chapter four, the existance of safely policy is an indication that its importance is known. However the formulation and implemation aspect is shown to have been associated with many problems. Some of these problems mentioned includes.

i) Non endorsement of safety policy by either the board or chief Executive which does not ensures full compliances ii) Lack of effective methods of distribution and publicity of the policy will not ensure the full knowledge of the safety policy and its content by all employees.

iii) Non-utilization of accident record, survey of firms own safety practice and the Nigeria factory acts as a basis of formulation of safety policy .

iv) Non consideration of opinion of all the workers when formulating safety policy

v) Lack of review of safety policy

vi) Delegation of overall firms responsibility for safety to non technical staff

vii) Non defined role of safety

coordination/ adviser

viii) Non existence of safety committee

ix Lack of effective utilization of project planning techniques of network analysis and method statement.

x) Non existence of effective safety training and education programme covering all categories of works.

xi) Lack of comprehensive safety checklist or standard for construction site.

These problems if not addressed will bring about set backs in the effective formulation and implementation of safety policy. To minimise this a general proposal for improvement of the practice was made in Chapter five.

Finally the author hoped that this thesis will be of immense benefit to construction firms and inspires scholars to undertake more research into the field of construction safety, especially on the aspect of economic benefits of safety, to construction firms.

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AG

APPENDIX A

Q U E S T I O N N A I R E

1. Name of organisation...............................
2. Date it was established........................
3. Types of projects being handled ....

Please kindly answer the following questions:

A - SAFETY POLICY

Safety policy is a course of action laid down by an organisation which serves as a guiding principle and procedure in accident prevention to be followed when planning and execution of work so as to achieve safe working condition and workers act in a safe way.

1. Does your organisation have a safety policy? Yes/No.
2. Is the safety policy written Yes/No.
3. Is it endorsed by the board of director or the chief executive? Yes/No.
4. Is it well published and distributed to all categories of workers? Yes/No.
5. What is the main objective of the policy?

....
....
....

6. What basis is it used for formulation of the

safety policy

(1) Accident records

(2) Existing practice on safety

(3) Safety Regulations

(4) Others specify please ....

....

7. Who is/are responsible for formulating the safety policy?

....

....

8. How often do you review the safety policy?

....

....

B - IMPLEMENTATION OF THE SAFETY POLICY
ORGANISATION FOR SAFETY

1. Are the various responsibilities for safety defined within your organisation from management down to the operatives? Yes/No.

2. Who is responsible to the board on issues concerning safety?

....

....

3. Do you have a safety adviser? Yes/No.

4. If Yes what are his major responsibilities?

....

....

5. If no who co-ordinates the safety activity of the organisation?

....

....

....

6. What are his major responsibilities?

....

....

....

7. What is the relationship of the safety adviser or co-ordinator with other people in the organisation?

....

....

....

8. Do you have a safety committee? Yes/No.

9. If yes what are its duties?

....

....

....

C - <u>SITE LAYOUT PLANNING</u>

1. Do you consider safety when planning the site layout? Yes/No

2. Please briefly state the safety factors considered when planning for:

   1. Plant location ....

      ....

2. Temporary access road ....

....

....

3. Temporary services ....

....

....

4. Material storage area ....

....

....

5 Location of Offices ....

....

....

6. Fencing ....

....

....

7. Car Parks ....

....

....

8. Accommodation, canteen and workshop

....

....

D - PROJECT PLANNING (NETWORK ANALYSIS)

1. Is safety being considered when undertaking project planning using Network analysis? Yes/No.

2. Is hazard related to ways and sequence of carrying out work considered when planning for work? Yes/No.

3. What are the possible hazards considered when planning for projects?

....

....

....

4. Please state how the network diagram is used in accident prevention in your organisation ....

....

....

E - PROJECT PLANNING (METHOD STATEMENT)

1. Is safety being considered when preparing the method statement?

2. When selecting for particular plants what safety factors are considered? ....

....

....

....

3. In selection particular methods of construction, what safety factors are considered? ....

....

....

4. What are the uses of method statement in accident prevention in your organisation?

....

....

F- EDUCATION

1. Does your organisation have safety education programme for employees? Yes/No.
2. What are the aims of such programme?......
....
....
3. Which categories of workers under go such education................................
4. Which of these methods is used in educating employees?
   (a) Posters
   (b) Films
   (c) Talks, Lectures and Conferences
   (d) Other please specify..................
   ....
5. How often is the education conducted?.....
....

G - TRAINING

1. Does your organisation conduct safety training? Yes/No.
2. What are the aims of the safety training?
....
....
3. Which category of workers undergo the safety training? ....
....
....

....

4. Is there an induction training programme for new employees? Yes/No

5. Which aspect of safety is the management staff trained? ....
....
....
   2. Foremen ....
   ....
   ....
   3. Work people ....
   ....
   ....

6. How do you train these categories of workers on safety?
   1. Management ....
   ....
   ....
   2. Foremen ....
   ....
   ....
   3. Work people ....
   ....
   ....

H - <u>SAFETY CHECK LIST AND STANDARD FOR SITE</u>

1. Is there a written safety checklist/standard for various

activities on site? Yes/No.

2. What are the major items being considered when drawing up this list?

....

....

....

3. Is the level of inspection on site in your organisation satisfactory? Yes/No

4. Who conducts site inspection to ensure that the safety standards is being adopted? ....

....

5. How often is site inspection conducted?

....

....

....

NAME: ....

SIGNATURE:................

RANK:....................

APPENDIX B

Immediate Cause	Possible Underlying Causes	failure / Inadequacy (in implementation
Poor House Keeping	Hazards not Recognised, Facitilies inadequate	- Supervising, training and Safety indocrimation (education)
Improper Use of tools, equipments, facilities	Lack of Skill and Know ledge Lack of proper procedures Lack of Motivation	- Employee Training - Established operational procedures - Enforcement of proper procedures, - Supervisory Safety indocrination (Educacation) - Employee training and Safety
Unsafe or defective equipment and facilities	Not recognized as Unsafe poor Maintenance Poor designer selection	- Supervisory Safety indocrimation (Education - Employee training and Safety Consciounes - Maintenance and repair system. - Planning, layout and design - Supervisory safety indocrination - Equipment, material and tools
Lack of Proper	Omissions	Operational Procedure

procedures	Errors by Supervision	Supervisory proficiency
Improvising unsafe procedures	Inadequate Training	Established operational procedures
		Enforcement of proper procedures
		Supervisory Safety indoctrination
		Employee training
		Employee Safety Consciousness
	Inadequate Supervision	Supervisory Safety indoctrination
Failure to follow prescribed procedures	Need not Emphasized	Employee Selection and placement Enforcement of Proper procedures
		Supervising Safety indoctrination
	Procedures Unclear	Operational Procedures
Job not understood	Instruction complex	Operational procedure, planning layout
	Inadequate Comprehension	Employee Selection and placement
Lack of awareness of hazards Involved	Inadequate instruction	Supervisory Safety indocrination
	Inadequate Warnings	Employee training and safety
		Consciousness planning, layout.
		Safety rules, measures and equipment
		Operational Procedures.

Lack of proper tools, equipment and Facilities	Need not recognized	Planning, layout.
	Inadequate Supply	Supervisory Safety indocrination
	Deliberate	Equipment, Materials and tools Morale and discipline
Lack of Guards and Safety equipment	Need not recognized	Planning, layout safety rules, measures and equipment Supervisory Safety Indoctrination Employee Safety Consciousness
	Inadequate availability	Equipment, materials and tools
	Deliberate	operational procedures Morale and discipline
Lack of Protective equipment	Deliberate	Morale and discipline
	Need not recognized	Planning, layout Safety rules, measures, equipment Supervisory Safety indoctrination
	Inadequate availability	Employee Safety Consciousness
		Equipment, Material, tool operational procedures
Exceeding procribed limits, load, strength, limits speed	Warning inadequate	Safety rules, Proper procedures

and so on	inadequate Instructions Lack of Comprehension Deliberate	Employee training Employee selection and placement Enforcement of Safety rules Employee safety Consciousness.
Inattention: neglect of obvious Safe Practices	Lack of Motivation Inadequate Comprehension	Enforcement of Safety rules and measures Enforcement of proper procedures Employee training Employee Safety Consciousness Employee Selection and placement.
Failure, reduced alertness and hypnosis	Excessive physical or mental requirement.	Planning layout Employee Selection and placement Operational procedures
Misconduct; deliberate failure to use protective clothing	Low inmorale and poor attitude misassignment	Supervisory training Employee selection and placement Planning, layout, Employee Selection and placement Employee training

Source: Modern Accident Investigation and analysis.
An Executive Guide T. S. Ferry. Pages 186-188

APPENDIX C

SAFETY SURVEY

How good is our safety programme? There is a chance to express your personnal opinion on how you feel toward safety.

Finish each sentence to show what you think of te programme. You may want to give example to explain your anwers.

There is no need to sign this survey. Your answers will be combined with those of thers to determine the groups opinion of our safety programme.

Be frank!

Tell us where our programme has failed. Tell us our good points too!

How can we do a better job in safety.

STATEMENT

1. Safety Training in my department................

2. My Knowledge of accident prevention.............

3. My basic view on Safety.........................

4. The best part of our safety programme is........

5. Cooperativeness of my work group in acheving safety..

6. Evidence of safety in my work area..............

7. Reward for good safety in my work area.........

8. Managements concern for safety.................

9. A person involved in a series of accident.......

10. We hear about safety..........................

11. My best peice about the safety programme.......

12. I think we can improve our safety programme by . ...

Source: Techniques of Safety Management, Dan Peterson. P

R & D Building Company
Pararad Road, Roselip

SAFETY COMMITTEE ANNUAL REPORT

Company Safety Officer:
Assistant Safety Officer:
Safety Consultant:
Company Doctor:

Summary of accidents as reported at monthly Safety Meetings

Number of recorded accidents	20
Number of reportable accidents treated on site (eg cuts, grazes, etc)	13
Accidents with hospital treatment but no other lost time	3

Description of injuries

Broken toe	Lost time 12 days	1
Broken ankle	Lost time 7 weeks	1
Head injury	Lost time 4 days (Sub-contractor)	1
Badly bruised hand	Lost time 7 days	1

Frequent bad practices noted

Scaffold defects
Trailing leads
Unguarded stairs and openings
Untidy sites

Conclusion

The health and safety of all employees and site visitors is of great importance, and employees as well as management should make every effort to enforce good practices at all times.

Works Director

Figure 21 *Company safety committee annual report*

R & D Building Company

Pararad Road, Roselip

SITE:
CONTRACT NO:
DATE:
REPORT NO:

SITE INSPECTION REPORT

The numbered items marked in the column below require attention as indicated. These are considered to be a breach of the Health and Safety at Work Act 1974, and the Factories Act, and should be rectified immediately.

1 SCAFFOLDING
2 LADDERS
3 HOISTS AND LIFTING APPLIANCES
4 CRANES AND EXCAVATORS
5 SITE VEHICLES
6 PLANT, MACHINERY
7 PORTABLE TOOLS
8 TEMPORARY ELECTRICS
9 EXCAVATIONS, GROUNDWORKS
10 SITE TIDINESS
11 PROTECTIVE EQUIPMENT
12 L.P.G. H.F.L.
13 WELFARE FACILITIES
14 FIRST AID
15 FIRE PRECAUTIONS
16 REGISTERS
17 SECURITY
18
19
20
21 SAFETY AWARD Points / Comments

Copies: Site
Contracts Manager
Contracts Director
Safety Office

Signed........................ Safety Officer

Figure 39 *Form for site inspection report*

R & D Building Company

Pararad Road, Roselip

PLANT DEPARTMENT

COMPETENCE CARD

Name ....

The company herewith confirms the above named employee to be trained and competent to drive on construction sites, the following plant or vehicles.

1. ....
2. ....
3. ....
4. ....

In addition the same .... has completed and passed the company standard test for such plant on ....
and is an authorised driver until ....
NB. These conditions may be repealed at the discretion of the company Safety Officer subject to any incident that may occur.

Signed ....

Figure 70 *Competence card for vehicle driver*

R & D Building Company

Pararad Road, Roselip

PLANT DEPARTMENT

DRIVERS ADVISORY CARD

The following must be observed at all times.

1. Keep machine in good clean condition.
2. Check and preserve tyre pressure, oil level and fuel level.
3. Have no naked flame when refuelling.
4. Report all defects immediately.
5. Carry out periodic checks as necessary for type of plant.
6. Maintain a clear and concise logbook.
7. Check and maintain guards to all moving parts.
8. Start the machine in accordance with training scheme.
9. Maintain good loading of plant.
10. Check, maintain and drive the plant as instructed and to the best of your ability.
11. Never abuse or use recklessly any plant or machine.
12. Do not drive a poorly loaded machine.
13. Do not check or adjust any machine when it is running.
14. Never carry passengers unless using suitable plant.
15. Do not leave a machine running whilst stationary
16. Never remain at your seat during loading.
17. Do not improvise where repair is needed.
18. Never commence travel without good checking around the plant.
19. Do not exceed acceptable speed limits.
20. Do not ignore any training advice or do anything that may be dangerous or hazardous.

Figure 71 *Drivers' advisory card reminds drivers of safety precautions*

R & D Building Company

Pararad Road, Roselip

CONTRACT:

CONTRACT ADDRESS:

	HAZARD	ACTIONS REQUIRED	ACTION BY	REMARKS
MAIN SITE OFFICE				
CANTEEN				
MALE TOILETS				
FEMALE TOILETS				
WASH AREA				
MAIN STORE				
TIMBER COMPOUND				
FUEL STORE				
L.P.G. STORE				
WORK AREA: STAGE 1				
WORK AREA: STAGE 2				
WORK AREA: STAGE 3				
SUBCONTRACTORS STORE				

I THE UNDERSIGNED HAVE INSPECTED THE SITE DESCRIBED ABOVE AND UNDERTAKE TO TAKE ALL ACTIONS REQUIRED TO ELIMINATE ALL FIRE HAZARDS.

INSPECTOR OF THE SITE ....

POSITION/TITLE ....

DATE ....

Figure 105 *Form for checking site for fire hazards*