

A STUDY OF CONSTRUCTION SAFETY ADMINISTRATION  
ON BUILDING SITES IN NAIROBI AREA.

BY

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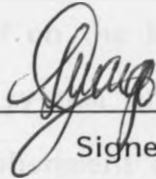
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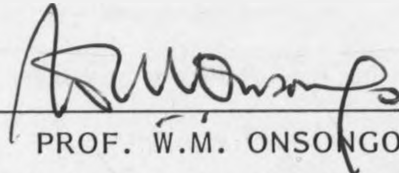


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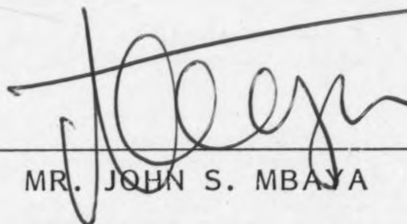
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## DEDICATION

This work is dedicated to my late grandmother, MWIHAKI, who had more than her fair share of sorrows (and joys) of the "odious" role of bringing up a young grandson and setting him off on the long and uncertain path of an education system which culminated in the accomplishment of this study.

## ACKNOWLEDGEMENTS

In way of acknowledgements it may not be possible to thank all those individuals and organizations who in one way or other contributed to accomplishment of this study. However it would be quite unethical and against known protocol and tradition if mention was not made of, and word of appreciation extended to a few who made outstanding contribution.

My supervisor Mr. J.S. Mbaya did all that was in his ability to guide me through evolution of the ideas, choice of analytical tools and the organization of findings in this study to come up with this volume. Professor W.M. Onsongo, of the Department of Civil Engineering, offered valuable ideas and comments which contributed towards the final revision of the study. The contributions of the members of academic staff in the Department of Land Development in diagnostic seminars channelled thinking towards the course and direction upon which the study finally took root. I am grateful to the Deans Committee of the University of Nairobi which awarded the generous scholarship which made the study economically feasible.

During the fieldwork phase of the project officials of the Development Control Unit of the Nairobi City Commission accorded help without which the collection of data would not have been as smooth sailing. The departmental staff of the

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My parents struggles to ensure that I got the best education they could afford me can never be repaid. All these were possible through God in whom all things are possible.

Finally, I would like to thank Mr. P.G. Kimani for patiently typing the work from the original handwritten draft and subsequently performing the painstaking task of effecting all the corrections made to the draft over time up to the production of the final revised version.

C.M. MWANGI

1989.

## ABSTRACT

This study is about the administration of construction safety on building sites. The phrase construction safety is hereby used in its wider usage and meaning which embraces the occupational safety of workers involved in construction work on the sites, the safety of parties who may only be remotely associated with the activities on site either as pedestrians or other people carrying out their businesses near the site or in its immediate environs but close enough for them to be affected by accidents occurring on site and finally the safety of material property that is likely to be damaged in case of accident occurrence emanating from the site activities. The term administration is taken to include the total control and direction of all matters that may relate or are circumstantial to the entire state of safety of the construction work place.

The study considers the administrators of safety at the construction site as being the complete institutional framework necessary for the existence of a construction work environment free of undue risks which are responsible for triggering off the accident causation mechanism.

The three institutions that the study considers as basic constituents in the creation of a framework for a safe system of work on the construction site and which therefore it set out to investigate are construction process management, the legislation and the enforcing machinery set up to enforce

the statutes of the legislation. The contributions of all the three institutions and other parties who may play a peripheral role must converge at the site where construction activity takes place in what may be termed as the construction work-place. Success of the efforts destined to make construction a safe place of work therefore depends on the harmonious integration and control at the site level. In this sense the site is the central core in the institutional network considered in the safety system. The study revolves around the site with site management as the pivotal institution on account of its role of harnessing all the resources from the three institutions in form of ideas, professional knowledge and material inputs and ensuring that they reach the intended level and are utilized effectively.

The main ideas of the theoretical framework upon which the study is based unfolds in the review of the general theory on industrial and occupational safety and culminates in the development of specialized theory on construction safety. The economic implications of safety to the general industrial undertaking and specifically to the construction industry and the firm are also outlined within the theoretical framework. From the specialised theory of construction safety a site safety model is developed which then forms the basis upon which the field survey is designed. The research set out to test this model by exploring the various variables within the sample of sites selected for observation.

Based on the findings of the research, the study concludes that sites in Nairobi are not incorporated with adequate safety measures and safeguards necessary to reduce risks at the work place to reasonably practicable levels so as to prevent accident occurrence and the resulting damage. This constitutes evidence that contractors are negligent in their role of providing a safe work-place. The study also reveals that safety is not well provided for in management philosophy and practice of the contractors both at the firm and the site levels. The most probable reason for this shortfall, as the study established, is lack of awareness and consciousness on the part of the contractor on the economic implications of a safe work environment to the well being of his firm and industry at large. The statutory control mechanisms contained in legislation, and the enforcing machinery also have several shortcomings which contribute to the deplorable safety status on the sites.

A basic recommendation of the study is the launching of a massive and elaborate education campaign to create awareness and arouse consciousness as to the benefits of a safe construction process to all the participants in the process. The study also recommends some institutional changes in the industry necessary to accommodate and enhance the safety status within the entire framework of the construction process. These include changes in the contractual relationships as well



as in the organizational set ups especially within the contracting organizations. Statutory changes are also necessary to make the statutes more effective in motivating contractors to provide a safe work-place and promote safe practice. This includes reorganization of the enforcing machinery for more effective vigilance on the contractors. These changes must be backed by an effective professionally reputable advisory personnel well versed with all aspects of production in construction and having specialised knowledge in the area of safety. The study therefore recommends the setting up of the right institutional machinery to develop and promote this cadre of personnel.

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## CHAPTER ONE

### INTRODUCTION

#### Problem Statement

The construction stage of the project marks the process of realization of design into a physical product which is expected to fulfill the needs of the client as articulated in his brief to the designer. It is a most crucial stage of the project in terms of resource utilization, composition and concentration. What is more important and relevant to this study is that the activities are concentrated at one particular place, the site. This is the piece of land of a given physical extent in which all activities have to be carried out, and on which the project is constructed.

The construction process in most cases is a complex one involving many activities and many people. The activities may require diverse specialities which means that many business entities have to be represented on the site at any one time. It may also require a whole range of plant and machinery necessary to perform some of the activities with speed and ease. A substantial amount of material requirements and components may also have to be stocked near the work place to facilitate smooth uninterrupted workflow. Hence all these people and material resources may have to be accommodated on the site. In addition there may be a lot of movements and interaction to facilitate and maintain the assemblage process. The site therefore becomes a hub of activity with different people doing

different operations interacting throughout and handling materials and components including work at various stages of construction. In such a busy work environment the concern for the safety of workers becomes a matter of prime importance due to the high levels of risks created.

At any work place, the responsibility for the health and safety of workers rests with the employer. This responsibility is both a legal and moral obligation which came to be recognized with the advent of organised industrial activity.<sup>1</sup> To this end, the employer is expected to take all reasonably practicable actions to prevent any potentially hazardous situations that are likely to cause injury to his employees. For the construction process on site, the main contractor is the employer and hence this responsibility rests with him.

The employer is motivated to perform these responsibilities by two incentives. The first one is the pressure of statutory requirements. This is provided for by the laid down legislation and other rules and regulations designed to ensure safe practice at work places. In Kenya, the Factories Act Chapter 514 of the Laws of Kenya govern every work place and lay down the requirements for safety, health and the general welfare of workers. The act also provides for the enforcement of its requirements by way of establishing the Factories Inspectorate.<sup>2</sup>

The second incentive supporting the employer's consideration for worker safety is economic. Any employer with a knack for good business will appreciate the economic

implications of incorporating aspects of safety of the work place in his business strategy. The implication will be reflected in the size of the annual bill for accidents. This will not only apply where he has to offer monetary compensation or meet medical expenses but the broader costs will include the many incidental expenses caused by disruption of work, damage to property and other costly factors which accompany nearly every accident.<sup>3</sup> Loss of skilled personnel arising from accidents is a serious cost to the individual firm and the industry as a whole but which may easily be overlooked by the individual employer. This is especially so in construction which is basically an industry of specialised skills. Each worker is therefore an extremely valuable economic resource element which should be safe-guarded at all reasonable costs.

The economic losses arising out of accidents should not be viewed as damaging to the contractors, business per se. The financial and indirect costs will inevitably cause an escalation of the project costs at the final account stage. Research has shown that accident costs can be as high as three (3%) per cent of total project cost.<sup>4</sup> In the final analysis the client who provides the resources to the industry will end up paying more for the project. This is what makes safety provision a joint responsibility of all parties in the industry, and necessitates a multi-disciplinary approach to the problem.

Due to these business implications, the economic consideration for safety becomes a function of management.

In construction, site management is expected to incorporate safety consideration in its management philosophy. Indeed a combination of good site management, discipline, training and the intelligent application of the relevant legislation have been cited as prerequisites in the provision of a safe work environment.<sup>5</sup>

Taken globally, occupational accidents and diseases remain the most appalling human tragedy of modern industry and one of its most serious forms of economic waste.<sup>6</sup> Many people are killed or receive injuries of various degrees every year. This is quite dear in itself not to mention the great losses in form of equipment damage and material wastage. The economic burden to society is therefore enormous when all forms of losses are considered. In the case of large scale accidents major social dislocations are caused. An accident like the one reported below can only be described as an international disaster and serve to show that industrial accidents are a world wide problem.

Eighteen people were killed and sixty nine injured yesterday when a half finished building collapsed in Aguascalientes, a town some five hundred kilometres northwest of here (Mexico City).....Most of the casualties were building workers employed at the site .....three men<sup>7</sup> buried under the debris were still alive.

Though safety is a problem of all industrial undertakings in the world today, the construction industry seems to have a worse record than average for the general industry.

Construction has for a long time been known to be one of the most dangerous of all industrial working places. It has been established that a building worker if involved in an accident is four times as likely to be killed as his colleague in manufacturing and service industries.<sup>8</sup> Safety authorities have asserted that the industry has the worst record of any which they have to deal with.<sup>9</sup> These accidents in construction occur quite often. For instance the number of people killed each year in construction in the United Kingdom over the last 20 years has averaged one man for each day worked.<sup>10</sup> A recent report quoting figures as recent as 1986 show that there are an average of twelve (12) serious injuries everyday but adds that this is a very conservative figure since many construction firms do not report accidents.<sup>11</sup>

What is most disturbing about the construction safety status as outlined above is the fact that it has been deteriorating over time. Parties with a responsibility of ensuring safe work environment have resorted to accusations and counter accusations among themselves as to who is responsible for the prevailing status. The contractor seems to have borne the blunt of the others wrath with an accusing finger being pointed at him and allegations that he evades his responsibilities in his search for quick profits.<sup>12</sup> Nevertheless, given the multidisciplinary nature of a construction project, construction safety becomes an area where the contributions of all parties are necessary if any success is to be achieved in creating a safe work environment. A proper definition of the roles of these different parties

is called for in order to facilitate adequate co-ordination and control of the entire safety system. With such an inter-disciplinary definition of roles it becomes easier to identify problem areas, diagnose the likely cause of the problem and thereby offer a basis upon which a solution can be sought.

The incidence rate in construction for fatalities and major injuries is 232 per 100,000 while that of all industries is 64 per 100,000.<sup>13</sup> This is the case both in developed and developing countries. In the United Kingdom an average of 200 people are killed while 30,000 are seriously injured every year.<sup>14</sup> Table 1 gives figures for several years. In Kenya, the data available shows that on average construction accounts for 55.7% of all fatal accidents occurring in industry.<sup>15</sup> This data is tabulated in Table 2.

This study was carried out in Nairobi area due to reasons outlined in a latter section of this chapter. A review of the print media in Nairobi was carried out to give an insight into the nature of construction accidents that have occurred in the area. In the six year period between January 1980 and December 1986, more than 40 incidents directly related to construction safety were reported in one local daily alone. A few extracts from these reports as given below will give the nature of the accidents occurring on sites and may be taken as a manifestation of the problem in Nairobi.

TABLE 1.1: NUMBER OF REPORTED CONSTRUCTION INDUSTRY INJURIES IN THE UNITED KINGDOM

YEAR	FATAL	SERIOUS INJURIES
1973	231	37,000
1974	166	34,000
1975	182	35,000
1976	156	36,000
1977	130	32,000
*1985	139	-
*1986	123	-

SOURCES: P.T. Armstrong, Fundamentals of Construction Safety, (London; Hutchinson and Co., 1980), p.16.

\* "360 Danger Sites Stopped." Building Trades Journal October 8, 1987, p.4.

TABLE 1.2: NUMBER OF REPORTED FATAL ACCIDENTS OCCURRING IN INDUSTRY IN KENYA.

YEAR	CONSTRUCTION SITES	OTHER INDUSTRIES	TOTAL DEATHS	PERCENTAGE OF SITE DEATHS
1982	26	15	41	63.4
1983	14	8	22	63.6
1984	35	3	38	92.1
1985	33	60	93	35.5

SOURCE: Factories Inspectorate, Ministry of Labour, compiled by P.S. Kisia, Implementation of Safety Requirements on Building Site, B.A Project 1987, p.26, Table 2.1.



The following report was on an accident which occurred during the construction of one of the tallest building in Nairobi.

The Nairobi City Commission fire brigade officers and policemen used a crane to remove the body of a worker who was killed by a falling object at the 12th floor of the post bank house construction site. The tragedy is the second to have occurred at the site.<sup>16</sup>

In the central business district (CBD) of Nairobi the popularity of high rise construction seems to have increased due to the scarcity of land. Developers have opted for multi-storey structures in an effort to meet the high demand for office space and other commercial uses. Most of the grisly accidents reported in the media seem to emanate from these sites.

The residential areas of Nairobi are not devoid of construction accidents. Particularly prone are the densely populated areas. Here, the high demand for rental housing targeted for the low and middle income earners has led to the proliferation of structures in the form of extensions to already existing houses or new unplanned and unapproved structures. During the construction of such houses accidents have occurred in numbers and severity enough to warrant public uproar and concern. In an article published in a local magazine the writer dubs the structures "killer homes" and notes that the danger posed by such construction extends not only to the construction workers but also to the ultimate users of the houses. A most deplorable case occurred in July 1987 in one of the most

populous residential areas of the city as the following extract reports.

Two people were burried alive and at least two others critically injured when a building under construction on Eastleigh 's sixth avenue collapsed yesterday morning. Four other people who were working on the building were taken to hospital where they were treated and discharged.

The City Commission Engineer..... condemned the building saying it had no plan.....The chairman of the village elders said illegal structures were mushrooming in Eastleigh because of the lust for money. <sup>17</sup>

Members of the public are also exposed to the dangers arising out of construction work on site. As people pass by the site they stand the risk of being hit by objects falling from high rise construction sites, if the proper safeguards have not been incorporated to protect them, as the following report testifies:

A University of Nairobi student and well known actress, Stella Awinja Muka, died yesterday after being hit by a falling object next to a construction site in Nairobi.

Police confirmed that Miss Muka, a third year literature student (sic ), was hit by an object falling off the uncompleted Lillian Towers building on University way at around 10.15 a.m. <sup>18</sup>

The data presented above leads to a clear and unequivocal conclusion with regard to construction safety world wide in general and Nairobi sites in particular. It can be inferred that sites in Nairobi are unsafe since workers and other relevant parties are at a risk of being injured as a result of the accidents

occurring on the sites. These may also cause material damage where they occur. The data also shows that construction has one of the worst safety records among all industries.

### The Hypotheses

The following hypotheses were formulated to offer guidance in carrying out the study. The data collected from the field was geared towards establishing the validity of these hypotheses. These are:

1. The deplorable record of construction safety in construction industry may be attributed to lack of safety measures and safeguards necessary in minimising the risks in the work environment (i.e. the sites).
2. The management philosophy and practice of the construction firms does not incorporate adequate provision for construction safety.
3. The statutory machinery necessary for ensuring safety at the work place (i.e. the sites) is inadequate.

### Objectives

This study has investigated on the likely causes of the seemingly bad safety performance of construction sites. Due to the multidisciplinary nature of construction and hence construction safety, many factors may be postulated as being the likely causes of the problem. A study of this scope cannot attempt to exhaust all these factors. It is the intention of the study to investigate one major factor on account of its pivotal role in the area of construction safety. This is management of the construction process, which is the institution responsible for ensuring a safe place of work on behalf of the contractor. The two supportive institutions which fall within the scope of study are the Parliament, in its capacity as the institution with the responsibility of enacting legislation on construction safety, and secondly, the enforcing machinery which in Kenya is represented by the factories inspectorate of the Ministry of Labour.

To focus on the problem clearly and to facilitate an indepth investigation of the same, it was found more appropriate to derive several objectives. These in effect became sub-problems.

In total, four objectives were derived:

1. To assess the safety performance of construction sites by determining whether adequate safety measures and safeguards are incorporated to reduce

to practicable possible minimum the risk of injury to workers and other parties. This in turn will help in assessing to what extent the current safety situation can be attributed to lack of these measures and safeguards at the work place.

2. To evaluate construction firms management philosophy and practice with an aim of determining the extent to which safety is provided for in decision making and in management practice. In effect this involved evaluation of the safety management programme set up in the firm and the provisions for its implementation at the work place.
3. To review the legislation governing the provision of a safe work environment on site. This would help establish how adequate it is in terms of elaborate coverage and comprehensiveness.
4. To investigate the machinery provided to enforce the legislation with a view to evaluating its adequacy in terms of vigilance on construction work-places and foolproofness in ensuring that the legislation is adhered to.

#### Significance of the Study

By assessing the safety performance of sites through looking at the extent to which the contractor incorporates safety measures and safeguards, the study hoped to reveal the areas

of neglect. This would provide a guideline in future to efforts of parties interested in improving on the present situation.

The theoretical framework and the literature reviewed for the study is basically on the principles of good management practice particularly at the site level and the relationship between this and safety. It is hoped that the study came up with an organized body of knowledge which the contractor and others interested in improving on safety management can fall back to in form of a theory on which to build on their practice.

At various stages in the study, the researcher has outlined the various merits and demerits of maintaining a safe work environment. These include the various direct and indirect economic effects such as the costs that result out of accidents and how these can be avoided by adopting the right attitude and practice on-site. The relationship between safety and productivity falls into this category. All these are geared towards educating the contractor on the benefits to be gained out of the maintenance of a safe system of work.

In the area of legislation governing safe working places in construction, it is hoped that the study has highlighted the shortfalls and failures of the current provisions. In any effort to review the legislation in future, it is hoped that this study in a small way will form one of the starting points from which the legislation can improve on these provisions. In this way the study will make its contribution to the future betterment

of the working conditions which may in turn contribute to the improvement of productivity of the industry in the long run.

Lastly, it is hoped that the study has opened up an area which hitherto had not been ventured into in this country for further study. This will guide further research into this area of construction safety and management which has been identified by writers as one of the areas which need improvements as far as management techniques and operating procedures in the industry are concerned. Such improvement is called for so as to improve the industry's efficiency, output and productivity.

### Scope of the Study

#### Physical Scope

The study was carried out in Nairobi. Though the original idea was to carry out a national study, this was not possible due to resource constraints especially time and finance. The choice of Nairobi was arrived at after a thorough reconnaissance of the area revealed that a study which encompasses construction at various stages was possible within close geographical proximity.

As the capital city of Kenya, Nairobi is the centre of construction activity in the country. A quick observation and reconnaissance of the area at any one time reveals that many construction projects are under construction at the same time. These are at various stages of construction and are also varied

in size, complexity and type. This meant that it was possible to observe projects at different construction stages and evaluate various variables that were of interest to the study. The sample would also include projects of various sizes and type.

In view of the constraints therefore, Nairobi was seen as a favourable area for study. Travelling was minimized as most of the sites lay within reasonable geographical proximity. This was especially important for this type of study because the method of observation required physical visits to the sites so as to assess the various variables included in the model.

### Conceptual Scope

Basically the interest of the study lay in the safety of the work environment during the construction process. This means that the researcher was only interested in the construction project during its construction stage. Safety aspects of the construction project either before the commencement of site activity or after project completion were outside the scope of study. This does not in any case imply that the design stage of the project does not affect the safety of the work environment. The definition of the scope was done in order to keep the study within manageable limits.

The research did not include the safety aspects of building materials or components. Material and component manufacturer's and their work places were therefore not included



in the study. However where the contractor made some of the components or materials on site, the activities involved in their manufacture were deemed to form part of construction activity.

As will be seen later in the study, mechanical plant and equipment cause a big proportion of site accidents. While the contractor is not responsible for the design or manufacture of machinery he may not be fully exonerated from the accidents caused by them. Most of the accidents caused by machinery are as a result of the improper usage of machines, failure to take the necessary safety measures and precautions to avoid injury or the operation of some of the machinery by unqualified people on site. These are aspects which the contractor has control over and which with proper safeguarding cannot cause accidents. The study therefore included machinery and plant as far as the contractor has control over them to prevent injury during their usage.

The study was concerned with the risks at the work environment as it affects the workers, authorized visitors to the site and any third parties such as members of the public who may be at risk of injury due to the site activities. It also included the damage to materials on site and the adjoining property in the immediate site neighbourhood caused by accidents on site. The study could not dwell technically on the clinical health effects to workers as a result of accidents occurring in the work environment.

In a nutshell, the interest of the study revolved around those activities that occurred on site of which the contractor had control over as the site manager and how these affected the safety of the work environment. These gave rise to the role of the contractor in taking the necessary precautionary measures such as the incorporation of the measures and safeguards necessary to reduce the risk of injury as far as is reasonably practicable. It also included the assessment and evaluation of the extent to which the contractor used his organizational abilities and his management philosophy to help avoid any potentially hazardous situations in the work environment.

The research also included the review of the existing legislation and the enforcement machinery as far as they governed and affected the contractor in his role of providing a safe work environment. The contention of this study is that legislation only exists to play a supportive role in the task of providing a safe work environment. The scope of the study therefore included an investigation into the existing legislation and an evaluation of its approach towards guiding and helping the contractor in his role of providing a safe work environment.

#### Organization of the Study

The study is organized into six chapters. The first chapter forms a general introduction to the study and contains the preliminary items forming the background to the study

including the statement of the problem and the study methodology.

Chapter two is a review of related literature. It contains the review of findings of researches carried out on the subject of construction safety. It begins with the review of literature regarding the relationship between safety and productivity and ends with a review of the various site safety models as perceived by different researchers.

Chapter three is about the developments in industrial safety management and legislation. It begins with a historical account which traces the evolution of industrial safety as a discipline. The rest of the chapter is on the recognition and development of the roles of management and legislation in safety. It also includes an account of how these roles are performed in the Kenyan setting.

Chapter four contains the operational model used as a basis for the field study. It is a derivative of chapters two and three. The conceptual models reviewed in chapter two are used in the design of the operational model, which also incorporates the role of site management in site safety.

Chapter five contains the analysis of the data from the field. This is arranged according to the objectives of the study. Conclusions and recommendations are discussed in chapter six which is the last one in the study.

### Research Methodology

After the preliminary or proposal stage of the study, the preparatory work in readiness for the fieldwork began. The first step was the building up of a theoretical basis and model which would be used in designing the data collection tools. The major source of materials of this nature were the various libraries in Nairobi. At this stage the major operational base for the researcher were the various libraries which had any documentary materials on the area of occupational health and safety.

### Sampling

The population for study comprised the number of construction sites in Nairobi operational at the time of commencing the field survey. For purposes of administration of the projects going on in the city and controlling physical developments, the Nairobi City Commission has divided the city into three divisions. These are the eastern, western and central divisions. Development control functions are under the city planning and architecture department of the city commission. In this department, a specialized unit known as the development control unit is in charge of overseeing all the developments coming up in the city and that no unauthorised developments come up. For purposes of effective control the three divisions are further divided into smaller geographical sections. Each of the sections is under the jurisdiction of an inspector.

Central division has three inspectors in-charge of westlands and city centre, industrial area, and eastleigh respectively. The Western division has three inspectors. They are in-charge of the three sections namely: Karen/Dagoretti; Kilimani/Lavington/Riverside; and Langata sections. The Eastern division has two sections also each covered by an inspector. These are Parklands/Muthaiga/Loresho sections and Nairobi West/Kariobangi/Mathare section, which covers most of the outskirts of the eastern suburb of the city.

In total the city had three hundred and fifty one ongoing projects at the time the author obtained information from the inspectors. Their distribution in the three divisions were as follows: 84 in Central, 86 in Western and 181 in the Eastern division. In view of the foregoing information and given the nature of the population and the geographical distribution, the most feasible sampling procedure was stratified sampling. The strata in this case were the three geographical divisions of the city as outlined above. In order to obtain a balanced sample in terms of geographical proportional representation, the total sample of fifty (50) was obtained proportionately from the three divisions of the city. The formulae used in arriving at the number of sites to be included in the sample from each of the divisions was as follows:

$$D/T \times 50 \quad \text{where,}$$

D = number of sites in division of city.

T = total number of sites (i.e. 351).

Hence 12 sites were selected from the central division, 12 from the western and 26 from the eastern division.

After determining the number of sites to be selected in each division, the actual random sampling exercise within the stratum began. To facilitate this, the researcher enlisted the use of random numbers. Each of the sites in each division was allocated a serial number beginning with 1 and proceeding in ascending order until all the sites in the stratum were numbered. The researcher then went down a table of random numbers selecting the sites whose serial numbers corresponded with the first numbers of the random table figure. Selection went on down the table until the proportion of sample size representing that particular division was arrived at. The researcher then proceeded to take the plot numbers and street names in which those sites were located and included them in the sample. The process was repeated for the other divisions until all three were covered. At the end of the exercise the researcher had the details of the fifty sites which later helped him locate them physically. This was possible with the help of the inspectors who were in the field most of the time and would easily locate the sites.

#### Data Collection

The main data collection exercise for the study spanned over a four month's period between November 1987 and February 1988 inclusive. The main source of primary data

were the construction sites in the Nairobi area. The major data collection tool was the questionnaire which was administered to the site managers, and a checklist which was used to record the performance of sites with regard to the incorporation of safety measures and safeguards. To administer the questionnaires, the researcher visited the selected sites, where the managers completed the questionnaires. The visits also acted as foras for informal discussions between the researcher and site management. Where the site manager was not present on site during such a visit an appointment was made for a subsequent visit. The purpose of the study did not appear on the questionnaires. This technique is recognized and recommended as a perfectly scientific and ethical one in research.<sup>19</sup> The study's goals are camouflaged in order to avoid influencing the elementary units response which may otherwise result in non-sampling error. Safety and construction accidents being a sensitive area to the contractor, this technique was considered necessary if genuine unbiased responses were to be obtained.

The researcher chose to analyse the data manually. It was felt that the manual interpretation of the results would be appropriate because the variables were not too many and therefore their analysis would be managed quite easily manually. This also implied that it could be quite easy for the reader to

understand and comprehend each of the variables separately and consequently draw any relationships between them easily.

The mode of presentation adopted is descriptive. Data is presented in tabular format. The tables were used to condense the findings of the various sub-sections and sections together thereby helping in displaying the relationships of the various variables for adequate visual observation and interpretation. The arithmetic mean and percentage are used extensively to show what proportion of the sample has a particular attribute of the variable being measured.

#### Definition of Operational Terms

##### Safety

A building or civil engineering construction site can be said to be safe when all the people concerned can go about their daily work without "undue risk" of having accidents. The phrase undue risk is used here since it is true that at no time can a person be free of risk totally. At any one time and place, life involves a certain degree of risk and exposure to some level of hazard. This is the context within which the term "Safe Site" is used in this study. It is realised that there is no one time that the site can be totally safe. All that can be hoped for is the reduction of the risk to a reasonably practicable level. As to what is meant by reasonably practicable, the following judgement by Mr. Justice Swanwick in 1968 set the precedence:



The overall test was still the conduct of the reasonable and prudent employer taking positive thought for the safety of his workers in the light of what he knew or ought to know. Where there is a recognised and general practice without mishap he is entitled to follow it, unless in the light of commonsense or newer knowledge it is clearly bad; but where there is a developing knowledge, he must keep reasonably abreast of it and not be too slow to apply it; and where he has in fact greater than average knowledge of the risk, he may be thereby obliged to take more than the average or standard precautions. He must weigh up the risk in terms of the likelihood of injury allowing and the potential consequences if it does; and he must balance against this the probable effectiveness of the precautions that can be taken to meet it and the expense and inconvenience involved. If he is found to have fallen below the standard to be properly expected of a reasonable and prudent employer in these respects, he is negligent. <sup>20</sup>

The process of making the site safe will therefore involve a number of tasks on the part of the employer aimed at reducing risk to an acceptable minimum. <sup>21</sup> The tasks will include such measures as the proper organization of the work environment and the incorporation of a host of safety measures and safeguards as outlined in the operational model of the study.

#### Accident

The persistence of an unsafe situation creates a risk at the work environment. Unless elaborate measures are taken to remove the unsafe situation and the risk an accident will eventually occur. To qualify as an industrial accident, an incident must have three essential qualities. Firstly every

accident will cause either injury to persons or damage to property or both. The injury may or may not be fatal. Secondly, the occurrence of an accident is never intended or planned, and thirdly, every accident is characterised by some abruptness.<sup>22</sup>

It is therefore a necessary condition that an industrial accident must produce unwelcome consequences which could be quantified in economic loss of one type or another. Conversely an event whose immediate consequences have been deliberately controlled cannot possibly be referred to as an accident. An accident as used throughout this study must therefore have a cost component which is felt by the person or entity responsible for the organization of the construction process. This cost can be avoided by taking corrective measures affecting the work environment to eliminate or minimise the situations conducive to accident occurrence.

### Safety Management Programme

As used in this study the phrase refers to a formal organized system set up in a construction firm to provide for a decision making and implementation machinery which provides for the planning and control of all safety matters in the organization. It includes the formal provision for the planning of safety matters at the management level of the organization and the implementation and control procedures for

the same at the work place level.<sup>23</sup>

The setting up of the programme starts with the formulation of a safety policy. This is indeed the heart of the programme. It must exist to guide all action of the organizational participants towards the goals and targets that must be attained in safety matters. The policy defines the commitment of the firms to safety and outlines the philosophy that must be adopted to achieve the objective. An organizational framework must then be set up to facilitate the implementation of the policy. This is formal and designed in the same lines as the general organizational structure of the firm. It will therefore take the form of a hierarchical structure to facilitate the transmission of the decisions made at the top to the work face. The setting up of the safety organization includes the creation of positions and their staffing with the necessary personnel to provide professional administrative services for the provision of a safe system of work.

The safety organization framework will also be used to channel resources, ideas and information through the firm to promote the safety cause. Budgeting safety resources will also be undertaken by the staff in the programme.

The programme therefore establishes the legitimate responsibility and accountability system for all the safety matters. It establishes a planned method by which management accepts the full responsibility for preventing accidents in its work environment. This means that the contractor through

his site managers must control the entire work environment and the actions of the people in it to ensure that a sense of safety pervades all their actions.<sup>24</sup>

In the next chapter literature related to safety is reviewed. Emphasis is given to research findings by researchers who have carried out studies on various aspects of construction safety, particularly the relationship between management and productivity on one hand and safety on the other. The review also includes theory on site safety and attempts by various researchers to come up with a model.

FOOTNOTES

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## CHAPTER TWO

### REVIEW OF RELATED LITERATURE

#### The Concept of Safety

A state of safety is one in which no danger of a damage causing accident exists. Safety should always be specified in terms of one or more risks. Total safety against a given risk can only be attained by eliminating the source of risk. When this is attained there is 100 per cent or total safety.<sup>1</sup> This however, is a theoretical concept as a greater or lesser degree of risk will always remain. Hence in any work environment the aim should be to eliminate as many risks as possible in order to attain the highest degree of safety possible in the prevailing circumstances.

Reflecting this on the construction industry the concept becomes clearer and applicable. The work environment in the construction industry at any one time is beset with myriad sources of risks to the worker. This is due to the nature of construction work. No operation or activity can be said to be truly repetitive in terms of what is involved in accomplishing it. A lot of improvising is necessary to deal with novel situations for which a solution is needed as fast as possible if the tempo of project construction work is to be maintained, within the many set targets as defined by the time schedules, tight budgets and technical standards.

Since the degree of risk in any work environment will keep varying depending on physical circumstances and human acts, the state of safety of the same will also keep changing from time to time. This will especially happen in an environment where the conditions under which work is carried out change very fast like is the case with construction work. This necessitates constant evaluation of the safety situation of the work environment if acceptable degree of safety is to be maintained.

### Safety and Productivity

#### Concept of Productivity

Economists refer to productivity as being the relationship between the output produced and the inputs which go into producing it. The usual method of arriving at this ratio is to measure productivity as the ratio of value of output to value of units of labour. The unit of labour used here is the number of workers or number of manhours worked. Productivity is said to rise when output increases while the value of the inputs remain the same, or alternatively when output increases more than proportionately to the increase in the value of inputs.<sup>2</sup>



### Importance of Raising Productivity

In any country whether developed or developing people want a higher standard of living for themselves and for future generations. However because of the markedly lower standard of living in developing compared to developed countries the need to raise living standards in the former is particularly urgent. Raising the quality of life in any country is always a difficult task. Temporary factors such as assistance from developed to developing countries, exceptionally favourable weather resulting in good harvest may both help raise the living standards in developing countries but only temporarily. In the final analysis it is the higher productivity which leads to high living standards.<sup>3</sup>

At present, the economic situation in many developing countries has become more difficult in the face of sluggish economic growth rates, recurrent inflationary trends, growing unemployment, rising costs of production and increasing incidence of protectionism in world trade. As it is now, developing countries have hardly any control over externally induced factors which serve to raise production costs and hence lower productivity. These include the high prices of petroleum products and capital inputs. The entrepreneur therefore has to exert every influence and control over those factors within his reach. The most important of these are management and labour as discussed here below.

## Labour and Productivity Growth

The main factors which contribute to productivity growth have been identified as the use of physical capital, technological innovation, good management practice and labour. The process of raising productivity via those factors may have some implications on industrial safety. Technological innovation will yield higher productivity but may also include some hitherto unknown safety hazards and risks. Industrial poisoning, emission of pollutants and radiation are other problems which modern society have to contend with as a result of the rapid technological change in industrialization. This implies that with technological innovation the safety problem may be exacerbated which means that more effective and efficient approaches to the industrial safety problem are called for.<sup>4</sup>

The main relationship between productivity and safety comes into focus when labour is considered as a source of productivity growth. In addition to being one of the most important resource in any productive enterprise, labour may also be regarded as being the most important source of productivity growth. It is becoming increasingly clear that the quality of labour force is an important determinant of productivity growth. Research in developed countries has shown that improvements in the quality of human resources as productive agents have been an important factor in raising productivity levels and fostering economic growth.<sup>5</sup>

The attitudes, discipline, education and skills embodied in the labour force do influence productivity levels considerably.

While talking of labour as just another productive input it must be realized that there are essential differences between it and all the others. Workers are mortal human beings who have human fears, dreams, and aspirations. A worker's psychological attitudes, social values, expectations and judgement will affect his productive capacity. A safe and healthy work environment is therefore a prerequisite for a productive worker.

The question as to whether it is possible to maintain a safe work environment while simultaneously raising productivity has puzzled managers and researchers for a long time. It was easier to believe that a manager who maintained a safe work environment had a lower productivity in his enterprise than his counterpart who never gave much attention to safety. The argument was that the maintenance of a safe work environment would involve the management and workforce in too much non-productive time and could also be costly in terms of the expenses incurred in acquiring safety resources.

These fears have been dispelled by recent research such as the one carried out by Hinze<sup>6</sup> in the construction industry, whose findings revealed that supervisors with the highest rated productivity in their crews also had better safety records. This led to the conclusion that good safety performance and high productivity are mutually related and

occur together.

### Implications of Occupational Safety on Productivity

The recognition of the importance of the human resource to productivity and the development process has implications for occupational safety and health. It is poor economics, humanitarian considerations aside, to inculcate and nurture the attitudes, education and skills appropriate to productivity increase in workers only to have them withdrawn from production either permanently or temporarily due to occupational accidents or diseases. This will certainly cause heavy losses where skilled and technical manpower is involved. Though less obvious and less devastating it could also apply for unskilled and semi-skilled labour already adapted psychologically to the rigours and discipline of work.

Improvements in occupational health and safety raises morale and productivity due to the fact that employees can concentrate more on their work without fear of personal injury.

Every government has a role to play in ensuring the safety and health of all its citizens. The importance assigned to improving occupational health and safety by any government will be influenced by the policy makers perception of the concept of development. In recent times it has become quite clear that economic development is not feasible without the total improvement of the quality of life of all people rather

than just the creation of wealth. This shift in emphasis towards a balanced social economic development reinforces the importance of occupational safety and health in the minds of the policy makers. The loss of life, limb or health in the process of creating wealth runs counter to the ethos of balanced social economic development. In as much as the common worker is to be the main beneficiary of development, his safety and health in the process of contributing to that development should be zealously safeguarded.

Developing countries especially may assign too low a priority to the improvement of industrial occupational safety and health in their quest for a quick solution to that economic problems. This in the face of the supporting evidence as adduced above, can only be said to be a naive and fool hardy approach to economic development as the following extract attests:

It must be stressed that in the face of economic trials, the final objective of development is a higher quality life for all; that unhealthy and unsafe work conditions distract from a higher quality of life; that the ultimate cost of occupational accidents and diseases resides in the despair and anguish of the victims and their loved ones, and that the moral fabric of society is weakened when it disregards the plight of those potential victims.<sup>7</sup>

#### Safety and Management

In conjunction with Charles Harrizon, Hinze carried out the research to determine the nature of safety programmes in large construction firms.<sup>8</sup> The study was carried out to basically determine whether there was any relationship between

the safety programmes of construction firms and their safety performance and secondly whether there was any consistency in the programmes of different firms. The findings of the study were that in general large construction firms have very formal safety programmes, with most of them having full time safety personnel at the project level. Safety personnel are generally well trained and are entrusted with the necessary authority with which to carry out their duties. To encourage safe practice on site, the firms offer incentives or rewards for good safety performances by supervisors mostly and workers to a lesser extent. Even among the big firms as those studied by Hinze<sup>9</sup> it was found out that the bigger the firm, the more formal the safety management programme was.

As regards the relationship between safety programmes and safety performance, it was found that the bigger firms among the sampled firms had better safety performances. This phenomena is attributed to the fact that the larger firms had more formal safety programmes. The formality of the programmes in the bigger firms was mainly evident in more prevalent use of accident reports, more formal training for new employees and safety personnel, more extensive use of safety incentives and more rigid company requirements on safety in general.

The findings of the research that there was a directly proportional relationship between safety performance and the company size gives credence to the general feeling from some

quarters in construction that small firms are responsible for the deplorable safety record of the industry. Hinze's research is related to this study in the sense that both had as the main theme the investigation of safety management of construction firms. The main difference between the two is that while Hinze dealt with only large construction firms, size was not a criteria in selecting the sample for this study.

The role of top management of construction firms in reducing accidents was studied at Stanford University by two researchers. Levitt and Parker<sup>10</sup> sampled top managers from 23 construction firms in the U.S.A. for study. For purposes of the study top managers were defined as those who were involved in the setting of the company's management policy. The nature of work undertaken by the firms from which the managers were selected included heavy building construction, highway construction, industrial and speciality trade construction. The study's objective was to find out whether a relationship existed between the accident rate of a company and the policies and practices of its top management. The approach was therefore to compare the policies and practices of top management in companies with outstanding safety records to those of managers in companies with average or poor safety records. The emphasis was on what the managers actually did rather than on their attitudes as far as management is concerned.

The results of the study attributed seven major practices to top managers of firms which had excellent safety performances. On the basis of the study's findings, top managers of construction firms who wish to reduce accidents in their companies were recommended to use these practices as guidelines. The seven practices attributed to these managers are:

1. They were well informed of the accidents records of all their sites. This allowed them to make periodic evaluation of the records. Where records were found to be deplorable immediate actions were taken to remedy the situation.
2. The managers used the safety records of a particular site as one of the criteria when evaluating the field staff for promotion or salary increase. This practice motivated the staff to strive for the maintenance of safe conditions of work.
3. They attached the same importance and concern to safety as they did to other aspects of the contract such as costs and time schedules. This made the site personnel realize that safety had a significant effect on the profitability of the company and hence gave it serious attention.
4. They encouraged a cost reporting system that gave a cost analysis of the accidents occurring on the sites and the submittal of the same to the head offices.



5. They provided and encouraged the use of safety equipment on site at all times.
6. They ensured the training of new workers joining their sites on safety aspects of their work.
7. They emphasised on work planning as an aspect which would greatly reduce accident occurrence. This view emanated from the fact that workers perform work faster, better and more safely when detailed planning that takes into account the materials, equipments, manpower and safety requirements of every task has been undertaken.

All these attributes are part of good safety management practice as is discussed in chapter three and four of this thesis. They are therefore covered in the model that is tested by this study.

Gans<sup>11</sup> examined the role of the construction manager in construction safety on site when the professional construction management (PCM) approach is employed. In this approach the construction manager undertakes the total management of the construction process on site on behalf of the client. His responsibilities include directing, coordinating and assisting the contractors in achieving a finished product within the required budget allocations, time schedule, quality standard, and technical specifications as dictated by the clients requirements. The major difference between the PCM approach and the general contractor approach in

Kenya is that the former is not a direct employer of labour on site. The responsibilities for safety of the work place are therefore bound to differ in the two approaches.

The paper outlined the various approaches to safety implementation and management under PCM. One particular approach which is quite close to the system practiced in Kenya is where the PCM takes full charge of safety direction on site leaving the various subcontractors to take instructions on safety matters from it. In the approach, the PCM designs a safety program for the project and leads, directs and coordinates the sub-contractors in the achievement of an intergrated system of providing a safe work environment for all the workers on site. In Kenya this approach can be applicable to large and complex projects where the main contractor has to coordinate the activities of many subcontractors of various sizes, types, and specialities. This is especially happening more in Nairobi where clients needs and requirements necessitate the construction of large complexes offering such facilities as flats, shopping arcades, theatres, restaurants and other facilities which go with modern lifesyles. Projects of these nature require services of specialised sub-contractors. In one of the projects falling under the sample for this study ten sub-contractors were present on site at one time during the project construction. Such a circumstance calls for immense organisational abilities in terms of planning and controlling the activities of all these distinct organizations. In such instances where many aspects of the project have

to be taken care of, it is easy for the management to ignore the safety aspect to the detriment of all concerned. This is where the experiences of the PCM approach will come in handy as outlined in the paper.

Hinze and Panullo<sup>12</sup> did a study to determine the relationship between job control in construction and safety performance. They defined job control as a combination of management ongoing knowledge of site conditions and its ability to react quickly to any special needs that arise on site. Job control can be achieved by having capable site agents on every site, through frequent visits by company directors or partners, through close communication between site and head office by telephone or radio contact or by any combination of these.

In summary the findings of the study showed that good safety performance tends to occur in those firms that have closer job control over their projects. Job control was measured by such terms as the nature and location of site and the degree to which informal contacts occur between top managers at the head office and the site personnel. Other measures included the top management's ability to physically monitor what was happening on sites and the channels of communication that existed within the firm. Communication is an essential ingredient of job control because dialogue between the various management levels and the workers can be helpful in achieving and maintaining smooth running of jobs.

It was a major finding of the study that those factors that led to promote proper job control as outlined above were readily available in smaller construction firms. This is particularly true of communication channels that run from top management to the workers on site. Applying this finding to the construction industry in Kenya it can be said that there is a likelihood of adequate job control in most of the firms on sites. This is inferred from the fact that most of the firms are either small or medium in size. This coupled with the fact that most have very few projects going on at any one time means that there exists potential for strong communication links between management and the sites. This aspect of job control was included for study in this thesis by investigating on the contact maintained between the firms top managements and their sites.

#### Safety and the Worker

Hinze<sup>13</sup> did a study on construction safety whose centre of attention was the construction worker. The purpose of the study was as he put it, "to identify particular factors which have a significant influence on worker safety". This is one of the few studies that have been done on safety with a primary focus being on the human aspects of construction safety. The sample for the study was selected from employees of local authorities dealing with road maintenance works. It was fairly appreciated that road maintenance workers were not a true representative of construction workers.

However they were chosen in order to overcome some serious difficulties that would be met with if typical construction workers were sampled. Some of these difficulties included the fact that typical construction (building) workers keep shifting from project to project usually with different employers and hence supervisors. The idea behind the study's sampling was to seek out a group of workers who had a fairly stable work environment and yet whose work was still related to construction.

The findings of the study showed that the psychological climate of an individual worker has a direct influence on his safety performance. The psychological climate as defined here included the workers relationship and attitudes towards his fellow workers, the supervisors and the personnel department of the employer. Workers who worked in smaller gangs which had cordial or friendly relationships among its members were found to be safer. This was also true for workers who had supervisors who showed them respect and gratitude by incorporating or considering their suggestions and by praising them for work well done. Safer workers were also found to have positive feelings towards their employer, had general confidence over their employer and felt that their employer cared for their welfare.

The general pace of the work as set by the employer was also found to have an influence on the safety performance of workers. Workers who had strict deadlines to meet and

who generally were involved in competition with fellow workers were found to get involved in accidents more often and had more injuries than their counterparts with more relaxed work schedules.

In summary, the researcher found out that the safer workers are those who work in pleasant work settings. The setting is influenced by three variables. These are fellow workers, the supervisor and the employer. All these three variables have a direct influence on the workers perception of the job environment. "If that environment helps the workers feel respected, recognised, accepted, cared for, and perhaps even loved, that worker will be in a much better frame of mind to conduct each day's activities". These findings seem to conform with the behavioral science management principles which hold that the social psychological environment of a worker will determine his satisfaction and productivity in general.<sup>14</sup>

The results of six studies on the relationship between construction safety and worker turnover are contained in a paper written by Hinze.<sup>15</sup> The paper present information on worker turnover and on new workers as they relate to job safety in the construction industry. The studies gathered evidence which proves that worker turnover in construction firms is a key factor in safety performance. It then goes further to show how management can deal with new workers to make them gain experience and become accustomed to the

work environment thus making them safer.

For purposes of the study turnover was defined as the rate at which workers in a construction firm or site leave their jobs and the rate at which their positions are filled up by new employees. Measuring turnover in the construction industry becomes extremely difficult due to the short duration of most projects and the fact that in a project different skills and trades are required at different stages of the project and only for a part of its duration. Workers are therefore hired at specific times when needed and dismissed when their skills are no longer necessary.

In summarising the results of all these studies it can be concluded that companies and supervisors with lower turnover of workers have better safety records. As regards new workers and their safety performance it was seen that the particular way various levels of management dealt with them influenced greatly their safety performance. A closer and more paternalistic relationship between management and the new worker was found to be more beneficial as far as his safety performance was concerned.

From the definition of turnover it is clear that turnover rate is related to the number of new employees. Since high turnover is harmful to safety in the way outlined above, it would be beneficial to keep it to a minimum. However for reasons given above, it has been shown that turnover will always remain high in the construction industry.

The only way to reduce the adverse effects of turnover is to help the new worker adapt to the new work environment as fast as possible. This is the task of management.

The relationship between safety of the worker and productivity has been discussed at length in an earlier part of this chapter. This relationship was contained in the findings of a study carried out in America.<sup>16</sup> This same research undertaken at Stanford University, also sought to define how work practices and job policies of site supervisors affected the safety performance of workers on the sites. The supervisors studied in the investigation were the top company representatives resident on the sites. These are the equivalent of site agents in the Kenyan setting. They were employed by firms ranging from small subcontractors to large general contractors. The sites being managed ranged from small to very big projects. Data was obtained from the supervisors on various aspects of site management ranging from general job management practices, on job safety policies and on safety attitudes of the supervisors, in addition to the general descriptive information about the jobs. The measure used to evaluate their safety performances was the number of recordable injuries as defined by the Occupational Safety and Health Administration Act (OSHA), which is the major legislative order governing safety of work places in America.

As regards the relationship between on the job



pressure and safety performance, the researchers found out that increase in job pressures was directly proportional to increase in injuries. This can be seen to be true by considering injuries as being the end results of a specific set of circumstances as are presented by unsafe work environments or unsafe activities rather than as results of unavoidable accidents. These unsafe activities are the result of such things as worker negligence, carelessness, ignorance and lack of attention to the work being performed. All these factors are directly proportional to the job pressure on a worker. When a worker is allocated tasks which are to be performed under very strict time schedules he is more likely to be subjected to a lot of stress as a result of which less attention is given to the performance of the task. This finding ties up with those discussed above under the study carried out on the human aspects of construction safety.

#### The Economics of Safety

Reducing accidents on site is not beneficial to the workers alone. The client and the contractor stand to benefit by way of reduced costs of construction through accident cost reduction. This justifies the view that the client should also take interest and indeed contribute to the provision of a safe work environment on site. Since he is not present on site during construction in most cases, the only way he can ensure this is by employing people who are committed to safety in the construction team. A most crucial

person in this team as far as safety is concerned happens to be the contractor who is to implement the project on site.

Research has been carried out to determine how clients can contribute to the propagation of safe construction. Part of the objectives of this study was to determine how clients can select only the safe contractors to construct their projects.<sup>17</sup> This was based on the findings of the earlier researchers to the effect that over time, some contractors have consistently been found to maintain much safer records than others. Clients selecting such contractors will therefore stand to gain by way of substantial cost reduction and saving in contract time. Such a selection criteria was expected to have three main qualities. It was expected to be predictive of safe project performance, be equally applicable to different construction firms and finally, be objective. In addition to these three, a practical criterion was expected to be easy to obtain from contractors and easy to use for the clients. For the American industry the criteria were got by using a rate based on the average number of injuries and illnesses of workers for a construction firm, and a rate developed by insurance firms based on the workers compensation for injuries over a certain period of time. Another method feasible as a selection tool would be the scrutiny of the firm's safety management programme otherwise known as the management safety accountability system.<sup>18</sup> A combination of all these techniques can give a good enough criteria for the selection

of a safe contractor.

The selection system outlined above will be used by the client in the prequalification stage of tendering. By using this safety criteria as part of the criteria used in prequalification, the contractors with poor safety performance can easily be identified and eliminated at the early stage of tendering. In Kenya the most feasible selection tool would be the examination of their safety management programme and especially their safety policies and the type of safety personnel the firm employs.

Witte<sup>19</sup> summarises the factors that motivate the contractor towards providing a safe work environment on site. Generally, the contractors viewpoint of safety in construction should be governed by three major aspects. The first one is his experience and knowledge of the legislation pertaining to work safety in the country where he operates in. If the contractor does not voluntarily take action to know what legislation governs him, then he will be confronted by the enforcing machinery of the regulatory agencies. These are mainly the inspectorates which are supposed to see that the legislation is observed. The second factor is his experience with the costs of accidents as they affect his insurance rates. Insurance policies on safety will normally be determined by the past safety records of the industry in general and the individual contractor in particular. This is the force of economics acting as a

motivator. The third is the humane factor which will depend on the contractor's attitude towards his employee's working conditions.

As purely a business entity whose major objective is to maximize profits, the economic motive will override all the others in moulding the contractor's general attitude towards safety.

while he is a humanitarian to the extent that he abhors injuries to his employees and damage to his equipment and the work, he is also, by nature of his very competitive business, a rugged individual both in nature and in philosophy and resents any infringement upon his prerogatives in the conduct of his business.<sup>20</sup>

These factors as outlined by Witte<sup>21</sup> are basically the three considerations that govern the employer's responsibility for the safety of his employees i.e. the economic, legal and humane considerations, as discussed in problem statement in chapter one. The economic motive overrides all the others and indeed forms the basis upon which the role of management in safety is built. This role is the theme of the study as can be seen from chapter one. A deep analysis of this role was therefore necessary for purposes of building up adequate theoretical framework before the field study was undertaken. Chapter three is devoted to this cause.

### Theory on Site Safety

The traditional approach to site safety was through education about hazards and suggestion on how to avoid or compensate for them. Most of the concern for safety on site by researchers and writers particularly has been by way of educating people on site about methods of incorporating the necessary safety measures into operations on site. Coupled with this has been the education on the type of equipment such as protective clothing to use for the protection of the worker on sites. This type of knowledge has conventionally been instilled in workers through such foras as the so called "toolbox meetings", first aid courses, posters posted on the site and other communication techniques including safety manuals. Tool box meetings refer to the informal gang assemblies held between the supervisor and his workers to consider the safety of the piece of work they are about to commence with particular emphasis on the risk to injury posed and the safe use of tools and protective clothing and other safety gadgets.<sup>22</sup>

These methods inherent in the traditional approach have been found to reduce the number and often the severity of accidents on the job and are the logical first step in any accident prevention programme. The importance of this approach stems from the fact that most accidents occur at the work face or what is otherwise known as the shopfloor level. In a conference organised by the UK institute of civil

engineers, it was noted that a high proportion of accidents occur at this level.<sup>23</sup> It has therefore been found quite logical that effort towards improving on the state of construction safety need to be concentrated at the "work face".

Nevertheless, it must be realized that the work face is a part of a wider system involving broader aspects of the site operations. If ways of cutting down on the loss of services of workers and damage to property brought about by industrial accidents on construction sites have to be found, safety must be considered as a system in its wider sense; a system composed of interacting factors from social, organizational and technical backgrounds derived from the personal as well as physical inputs to the work environment.<sup>24</sup> The recognition of safety as a system and the realization that a holistic approach is necessary in solving the safety problem has come about as a result of studies and research findings by various people. These are the subject of the remaining part of this chapter.

#### Identifying the Safety Factors

A number of researchers have identified what they called the "personal" and "physical" factors in the safety system. Shrader<sup>25</sup> who did research on safety and environmental health in construction in America saw the safety system as being made up of many variables, inherent

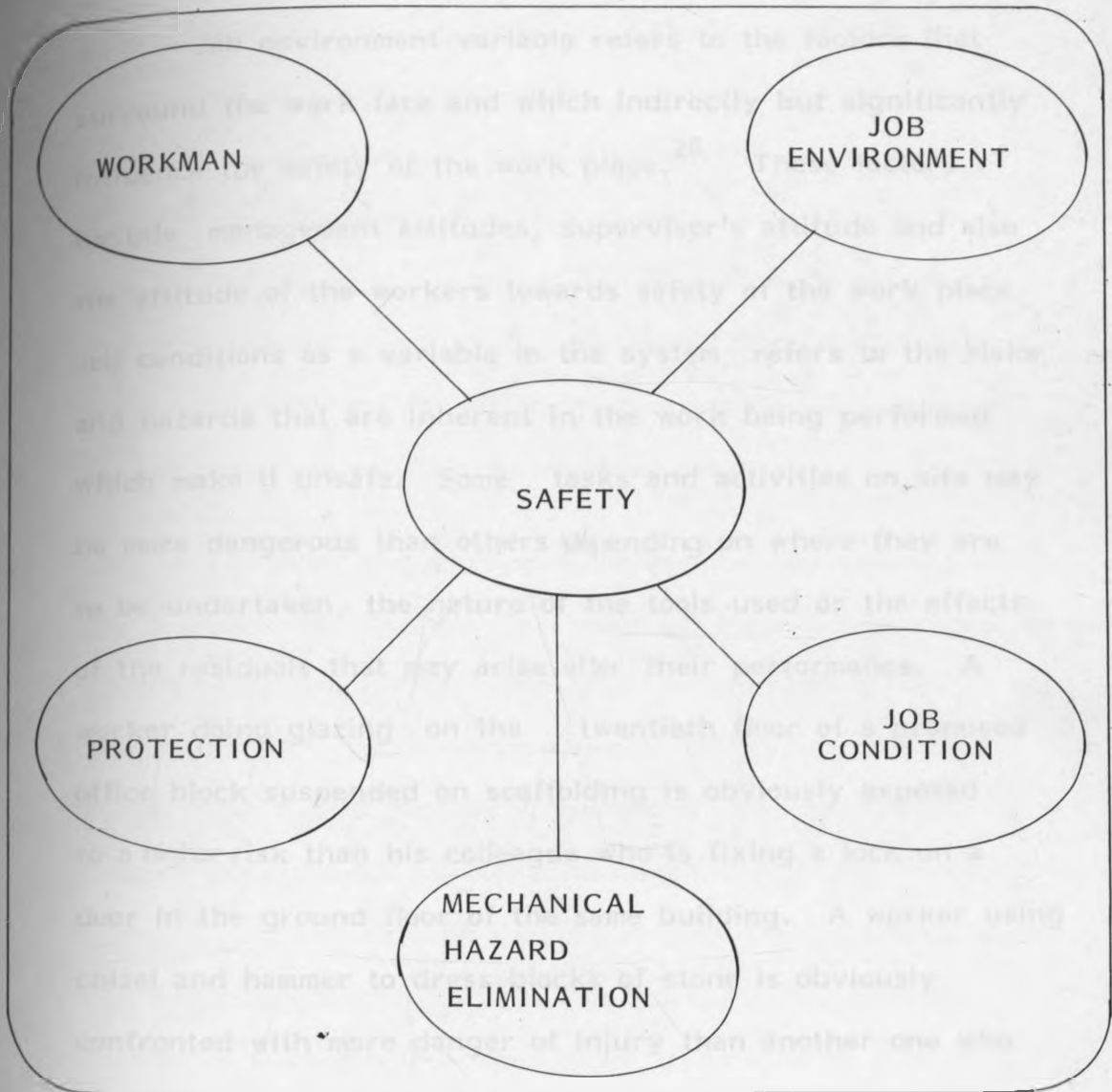
in a construction work place, interacting and thereby determining how safe a job is. He asserts that in the safety system the personal and physical factors cannot be clearly defined but "melt" together into a whole that encompasses all the components of the safety system. He perceived five greater variables that influence the balance of the system. If at least one variable in the model is neglected or is deficient the entire network is out of balance and the system disintegrates. Each variable is in turn made up of a number of factors or surrogates that can be observed to determine how effective the particular variable is within the entire system.

The five variables identified by Shrader are

- . Job environment
- . Job condition
- . Mechanical hazard elimination
- . Protection
- . Workman.

The interaction of the five factors to form the safety system is shown in figure 2.1.

PERSONAL



PHYSICAL

FIG. 2.1: THE SAFETY SYSTEM, SHOWING THE VARIABLE COMPONENTS THAT MAKE UP THE WHOLE AND INTERACT TO FORM A SYSTEM.

SOURCE: Henry W. Parker & Clarkson H. Oglesby, Methods Improvement for Construction Managers, p.154.



Job environment variable refers to the factors that surround the work face and which indirectly but significantly influence the safety of the work place.<sup>26</sup> These factors include management attitudes, supervisor's attitude and also the attitude of the workers towards safety of the work place. Job conditions as a variable in the system refers to the risks and hazards that are inherent in the work being performed which make it unsafe. Some tasks and activities on site may be more dangerous than others depending on where they are to be undertaken, the nature of the tools used or the effects of the residuals that may arise after their performance. A worker doing glazing on the twentieth floor of a proposed office block suspended on scaffolding is obviously exposed to a higher risk than his colleague who is fixing a lock on a door in the ground floor of the same building. A worker using chisel and hammer to dress blocks of stone is obviously confronted with more danger of injury than another one who is painting the inner face of a masonry wall when we only consider the tools that both workers are using.

Mechanical hazard elimination is a variable in the system that include factors that may be used as measures on how well and how effective the individual worker is kept out of potentially hazardous areas or situations through physical or mechanical means.<sup>27</sup> On a building site this variable may be represented by such factors as erection of barriers around excavations or the use of soundly constructed scaffolding to

prevent a worker falling from heights. "Protection" is a variable comprising protective equipment provided for the worker to avoid injury in hazardous working conditions. These factors include protective gadgets such as helmets (hard hats), goggles (safety glasses), ear plugs and boots (hard toe shoes). It also includes devices incorporated in plant and machinery for the protection of the operator such as roll bars, protective cabs and seat belts.

The final and most complex and crucial variable in the system is the variable "workman". It can be measured by such attributes of the worker which affect and influence his interaction with the other variables in the system. These includes his habits, beliefs, impressions, education and cultural backgrounds, social attitudes and physical characteristics.<sup>28</sup> It can be seen that these comprise the physiological and psychological attributes of the worker. For instance a younger worker will be less likely to be injured in a certain circumstances than another older worker whose reflexes are less quick and sharp and who has generally lost his agility. This variable therefore summarises what may be regarded as the human aspects of construction safety. It is nevertheless the most difficult variable to study and practically very few researches have ventured into its investigation. Hinze<sup>29</sup> recognizes this and offers a possible explanation as to why the largest void in construction safety study has been the failure to focus on the safety performance of the individual worker to determine which factors have the

most influence on an individual's safety performance.

It can be readily seen why this has not been the focus of past safety research studies..... the data collection process at the worker level is a mammoth task... Workers are relatively inaccessible..... Workers are often so different in so many respects that few conclusive statements could be drawn from the results.<sup>30</sup>

Leather<sup>31</sup> developed the above model of the system a stage further. He identified both the physical and personal factors in the system and enumerated the different ones falling under each group. He calls the physical factors the "environmental or structural factors" and refers to the personal factors as the "individual or psychological factors". These were identified as a result of a study carried out to determine the factors that workers considered to be characteristics of both an extremely safe and a very unsafe way of doing a particular job.

#### Physical Factors

These may be referred to as the environmental or structural factors in work environment. They are summarised here below.

#### Site Conditions:

Under this category falls such aspects as the safe access and egress from work, the layout of the site and the the general physical organisation of the site which gives distinction between the various sections of the site to provide

for the proper functioning of the site as a work place.

Site Tidiness:

This group of factors include the proper storage of materials on site, the storage and handling of tools and the general cleanliness on site. A clean site with materials well stacked in designated sections on sites combined with tools carefully maintained and handled will pose less danger of injury than a site which has materials and tools scattered all over, liquids spilled and litter laying about the site.<sup>32</sup>

Availability of Technical Resources:

Protective clothing and other gadgets necessary on site to safeguard the worker or to be used in case an accident occurs are provided for under this factor. A safe site must incorporate protective measures as well as precautionary measures which will be necessary in case an accident occurs.

Inter and Intra Group Cooperation:

This is a measure of the degree to which workers in the same gang cooperate between themselves when performing tasks and also the cooperation between different gangs. Cohesion between members of the same gang and the bond between the entire work force will enhance the safety of the workers. A gang which has cooperation amongst its members will have less friction with each worker sharing a mutual

concern for fellow workers, a situation which is conducive to a pleasant work environment for every worker, thereby resulting in a safe work environment.<sup>33</sup>

#### Control and Supervision of Work Activities:

Supervision styles adopted by the supervisor and his attitude towards safety will play a big role in determining the safety of the work environment. Research findings have proved that where a worker is given a chance to contribute his ideas towards the performance of a certain task and where these are given serious consideration by management, it is more likely that the task will be performed in a safe way and the workers in such a gang will be safer. This is in line with the management style known as "participatory management" where the worker is involved in the management process.<sup>34</sup> Proper control of work activities will be achieved by having capable field supervisors on each project. It will be given impetus and enhanced through frequent visits to the sites by company directors and other senior management members of the company.

#### Effectiveness of Long Term Planning:

The nature of construction makes planning a very important management tool. One reason why this is the case is the fact that a project is a one-off non-routine undertaking which means that past experiences may not be relied upon to provide effective solution to novel problems appearing

in a new project. Very rigorous planning is therefore called for in order to take account of any details that may disrupt the construction process after commencement. Tight time schedules and cost targets also necessitate elaborate planning to avoid far reaching effects that may result from deviation from set targets.

The economic implications of safety in a project demand that safety considerations be incorporated into project planning at the earliest possible stage of project implementation. Accident prevention cannot be a reality if situations that cause accidents are not foreseen and avoided. In the developed countries where many contractors use the critical path method (CPM) as a planning tool safety aspects can easily be assimilated into the planning programme. In the CPM technique where the project is broken down into its various work elements planning for safety becomes quite comprehensive. Manuals which contain guidelines and safety considerations of a whole range of site operations help in the planning exercise.<sup>35</sup>

#### Position and Role of Safety Officer and Representatives

In order that safety may be given its proper attention in a construction firm, many construction management writers have recommended the presence of a full time safety officer within the management structure of the company. Conceptually, the role of the safety officer is twofold. Firstly, he is an advisor to site management on all safety aspects of construction work. Secondly, he is expected to undertake responsibility for

all safety matters on sites. This includes liaison with any extrenous institutions with interests in safety of workers such as government enforcement agencies and the trade unions.

The duties of the safety officer will vary from firm to firm depending on the size of the firm and the type of work the firm undertakes. In general the duties must cover the following aspects.<sup>36</sup>

1. Formulation of the company's safety policy.
2. advising management on legislation pertaining to safety matters.
3. Assisting in the drafting of safe working procedures and codes of practice.
4. Reporting and investigating accidents with the preparation and analysis of safety records.
5. Safety training.
6. Safety propaganda which includes the preparation of manuals and posters on safe practice at work which should be made available to the workers.
7. Safety assessment of site management practices
8. Carrying out inspections on sites.
9. Monitoring the work of safety committees in bigger organizations.

The position of the safety office in the organizational hierarchy within the firm will determine the importance with which safety is viewed in the organization. Where the office is in the management category the officer will be in a position

to wield considerable influence and power within the organization as a result of which there will be higher commitment to safety in the entire organization than would be the case where the position is at a lower level. The importance of such influence may count when the safety branch competes with other departments for scarce resources from the company's pool of resources.

The most essential qualification for the safety officer will be a strong commitment to safety. Ability to communicate and lead others in enthusiasm towards safety is also a strong point. A technical background is only essential to the extent that the officer needs to talk with authority on technical matters when dealing with site managers and other professionals in the project team.

Safety representatives are selected workers who are expected to liaise with the safety officers and other safety institutions in helping maintain a safe work environment. Being workers themselves it is expected that they may have first hand knowledge of safety aspects of the work environment that may be important in formulating guidelines for safety management. The duties of the representatives are varied in scope but comprise all aspects of safety matters on site and especially the work face. They are expected to investigate hazards and examine the causes of accidents when they occur. It is also their duty to investigate employee complaints on general health, welfare and safety on site. They are then



supposed to report on all these aspects to the management. The duties will require that they make regular site inspections and are therefore empowered to do them. Sawacha<sup>37</sup> studied the effects of representatives on safety performance in United Kingdom and found out that their introduction had considerable impact upon the attitudes of workers and management towards safety in construction. Another study on representatives compared their impact in construction versus other industrial activities. The results showed that their introduction had caused conflicts between employers and trade unions arising from the issue of their appointment. This has almost caused total failure of their intended purpose in United Kingdom.<sup>38</sup>

### Pay Structure

Working hours and the pay structure will affect the efficiency of the worker. In general efficiency falls when excessive overtime is worked. Accompanying this fall in efficiency will be a rise in accident rates. In an industry like construction where the use of overtime is widespread, the effect of overtime and pay structure to safety must be given serious consideration. This need becomes a necessity when one considers that construction work requires great physical exertion and hence the number of hours worked will affect the efficiency more than average which in turn results to loss of concentration and increases the likelihood of unsafe actions. The reasons for the widespread use of overtime in the industry are that workers like the additional

income and management gains better utilization of the existing manpower. In spite of this economic advantage arising from this arrangement, managers with a commitment to safety must try to limit the number of hours worked by every worker to an optimum level. This will not only be for the benefit of the worker but also in the long run the company will stand to benefit since the optimum efficiency of the worker will be maintained. An optimum level of 50 hours per week has been recommended.<sup>39</sup>

The question of overtime and pay structure as it relates to safety should be given a higher consideration in a developing country like Kenya where workers are more likely to be worse off economically than their counterparts in the developed countries and hence may strive to maximize on the number of hours worked in order to earn the extra income whenever the chance arises. Coupled with this is the general lack of skilled manpower which means that management would even be more eager to maximize on the usage of available skilled personnel. This is likely to contribute to the already bad safety record of the industry.

#### Personal Factors

The personal factors to safety as identified by Leather and his colleagues<sup>40</sup> at the University of Lancaster included:

- . Care and attention on the part of the individuals.
- . Skill and experience brought to the job.

- . Safety training.
- . Origins of safety norms.
- . Accuracy of subjective risk evaluations.
- . Perceived responsibilities.
- . Feelings of competent autonomy or fatalism.

### Conclusion

Seen in the context of the safety factors as discussed above, this study concentrated on the physical factors of the safety system. It is however difficult to completely separate these from the personal factors in any study of safety. Any accident or potential accident-causing situation will contain both physical and personal aspects as contributing to creation of the risks giving rise to the accident. To limit the study within manageable scope only a few of the factors were investigated. The integrated conceptual model from which the operational model was derived is discussed in chapter 4.

The next chapter discusses the evolution of the industrial safety as a discipline of concern to industry and the role of management and legislation in safety. This lays the theoretical framework from which the theme of the study is derived. It includes tracing of the growth in this role of management and its recognition and incorporation in industrial enterprises. The chapter also covers aspects of legislation including the early legislative approach and the eventual developments towards comprehensive and wider coverage of safety matters and the seeking of more appropriate approaches

to legislation. The Kenyan setting with regard to safety management and legislation is analysed in the chapter.

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## CHAPTER THREE

### DEVELOPMENTS IN INDUSTRIAL SAFETY MANAGEMENT AND LEGISLATION

#### Evolution of Industrial Safety Concepts

Accidents and the resulting injuries have been a familiar part of life ever since man started his working life eking out a living from his environment. This he did by engaging in various activities geared towards extracting material resources and refining them to satisfy his basic needs for food, shelter and clothing. As time went by man became a more complex being and having satisfied the basic needs, started striving to satisfy other secondary wants. This was the very beginning of industrial activity as we know it today. As his needs increased so was the increase in industrial activity both in variety and complexity. This coupled with the increase in population called for more production in factories. This increase in production, however, brought with it an increase in risk of injury from accidents.

Right from these early times unsafe behaviour was recognized as being the prime cause of most accidents. This belief was so much upheld so that when an accident occurred and a worker was injured, it was regarded to be a result of the worker's negligent behaviour and as such the employer felt no responsibility for it. Nor did his employees expect him to.<sup>1</sup> This view continued until the beginning of the industrial revolution era when more concern was given to the

worker's plight by the workers themselves through their unions and by the government. Employers also started realising the importance of maintaining a safe work environment not only on humanitarian grounds but also from an economic viewpoint. This culminated in the enacting of the first laws governing safe practice aimed at protecting workers in their work environments. In the United Kingdom the first industrial health and safety legislation was passed in 1802.<sup>2</sup>

The pioneer preventive action against industrial and occupational accidents was to improve on the unhealthiest working conditions and remedy the appalling lack of physical protection against the most dangerous occupational hazards. This was mainly under the auspices of such international bodies as the international labour organization (ILO) and the World Health Organization (WHO). One of ILO laid down aims is to promote the protection of the worker "against sickness, disease and injury arising out of ....employment" as is defined in its constitution.<sup>3</sup> The first international standards were designed either to do away with the more serious abuses impairing health, such as the employment of very young children, over-long hours of work, the absence of any protection on working women, and night work by women and children. They also dwelt on ways of combating the risks most commonly encountered by industrial workers.

Special attention was given at that early stage to the industries with the worst safety records and characterised

by high incidence of accidents and diseases. First priority was given to mining. This was considered to be the most dangerous industry and the first requirement was on the elimination of dust in mining operations. Construction came second together with dock works. These were given special consideration and took second priority on account of their high accident rates.

Moving from the more serious abuses and the highest incidence of accidents and diseases, attention was further concentrated on a more comprehensive approach designed to promote the highest standards of safety and health in industrial occupations. A model code of safety regulations for general industry was issued by the ILO in 1949 on the basis of work initiated during the second world war.<sup>4</sup> This was a step towards the achievement of a comprehensive approach. This model, with its periodical revisions and amendments, has over the years become the basis for standards in all industries in most countries. It furnished an impetus which has now found expression in a wide range of codes of practice and guides to safe practice which are formulated to complement it. The year 1950 saw a revolution in the area of industrial safety legislation with this broader approach catching on in many countries as a basis for the formulation of comprehensive international standards for the protection of workers health, welfare facilities and occupational health services.

In the 1960s these standards were supplemented by a new series of specific provisions dealing with particular risks which assumed increased importance.<sup>5</sup> Those included international standards on the guarding of moving parts of machinery in general industry. This came in the wake of the discovery that one in every six accidents in factories was caused by machinery. In more recent years action in respect of industrial safety has taken new forms other than just the formulation of technical standards to govern practice at the work place. The ILO has led a crusade in the form of technical cooperation with the developing countries in an effort to prevent them falling into the same pitfalls that the developed countries found themselves in during the development of their industrial sectors. This cooperation has basically covered the field of occupation safety and health for the general industry, with the state, workers and employers being brought together to exchange ideas on the solution of problems in industrial safety.

It can therefore be seen that the industrial revolution era marked a very important turning point in the development of industrial health and safety concern and awareness. This period witnessed the change in attitude from the widely held belief that accidents were the result of fate and would not be foreseen and prevented. It became apparent to all concerned that with proper planning, foresight and safeguarding most accidents could be prevented from occurring and hence all their bad effects avoided. This

realization came in the wake of the advance in the methods of production which brought with them greater risks of damage. This was especially so with the shift from manual to mechanical energy in industrial processes, which began with the steam boiler and the utilization of steam power for the operation of many kinds of machines. As the number of boilers and machines grew so did the number of boiler explosions and machinery accidents. Such accidents caused wanton human suffering and material losses that had never been experienced before. This subsequently led to the emergence of new concepts in industry in the form of safety protective measures which came in the form of both "safety engineering" and "protective equipment". These two aspects had to be integrated in the design of any new production process or any major industrial machinery. Closely coupled with this was financial compensation to the injured parties and for any material losses in the form of damage to machinery and raw materials and unfinished goods in the production process. Thus, occupational safety action and accident insurance were born.

With further developments in industrial processes new sources of energy had to be introduced. These included oil, electricity and more recently nuclear power sources.<sup>6</sup> These two advancements brought with them new problems in occupational safety that called for new forms of intervention. In addition to safety engineering there gradually emerged new concepts and disciplines in industry. These were

industrial hygiene, occupational medicine, occupational psychology, human engineering and ergonomics. These have gradually developed as new specialised areas of research and study hand in hand with the growth in complexity of industrial processes and the consequent dangers posed in industrial places of work. These evolved from primary disciplines such as medicine, psychology, and industrial design and engineering.

The realization that accidents had significant economic consequences on industrial undertakings came as a result of the serious industrial accidents that caused heavy losses in the form of material damage. This changed the view of the prudent entrepreneur as far as industrial accidents were concerned. He realised that in the competitive business world, the burden that the cost of such damage puts on the firm's finance has to be considered together with the cost of injury to workers. Thus arose the need to reduce both costs in terms of financial implications. This led to the emergence of new concepts of damage control and loss control. Later the costs due to malevolent human acts like theft, burglarly, vandalism and sabotage were added under the comprehensive term total loss control within which safety was associated with security. A further extension resulting from deeper and broader economic studies, led to the notion of risk management. This was a broader concept embracing all the above costs related to safety and security and in addition including other costs related to the uncertainties of

entrepreneurial activities (for instance the introduction of new products in the market) and other marketing and internal or external financial facts that could disrupt the flow of future earnings.<sup>7</sup>

Risk management has therefore emerged as a broad but specialized discipline encompassing all those philosophies and the subsequent techniques which have evolved from the need and concern for protecting all of an undertakings assets. These assets are made up of the physical property, production flow and above all, the employees. The theories of risk management and the consequent techniques motivate management and arm it with the necessary tools to take effective action and control in safeguarding the assets of the enterprise.

#### Economic Cost Analysis of Safety

To many managers in industry and especially those in charge of project implementation such as is the case in construction the importance of controlling time and cost is paramount in all their decision making endeavours. The economic responsibility for safety is therefore expected to be the most forceful in motivating them to take the necessary preventive action.<sup>8</sup> The concern for cost control by managers is further compounded by the fact that the cost of accidents in an industry like construction is immense. The application of cost analysis in the design of accident prevention programmes is therefore well applicable to the industry. The question is

whether or not it is possible to reduce all the ill effects of accidents into monetary terms so as to arrive at a meaningful cost component. For material losses where no injury occurs the accounting of loss can easily be assessed, but where human loss is concerned, the costing becomes more difficult. The only recourse to this problem is the large number of precedent that have been set by courts of law and insurance companies while awarding monetary compensation to injured persons or to relatives of the ~~dead~~ party (in the case of fatality). Such figures are however only available in developed countries where the area of safety and legislation has become so developed to the extent that many cases have been decided and compensation awarded.

After costing all the accident losses in monetary terms by one method or the other the figure arrived at is the accident cost. The process of accident cost analysis then begins. To do the analysis the concept of "total accident costs" is introduced. This is defined as the sum of the direct costs of accident and the cost of the accident prevention programme designed to avoid them. The cost of the programme will be easier to quantify and will therefore present no problems to management. The approach then is to try and minimize the total costs.<sup>9</sup>

As observed earlier in chapter 2 in the definition of safety, the degree of safety will increase as risks are minimised on the job. Translated into cost concepts this means that the cost



of accidents will fall as safety measures are increased. This is true in construction and the resulting relationship can be seen herebelow. As risks are reduced, the accident costs will fall, but in order to reduce risks we must spend money on accident prevention.

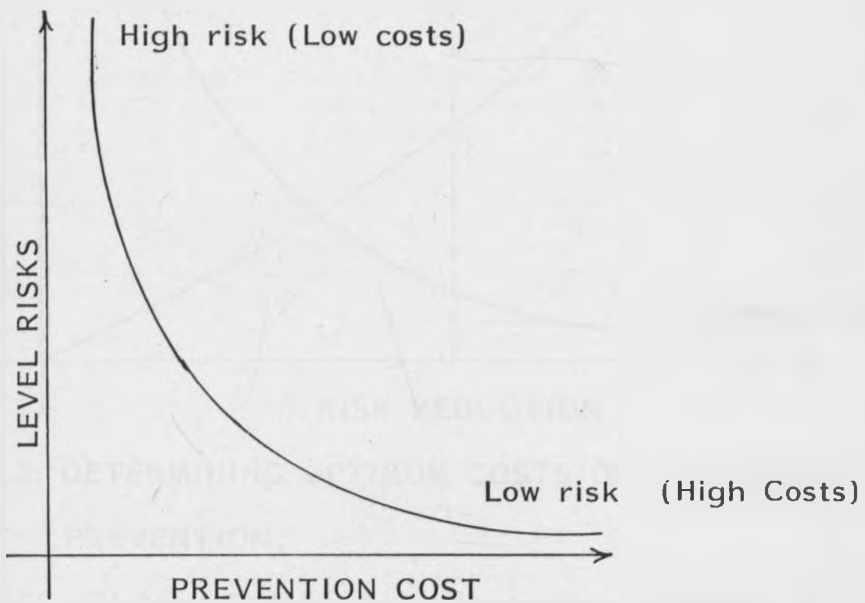


FIG. 3.1: THE RELATIONSHIP OF COSTS TO SAFETY MEASURES.

SOURCE: Richard Fellows et al, Construction Management in Practice, p.102.

By plotting the two cost curves i.e. the accident costs and preventive costs on the same graph of risk reduction and cost, they can be aggregated to obtain the "total cost" curve. The lowest part of the curve will give the optimum expenditure on accident prevention.<sup>10</sup>

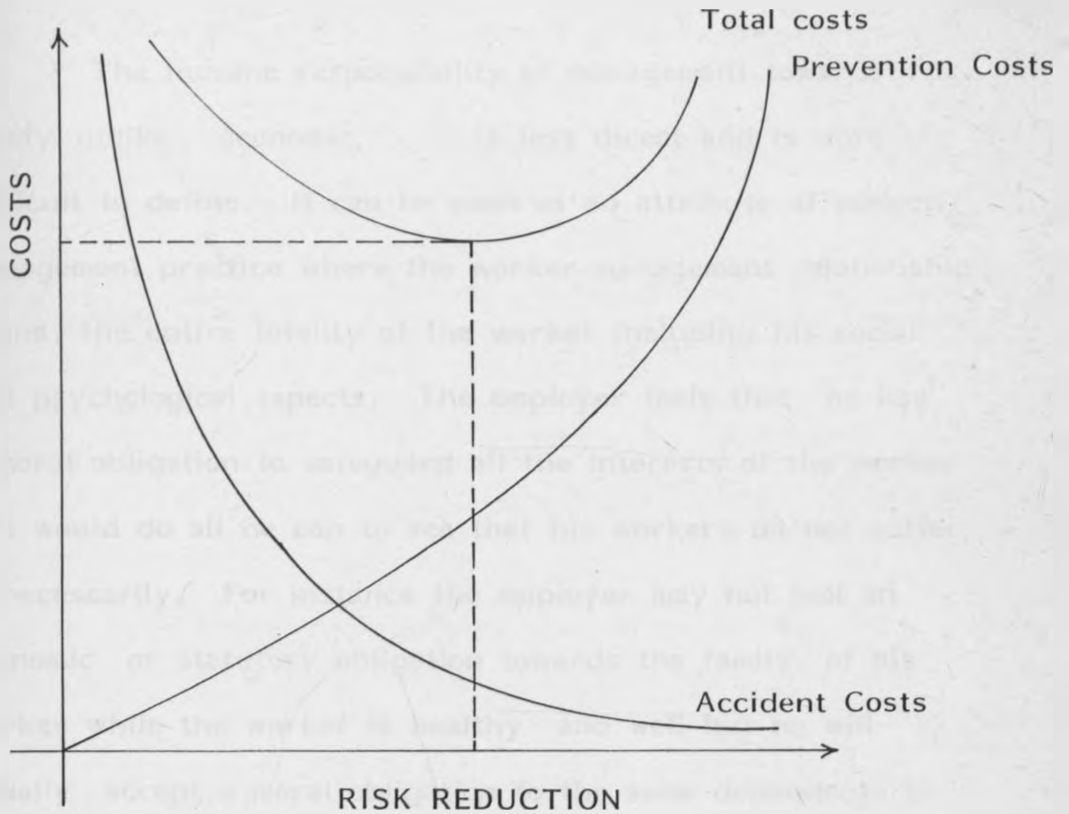


FIG. 3.2: DETERMINING OPTIMUM COSTS OF ACCIDENT PREVENTION.

SOURCE: Richard Fellows et al, Construction Management in Practice, p.103.

Practically this method can be applied by companies quite easily. Management will extract from the company records the costs of safety in terms of the provision of safety administration, protective clothing and equipment, insurance, extra manpower for safety reasons and other less direct costs. The value of the costs of prevention as aggregated above will then be expressed as cost per worker and then compared with the cost of accidents per worker.<sup>11</sup>

The humane responsibility of management towards safety unlike economic, is less direct and is more difficult to define. It can be seen as an attribute of modern management practice where the worker-management relationship spans the entire totality of the worker including his social and psychological aspects. The employer feels that he has a moral obligation to safeguard all the interests of the worker and would do all he can to see that his workers do not suffer unnecessarily. For instance the employer may not feel an economic or statutory obligation towards the family of his worker while the worker is healthy and well but he will usually accept a moral obligation to the same dependents in the case of his death especially if the death arose out of some aspects of his work. In the same vein the employer ought to feel obliged to do all that is in his powers to prevent any calamity befalling the employee so that his dependents do not suffer unnecessarily. This will include safeguarding his safety and health.

The legislative or statutory responsibility of management is a more direct one and is easy to define. It is set by the rules and regulations included in all legislation pertaining to safety of work places. Legislation is aimed at protecting the employed person and the general public from the hazards of work activity. It therefore sets the minimum standards to be met. The prudent employer should always ensure that these standards are raised to meet the humane and economic considerations. As a consequence to

this, various industries have set the standards to be met in safety in order that an all round programme be obtained to encompass the economic, humane and a statutory requirements. This has been achieved by way of formulating codes of practice which set out in non-legal terms the best methods of complying with all the requirements.

In order that all these responsibilities are fulfilled, management must carry out some detailed duties on behalf of the employer.<sup>12</sup> The employer's duties are summarised herebelow.

1. Provide, as far as is reasonably practicable, a safe and healthy system of work and to maintain plant accordingly.
2. Ensure the absence of risks in conjunction with the handling, storage and transport of articles.
3. Ensure the provision of information, instruction, training and supervision to all the work places and the workers employed therein.
4. Provide a safe place of work including access and egress and most of all a healthy and safe work environment.

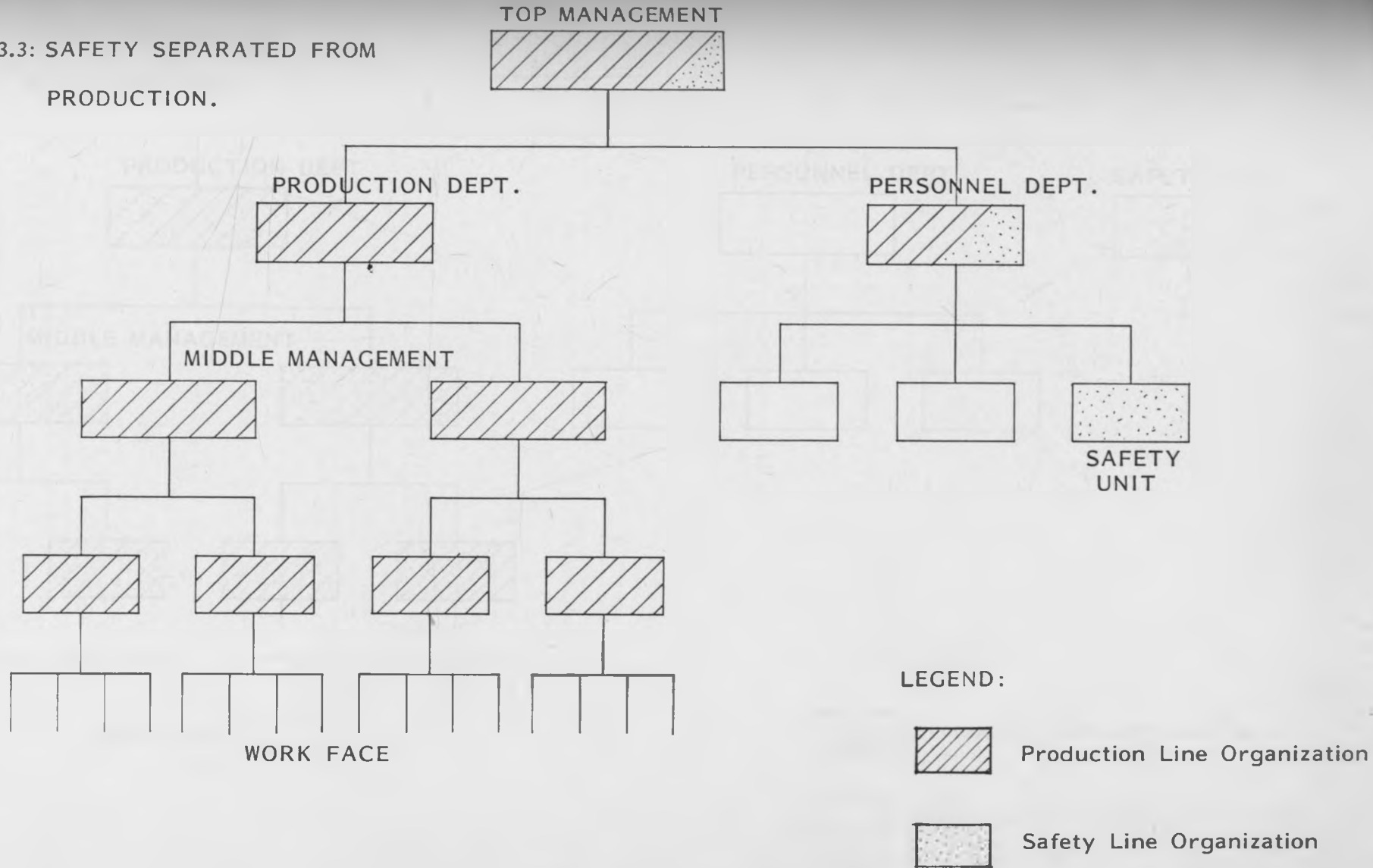
These are the primary duties of management in safety. From these a whole range of secondary ones can be derived by top management in practical terms to guide the day to day activities of all concerned in production.

### Safety Organization

To meet the responsibilities outlined above, it is incumbent upon management to design a proper management system which incorporates safety in the production process. In doing these, management must strive to evolve a structure which clearly defines the duties and responsibilities of the various levels as far as safety is concerned. This is what is commonly referred to as the safety organization or safety management program. By means of the safety organization, management establishes a form of responsibility and accountability system by which everybody in the organization is subjected to. A good program should therefore ensure that safety is integrated rather than separated from production. Such an integration is outlined in figure 3.4.

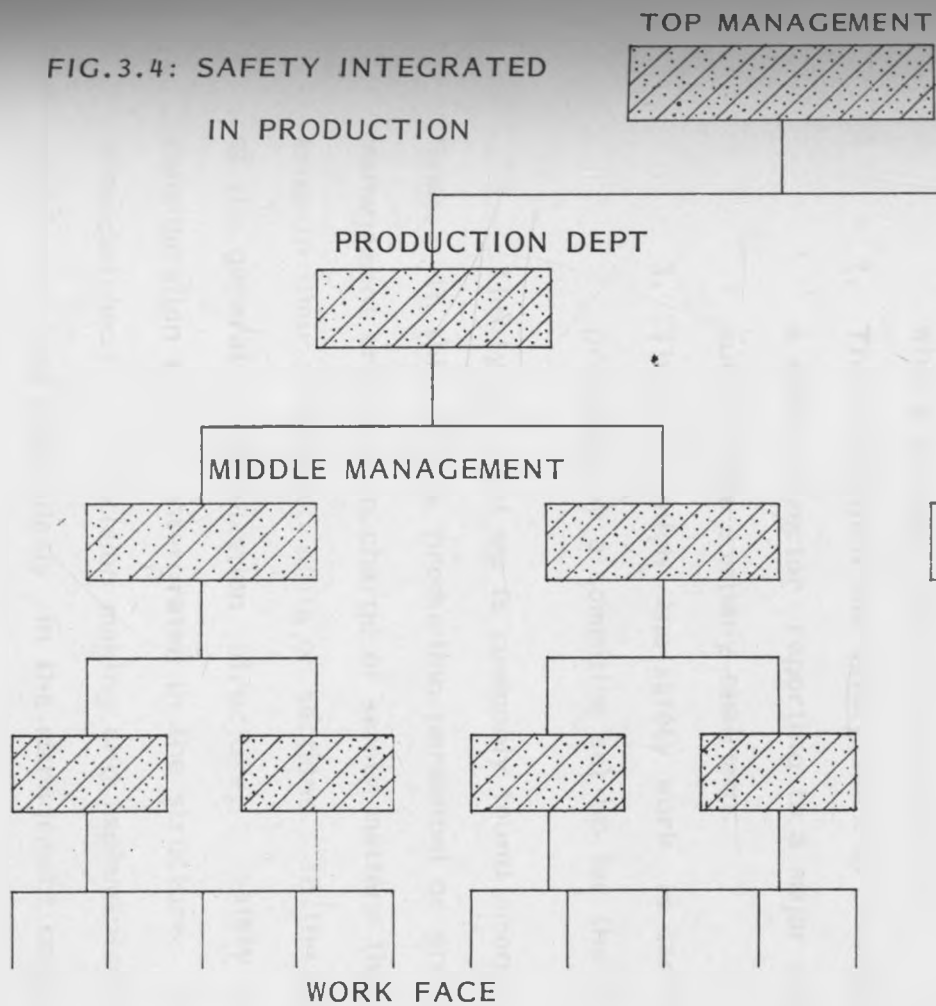
The only way safety can be integrated in production to attain the structure shown in figure 3.4 will be by having total commitment by top management. By this means safety will be elevated to a level where its influence can be felt in the entire production process and safety consideration incorporated in all decisions regarding production. In the situation shown in figure 3.3 the safety role is relegated and subjugated and therefore though there is a safety unit, it cannot exercise the necessary influence where it matters because first, it is separated from production and secondly because it is so low on the authority structure to be given any serious consideration by the people who matter in the

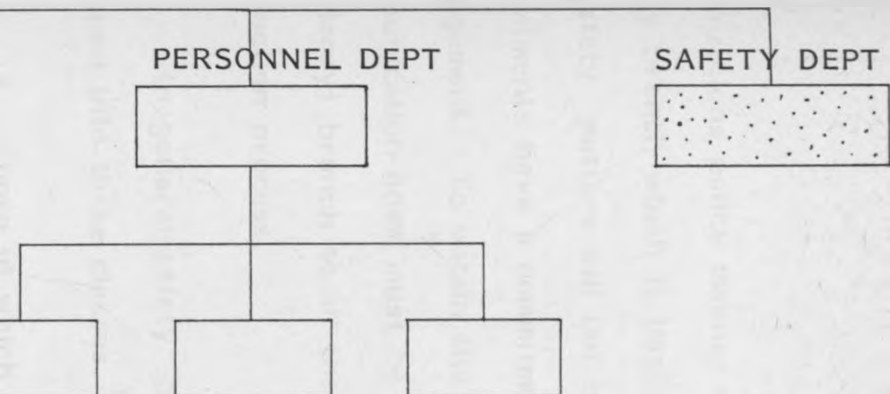
FIG. 3.3: SAFETY SEPARATED FROM PRODUCTION.



Source: Encyclopaedia of Occupational Health and Safety, p.154-7.

FIG.3.4: SAFETY INTEGRATED  
IN PRODUCTION





LEGEND:



Production Line Organization



Safety Line Organization

Source: Encyclopaedia of Occupational Health and Safety, p.154-7.



organizations policy making machinery. The role of the safety branch which is basically to advise the other branches on safety matters will not be attained unless the other departments have a commitment which is instigated by top management. To obtain the structure shown in figure 3.4 communication lines must be established from the safety (advisory) branch to all the branches and levels of the production process.

In general, safety organization in industry may be grouped into three classes.<sup>13</sup> These are:

1. Those in which the safety work is carried on wholly through the line organization.
2. Those in which the safety work is directed by a safety director reporting to a major executive such as the company chairman.
3. Those in which the safety work is carried on primarily by a committee set up for the purpose.

The type 1 set up is commonly found among small firms. In this set up, production personnel or production management are fully in charge of safety matters that may arise in their production units or sections. In the setting up of the general organization structure, safety is given consideration and is intergrated in the structure. It is provided for in the decision making and implementation machinery and particularly in the management corporate policy. The chief executive of the firm is hence the leader

and initiator of all safety actions and his actions and behaviour must portray total commitment and concern for safety for others lower down the hierarchy to emulate. He must also give a larger share of his personal attention to safety than would be the case if the company had employed a full time safety professional. Where he finds the work overwhelming he can employ a safety specialist who normally acts as his technical assistant in matters pertaining to safety. As the organization grows the safety specialist may take greater and greater control and gradually take over the safety function. This leads to the evolution of the second organization type (type 2.).

The strength of type 1 organization lies in the fact that the entire responsibility for providing a safe system of work in a particular production unit lies with the line manager or head of that unit. It is his duty to incorporate safety into each and every part of the day to day activities of his unit. Just as he plans and supervises the work of each of his men for adequate production and satisfactory quality, so he plans for and supervises safety. He must become the most informed and most safety conscious person in his unit. Where he has genuine concern for the maintenance of a safe work place, safety will pervade all the activities of the unit and will have the necessary attention from everybody in the unit. This will of course depend on the attitude of the chief executive towards safety which his line managers will definitely emulate.

The only weakness with this type of organization is that busy supervisory personnel and line managers may find it extremely difficult to acquire the specialised knowledge needed to reach a high standard of performance. This type may therefore appeal to industries where the production process is not quite complex to warrant thorough technical knowledge of the production process in order to implement the necessary safety requirements, but where the production process involves a myriad of fine detailed activities which increase the number of risks posed to the worker at any particular time. This type of organization may be of suitable and wide application to construction work on account of the fact that the industry is made up of many small firms who have been identified as the major culprits of the bad and still deteriorating safety record.<sup>14</sup>

Type 2 style of safety organization set up is commonly used by most large firms. Its success and effectiveness depends on two features. First is the attitude of top management and second the competence and ability of the safety director. The position and job of the safety director is a very difficult one. He acts as a mediator between the board of directors and the rest of the organization. The difficulty comes in because he does not have any formal authority on the lower management and supervisory levels but is rather an adviser. His effectiveness on the job will depend on his ability to secure the confidence and respect of the supervisors

and the board of directors. This will be complemented by the amount of responsibility given to him by the chairman and board of directors of the company.

The safety director should be directly answerable to the chief executive of the company. It is important that the communication channel between him and the executive head be open and direct such that safety matters receive full and prompt consideration with the appropriate action being taken as fast as possible. In addition he should be the custodian of all safety information for the company. Technical knowhow on safety issues per se and on the production process is therefore essential to him. This information should be compiled and analysed in a manner that befits its intended purpose i.e. to elicit suitable action from management, to increase understanding and effort on the part of supervisors, and to promote interest and participation on the part of the workers.<sup>15</sup>

The type 3 or the safety committees organization set up is well suited for medium sized firms where the appointment of a full time safety director is not justified but where the enterprise is too big for the type 1 organization to work effectively. The members of the committee are chosen by the management and may come from the different production units or different functional departments. The major strength of this organization is that decision making is done by a multi-disciplinary group rather than by a single individual.

This is derived from the premise that joint judgement is generally better than that of any one individual in a group. This organization set up has one major weakness in that execution of the decisions made becomes quite difficult. Prompt, effective and orderly execution of decisions in any organization depends upon the placing of authority and responsibility in the hands of one person. To get rid of this anomaly the committee should have a powerful chairman preferably the chief executive of the company.<sup>16</sup>

#### Safety Education and Training

Safety education and training is an important component in the establishment of an effective safety programme. It should be given the same serious concern as the setting up of the organization and the formulation of safety policy.<sup>17</sup> The two terms, education and training, have an important distinction which should be made clear.

Education may be said to deal primarily with the development of the mind, broadening one's knowledge and understanding in a particular area. Safety education aims at developing safety mindedness on all those that it is aimed at. The creation of vivid awareness of the importance of eliminating accidents and development of a mental awareness in recognising and correcting conditions and practices that might lead to injury should be the end results of safety education. Training on the other hand, deals primarily with

the development of skill in the performance of a certain task or operation. Hence in safety training, the objective should be the development of a person's skill in the use of safe work techniques and practices. <sup>18</sup>

A number of developments in the area of occupational safety and health has increased the need for safety education and training. One such area is safety legislation. Over the last five decades this area has received a lot of attention and has developed by leaps and bounds. This development has resulted in the drawing of comprehensive legislative regulations which have a bearing on different groups in industry. Coupled with this has been the increase in risks and dangers posed to workers arising from increasing complexity of work places. With these developments different participants need training and education in order that they may carry out their roles effectively. Enforcement agencies need training in order that they may understand the intricacies of the fast changing workplaces. Workers also need to be trained on the risks and hazards that they face in the work environment and on the importance of maintaining safe practice in their day to day activities.

On the part of management, there has arisen a need for technical awareness. It has become the responsibility of management to forecast dangers in new production techniques being introduced by the fast technological innovation and to have them eradicated at the design stage of production

techniques. In order to do this confidently management must be educated on the importance of eliminating risk from the work environment and also on the safe methods of production. Management's role in education and training is further enlarged by the fact that the task of educating the workers to a great extent lies with it.<sup>19</sup>

For its part labour, through the labour movement in the form of trade unions, the concern for training and education has arisen as a prerequisite to its crucial role in pressing for improvements in working condition. It has become quite clear that the task of negotiating for improved working conditions is made much more successful when workers and their representatives have technical knowledge and awareness relating to the dangers created by conditions which they seek to change.

Safety training and education is closely related to communication. The process of imparting specialised knowledge to those who need it is not complete until it reaches the targeted group. Mere reception is however not adequate. It must be made sure that there is no distortion in the message and that any undue delays are avoided so that messages reach the recipient in good time to carry out the intended action. This will only be possible where effective communication channels are established linking all the participants in the safety system. In communicating the

safety message it must be realized that the most effective way this can be done is by beginning with the creation of awareness in the entire work environment. Industry as a whole from top management to the lowest level employer, employer agencies as well as trade unions, must be aware of the immense gains to be won from the creation of a safe work environment.<sup>20</sup>

This is where communication as a tool can be used to make its greatest contribution. It is only after such a campaign is launched that action can be shifted to the imparting of specialised knowledge on the participants. Otherwise it may be possible to have a very comprehensive safety program but still continue to have accidents occurring and all the losses associated with them. Powell<sup>21</sup> et al discovered this fact when they found out from their shop floor research that most of the knowledge available for accident prevention remains unapplied because communication between the operative level and top management is defective.

The importance of safety communication arise from the fact that over 80 per cent of all accidents can be attributed to human error. Indeed very few accidents have anything to do with defective or faulty machinery per se. It therefore follows that if any tremendous impression is going to be made on the heavy accident toll in industry the safety message has to be communicated to the relevant parties loud and clear as part of the safety education process. To ensure effectiveness of the process, safety communication must be properly planned and directed at the target group in the right language.



The importance of this need not be over emphasised as it has been shown that improper conception of the message will not only fail the communication process but it may even contribute to accidents due to raised anxiety levels in nervous workers.<sup>22</sup>

### Organization of Construction Safety in Kenya

#### Management of the Building Process

In Kenya, the construction industry like in many other commonwealth countries has borrowed a lot in terms of organization and structure from the British construction industry. The system in the UK has evolved overtime since the 13th century to give a structure whereby the designers, manufacturers of materials and components and the actual builders all form separate business entities. Bakuli,<sup>23</sup> traces the historical development of the British construction industry from the early times of the 13th century when the basis of the production process was the craftsman until the late 19th and early 20th centuries when the system of separation between the client, designers, and the builders took complete root. This later period corresponded with the colonisation era when most of what are today the commonwealth states became British colonies. The colonised states inherited most of the institutional set ups of their colonial masters and construction was no exception. These were retained by the independent states among other legacies of the colonial era and have survived to the present day.

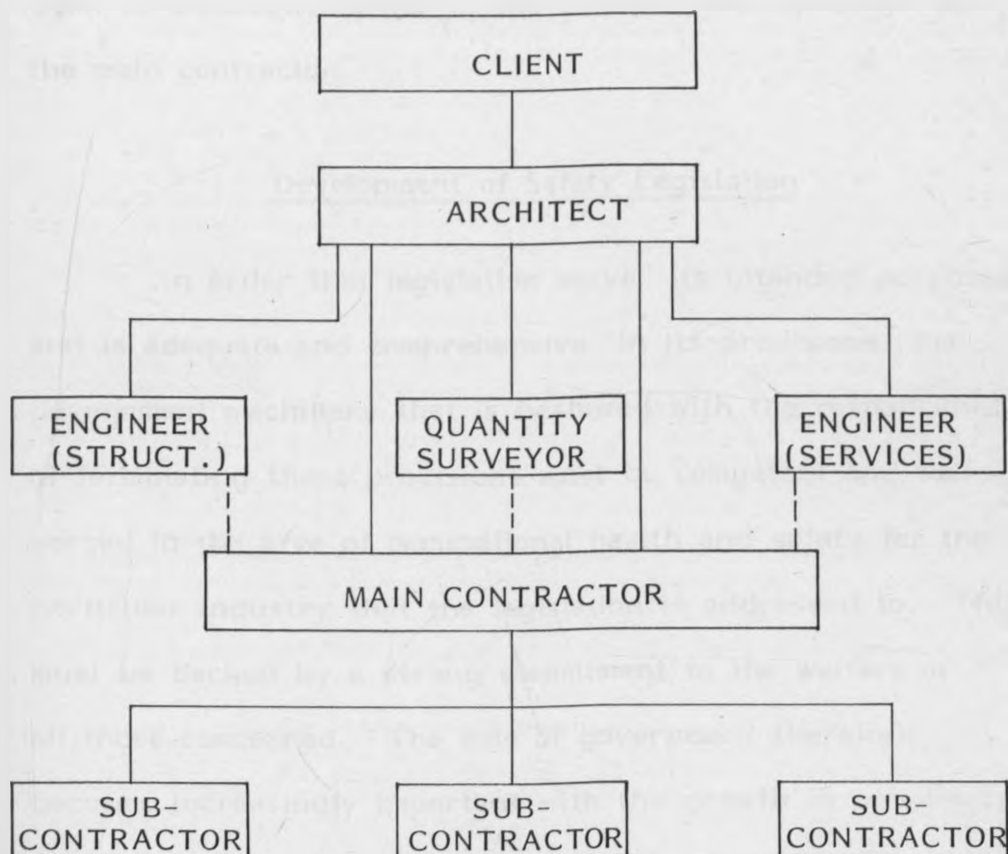
Mbaya<sup>24</sup> outlines the evolution of the system of construction project management in Kenya from the early 20th century when the manifestations of the colonial influence on the industry began to be felt. At this period no organised management procedures had evolved. The clients who mainly comprised the missionaries, colonial administrators and early settlers were their own designers and managers at the same time. They produced their own designs, purchased their own materials and organised local labour to produce shelters and other construction products they desired. These ranged from administrative offices and residences for the officers, mission houses, simple farm structures and other recreational facilities that went with the white immigrant living styles. For the more complex structures the usual practice was to import ready designs from Britain and implement them as they were.

The system as it is today made its entry into the local scene after the second world war. After the war there was an influx of European settlers whose needs for construction products were more sophisticated than the earlier settlers. Within those new immigrants were included construction design professionals including architects, engineers and quantity surveyors who had enlisted in the British army. The professionals organised themselves into professional associations and their members set up consultant offices in Nairobi. With the new demand for construction services, the general contractor evolved as the entity to take full charge of

assembling the building on site.

The industry in Kenya today is a conglomeration of different types of specialities with each one of them taking care of some distinct aspect of the construction process. The client is the initiator of the process and the provider of all resources to be used for the project. When he has need for any of the products of the industry he approaches one of the members of the design team mainly the architect. The architect studies his needs and requirements and given the clients ability in terms of the amount of resources he is able to commit to the project, designs a suitable project. Depending on the magnitude and complexity of the project it is upon the architect or the client acting upon advice of his principal consultant to commission the other professionals necessary for the project execution including the quantity surveyor, civil/structural engineer, and so on. After the design is complete or after a substantial part of it has been done, contractors are then invited to bid for the construction works. The project then enters the tendering stage of the process during which the contractor to construct it is selected.

FIG. 3.5: ORGANIZATION OF CONSTRUCTION PROJECT MANAGEMENT STRUCTURE IN KENYA.



----- Indirect flow of authority and communication

———— Direct flow of authority and communication

SOURCE: Adopted from Anthony Walker, Project Management in Construction, p.141.

From the above analysis it comes out clearly that the main contractor is the person or entity responsible for the management of the site construction process. The architect who is conventionally the leader of the construction team only has a secondary role of ensuring that his designs are followed and any instructions he gives are implemented. The contractor employs all the labour he needs on site and is responsible for all aspects of their welfare. All responsibilities and duties for providing a safe system of

work as discussed earlier in the chapter falls squarely on the main contractor.

### Development of Safety Legislation

In order that legislation serve its intended purposes and is adequate and comprehensive in its provisions, the government machinery that is bestowed with the responsibility of formulating these provisions must be competent and well versed in the area of occupational health and safety for the particular industry that the legislation is addressed to. This must be backed by a strong commitment to the welfare of all those concerned. The role of government therefore becomes increasingly important with the growth in complexity of safety and health problems brought about by the complexity of work places.

The government's commitment towards safety will not be effective unless it is backed by the workers and the employers. Consultations and contributions between these parties ought to flow freely among them.<sup>25</sup> In Kenya the safety legislation has been adopted from that of the United Kingdom, whose development is discussed below.

### Evolution of Safety Legislation in the U.K.

In the United Kingdom the first industrial health and safety legislation was an act of Parliament in the year 1802. This was specifically enacted for the preservation of the health and safety of apprentices and others employed in

cotton and other mills. It required the cleaning of the factory by two washings with quicklime every year and the admission of fresh air by means of a sufficient number of windows. Among other things, the act prohibited work at night. This was the prerequisite to the development of the factories Act.<sup>26</sup>

In 1844 the first edition of the factories Act was launched.<sup>27</sup> This followed a series of piecemeal legislative regulations which the Act consolidated into one legislative order covering all spheres of industrial activity. Many revisions of this Act followed in subsequent years to take stock of the ever increasing complexity of work places and variety of industrial activity. The compelling force here was the increasing number of accidents and the loss and suffering that resulted from these. This in fact led to the development and passing of the workmen's compensation Act in 1897 which was enacted to provide a just basis for compensating workers suffering losses from industrial accidents. It was also hoped that this Act would act as a deterrent to employers and would complement the factories Act in promoting the provision of safe places of work.<sup>28</sup>

The last factories Act was passed in 1961.<sup>29</sup> It dealt with numerous requirements for factories and other places of work deemed to include conditions that would pose risk to the workers. It had 14 parts incorporating 185 sections with seven schedules. Apart from the factories Act there

were other legislative regulations which were developed to complement it by way of providing for specialised work places or unique hazards. These included the asbestos regulations which were passed in 1969 and the protection of eyes regulations passed in 1974. Construction being a specialized area as far as working conditions and the risks posed are concerned, a series of specialized regulations were drawn to govern its operations. These included the construction (general provisions) regulations passed in 1961, the construction (lifting operations) also passed in 1961, the construction (health and welfare) regulations and finally the construction (working places) regulations both passed in 1966. A number of other regulations covering different industrial working places were also passed.<sup>30</sup>

It is clear from the above discussion that there were many laws and regulations covering different industrial working places passed over a period of two and a half decades after the second world war. In fact by 1970 despite many previous periodic attempts to consolidate safety legislation, there still remained a mass of laws and other statutory instruments which governed industrial health and safety in the U.K. By 1970 it was estimated that approximately two-thirds of the workforce were protected by more than 30 statutes and 500 statutory instruments.<sup>31</sup> There arose a general feeling among all concerned that the health and safety legislation needed overhauling

This culminated in the commissioning of a committee by the government to consolidate safety and health legislation among other things. The committee was appointed in the same year (i.e. 1970) and was chaired by Lord Robens. The Robens committee, as it came to be commonly known, had extremely wide terms of reference and its brief related to the whole field of occupational risk and protection of the public from hazards connected with industrial and commercial work. The committee carried out an investigation and made its report and recommendation to Parliament concerning occupational health and safety. The research took two years to finalize and the final report of the committee was realized in 1972. It contained, to say the least, radical proposals for the future of health and safety legislation. The fundamental declaration of the report was that the primary responsibility for the enhancement of occupational health and safety status lay within those who create the risks and those who work with them.

The report recommends a single statute of general application to replace the plethora of existing legislation.<sup>32</sup> However, it warned against the practice of relaying too much on government regulations. Instead it emphasized on voluntary efforts and individual responsibility. To facilitate this, statutory requirements would have to be simple which held within them simply assimilated concepts of general application. Hence the burden of legislation would be reduced by avoiding too much preoccupation with circumstantial details but rather aim at shaping attitudes and create the infrastructure for



better organization of occupational safety and health based on the industry's own efforts. Greater emphasis was therefore to be laid on management responsibilities for providing and maintaining a safe system of work rather than on technical safety standards.

The report also noted that legislation had in the past emphasized on the workplace environment per se. It recommended the widening of the scope in this connection to include the protection of visitors and the general public. Enforcement procedures were also found to lack reality. It was recommended that new procedures should be introduced which would encourage compliance with the law rather than adopt punitive measures every time an employer defaulted on the regulations. It was also found necessary that whenever possible the active participation of trade unions at the workplace as well as national level in safety matters should be encouraged.

Roben's report therefore became the basis for restructuring and modernising of the national organization of occupational health and safety in the UK, as well as for the development of a flexible system of standards in the form of codes of practice. This culminated in the enactment and passing of the "Health and Safety at Work etc. Act" in 1974.<sup>33</sup> This piece of general legislation specifies responsibilities of the various parties. It is supplemented by rules contained in the codes of practice adopted after consultations with the

relevant parties in each industry. The major point of departure from past statutory orders was that in this act, the rules contained therein need not be enforced if the objectives fixed by it can be attained by other equally efficient methods at the workplace. On the other hand codes of practice require from the employer only what is reasonably practicable.

The flexibility of the current legislation in the UK is quite clear as analysed above. The approach adopted, as was recommended by the committee, was that of laying down the general principles or fixing of broad objectives without detailing or restricting the way these are to be met. This approach calls for an enforcement authority with considerable technical knowledge for the overall administration of the legislation. This became the case with the Health and Safety Commission of the UK which was established and charged with the responsibility of preparing safety and health regulations, approved codes of practice and enforcing the same at working places. It is composed of persons with experience in the field of industrial management, in the trade union field and in the medical, education and local authority spheres.<sup>34</sup>

One of the principle objectives of the act as has been pointed out in the discussion is to involve everybody at the workplace in the persuance of better health and safety conditions for all concerned. Towards this end the act

outlines elaborately the responsibilities of both management and work people. Section 2 of the act bestows upon the employer a general duty of ensuring the health, safety and welfare of all employees. His responsibilities are therefore derived from this duty.<sup>35</sup>

1. To develop systems of work which are practicable, safe and have no risk to health.
2. To provide plant to facilitate this duty, and this general requirement is to cover all plant used at the workplace.
3. To provide training in the matter of health and safety; employers must provide the instructions, training and supervision necessary to ensure a safe work environment.
4. To provide a working environment which is conducive to health and safety.
5. To prepare a written statement of safety policy and to establish an organizational framework for carrying out the policy; the policy must be brought directly to the attention of all employees.

On their part, of the employees also have a duty to ensure the following:

1. To take care of their health and safety and that of other persons who would be affected by their acts or omissions at the work place.

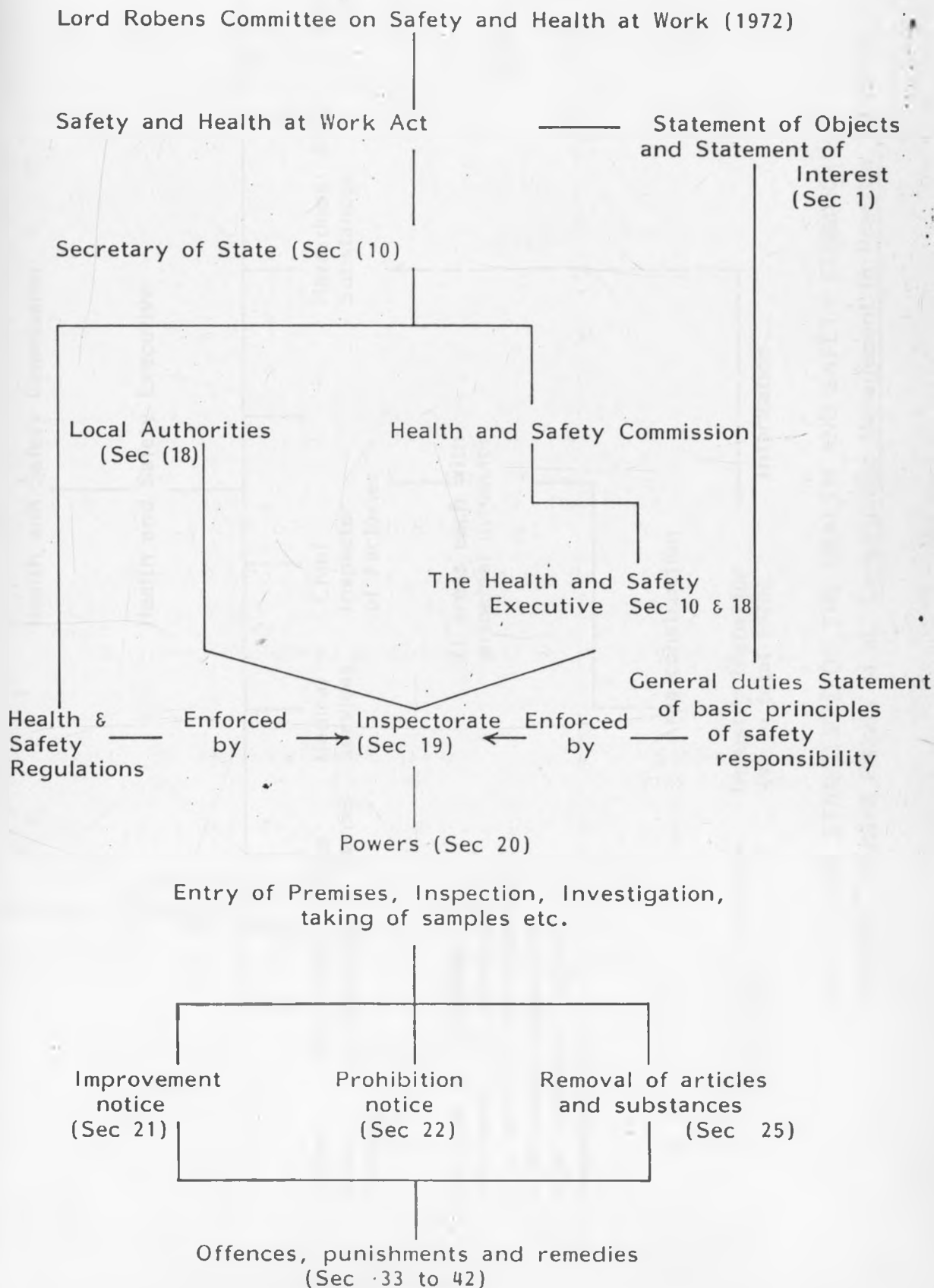
2. To cooperate with the employer to enable everyone to comply with the statutory provisions.

Figure 3.6 shows the structure of the act outlining the lines of authority created to facilitate carrying out its objectives. Figure 3.7 shows the organization of the health and safety commission which is the supreme body established by the act to oversee all matters related to industrial safety including the review of safety from time to time and the enforcements of the provisions of the act.

The act provides for an inspectorate to back the duties of the employer and the employees. The inspectors are the people directly involved in the inspection of the safety of work places. To make this feasible the act grants them powers to enter sites for purposes of inspection. The inspection may include the taking of photographs and samples. In addition the inspector may require the site manager to produce documents and any other information which he deems necessary in his inspection procedure. He has the powers to inform the work people of any matters that in his opinion may be deleterious to their health and safety. However whenever such information is given the inspector has an obligation to give the same to the employer to allow him a chance to rectify the situation if it arises as a result of his act or omission.

As seen from the structure of the act in figure 3.6 three possible remedies exist where an inspector finds the

FIG. 3.6: THE STRUCTURE OF HEALTH AND SAFETY AT WORK ETC. ACT 19TH 1974 ( PART 1)



SOURCE: F.N. Eaglestone, Insurance for the construction Industry. (London: George Godwin Limited, 1979), p.39.

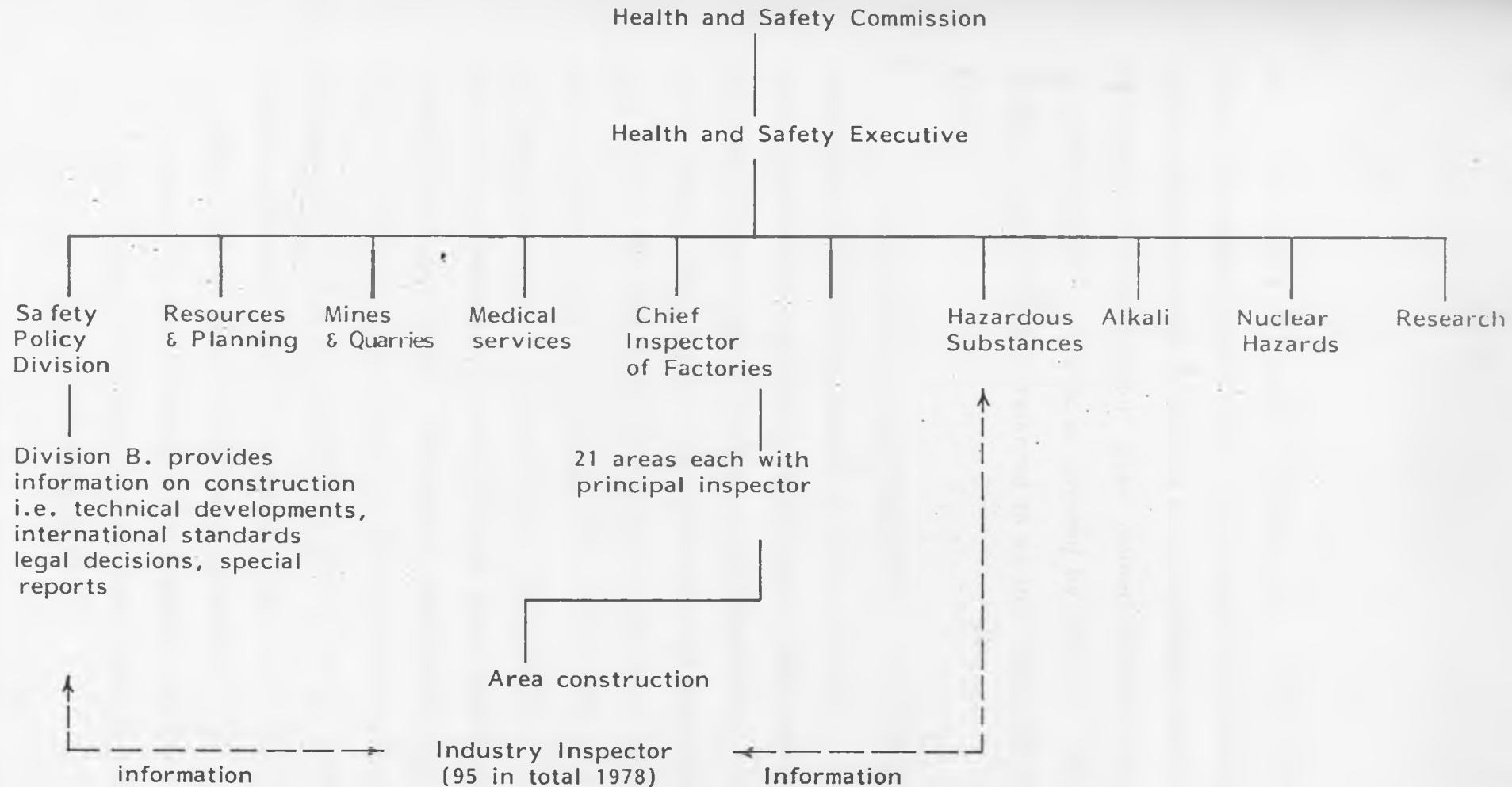


FIG.3.7: THE STRUCTURE OF THE HEALTH AND SAFETY COMMISSION  
 SOURCE: Richard Fellows et al, Construction Management in Practice, p.100.

site in breach of the Act's requirements. These are the issue of an improvement notice, the issue of a prohibition notice and the removal of articles and substances which in the opinion of the inspector pose eminent danger to workers or other members of public as covered by the act. This last remedy is also commonly referred to as the "seize and destroy" order.

The "improvement notice" means that if in the inspector's opinion the site is contravening a certain statutory provision, then he serves the manager with the notice which contains his opinion concerning the breach of the regulation. This notice further must specify the particulars of the breach and demand that the employer rectify the situation within a given period. When in the inspector's opinion the work being carried out involve a risk of serious injury to the worker, then he is empowered to issue the work place management with a "prohibition notice". This notice constitutes the inspector's statement of opinion as to why he has issued it, and the instructions to the relevant person not to continue with the operation until the necessary steps have been taken to improve on the safety of the said operation. The "seize and destroy provision empowers the inspector to physically seize and destroy any article or substance which he believes causes eminent danger to all concerned.<sup>36</sup>

It is therefore clear from the powers given to the inspector that the Act guides the inspectorate towards

adopting a corrective and a compromising approach towards the enforcement of the statutory provisions rather than a punitive and confrontational approach. Prosecution will only be a matter of last resort when the entire procedure aimed at guiding the erring party towards correcting the error has been exhausted. This is in conformity with the Roben's committee recommendations upon which the Act is founded.

### Safety Legislation in Kenya

The factories Act, which came into operation on September 1st 1951, is the general legislative order which governs the provision of safe and healthy work places in Kenya.<sup>37</sup> The Act contains statutes of general application to all industrial working places. Since the adoption of the general legislation, the need has been felt to formulate subsidiary legislative orders to cover some specialised industrial working places. The Act provides for such subsidiary legislation where the Minister for Labour is bestowed with powers enabling him to pass any rules or regulations which he deems necessary to complement the Act in the governing of safety health and welfare of workers at work places. Once such rules have been passed by the minister they become operational and form part of the Factories Act requiring observance by the employers and subject to enforcement by the established machinery. It was not until 1984 when rules of particular application to the construction industry were passed. The Factories (building operations and



works of engineering construction) rules became operational on the 15th February 1984 and are applicable to works of general building and civil engineering nature.<sup>38</sup>

The general Act covers provisions for the health safety and welfare of persons employed in factories and other places of work which fall under its definition of a factory. It is divided into 11 parts covering different aspects of worker safety, health and welfare. The most relevant parts to this study include parts V, VII, X and XI which cover the following aspects.

- Part V: Safety - General Provisions.
- Part VII: Health, Safety and Welfare - Special Provisions and Rules.
- Part X: Administration.
- Part XI: Offences, Penalties and Legal Proceedings.

An evaluation of construction Safety Legislation in Kenya is contained in chapter five.

Chapter four outlines the general principles of construction site safety practice and management. It begins by discussing the characteristics which make the industry worth a different approach in the area of safety. The principles as discussed are derived from the general theory on industrial safety with modifications to suit the unique character of the industry. It is from this principles that a questionnaire and checklist were designed to gather data

from the field. As in any other area of management, it must be emphasized that the principles as outlined are only guides to good practice with room for modifications to suit particular situations. The operational model derived from the principles is only a guide and not a stereotype model to be applied by every site manager without regard to particular site conditions. A sense of pragmatism is therefore called for in the application of the principles to actual practice.

FOOTNOTES

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## CHAPTER FOUR

### CONSTRUCTION SAFETY PRACTICE AND MANAGEMENT

#### Unique Characteristics of the Industry

The reason why construction industry has remained one of the most dangerous working places of modern times is contentious. One school of thought may be that construction work is inherently dangerous and hence poses a more than average risk to its workers. The other extreme view would be that workers and employers alike have remained largely negligent in their roles towards safety in the construction work places. Whatever the view adopted and in whichever country - developed and developing alike, it is true, that construction as an industrial work place and activity has some unique characteristics that warrant a different approach in the area of occupational safety.

Hammer<sup>1</sup> identifies four special work characteristics which in combination appear in construction to make the work environment in the industry different from that of the general industry. First is the continuous alteration of the place of work. This is different from the conventional factory - like in manufacturing where the place of work remains relatively static. This means that it is easier to control the work environment and especially the factors that affect safety (as outlined later in the chapter) in general industry than in a construction site. The worker in a static work environment

becomes more accustomed to the environment and becomes more and more familiar with the operations that he is expected to perform. Continuance work in a familiar environment breeds confidence in the worker which in turn means that he becomes safer. This follows from the proven fact that a new worker or one in an unfamiliar work environment is more liable to injury than an experienced worker.<sup>2</sup> The construction worker may be considered a new worker every time he moves to a new site since the work environment in each site is different due to the different project construction demands.

The second characteristic derives from the presence of many entities of different specialities on the same work place, the site, under the control and co-ordination of the main contractor.<sup>3</sup> In general, the task of integrating the activities of all the subcontractors to achieve a harmonious project execution pace is a mammoth one on the part of the main contractor. The more the subcontractors on site, the harder the task of co-ordinating their activities. In such hectic circumstances it is easy for the site management to use all their energies in trying to control more conspicuous matters which seem to have direct and immediate financial implications to the project such as the meeting of tight time schedules and cost targets thereby neglecting and overlooking other matters of equal importance to the totality of the project successful completion, such as the safety of the work environment. Though the main contractor may have the right attitude and commitment to safety the subcontractors may have



their own interests and priorities which may not necessarily be in sympathy with the main contractor's policy. In the U.K. the health and safety executive which is the government agency overseeing all matters related to safety of work places has identified subcontractors as being among those responsible for the propagation of the industry's deplorable safety record.<sup>4</sup> However noble the main contractor's intentions regarding safety are, they will not be translated to reality if the subcontractors on site have no commitment to safety. This is as opposed to the situation in a conventional factory where all the processes are under the control and execution of the same entity.

The third characteristic is the high turnover of workers in the construction industry.<sup>5</sup> The argument advanced for the first characteristic can be extended here. The high turnover of workers will mean that new workers will keep being recruited on site to replace the departing ones. Before they gain any meaningful experience and become accustomed to the site, they will face a higher risk of injury than would have been the case if the old workers had remained. Contrary to this, workers in most of the other industrial undertakings tend to be more stable in their employment and are therefore more likely to spend much more time with the same employer and in the same work environment, performing the same operation.

The fourth factor observed in construction is the fact that people in the construction tend to be generally

individualistic, are great improvisors and very ingenious.<sup>6</sup> This arises from the very nature of a construction project. No two projects will ever be identical. This extends to the nature of the activities necessary in the construction of the project. For any new project, situations will always arise which may not have been experienced before in another project. This will call for the instant development of new methods of dealing with novel situations. During such instances when solutions are being sought to new situations, the element of risk in the performance of the activity is highly increased.

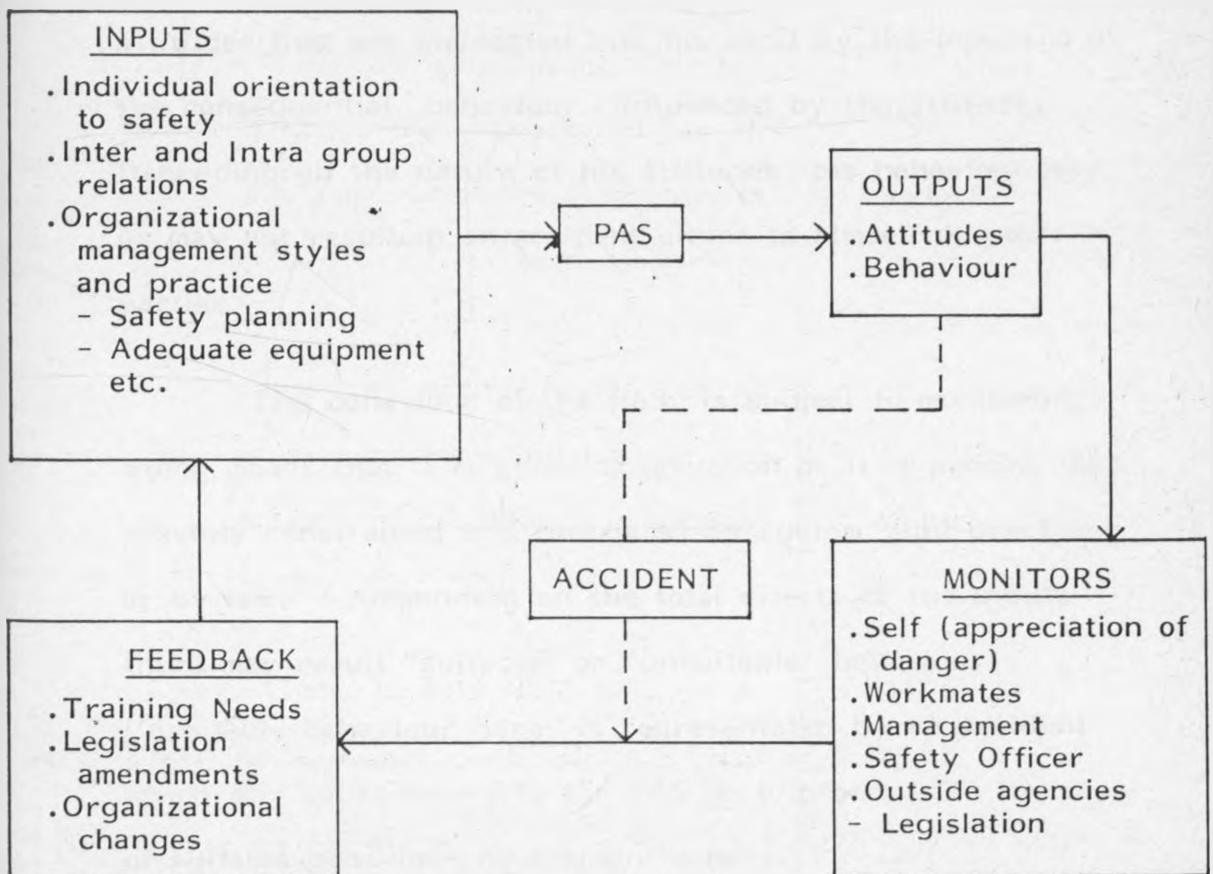
A more elaborate approach requiring more attention in working out details at every project level is therefore called for in dealing with safety in the construction industry. This means that the people in construction have to devote more resources towards the creation of a safe work environment than their counterparts in other industrial working places, if high levels of risks have to be reduced to reasonable levels. This will only be achieved by inculcating the right attitude and instilling a sense of total commitment in the minds of the people in construction.

#### Integrated Conceptual Systems Model

The physical (environmental or structural) and personal (psychological) safety factors as discussed in chapter two can be integrated into a model that also includes the other

safety institutions that are included for investigation in this study. These are management, the legislation and the enforcing machinery. The model can also be diversified to include any other bodies with an interest in construction safety on building sites such as trade unions. For purposes of this study only the physical factors, management legislation and the enforcing machinery are emphasized. The model was originally developed by Phil Leather and his colleagues in the department of behaviour in organizations of the University of Lancaster.<sup>7</sup> (See figure 4.1).

FIG. 4.1: INPUTS AND OUTPUTS OF A POTENTIAL ACCIDENTS SUBJECT (PAS) ON A CONSTRUCTION SITE



SOURCE: Phil Leather self and organization in the perception of safety and danger in the Construction Industry.

The model centres around what its pioneers called the Potential Accident Subject (PAS).<sup>8</sup> The PAS is defined as the individual who, by his presence on the construction site is the potential accident victim or the potential accident contributor not necessarily the victim. This is mainly the worker, any third party or property that is liable to damage in the event of an accident occurring.

A study of the model reveals that the PAS is subject to a set of inputs comprising information and influences which affect his behaviour. They may either produce safe practice on the part of the subject or alternatively affect him psychologically to cause unsafe practice. This will eventually lead to the outputs defined in terms of the attitudes that are inculcated into his mind by the inputs and the consequential behaviour influenced by the attitudes. Depending on the nature of his attitudes his behaviour may or may not result in an accident either to himself or other parties.

The behaviour of the PAS is subject to monitoring which means that it is under observation or it is policed and possibly constrained and controlled by custom and practice or by law.<sup>9</sup> Depending on the total effects of the inputs there may result "suitable" or "unsuitable" behaviour. Unsuitable behaviour here is represented by an accident which may cause injury to the PAS or to others. In the case of suitable behaviour, no accident occurs.

In the event of "unsuitable behaviour" or in other words an accident, suggestions or demands for change are returned to the input stage in the form of feed back. Feedback will demand that the inputs be reinforced or modified in the hope that suitable behaviour will result and so the cycle continues.

In this conceptual model the inputs to the scheme are the physical and personal factors as discussed earlier. It is further seen that the monitors which perform the monitoring are the institutions which include management, legislation, trade unions and the enforcing body. The mechanisms by which change may be effected into the system are threefold. These are the training of the worker (the PAS), propoganda in form of manuals or posters, which are designed to change his attitude and fix the principles of safe practice into his mind, and finally example by others which he emulates in his daily activities. Example may be in form of demonstrations by management to the worker that it is doing all that is feasible within technical and legal requirements to ensure safety at the work place. This is what may be termed a good example and when emulated by the PAS will produce safe practice. The other extreme is where management is not committed to safety and where the worker copies the example to give rise to unsafe practice.

### The Operational Model

In the operational model that the researcher set out to test on the sites the inputs referred to in the conceptual model above were represented by the various physical factors on site as included in the checklist (see appendix 1) forming part of the questionnaire administered. Management and legislation (as defined in the study) can be traced in the above model as the "monitors" and "inputs" to the system. The enforcing machinery may also be defined as a "monitor".

### Site Safety Checklist

The idea behind the site checklist as a model is the fact that majority of accidents in construction happen because routine site activities have not received sufficient forethought and care. The checklist can be used to gauge how efficient the integrated safety system developed above is. Any shortcomings and failures in the system will be manifested on site by the simple factors that are included in the checklist. Corrective action to the failures of the system will have to be based on the situation as observed on site. The effectiveness of the safety policy and the commitment and participation of top management in site safety will be reflected by the happenings on the site.<sup>10</sup>

The following list is by no means exhaustive but may act as a guide to any site manager on aspects of general concern on a site.

### General Site Safety

Unsafe situations and practices should be pinpointed so that steps can be taken to correct them before anyone gets hurt. This calls for proper site inspection by site management especially the site agent and his supervisors. Subcontractors should be included in such inspections and any unsafe situations which have arisen as a result of their operations on site pointed out to them for immediate improvement.

### Safe Access

All roads, gangways, passageways, hoists, staircases, ladders and scaffolds should be in good condition, properly lit and free from obstruction. A proper interconnecting relationship should be maintained between the various parts of the site to facilitate "communication" between the various physical units of the site such as the site office, the storage area and the "action" areas (where materials such as concrete are mixed) and the work points (where the materials are being used). For instance the entry to the site should be located in such a way that any visitor to the site is lead automatically to the site office without having to pass through the work or storage areas. A proper site plan is therefore necessary before the contractor moves into the site. In the design of a site plan site management should include a person well committed and knowledgeable in site safety.

### Ladders

Ladders should be in good condition and properly secured. The construction of ladders by carpenters and their subsequent securing at the work point ready for use should be given special consideration given the fact that falls contribute to the highest proportion of accidents on sites. In the U.K. falls from ladders in building operations alone (excluding civil engineering works) kill an average of five people every year.<sup>11</sup> Thorough and regular inspections should be carried out on each of the ladders in use. Special attention should be given to ladders which have been out of use for some time as their sturdiness may have been affected. Inspections should be carried out by the supervisors, site agents, and safety officers, or their representatives.

### Tubular Scaffolds

Scaffolding should be complete (decking, toeboards, guardrails), properly supported and adequately braced with the loading evenly distributed. It must never be overloaded. It should be inspected weekly to make sure that it has not lost its stability of some of its members and that some of the joints and supports have not become loose.<sup>12</sup> Like with ladders special attention should be given to its construction with only competent men being allowed to construct it under supervision of a person in charge of safety on the site. The materials used, particularly the boards



for the decking should be selected with care.<sup>13</sup>

### Excavations

Adequate timber should be provided and used to support the sides of any excavations where workers are expected to work inside them. The legislation in Kenya provides that for any excavation more than 1.2 m deep timbering should be done to prevent the sides of the trenches caving in and injuring workmen in the trenches.<sup>14</sup> The adequacy of timbering will depend on the type of soil that the site stands on. The extent of timbering will therefore depend on site soil conditions of each site.

Barriers should be erected along the sides of any trenches or pits to prevent people falling inside them. This is especially necessary on a site where extensive excavations have been done on a part of the site maybe for purposes of basement or other large scale underground construction. This means that part of the site will be at a lower level than the other one. A barrier is necessary all around such excavations to prevent any accidents occurring. The law provides that any excavation more than 2.0m deep be provided with adequate barrier when access by workmen, plant and equipment or material to or from it is not necessary.<sup>15</sup>

Pits and other openings are particularly common in demolition and alteration works. These can be dangerous especially if the site is restricted meaning that workers have

to cross over them when going about their business. Extra care is necessary here with covers being the most appropriate safety measure. These should be strong enough to carry the weight of workers and any materials they may be carrying as they move about the site.<sup>16</sup>

Though barriers or fences will prevent any vehicular traffic from coming too near the excavation and hence avoiding any danger of overloading the grounds adjacent to the sides of the excavation causing collapse of the sides, it is wise to take further precautions to make sure that no vehicles or other plant or machinery is allowed to come too near the excavation. This may be by means of posters or signboards warning that vehicles are not allowed to go beyond certain points.

#### Transport around the Site

All vehicles being used on site in transporting materials or components into the site must be driven safely and carefully. Materials and components being transported must be properly loaded to avoid the risk of any of them falling off and possibly injuring workers going about their business on site. Overloading should be avoided at all times. Vehicles should not be allowed to ride in dangerous positions such as areas adjacent to excavations or on gangways and/or passageways not designed to carry their weights and accommodate their dimensions.<sup>17</sup>

Tipping lorries and other hoisting vehicular plant pose particular danger to unwary workers. Materials being tipped may injure workmen who may be nearby. This can be avoided by having the area where tippers offload separate from the area where workers are busy.<sup>18</sup>

### Machinery

In one year alone (1967) in the UK accidents with machinery on site caused 39 deaths, kept 6774 injured workmen off work for more than three days and caused material and property damage worth over £2 million.<sup>19</sup> This shows the extent of losses in terms of human life, lost man-hours and material damage. Contractors must therefore do everything possible to avoid such wanton losses. All dangerous, and especially the moving, or sharp parts of machines must be securely guarded. Particular attention must be given to some deceptively safe parts. For instance hidden parts such as projecting shaft ends may be particularly dangerous. These measures should be complemented by proper protective clothing and other safety gadgets on the part of the workmen operating the machine.

All operators must be properly trained to handle the machines and issued with valid operators licences in the case of mobile plant. Periodic inspections of the machines will ensure that they are in good conditions. Proper maintenance, servicing at the prescribed intervals as

instructed by the manufacturers must be done to ensure that unworthy machines which are potential danger points are not used on site.

### Hoists

Hoistways must be enclosed and provided with gates at every landing. These must be kept shut when the hoist is not being used at a particular landing for either loading or offloading. All hoists must be inspected periodically preferably after every week. After every six months a complete overhauling inspection must be done. Hoists designed for materials must be used for any other purposes such as carrying workers. Hoists are not very common on Kenyan construction sites. Of all the sites visited by the researcher during the carrying out of this study only one site was using a hoist. This however does not rule out their increased use in future.

### Cranes and Lifting Appliances

Cranes should be regularly maintained and inspected. A test certificate should be given by the dealers. Due to the heavy loads that the crane is expected to move around a site and the subsequent pressures to be transmitted to its base, each crane must be sited on a hard level base and marked with safe working loads as prescribed by its manufacturer. It should never be overloaded. The crane driver and his assistant must be fully trained and possess

valid licences. Although the number of crane accidents is small relative to other causes, they are responsible for a high fatality rate.<sup>20</sup>

### Electricity

All apparatus running on electricity, the necessary wires, cables and connections must all be sound and properly insulated. They must be sited in such places that workers will not disturb them as they go about their affairs on site. Wires particularly must be ran along routes where they will not interfere with work on site. Crisscrossing of wires across working areas is tempting due to the savings resulting from saved cables. This should be avoided. If overhead cables or underground ones pass over or under the site respectively, their exact positions should be established (especially the underground ones). Special precautions should then be taken to avoid their damage or interference with to avoid electrocution. Mere contact with a cable may cause great harm to a worker such as the loss of a limb or complete incapacitation, not to mention that in many cases death may occur.<sup>21</sup>

### Hoarding

Where the site is located in an area with pedestrian traffic next to the site, hoarding must be constructed in such a way that it protects them from debris and other materials which may fall from working points above.

In the heart of a city like Nairobi where there is heavy pedestrian traffic adjacent to sites, fully enclosed gangways must be built adjacent to the hoarding to provide people with a safe passage. Pedestrians must also be warned by way of a notice to walk in the constructed gangway.

### Protective Clothing

Provision of protective clothing is one of the basic construction safety measures but one of great importance. These can guard against many common injuries on site which cannot otherwise be prevented from occurring. Such occurrences which may cause minor but frequent injuries if not guarded against include small objects such as materials and tools falling on ones feet or other parts of the body, knocking ones head against workplaces as one bends to pick up something, head or skull injury from falling debris, burns from hot materials or tools and so on. A helmet for instance, may make the difference between a crushed skull and a slight headache in case of heavy materials or debris accidentally dropped or toppling over a worker.<sup>22</sup>

Protective clothing must be provided at least to the minimum standards required by law. In Kenya the law requires that a contractor provide "adequate and suitable" protective clothing to all workers working in open air. However, it does not specify what is adequate and suitable. Protective clothing must be reasonably sound both in terms

of quality and size in order that it gives the intended protection to the worker. Worn out or ill sized clothing is worse than no clothing at all. An overall with loose hanging sleeves and in tattered shreds will increase rather than reduce danger of being injured by machinery since the loose parts may be caught by the moving parts and hence expose the wearer to danger. Helmets must be hard enough and well fitting to withstand the force of falling debris.<sup>23</sup>

### Fires and Explosives

Adequate fire protection must be provided on site to avoid damage that may result as a result of accidental fires. Attention must be given to the prevention of fires and to their control in case they occur. Provision for fire prevention is an aspect that may escape the attention of even the inspectors and those charged with the drafting of rules and regulations for construction safety. This is because fires are not common occurrences on building sites. This should not be taken to mean that when they occur they do not cause significant destruction. On some sites it is common to have some very highly inflammable liquids and materials stored within.

As far as fire prevention is concerned, the best way to do it will be to avoid situations which may be conducive to the start and spread of fires. Dirt and litter must not be allowed to accumulate on site. Workers must be warned not to smoke carelessly on site, a habit which may increase the

likelihood of a fire when workers throw cigarette butts or matchsticks around the site. These may start a fire especially if they land on flammable materials.

Putting out fires can be adequately provided for by having fire extinguishers around the site. These must be located at conspicuous points where they will be readily accessible in case of a fire.

A competent person should take charge of the storage, handling and use of explosives. Explosives are common where there are some excavations in hard rock to be done. Before any explosives are done the site must be clear of workers and the necessary measures included to protect all machinery and adjacent property that is liable to damage.

### Formwork

All designs and construction of shuttering and formwork must be checked properly by a supervisor well versed in its construction and in safety aspects. The props must be plumb and properly based out to distribute the weight evenly on the ground. Proper wedges must be used to provide adequate and sturdy support pressure.

### Site Planning and Layout

Safe conditions of work should be provided for at the site planning stage. The first step to be taken in planning



is a close and thorough examinations of the site area. The factors to be given special attention should include a study of the ways of access for both mechanical equipment and people, and of the traffic ways on site itself. The choice of means of transport and services needed around the site should be done early enough during this stage so that the construction of roads, sewerage systems, water mains and power supply lines is well correlated to produce a smooth practical network.<sup>24</sup>

Planning the site layout should include provision for material stacking areas to avoid the possibility of double handling or scattering of materials around the site. The need to isolate and protect materials or substances which are harmful should be borne in mind. In general the contractor should aim at having an organized, neat and tidy site during the site operations. Forethought during the planning stage will be more than repaid by the savings obtained from reduced accidents and smooth operations. Indeed, tidiness in mind and action are interactive and related to safety.

### Safety Management in Construction

With regard to safety, the unique characteristics which have been identified with the construction industry justify a slightly different treatment of the same in the area of safety management. The presence of these factors coupled

with the fact that the construction manager is always under pressure to complete the project within rigid time and budget framework means that a more rigorous and pragmatic approach must be adopted by management. However, even with the institution of such an approach, construction management may still have problems controlling safety due to the diversity of variables on the job and between different projects. These include climatic conditions, regional differences in the labour force, type of contract, method of payment and labour mobility. However, even within the industry itself diversities in attitude and approaches exist. In the United Kingdom, studies have revealed that only about 20 per cent of all fatal accidents occur in large companies. This is hardly surprising given the fact that top management of larger firms have been found to have more commitment to their safety programmes.<sup>25</sup>

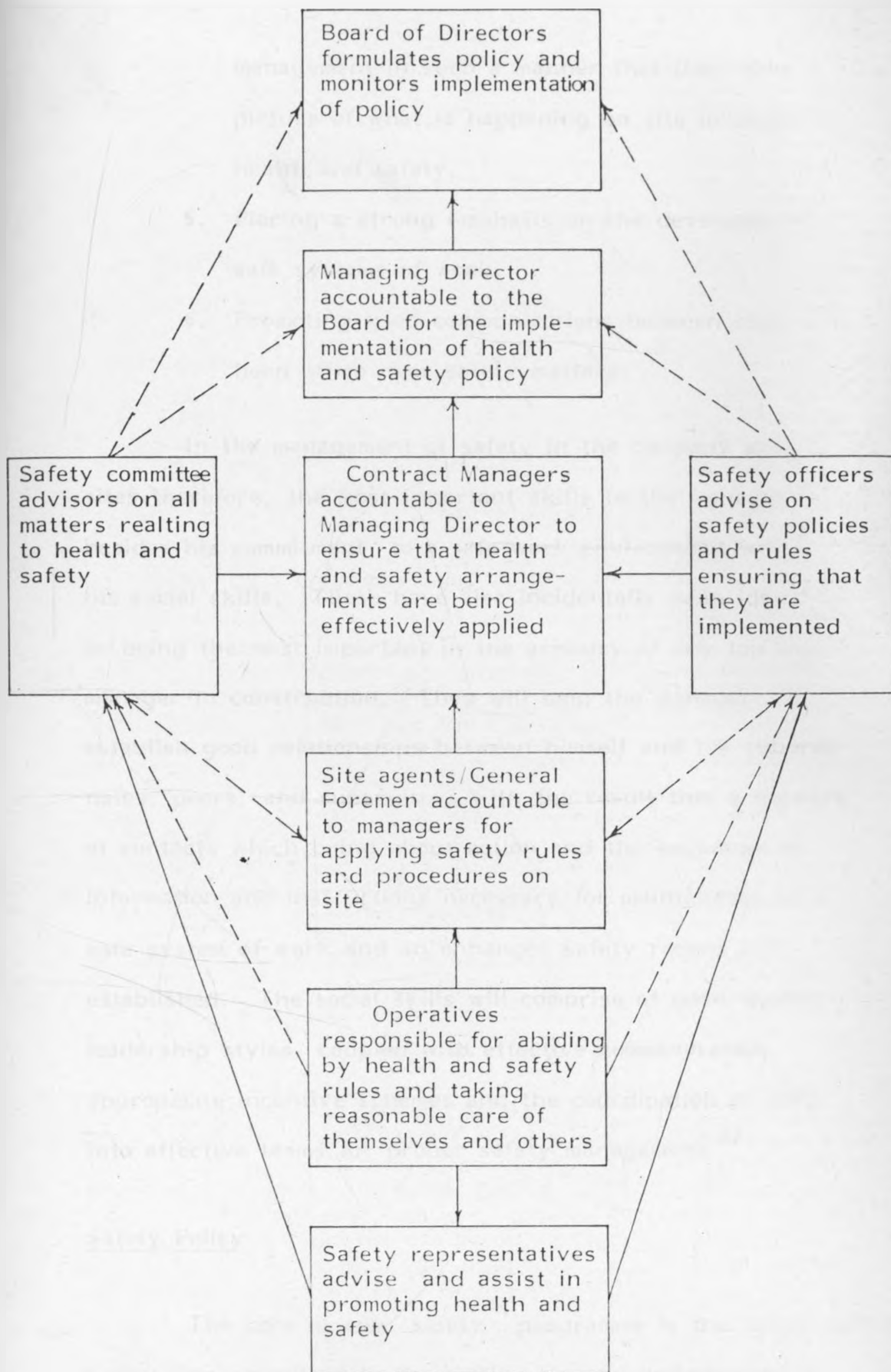
In looking at the total management nature in construction it is good to make it quite clear that no single best way of managing a project exists. Anybody with an interest in management of the construction process sooner or later realises that considerable flexibility and pragmatism is always called for in solving management issues in construction. This attribute equally applies in the management of safety in construction. No stereotype design of a safety programme policy, or organization structure can be recommended as being equally applicable to all construction firms and projects. However, a typical model organization structure

intended to describe a general arrangement and layout for a safety organization can be proposed to act as a guide as to the various relationships that need to be established in an individual firm's safety programme. Thereafter it is upon the management of every firm to adopt it to its own needs and requirements depending on the circumstances under which it finds itself at various times. This is shown in figure 4.2 overleaf.

In setting up the safety organization for the programme, care should be taken to minimize administrative rules and to keep the hierarchies shallow. This will be necessary to facilitate effective communication needed for fostering teamwork and quick decision making. This is essential in construction where the general pace of activity is high requiring fast but effective and correct decision making. The following general rules must be followed in setting up the structure.<sup>26</sup>

1. Delegation of responsibility down to the workforce
2. Identification of key personnel to direct the safety effort in specific areas of work, e.g. maintenance of plant and machinery and the keeping of clean records.
3. Developments of job descriptions which emphasize that site managers are accountable for safety on site.
4. Monitoring of safety by a safety officer of the company and the submission of reports to senior

FIG. 4.2: SAFETY STRUCTURE FOR A CONTRACTING COMPANY



LEGEND

- - - - -> Indirect Relationships
- > Direct Relationships

management in such a manner that they have a picture of what is happening on site in terms of health and safety.

5. Placing a strong emphasis on the development of safe systems of work.
6. Promoting good communications between sites and head office over safety matters.

In the management of safety in the company and on sites therefore, the most important skills to the manager besides his commitment to a safe work environment will be his social skills. These have also incidentally been identified as being the most important in the armoury of any top flight manager in construction. They will help the manager establish good relationships between himself and his subordinates, peers, and supervisors with the result that a network of contacts which bring about action and the exchange of information and instructions necessary for maintenance of a safe system of work and an enhanced safety record are established. The social skills will comprise of good quality leadership styles, coupled with effective communication, appropriate incentive schemes and the coordination of staff into effective teams for proper safety management.<sup>27</sup>

### Safety Policy

The core of any safety programme is the safety policy. Every firm committed to the setting up and perpetuation of

an effective safety programme must have its own policy tailored to suit its needs and objectives. The policy must contain several attributes as discussed in this section. It must contain in writing a statement of the responsibility and accountability system for each level of employee in the prevention of injury and damage within the organization.<sup>28</sup>

Unless the two are clearly defined, then the policy will not have proper anchorage and wastage and damage will continue to occur. The mere statement of the responsibility and accountability will not in itself motivate people to take them up. These must be reinforced by an awareness of the legal, personal and economic consequences that may result from laxity. The creation of awareness will be effected by pointing out the statutory consequences that may result from contravention of the provisions of the legislation. The firm may also have its own disciplinary measures for non adherence to the set down regulations. To further complement this the policy must have provisions for the necessary training at all levels to enable each individual to carry out his responsibilities as laid down in the policy.

The policy must contain a provision that places upon the contractor the obligation to take into account, at tendering and planning stages, all those factors which help in eliminating injury, damage and waste. These will include all those factors as covered in the checklist outlined in the preceding section depending on the needs of a particular project. This will make sure that the tender sum the firm submits to the

client covers all the safety expenses that the contractor anticipates to meet on site. This will rectify situations where contractors have been known to cut down on their safety provisions in order that they may undercut their rivals and win contracts.<sup>29</sup>

The policy must also provide for the setting up of an accurate and appropriate accident reporting system. This will include thorough investigation of accidents when they occur to determine their causes with a view to providing a remedy and avoiding their occurrence in future. The system must also encourage the supervisors to establish a cost analysis of all accidents reported. This will help ascertain the accident costs as a proportion of total accident prevention programme.

In the final analysis the setting up of an effective programme requires financial resources to run. The policy formulation must therefore include the provision for the setting aside of sufficient funds for the setting up and maintenance of the programme. It must facilitate the drawing up of a budget periodically to be included in the total recurrent budget for the firm. The expenditure on the safety programme is justified by the fact that it will help prevent larger sums from being wasted in the long run when accidents occur.

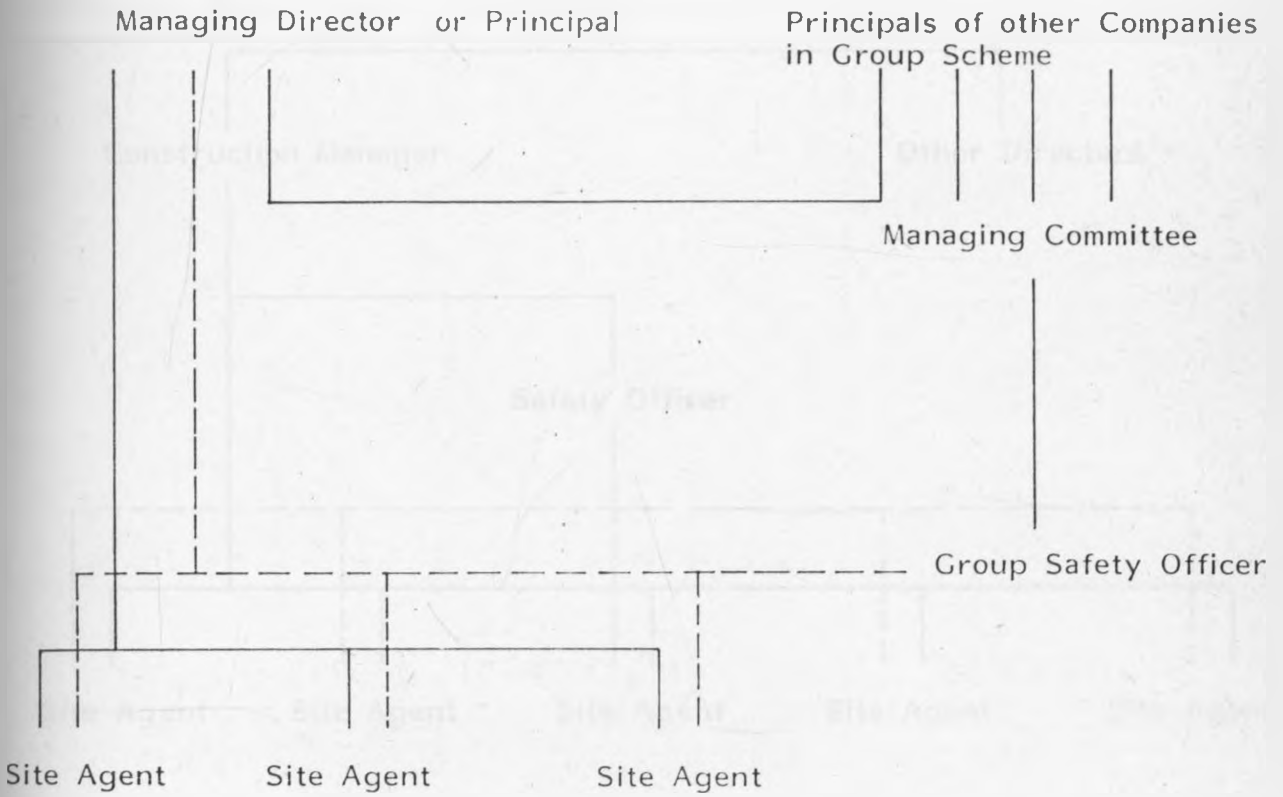
## Organization

Safety organization and control is a function of line management in the contractor's organization. It has been said that the key to the improvement of the bad construction industry safety records lies in the attitudes of top management and its ability to communicate safety policies to line management who will implement them on site.<sup>30</sup> The setting up of the organization will entail the drawing up of formal lines of relationship and levels of responsibility among the participants in the contractors organization. This is an important process in the setting up of the safety programme since it will determine whether the contents of the safety policy will be implemented effectively.

The building advisory service for the National Federation of Building Trade Employees (NFBTE) of the UK in 1978 recognized the need for a safety organization in any construction firm.<sup>31</sup> It came up with specimen organizations to act as guidelines to different size of firms in the setting up of their safety organizations. Three specimens were outlined to correspond to small firms on a group safety scheme, a medium sized company and finally for a large construction firm. They were not meant to be the actual models to be adopted by firms but were designed as outlines of the various lines of relationships that were necessary in any organization. These are outlined in figures 4.3 to 4.5.



FIG. 4.3: SAFETY ORGANIZATION FOR A SMALL COMPANY  
IN GROUP SCHEME.



SOURCE: "Construction Safety, Policy, Organization, Administration.  
Building Advisory Service for the NFBTE 1978, p.7-8.

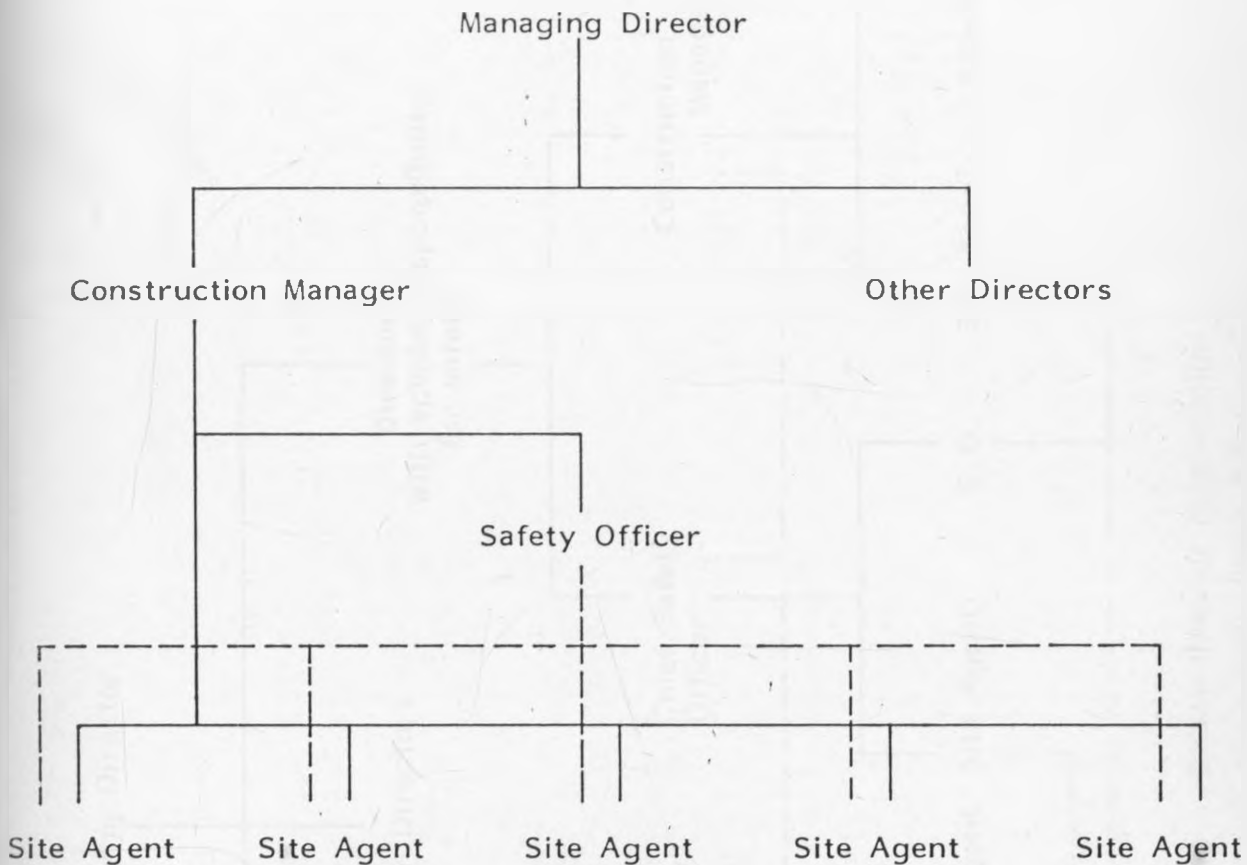
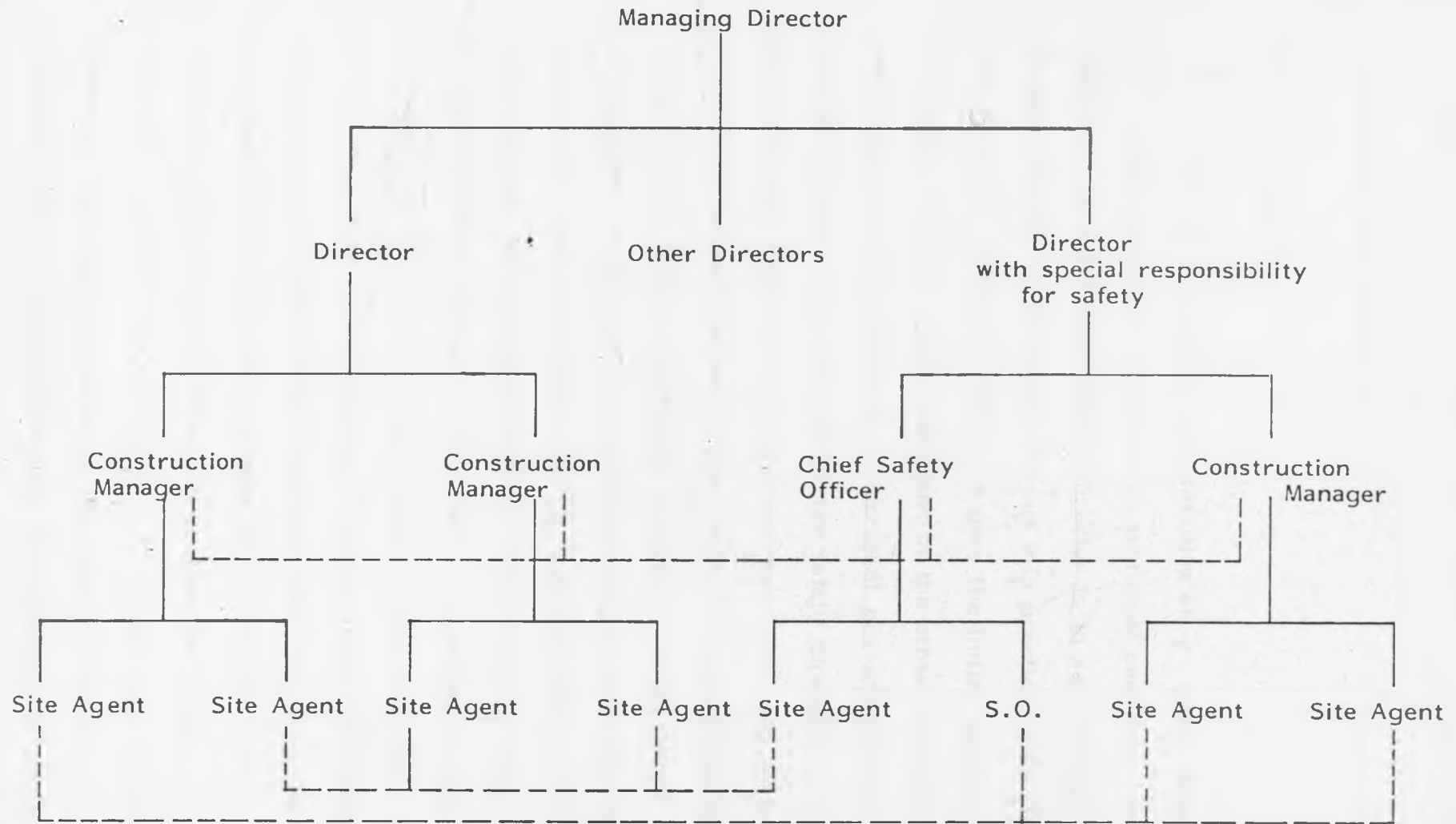


FIG. 4.4: SAFETY ORGANIZATION FOR A MEDIUM SIZED CONSTRUCTION FIRM.

SOURCE: "Construction, Safety, Organization, Administration, Building Advisory Service for the NFBTE, 1978, p.7-8.

FIG. 4.5: SAFETY ORGANIZATION FOR A LARGE CONSTRUCTION FIRM.



----- Safety lines of relationship  
 \_\_\_\_\_ Production lines of relationship

SOURCE: "Construction Safety, Policy, Organization, Administration, p.7-8.

### Management Responsibilities

#### Safety Director:

In small firms the responsibilities of a safety director are normally bestowed on one of the principal partners. Generally the major task for the director is to see that the matters covered in the policy are put into practice at the work place.<sup>32</sup> He is the person to give the initial impetus to the safety crusade. The commitment of the other managers and the energy they reserve for accident prevention will depend on what they emulate from the safety director. In order that he transmits the right attitude to the rest of the participants he must be well versed with all the prerequisite and peripheral matters pertaining to safety. In particular he must have a thorough knowledge not only of the legislation that govern work on site but also of the principles of safe work systems. He must encourage the integration of safety into the production process and promote the philosophy that the right way to do a job should always be the safe way. At sittings with other board members he must ensure that safety considerations permeate all the decisions made regarding the implementation of the project on site and emphasize its importance in production. This will ensure that safety receives its rightful share of concern and resources. During tendering and planning stages of the contract he must safeguard safety matters and ensure that adequate allowances

are made to avoid any problems during production on site.

### Construction Manager

It is the construction manager's role to draw up a master plan of the firm's policy on site.<sup>33</sup> He should understand the safety policy well enough to be able to draw up a plan for its implementation on site. He should ensure that the system of responsibility and accountability outlined in the policy is staffed with the right people taking up their right responsibilities. It is his duty to allocate safety missions to the various subcontractors on his sites. During the planning stages before site works commence he should counter-check with every site agent to ensure that safety measures are incorporated in all working methods. To every site management he should issue written instructions detailing the recommended working methods and sequence of operations outlining all the hazards inherent at each stage and how they should be taken care of. Once work commences on site he should make follow-ups to ensure that it proceeds as planned and all the safety regulations are followed. As a way of motivating site management towards safe work practices he should design an incentive scheme for individual promotion which takes safety performance into consideration.

### Site Agent

The site agent is the man responsible for the overall management of site activities. He will therefore be a very big influence and determinant in the implementation of any policy emanating from the top. In the safety organization he should organize his site such that work is carried out to the required standards with minimum risk to his men, equipment and materials.<sup>34</sup> On large sites where he cannot maintain an interpersonal contact with the work force he should issue written working instructions on safe working methods. Along the management lineage he is the most qualified with regard to the technical aspects and the day to day activities that take place on site since in most cases managers above him are physically off the site most of the times. He is therefore the right person to convert all the management's safety statements into the technical details that will ensure that the policy intentions are realized. He should be well versed with all the technical standards and codes of practice which ensure safe practice on site. He must also have an understanding of the practical application of the safety legislation governing work on site.

In the day to day management of the site he should ensure that it is always kept safe by keeping it free of all risks. He should give all trade foremen precise instructions on their responsibilities for the correct working methods and see to it that they do not allow men to take unnecessary

risks.<sup>35</sup> He should oversee the delivery and the orderly stacking of materials, safe positioning of plant and the safe installation and maintenance of all services needed on site such as electricity water, drainage, and any other service that may affect the safety of the workplace. Planning and maintenance of a tidy site as well as the supply of protective clothing to workers and making sure that they are used by all workers are also his duties. Most essential he should always set a personal example by radiating a sense and concern for safety in all his activities on site.

Chapter five is the analysis of data. It is divided into four sections corresponding to the four objectives of the study. The first two sections analyse data from the survey of sites in Nairobi while the other two evaluate the statutory machinery governing safety practice on construction sites.

FOOTNOTES

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26. Ibid, pp.108-110.
27. Barry Fryer, "Managing on Site," Building, (June 15, 1979), pp.71-72.
28. National Federation of Building Trade Employers, Construction Safety, pp.1-5.
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## CHAPTER FIVE

### DATA ANALYSIS

#### Introduction

This chapter contains the analysis of data collected for the study. It is divided into three sections. Section one contains the analysis of the data collected using the checklist. Section two is the analysis of the questionnaire. Section three contains a review of the legislation governing safety at construction work places and an evaluation of the existing statutory machinery for enforcing the safety regulations at work places as provided for by the legislation.

Out of fifty construction sites sampled for the study, thirty-nine were accessible to enable full assessment of the factors covered by the checklist and obtain completed questionnaires from site management. This represents 78 per cent sample response. Out of these 15.4 per cent were alterations and extensions of the existing property while 84.6 per cent were new construction projects. Out of the thirty nine, 25.6 per cent were in central division, 20.5 per cent were in western division while 53.9 per cent were in the eastern division.

As part of the questionnaire, a question was included which required the person completing it to give his designation in the site organization. Table 5.1 gives the results.

TABLE 5.1

DESIGNATION OF PERSON COMPLETING THE QUESTIONNAIRE

DESIGNATION	SITES	
	Number	Percentage
Director/Principal	10	15.6
Site Agent	17	43.6
Site Engineer	11	28.2
Accountant	1	2.6

SOURCE: Field Survey, 1987/88

This shows that 97.4 per cent of the persons completing the questionnaires were the heads of construction sites visited. They were therefore presumably knowledgeable in the management philosophy and practice adopted for the various sites and were close to the decision making core of the firms which they worked for.

Safety Measures and Safeguards

The checklist was used in the field survey to help determine the extent to which contractors incorporate safety measures and safeguards on site. Twenty measures and safeguards were included in the checklist. The checklist was by no means exhaustive. The criteria used in selecting the measures and safeguards into the checklist was the ability to

assess each of them on the sites visited with ease and in an objective way.

#### Site Access and Egress

Out of the thirty-nine sites visited eighteen or 46.2 per cent had clear unobstructed access and egress. The relevance of this measure to a safe site has been discussed in chapter four. This shows that 53.8 per cent of all sites had accesses which were not conducive to safe access and exit to and from sites. This included sites which had accesses obstructed with either materials, litter or hazardous situations such as unguarded excavations.

#### Site Tidiness

Site tidiness was measured by three variables included in the checklist. These were the manner in which materials were stored on site, the way tools were handled and whether the site was provided with spoil heaps for dumping waste materials such as excess excavated materials and other gabbage. Table 5.2 summarises the findings of the study on site tidiness.

TABLE 5:2

SITE TIDINESS OF SAMPLED SITES

VARIABLE MEASURES	SITES	
	Number	Percentage
Materials stacked	18	46.2
Tools kept in tool kits	21	53.8
Spoil heaps for waste	15	38.5

Source: Field Survey, 1987/88.

Personal Protective Equipment

Safety helmets (hard hats), hand gloves, safety glasses, hard boots and overalls are the most commonly used protective equipment for any safe site. These were included in the checklist to assess their availability on sampled sites. Table 5.3 is a summary of the survey with regard to these measures.

TABLE 5.3

AVAILABILITY OF PERSONAL PROTECTIVE  
EQUIPMENT ON SITES

VARIABLE MEASURES	SITES WHERE AVAILABLE	
	Number	Percentage
Safety helmets	12	30.8
Hand gloves	0	0
Hard boots	2	5.1
Safety glasses	3	7.7
Overalls	4	10.26

Source: Field Survey, 1987/88.

The data shows that safety helmets were relatively more common in sites than the other equipment while hand gloves were virtually non existent in all the sites. Only 5.1 per cent of sites provided their workers with the recommended hard boots. On some of the sites workers were provided with ordinary rubber boots which did not qualify to be classified as hard boots offering the necessary protection against falling objects or sharp pearcing protrusions such as nails.

Precautionary Equipment

The checklist included three measures as a test to determine the extent to which sites were equiped to handle emergency situations in the event of accident occurence.

The three variable measures are first aid kit, a resident qualified first aid personnel and fire extinguishers provided on site.

The findings are summarized in table 5.4.

TABLE 5.4  
AVAILABILITY OF PRECAUTIONARY  
EQUIPMENT ON SITE

VARIABLE MEASURES	SITES WHERE AVAILABLE	
	Number	Percentage
First Aid Kit	6	15.4
Qualified First Aid personnel	0	0
Fire Extinguishers	2	5.1

Source: Field Survey, 1987/88.

Mechanical Hazard Elimination

The variables included under this group were expected to offer a measure of how effectively the worker is protected against potentially hazardous situations on the job by use of mechanical or physical means which essentially guard against foreseeable risks. Six variables were included in the checklist for this purpose. Table 5.5 gives the six measures and the corresponding number of sites out of the sample which incorporated them.



TABLE 5.5

PERCENTAGE OF SITES INCORPORATING  
VARIOUS MECHANICAL HAZARD  
ELIMINATION MEASURES.

VARIABLE MEASURES	SITES INCORPORATING	
	Number	Percentage
Timbering of excavations	3	7.7
Hoarding around site	16	4.1
Barriers from excavations	2	5.1
Soundly constructed ladders	5	12.8
Soundly constructed scaffolds	4	10.3
Safe electric cable layout	33	84.6

Source: Field Survey, 1987/88.

A major observation from the survey was that most of the sites had the measures referred to above but the construction was not sound in that some essential components were not included. For instance a site would have a hoarding around but the hoarding lacked the slanting upper edge which was essential in protecting people passing nearby from being injured by debris falling from the site (see Plate 4 ). Soundly constructed scaffold should have complete decking, toeboards and guard rails around the working platform. A soundly constructed ladder is one where it has properly fixed rungs and is sturdily fixed to the ground when being

used. All these measures are discussed in chapter four.

### Propaganda and Awareness

To test whether site management took deliberate steps to educate the workers and members of the public on matters pertinent to safety two measures were included in the checklist. These tested whether a site had any safety posters or other informative methods of propaganda on site and if the supervisor held any meetings with the workers to educate them on the risks and hazards that they may encounter while performing a certain task, and suggesting to them ways and means of avoiding them (i.e. tool box meetings). Table 5.6 summarises the findings with respect to these measures.

TABLE 5.6

#### PROPAGANDA AND AWARENESS MEASURES ON SAMPLED SITES

VARIABLE MEASURES	SITES	
	Number	Percentage
Safety posters	1	2.6
Tool box meetings	0	0

Source: Field Survey, 1987/88.

Out of the sampled sites it was only one site where safety awareness posters were observed. The site was located in the city centre and the contractor had constructed a gangway alongside the street - the site adjoined to in order to protect pedestrians against falling debris from the site. The posters cautioned pedestrians against using the unprotected part of the street pavement and observed that the contractor was not liable for any injuries occurring in such a circumstance (see Plate 6 ).

### Summary

As observed earlier in the chapter the checklist contained a total of twenty measures and safeguards which were used as variables to measure the extent to which the sampled sites had necessary safety measures and safeguards incorporated. Table 5.7 shows the frequency distribution of the site scores\*as obtained from the raw data in the checklists (see appendix III ).

TABLE 5.7

SAMPLE FREQUENCY DISTRIBUTION  
OF SITE SCORES

Scores (out of 20)	Tally	Number of Sites
1		6
2		9
3		7
4		4
5		3
6		3
7		3
8	-	0
9		1
10	-	0
11	-	0
12		1
13	-	0
14		1
15		1
SAMPLE SIZE		39

The arithmetic mean and standard deviation of the scores are calculated below.

TABLE 5.8

Site Score (X)	Frequency (f)	fX	X <sup>2</sup>	fX <sup>2</sup>
1	6	6	1	6
2	9	18	4	36
3	7	21	9	63
4	4	16	16	64
5	3	15	25	75
6	3	18	36	108
7	3	21	49	147
8	0	0	64	0
9	1	9	81	81
10	0	0	100	0
11	0	0	121	0
12	1	12	144	144
13	0	0	169	0
14	1	14	196	196
15	1	15	225	225
	n= 39	∑ fX= 159	∑ X <sup>2</sup> = 1240	∑ fX <sup>2</sup> = 1145

$$\bar{X} = \text{Mean Score} = \frac{fX}{n} = \frac{159}{39}$$

$$= 4.08$$

$$S = \text{Standard deviation} = \sqrt{\frac{\sum fX^2 - n\bar{X}^2}{n-1}}$$



PLATE 1: An obstructed site access. Note the debris laying just inside causing obstruction to the already restricted access.

This photograph was taken at Ngara, Nairobi, in 1987.



PLATE 2: A relatively clean and unrestricted site. Note workers without proper protective gear.

This photograph was taken at Hurlingham, Nairobi, in 1987.



**PLATE 3:** Workers in precarious work positions. This signifies the attitude of workers and management towards site safety.

This photograph was taken at Westlands, Nairobi, in 1987.



**PLATE 4:** Inadequate protective hoarding on a site where part of the building under construction is already in use. This poses grave danger to the users.

This photograph was taken at Westlands, Nairobi, in 1987.

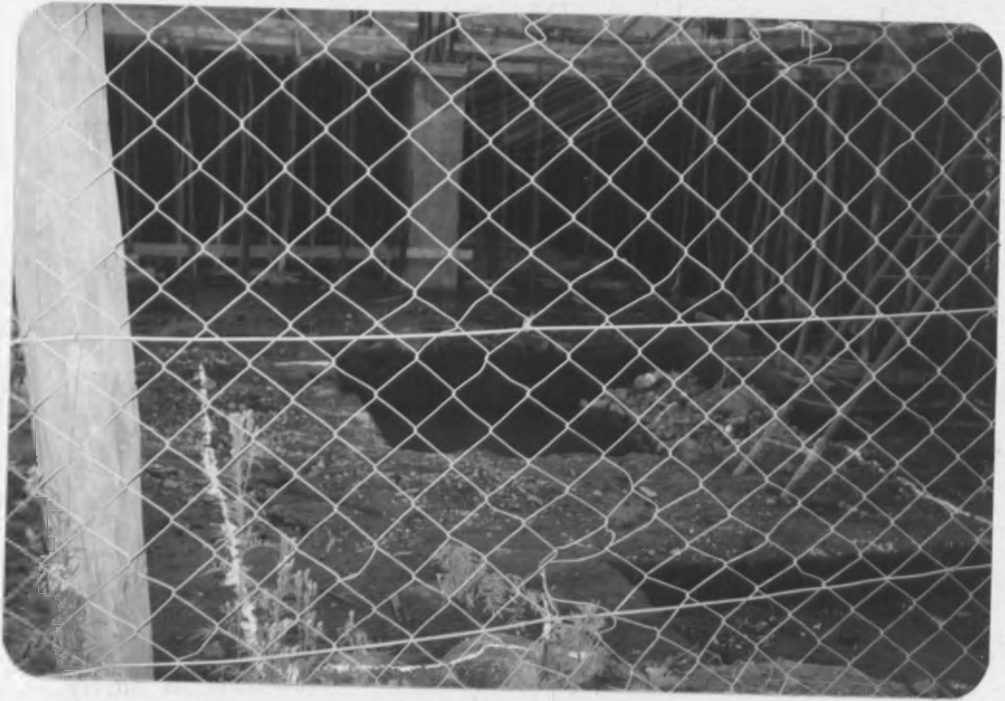


PLATE 5: Excavations left without proper barriers or fencing. Poses danger to workers. This photograph was taken at Eastleigh, Nairobi, in 1987.



PLATE 6: A properly constructed gangway. A necessity for all sites in the city centre. Note the warning poster. This photograph was taken at City Centre, Nairobi, in 1987.



### Safety Management Practice

This part of the data analysis concentrates on the management aspect of construction safety. The variables analysed herebelow were designed to help determine the nature of safety management programmes of construction firms in Nairobi. The findings of the survey are used to make inferences about the safety policy, organization and administration of construction firms in Nairobi.

#### Safety Policy

The first question in this section related to the safety policy in the construction firm. The site manager who in most sites was designated as the site agent or site engineer was required to indicate whether safety was included in his firm's corporate management policy. Out of the managers interviewed 64 per cent indicated that their firms included safety in the corporate policy.

As outlined in the preceeding chapter, safety policy is the heart of any safety management programme and it is expected to guide everyone in the organization in every decision that may affect safety of the workers. It defines the responsibility and commitment of top management of the firm towards safety. The inclusion of the safety aspect in the corporate policy of the firm can be taken as a strong indication of the firm's commitment to safety on the sites.

A figure of 64 per cent is in this case relatively high. This may be seen to contradict the findings of the preceding section where it was seen that most construction firms lack sufficient safety measures and safeguards necessary for a safe work environment. It should nevertheless, be noted that the success of any safety programme will depend on whether or not the policy is implemented. Hence there arises a possibility where though top management may have a positive attitude and commitment to a safe work environment, it may not be translated into practical action if the necessary machinery for implementing the policy is not set up in the organization and on every site.

#### Safety Director

To test whether the responsibility for a safe work environment was handled by a member of the top management in the organization, the site managers were asked to indicate functions which were dealt with by the board of directors of their firms. Four possible functions were enumerated in the question. Among the functions enumerated in the question was safety of the works. Out of the sampled site managers none of them indicated that safety was the priority of the board of directors. The sincerity of this answer is reinforced by the fact that 25.6 percent of the managers were directors or principals of their firms and hence knew what went on and were in fact participants, in the board of directors deliberations.

It is interesting to note that almost all the managers indicated that finance for the works and tendering were both dealt with by the board. This shows the importance management attached to job acquisition and the financial status of their companies as compared to safety of the works. This indicates a big anomaly on the part of management since it reveals that they do not realize that safety of the work environment is a factor in determining the firm's profitability.

#### Safety in Construction Planning

The question on construction planning was included in the questionnaire to test whether safety considerations were included by the contractor when he was planning his work before commencement of site operations. About ninety per cent of the managers indicated safety as being one of the factors that their management considered during the planning process of the project.

#### Safety Officer

Only one out of the thirty-nine site managers indicated that his firm employed a safety officer. This represents about 2.6 per cent of the sample. It is important to note that this one site was rated highest in the checklist as analysed in the preceding section meaning that it had the highest number of measures and safeguards included in the checklist. This indicates that there is a definite correlation between good safety performance and safety

### Safety Training

On whether or not contractors offered any form of training to their workers, thirty-seven out of thirty-nine of the managers indicated that they did. Of the thirty-seven firms which trained their workers, twenty-one of them offered a training to both tradesmen and supervisors while twelve offered training to tradesmen only. None of them offered any training to workers in the management category.

Out of thirty-seven firms which offered training 56 per cent indicated safety as being one of the aspects covered in their training programmes. The need for education and training in the success of any safety management programme is outlined in chapter three of the study. Participants to the construction site processes need education to create in them awareness as to the importance of carrying out the processes in the safest way possible. Training is necessary in order to impart into these people the safest techniques of going about their work on site. This is not only necessary for workers but also for the management.

The results show that almost 50 per cent of the sites sampled do not incorporate any form of safety training in their general training scheme. Workers in these firms therefore do not have any form of training on the safety aspects of their work. This means that there is a high likelihood of them not being aware of the hazards and the risks that they face while performing their duties. Accidents

which may be easily prevented if the worker knew of the underlying hazards and the risks may therefore occur and cause injury and damage. None of the firms offer any safety training to management. This means that unless the members of the management team had some training before they entered employment or before they were promoted to their positions then they may not have any knowledge on construction safety. This increases the likelihood that their attitude to safety may not be positive. As they direct and lead workers in performing operations on site their decisions may conflict with the tenets and philosophy favourable to the maintenance of a safe place of work.

### Safety Meetings

In order to establish whether site management held periodic meetings with supervisors to review the safety of the work environment, a structured question was included in the questionnaire. The first part required the managers to indicate whether they held any meetings at all with the supervisors. Thirty-eight out of the total thirty-nine managers contended that they held meetings with the supervisors on site. The second part established that three out of the thirty-eight discussed safety of the works in such meetings.

This indicates that about 8 per cent of the interviewed site managers discussed safety with their supervisors

and foremen. This finding ties up with the earlier one where it was found that none of the sites had any safety committees. It is during safety committee meetings that the safety issue would be discussed at length and any aspects that are beyond the committee would then be brought forward in any subsequent meetings between management and the supervisor. It logically follows that since such committees do not exist then the safety issue would not be discussed in any other forum.

#### Safety Inspections by Top Management

To evaluate further the commitment of top management of construction firms to safety the questionnaire examined the frequency of site visits, and inspections by the directors or principals of the company. Thirty-seven out of the thirty-nine confirmed that the directors or principals of their companies made site visits. Indeed as observed elsewhere in this section 25.6 per cent of the managers themselves were directors who were stationed at the sites visited as site agents. The frequency of the site visits are summarised and presented in Table 5.7.

The analysis shows that 87.1 per cent of the sites were visited by the director or principal at least once every month. This may be said to be a high level of control on sites by the executives of the firms and may be taken to mean that

TABLE 5.9

FREQUENCY OF SITE VISITS BY  
DIRECTORS/PRINCIPALS OF CONSTRUCTION FIRMS.

Interval of Visits	SITES	
	Number	Percentage
Daily	19	48.7
Weekly	11	28.2
Monthly	4	10.2
Occasionally	3	7.8
None	2	5.1
TOTAL	39	100

Source: Field Survey 1987/88

almost everything which goes on site, including safety matters, has the sanction and approval of the senior executives of the company. Only one out of the thirty-seven managers included safety as being among the factors of concern to the executives during the visits. This represents 2.7 per cent of the sites surveyed. It shows that safety of the work did not feature prominently among the top priorities of the directors during their site visits and inspections.

### Safety Reporting

Safety reporting was investigated firstly to establish whether construction sites had any form of accident reporting system from the site to the company's head office. An accident and general safety reporting system is one essential method of informing the company's management on the safety status of the sites. An economic analysis can then be prepared from such information in the manner outlined in chapter three and on this basis the accident prevention programme and eventually the total safety programme can be evaluated.

Second, was to find out how safety was ranked among other aspects of construction included in the reports that were presented to the firms top management periodically.

The first part of the question required the manager to indicate whether the firm for which he was working for, required the preparation of periodic reports from the sites on various aspects of site welfare. Thirty-two out of thirty-nine or 82 per cent of the managers affirmed that they were required by their superiors to prepare and submit progress reports to their head offices. Part two of the question required the manager to indicate from a list of four aspects the ones that he included in such reports. One of the aspects was safety report for the project. About twenty-three percent of the managers included site safety as one of the aspects that they



included in the project progress reports. Hence only less than a quarter of the sample had any form of safety reporting system between the site and the firms top management at the head office. Secondly the results show that safety was not rated highly among those issues that had to be included in the progress reports for the attention of the executives of the company. This can for instance, be contrasted with a factor like the financial report of the project which was another factor included in the list. Sixty-nine per cent of the managers included financial report of the project as being one of the matters that was included in the periodic project progress reports submitted to the head office.

#### Supervisor's Authority in Safety

The supervisor, when inculcated with the right attitude and commitment, can be a great force in ensuring safe practice at the work-face. This attitude and commitment must however be backed by the necessary authority delegated from the top. This arises from the fact that he is the last person at the lower end of the management hierarchy and hence in direct contact with the workforce and the production line. In most cases on construction sites, and especially in a situation like the Kenyan one where it is a common practice to hire operatives on daily basis, he may be the longest serving member of the lower level workforce and in some cases, be involved in the project from inception to completion. He can therefore be relied upon to transmit the policies of his firm

to the workers, and especially the new ones who keep joining the firm,

To find out the authority the supervisor holds in eliminating potentially hazardous work situations on site, the site managers were asked to indicate situations when a supervisor was authorized to stop work on site. One of the situations listed was when the workers were threatened with an eminent danger arising from the work situation. Eighty-five per cent of the site managers indicated this as one of the situations when the supervisor was authorised to stop work.

This shows that most site managements are concerned that their workers do not get injured at the work place. Whatever the motive behind this concern it is in itself a noble feeling and it expresses the attitude of the employer towards the worker's welfare. However, it is eminent, from the results presented earlier in this chapter that the construction firms do not have adequate foresight in terms of instituting the necessary planning and execution measures to see that the risks that face the worker are eliminated from the work environment. A genuine concern for the safety of the worker goes beyond stopping of work when eminent danger of injury is foreseen. It should entail the deliberate elimination of risks which bring about hazardous working conditions.

### Safety Attitudes and Consciousness

This sub-section deals with the attitudes and awareness of the site management towards safety. The purpose here was twofold. Firstly to test whether site management is fully aware of the broader implications of the presence of a safe work environment to the business well being of the construction firm and secondly to establish whether the contractor is satisfied with the way safety is provided for in the entire construction process.

### Safety in Contract Overruns

For any knowledgeable contractor the economic incentive to the provision of a safe workplace overrides the humane and statutory considerations. This observation is made in the light of the many drawbacks that may result from the occurrence of accidents on site and the economic effects which they may have on the project. Delays for instance will inevitably occur when a worker is injured and kept out of work for several hours or days. In the extreme case a fatal injury means the permanent loss of the services of the worker to the firm. The effect of such a loss may not be directly, felt by the individual contractor since he can easily engage another worker almost immediately given the high turnover of the construction industry. The aggregate effect on the entire industry can nevertheless be quite staggering.

This is especially so in the construction industries of developing countries where skilled workers in some trades are still in short supply. Machinery alone which is only one of the causes of construction accidents, can deal a heavy blow on the workforce, such as was reported in the UK where it caused injuries to 6774 workers who were kept off work for more than three days in one year only.<sup>1</sup>

Cost escalation is another aspects of contract overrun which may result from accidents on the site. Damage to materials and work in progress will inevitably cause escalation of project costs. In the UK example cited above, such damage amounted to a value of over £2 million.<sup>2</sup> The statutory requirements sets the minimum standards to be met by the contractor. It is upon him to to raise these standards to a level where the economic losses are eliminated.

To test the contractors awareness of the effects that an unsafe work environment may have on his time schedules and cost budgets a structured question was included in the questionnaire. In the first part of the question the site managers were required to indicate, from among four aspects given, the ones that were likely to cause delays in the progress of construction work on site. One of the aspects listed was injury to workers. Out of the thirty-nine managers interviewed, 18 per cent indicated this as being one of likely causes of delay in work on site. This shows that

18 per cent of the managers were aware of the possible delays that accidents would cause.

In the second part of the question the managers were asked to indicate whether the factors they had named in part one as being possible causes of project delays would also cause an escalation of their operational costs on site. All the 18 per cent of the managers who had included accidents as a likely cause of project delay also indicated that they could cause an increase in costs. This shows that majority of the site managers, comprising 82 per cent of those interviewed were not aware of the cost of accidents in terms of both time and cost overruns. Such an apathy on the people who hold positions of considerable influence in the management of the construction process can only be taken to mean that safety is left out of the management philosophy adopted in construction workplaces.

### Safety Legislation

To test the contractors knowledge of safety legislation which govern his operations on site the site managers were asked to specifically indicate areas of construction work which were covered by legislation. Safety was included among the areas which were listed in part one of the question. All the managers included safety as one area which was covered by legislation. This shows that all the managers in the sample were aware that there were statutory requirements that governed their operations on site in the provision of a safe place

of work.

In part two of the question all the managers again concurred that that legislation did not have any shortcomings which they knew of. These answers could be interpreted to mean several things. Firstly it may be possible that the managers were not conversant with the contents of the legislation. This meant that they felt that they were not competent enough to comment on these contents. An alternative explanation would be that some of the managers would have felt that they did not have anything to do with the legislation and as such these comments were not necessary. A third alternative explanation would be that some of the managers who may not have fully appreciated the academic purposes of the study may have been hesitant to commit their true feelings fearing any consequences. Whatever the reasons behind these answers, it shows that no meaningful feedback on important areas such as legislation can be obtained from the people who are responsible for the implementation of such requirements.

#### Safety in Building Contracts

In order to determine the contractors feelings on the way safety is provided for in the contractual agreement between him and the client, the managers were required to point out aspects of the job which they felt were not well covered. Four aspects of construction work which affected the client - contractor relationship were listed down, one of

them being the safety of persons and property.

Eighty-two per cent of the managers indicated that all aspects listed were well covered. Of the other 18 per cent only three gave safety as being among the aspects which they felt were not well covered by the contract conditions. This gives a percentage figure of 7.7 per cent as representing the sample proportion which felt that safety was not well covered in the contracts. On the strength of this finding it may be said that most of the contractors (i.e. 92.3 per cent) do not have any complaints as regards the way safety is provided for in the contracts.

#### Safety Insurance Coverage

In an effort to elicit the opinion of the contractor with regard to the way safety is currently covered by insurance a question was included in the questionnaire to this effect. In the question, four areas were listed down and the site managers were asked to indicate which ones among them were not well covered by insurance. Safety of the works was one of the four areas listed down. Out of the total sample 15.4 per cent indicated safety as being one area which was not well covered by insurance. The rest of the contractors left out safety from among the areas they indicated as being not sufficiently covered. This shows that it is only 15.4 per cent of the contractors interviewed, who felt that safety was not given sufficient insurance coverage. Majority of the

contractors, 76.8 per cent, seemed satisfied with the insurance cover.

### Trade Union Participation in Safety

An integrated approach to safety has been recommended as the only way that the safety problem can be solved in the construction industry. All parties with some interest in the industry including trade unions, contractors, designers and the government should each play their rightful role if the accident menace has to be curbed.<sup>3</sup> The contention of this study is that this integrated approach will ultimately hinge on the main contractor as the supreme manager of the construction process on site. He is the person relied upon to implement the recommendations and contributions of all the other parties to the integrated approach. The attitude of the contractor and his cooperation with the other parties are therefore of paramount importance in the success of the approach to the safety problem.

To gauge the attitude of the contractor regarding the integrated approach to the solution of the safety problem, the study sought to know their view as regards the participation of trade unions in the safety of the workers at the site level. To obtain an unbiased opinion the question listed four areas where trade unions were likely to participate in and the managers were required to indicate which among them they thought trade union should participate in. One of these areas



was safety of the workers.

About fifty one per cent of all the managers included safety as being among the issues that they felt trade unions should participate in. Though this represents the majority it also shows that a large number of them, 49 per cent, have yet to become aware of the importance of safety in general worker welfare and the institutions that would be counted on to improve on it.

### Conclusion

Table 5.10 summarises data on safety management programmes of sampled sites. The results show that the variables can be ranked into three groups according to the proportion of firms that incorporate them. On the upper end are variables which more than 60 per cent of the sites incorporate in their management programmes. These are safety policy, safety considerations in construction planning and authority of supervisor to promote safety. The percentage number of firms incorporating these are 64.1, 89.7 and 84.6 per cent respectively. This implies that, relatively, most of the firms in the sample incorporate the safety considerations in their corporate policies and in planning construction work before commencing site activities. A good management philosophical framework therefore exists upon which satisfactory safety management programmes can be built.

At the lower end of the scale is a group composed of four variables which less than 3 per cent of the sample

TABLE 5.10  
INCORPORATION OF SAFETY MANAGEMENT  
ASPECTS BY SAMPLED FIRMS.

SAFETY MANAGEMENT PROGRAMME ASPECTS	SAMPLED SIZE	
	Number	Percentage
Safety Policy	25	46.1
Safety Director	0	0
Safety in Construction Planning	35	89.7
Safety Officer	1	2.6
Safety Committees	0	0
Safety Training	22	56.4
Safety Meetings	3	7.7
Safety Inspections	1	2.6
Safety reporting	9	23.1
Safety in supervision	33	84.6

Source: Field Survey, 1987/88

incorporate. These are the presence of a director in charge of safety in the firm, employment of a safety officer, safety inspections by top management and the existence of safety committees. The percentage number of firms in the sample incorporating those were 0, 2.6, 2.6 and 0 respectively. This means that those four variables are the weakest parts in the safety management programmes of these firms. Of important notice here is the fact that these four variables concern the role of top management in the safety matters of their firms.

In between the two extreme groups is the group comprising safety training, safety meetings and safety reporting aspects of the programmes where the percentage number of firms incorporating them were 56.4, 7.7 and 23.1 respectively.

#### Review of the Factories Act<sup>4</sup>

Though the Act covers all work places a critical review of its provisions show a clear bias towards factories where works of manufacturing nature take place. A look at most of the provisions shows that reference tend to be the conventional indoor work place with a lot of attention and emphasis laid on the fencing of heavy machinery and safety measures to be incorporated in steam powered machinery and steam boilers. Such machinery and the working conditions that come with them are obviously not common in construction work places where most of the operations take place in open air and most activities are labour intensive and manual with

a lot of use being made of simple manual tools and improvised methods and techniques.

A look at the contents of those parts which seem more relevant to general industrial work places and hence to this study such as part V and VII also reveal that the provisions therein are more applicable to the conventional factory than to a construction site. Part V for instance contains intricate technical items mainly dealing with the safe installation and maintenance of machinery more common to manufacturing such as electric generators, motors, hoists and lifts. Part VI is an extension of part V but deals with more general matters of work environment and worker protection such as the use of protective clothing and the removal of dust and fumes from the work environment.

Part X of the Act provides for the overall administration of the Act including the establishment of the factories inspectorate. The labour commissioner of the time is declared the administrator of the Act. For purposes of manning the inspectorate, the Act provides for the appointment of inspectors and confers upon them due powers to enable them carry out their work effectively. The duties of the inspector are not specifically stated in the Act but can be inferred from the powers that he holds. They generally include the inspection and examination of any factory for purposes of ascertaining whether or not the provisions of the Act are adhered to by all concerned. This part also gives the inspector powers to

prosecute, conduct or defend before a Court of law of the magistrate level any charge, information, complaint or other proceedings arising under the Act something which in ordinary circumstances only an advocate of the high court can do.

Part XI of the Act provides for the legal machinery for the prosecution of parties found contravening the provisions of the act. It lays down the various instances which are construed to constitute an offence under the provisions of the act by various parties mainly the employer or employee. It goes further to prescribe the penalties that will be imposed on the guilty parties for the various offences.

The Factories (building operations and works of engineering construction) rules of 1984 were specifically formulated to govern the health, safety and general welfare of workers in the construction industry with particular reference to sites as places of work. They were meant to complement rather than replace the general factories Act and for all practical purposes are treated as part of the Act. The rules are made up of eighteen parts which cover different aspects of construction work and which collectively offer comprehensive coverage of most of the technical aspects of construction which have a bearing on the health, safety and welfare of the work environment as affects the worker. Worthy of special mention is part II of the rules which define the duty of the contractor to ensure the health, safety and welfare at the site.

The other provisions of this part include the requirement for the contractor to notify the chief inspector of factories in writing of the commencement of operations on site and the details of the works including the name of his firm, the number of people to be employed on site, the location of the site and the dates of commencement and anticipated completion date of site operations. A contractor who employs more than 20 people is also required to appoint a safety supervisor from among his senior employees on the site.

The other parts of the rules cover different site operations and the safety measures to be incorporated as statutory requirements. These operations include inter alia, excavations, cofferdams, transport on site, demolition works, scaffolding and lifting operations. It is from these rules that the inspectorate derived a basis for site inspection as is seen by the format and content of the document they use to record all findings during the site inspections (see appendix IV). From the contents of the inspection report form it is clear that the inspectors' duties are technically oriented dealing with intricate technical details of the site works which have a bearing on the safety of the workers.

### The Factories Inspectorate

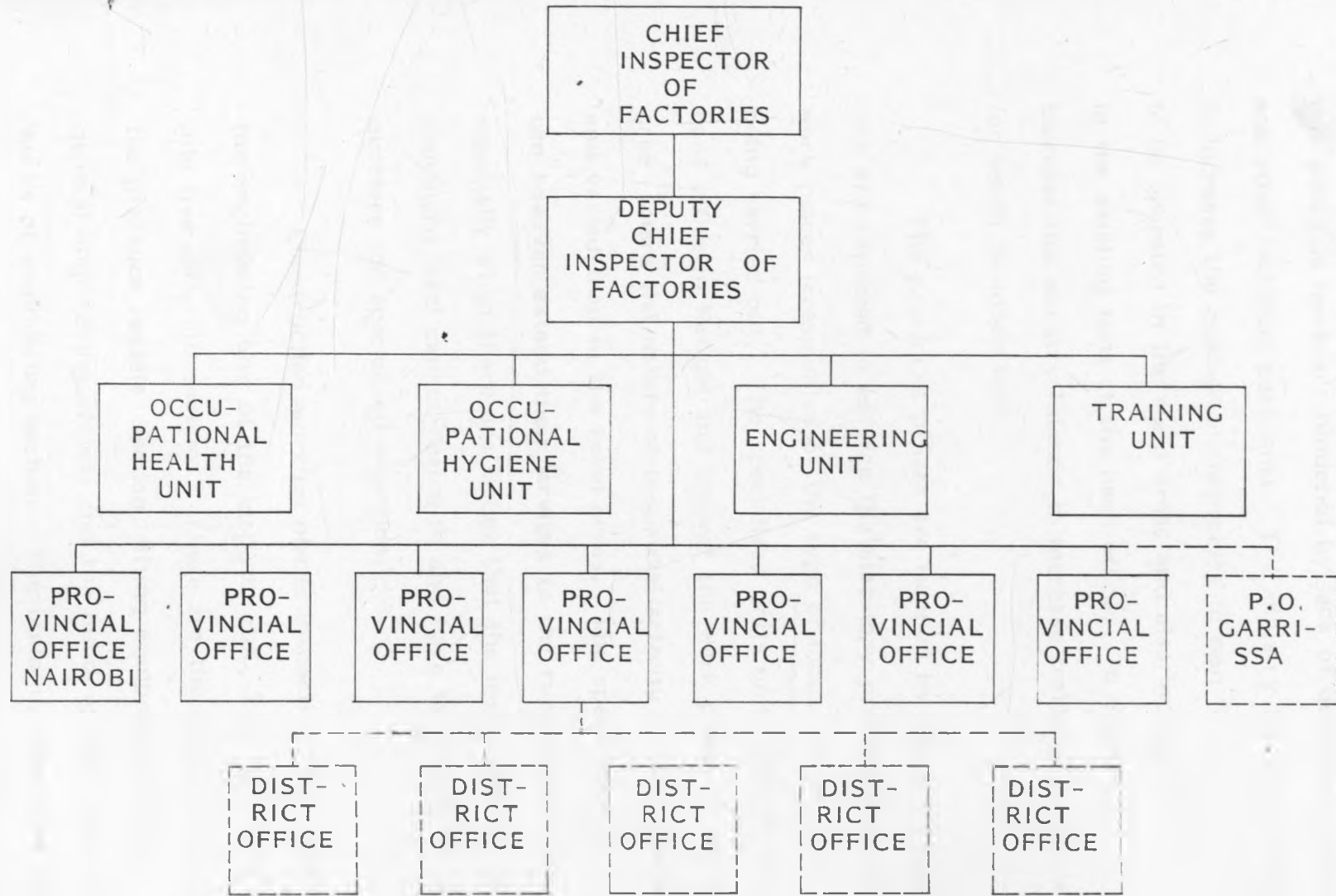
#### Structure of the Inspectorate

In accordance with part X of the Factories Act which provides for the administration of the Act the Ministry of

Labour has a specialised department established to enforce the provisions of health and safety statutes existing at any particular time. The Factories Inspectorate department is headed by the Chief Inspector of Factories who is the de jure enforcer of the Act with the inspectors in the department acting on his behalf. Next in line is the deputy Chief Inspector who assists and deputises for the chief inspector in all the day to day affairs of the inspectorate. The next level in the hierarchy is occupied by senior inspectors who head the various specialised units or the provincial offices. The structure is shown on figure 5.1.

For purposes of the effective coverage of the various aspects of occupational health and safety and in view of the multidisciplinary nature of the subject matter, the inspectorate is divided into four specialised units. These areas are occupational health, occupational hygiene, engineering and training. These four units work independently and make their independent reports to the chief inspector on their areas of concern. Most work places require an inspection by the first three units in order that all aspects of the health and safety of the work place be verified. To facilitate a comprehensive coverage of the whole country the inspectorate has established regional offices at all the provincial headquarters except the North Eastern Province (at the time of undertaking the survey). With the introduction of the District focus for Rural Development Strategy the inspectorate has started opening up district offices. The implementation of

FIG. 5.1: STRUCTURE OF THE FACTORIES INSPECTORATE DEPARTMENT



SOURCE: Chief Inspector of Factories, Ministry of Labour.



this policy is however hindered by lack of qualified inspectors and other technical personnel. The ministry therefore intends to increase the number of inspectors to man the new offices to be operated in the rural areas and also increase the ones in the existing team at the head office. To enable this increase the ministry intends to increase training appointments for would be inspectors.<sup>5</sup>

The provincial offices are manned by general inspectors who are expected to enforce the statutory provisions at all work places irrespective of the type of industrial activity being carried out. The specialised units only exist at the head office in Nairobi and inspect the work places in Nairobi area where the nature of industrial activity is more complex and varied than in the rural areas. The specialised units can however extend their services to the rural areas and especially when there are issues that the inspectors at the provincial level cannot deal with and have to consult the headquarters for specialised attention.

Construction working places inspection falls under the engineering unit of the inspectorate. This unit is divided into five different sections. These are the electrical section, the pressure vessels section, lifting equipment section, general engineering section and the building operations and works of engineering section. The building operations section is headed by a senior inspector who is assisted in his work by a team of inspectors. At the time of carrying out this

study this team consisted of 3 inspectors. Though they have jurisdiction over the whole country covering all works of construction nature, the operations are normally limited to Nairobi area leaving the rest of the country to the provincial general inspectors who do not have any specialised training in construction. One striking feature is the gross inadequacy of inspectors in the Inspectorate. In construction particularly, a team of four inspectors only is far too small even for Nairobi alone. This gives a high likelihood of many sites especially the small ones escaping the eye of the inspectorate and going without any inspection throughout. Given the fact that small contractors have been known to be the heaviest contributors to the industry's bad safety record, this situation is bound to worsen the safety record in the industry.<sup>6</sup>

Ideally, the inspection procedure sets off with the notice of commencement or intention to commence works filed by the contractor to the Chief Inspector. However, it was learnt in the course of the study that practically very few contractors notify the inspectorate of the commencement of works on site. Hence the inspectors have to resort to other methods of identifying sites where construction work is being undertaken. For Nairobi area, they mostly rely on the city commission, among other sources, for information as to what projects are under construction at any one time. This is also not an effective method as very many projects are undertaken without the commission's knowledge. A case in point here are the many illegal constructions which are

undertaken especially in the city's residential areas where it is only after serious accidents occur that the city authorities rush in to condemn them after the press has publicised them.<sup>7</sup> The other method used by the inspectors to gain knowledge as to the existence of construction work is chance where an inspector may detect a hitherto unknown construction site and thereby make necessary arrangements for its inspection. Clearly it is the contention of the study that a more foolproof method of detecting operational sites is necessary if the inspectorate has to be effective in carrying out its responsibilities. At present the inspectorate does not keep an up to date record of the sites that are in operation at any particular time.

After obtaining the details of a certain site in a certain location of the city, the inspectors make arrangements to visit it. The inspector is bestowed with certain powers to enable him carry out inspections at the work place in this case the site. He can take samples, photographs or records from the site to enable him arrive at his assessment and make his report. The findings from the inspection are recorded in a conventional form which contains provisions for filling in all the details as required by the statutes (see appendix IV ). On this basis the inspector makes his overall recommendation.

### Conclusions

Of notable concern about the inspectorates approach to safety of sites, as laid down by the statute, is the

emphasis that is given to prosecution of contraveners of statutory provisions at the expense of other remedial alternatives. The Act provides litigation as the only solution to statute contravention without the parties responsible being given a chance to remedy the situation before litigation is instituted. This approach, though used with quite some vigour by the inspectorate does not seem to have borne any favourable results by way of changing the attitude of the contractors. In the four months period between October 1986 and January 1987 eight contractors were prosecuted in courts of law for contravening various statutory requirements in Nairobi alone.<sup>8</sup> If this was taken to typify the frequency with which suits are filed in courts of law and bearing in mind the findings of this study as presented earlier in the chapter, then it may be concluded that contractors do not seem to be deterred by the prospects of prosecution. This kind of situation is only likely to breed a confrontational approach between the inspectors and the contractors with the later using all the tricks in the book to evade the regulations and the authorities. A more harmonious approach would be where the inspectorate combined the roles of enforcer and adviser. In this approach, where a contractor is found contravening a certain regulation of the statutes, the inspector should take his time to educate him on the benefits of implementing it and at the same time give him a chance to rectify the situation by for instance, the issue of an improvement notice. Where the contractor does not rectify the situation

this should be followed by the issue of a prohibition notice. It is only after this machinery has been exhausted that the inspector may resort to prosecution. Clearly for such a system to apply a need for amendment of the present legislation is necessary. With the legislation as it is today, only a court of law can legally restrain a contractor from proceeding with construction work even when serious threat to safety of workers and other parties provided for in the statutes is eminent and foreseen by an inspector.<sup>9</sup> Given the fact that the litigation procedure takes time to execute, by the time court passes action against the contractor, damage may already have been caused.

FOOTNOTES

1. W. Batty Smith, "Accidents - The Used Mobile Plant and Machinery on Site," Building, (Sept. 29, 1969), p.130.
2. Ibid.
3. Brian Warner, "Big Site Banishes Bad Accidents," Building Today, (Oct. 19, 1987), p.26.
4. Republic of Kenya, The Factories Act Chapter 514, 1962, Revised Edition, 1972, Government Printer.
5. Sunday Nation, May 29, 1988, p.22, COL 103
6. Brian Warner, "Big Site Banishes Bad Accidents," Building Today, (Oct. 29, 1987), p.24.
7. Blamuel Njururi, "Nairobi Killer Homes: A Grave Matter," Financial Review, Sept. 21, 1987, pp.6-8.
8. Chief Factories Inspector, cited by P.S. Kisia, "Implementation of Safety Requirements on Building Sites." (B.A. Project, April, 1987), p.18.
9. Daily Nation, October 26, 1987.

## CHAPTER SIX

### CONCLUSIONS AND RECOMMENDATIONS

#### Conclusions

Every industrial activity like all other human endeavours, has a certain element of risk attached to its performance. Hence accidents will always occur causing injury to workers and damage to property. However, construction seems to carry a more than average level of risk compared to other industrial activities. Construction will therefore always be a dangerous activity.<sup>1</sup> This may be attributed to the unique character of the industry as discussed in chapter four. The uniqueness of the industry should nevertheless not be used as a scapegoat to escape responsibility of providing a safe work environment.<sup>2</sup> Though accidents may continue occurring in the industry it is upon all concerned to reduce the occurrence rate to the lowest possible minimum by doing all that is reasonably practicable to prevent them.

With regard to the findings of this study it can be said that the participants in the construction process cannot be exonerated from the safety problem. The data presented in chapter five has shown that sites in Nairobi incorporate only about 21 per cent of the necessary prevention measures at the work face. This is enough evidence to prove that an element of negligence on the part of the parties responsible exists and contributes significantly to the exacerbation of the

safety problem beyond the level that can be attributed to the characteristics of construction as an industrial activity.

### Safety Management

Writers in construction have never failed to point out the scarcity in managerial abilities that continue to plague the industry.<sup>3</sup> The dismal performance of the industry in many aspects has been attributed to the shortfall in this essential resource. From the findings of this study it seems that construction safety as an aspect of construction has not been spared the ill effects of this shortfall. In the light of the findings from the proceeding chapter, it has been shown that many essential aspects of a good safety programme lack or are not adequate in the construction firms and on the sites sampled for study.

As regards safety policy and safety planning the findings of the study lead to a conclusion that, these two aspects are well incorporated by the majority of the construction firms. Sixty-four per cent and 90 per cent of the firms dealt with incorporated safety aspects in their corporate policy and in planning, respectively. This shows that for one reason or another majority of contractors recognize the need for the incorporation of safety in their policy and planning tools. The most likely motive behind this good score may be the force of statutory duty and contractual obligations. The economic motive is ruled out as being overriding in this case since evidence



gathered by the study show that most contractors do not fully appreciate the economic merits of a safe work environment. Though the formulation of a safety policy and the incorporation of safety aspect in construction planning are necessary prerequisites to the success of any safety management programme, the two will not do much in terms of enhancing the performance of the firm and its sites if they are not supported by the commitment and attitude of top management. This is testimony to the statement that the policy is the heart of the programme but will live or die by the support it is given by top management.

The attitudes of top management of the construction firms in Nairobi towards safety can be inferred from three variables included in the questionnaire. These are "safety director," "safety officer" and "safety inspection by management." The percentage number of sites which had a director in charge of safety, employed safety officer and where top management carried out safety inspections on site were found to be 0, 2.6, and 2.7 per cent respectively. Thus, the attitude and practice of top management towards safety can only be described as apathetic. Top management of construction firms in Nairobi lack the commitment, enthusiasm and more important the practical support necessary for effective implementation of the safety policy on site. The implication of this situation is far greater than a casual observation reveals. Site managers will most likely emulate the attitudes of their superiors. This will mean that the policy of the firm will most likely go unimplemented at the work place

where it is most needed. This argument holds from the findings of this study where it was found that most of the site managers of the sites investigated do not incorporate adequate measures and safeguards at their sites.

The questionnaire had three questions relating to the management of safety at the work face. The three questions touched on safety committees, safety meetings and the authority of the supervisor in safety matters. It was found out that there are virtually no safety committees and it was only in 8 per cent of the sites where safety meetings between workers and management were held. As regards the authority of supervisor in safety matters it was established that in 85 per cent of the sites supervisors were allowed to stop work in situations where workers were threatened with injury. This result show that management of safety at the work place lacked in terms of worker participation in safety matters. Workers were not given a chance to contribute ideas to the setting up and implementation of the accident prevention programme. Where such ideas have been recognized by managements and used in the management of safety it has been shown that workers are generally safer in their work environment.<sup>4</sup>

#### Management's Consciousness Towards Safety

In the context of this study management's consciousness towards safety may be seen in the light of its two recognized responsibilities. These are the economic and statutory responsibilities of management in safety. In chapter five

specific instances were pointed out when the findings tended to infer the management's ignorance of the economic or business implications of a safe work environment. In later sections of the chapter it was shown that only about 18 per cent of all contractors sampled fully appreciated the time and cost overruns that would result from construction accidents. With due regard to these findings it can be said that contractors in Nairobi do not fully appreciate the economic consequences of construction safety. The economic incentive that motivates an employer to incorporate safety in his work place is therefore lacking with a consequence that sites have remained relatively unsafe working places due to lack of necessary action.

As regards the contractors consciousness to the statutory provisions that govern him on site, the study has shown that all contractors were aware of the existence of the safety legislation that they were expected to adhere to. The reluctance of most contractors to comment on the adequacy of the legislation shows a high likelihood that they may not have been aware of the contents of the legislation. There is also a possibility that most contractors regarded it as a statutory requirement which did not have any bearing on their interests as businessmen. They would therefore be indifferent towards it.

### Statutory Control

Even before turning to the results of the evaluation of the contents of current legislation and the control mechanisms, it is quite clear from the findings of the study that its provisions have not achieved much success in terms of ensuring that construction work places are kept safe by eliminating all the potential foreseeable risks and hazards from the work environment. The very fact that the current state of safety as presented has persisted unabated on sites is enough basis for condemnation of the existing legislation and a conclusion that there must be something terribly amiss either in its technical provisions or with the policing machinery established under the act in the name of the factories inspectorate.

A look at the contents of the existing legislation has revealed that major emphasis is put on detailed technical safety standards which the employer has to adhere to in the provision of a safe work environment. It therefore seems that the legislation is written for a technical manager rather than a purely entrepreneurial employer or general administrative manager who may not have any knowledge of construction by training apart from the little knowledge he may have picked in his day to day interaction with more specialised people in construction. Considering the fact that most contractors in Kenya, especially the small ones, do not have any advanced formal education, this aspect makes the existing legislation even more complex.<sup>5</sup> It increases the likelihood that most

managers do not comprehend the contents of legislation which thus result in the poor safety standards on sites.

The current legislation lacks in provisions on management responsibilities for site management towards safety. The provision of safety management programmes is therefore not catered for and site management does not have any legal obligation to incorporate safety in their practices. For instance, contractors are not required by law to draw any safety policies, select safety committees or set up safety organizations in their management structures. The existing legislation also does not lay any basis upon which the workforce and other parties in construction such as the client, trade union or designers can be involved in safety matters by for instance incorporating trade unions at the shop floor level or the client and designers in the funding, development and dissemination of safety information in the industry.

In total the existing legislation fails to treat and define safety as a system composed of many interrelating components. It also fails to foster an atmosphere conducive to the adoption of an integrated approach to the provision of a safe system of work at the workplace, with all the parties involved in the construction process having defined roles to play which when combined fall into place to produce a safe and accident free system of work.

### Recommendations

The first step towards the improvement of the current state of safety on construction sites should be the launching of a massive education campaign to arouse awareness among all parties with direct and indirect bearing on accidents occurrence and their prevention. This includes the contractors, designers, workers, clients and members of public. The benefits of such campaigns will arise from two areas. Firstly, parties within and outside the industry will become more enlightened as to the economic and other benefits that can be derived from the maintenance of a safe work environment. Presumably, this will act as an incentive to make them more willing to take up their responsibilities in the safety system. Secondly, more parties and especially workers and members of the public will become aware of their rights to a safe construction process. This will motivate responsible parties to become more careful and perform their roles with more diligence after more workers and members of the public litigate against any breaches of duty arising out of negligence on the part of the responsible parties.

The campaigns could be organized by different institutions including the Ministry of Labour through its Factories Inspectorate department; the labour movement through the trade unions; the employer associations such as the Kenya Association of Building and Civil Engineering Contractors (KABCEC); and the Kenya Association of African Contractors

(KAAC). They may take the form of seminars, posters, or general educative programmes on the mass media such as newspapers, radio and/or television. A source of much relief and inspiration as concerns this aspect is the fact that a programme has already been initiated towards the above goal. Impact, an international programme dedicated to reducing incidents and risks of avoidable disablement, prepared a programme for the Voice of Kenya television entitled "Safety and health in Industry." Though not designed specifically for the construction industry, the programme aims at highlighting and educating all parties concerned on the risks inherent in a number of occupations and recommending ways of reducing them. It is reported that the programme has aroused much interest and favourable response from members of the public and viewers have sought more information in this area.<sup>6</sup> It is the hope of this study that from the enthusiasm which has resulted from this programme, the parties concerned have realized the effectiveness of education campaigns through the mass media.

Considering that many households in Kenya do not have access to television, other more accessible media such as radio should be used, if many more people are to be reached.

In order to enhance the role of management in safety, the existing legislation should be amended to put more emphasis on the role of management. Provisions should be made to make it a statutory duty for every contractor to have

a safety management programme made up of such aspects as safety policy, safety committees and the employment of the advise of safety professionals. Contractors should be compelled to draw up a safety responsibility and authority structure within their organizations which will be formalised by an organizations chart (organigram). This would be available at every site to inform all parties on site as to their responsibilities and all that is required of them as contribution to the system. Given the fact that most of the contractors are either small or medium in size they will find it uneconomical to employ a professional safety adviser. In view of this a group scheme is recommended where group safety officers serve as professional advisers to a number of firms. The resources obtained from a collective pool made up of periodic subscriptions from all the firms in the scheme will be used to pay for the professional's fee and to meet any other costs of establishing the group safety scheme. The organization of such a scheme will only be possible through employer organizations such as Kenya Association of Building and Civil Engineering Contractors and Kenya Association of African Contractors.

Professionalism in safety management in construction will only be possible if backed by specialised professional personnel. It is therefore a recommendation of this study that there be established a professional body of safety personnel organized in the same lines as the other professional bodies in industry. The establishment of such a body can enhance the



safety status drastically at the work place. Such an association would work in liaison with the government, legislators, employer organizations and trade unions to lobby for the recognition of safety as a professional area worthy of more respect than it is currently accorded by the employers. It will also lay guidelines as to the qualifications a recognized safety professional adviser should hold and hopefully keep a register of genuine safety professionals including taking responsibility for their professional conduct. This will avoid loopholes where employers would employ people of lesser or dubious qualifications in an effort to evade the legislative requirements.

Among other contributions the professional association can offer professional services to the group safety schemes mentioned above and also to individual enterprises that are big enough to employ full time safety officers. The association can also be consulted by government agencies and legislators in the formulation and amendment of legislation periodically to take account of the ever changing industrial work environments. It can also be relied upon to design and organize awareness programmes to educate parties on the safety discipline and at the same time provide professional trainers to train students of construction in aspects of safety based on their curriculum requirements.

In his opening speech during the state inauguration of the Sixth Parliament His Excellency the President Daniel T. Arap Moi said that one of the businesses that will preoccupy the first

session of sixth parliament will be the purposeful debating of various bills and amendments to existing legislation. Among the legislation lined up for debate and amendment, the President specifically singled out for mention the legislation governing the safety and health requirements in factories and other places of work.<sup>7</sup> Seen in the context of the problem being investigated by this study, this pronouncement would not have come at a more opportune time.

This study has pointed out the complex and technical nature of the current legislation. It therefore recommends that during the amendment, the legislation be replaced by simple easily assimilated concepts of general application. Such concepts will act as guidelines on how the work environment can be made a safe one. The checklist presented in chapter four, for instance, is an example of the simple concepts that when collectively incorporated will produce an acceptable standard of safety. The statutes of general application can be complemented in each industry by non-statutory codes of practice drawn by specialists in industry. In construction, architects, engineers and contractors through their professional associations can be relied upon to come up with approved codes of practice. The advantage of codes of practice over statutory provisions is the relative flexibility of the former. In addition, codes of practice can be easier to produce and revise. They can also be easily introduced into the curriculum of construction training programmes due to their technical rather than legal bias. This will reduce the rigidity and legal content of the current legislation which is already a basis for public criticism.<sup>8</sup>

In line with the amended legislation, the enforcement machinery should adopt a more liberal approach in its work with less emphasis on litigation and more efforts being diverted towards counselling the contractors on ways by which the heavy accident toll can be reduced by incorporation of simple but effective concepts into the work environment. The inspectorate department should incorporate an information and education wing in which a data bank of educative materials can be kept and practical methods of disseminating them to relevant parties devised.

The emphasis on simple statutes of general application will mean that safety inspectors be knowledgeable in technical aspects of the industrial activities which they are required to inspect. In construction, people with middle-level technical knowledge of general building and civil engineering such as graduates of the national polytechnics (i.e. Kenya or Mombasa) would be well suited for recruitment as inspectors. In this way they will not only act as policing agents of the existing legislation but also as para-professional advisers to employers and workers on their responsibilities and on how they can live up to them. This will be possible by incorporating aspects of construction safety in the training programmes of these institutions.

As a check against awarding contracts to contractors with bad safety records and as an incentive for them to improve on that performance, one of the criteria for awarding building contracts should be the contractors past safety record. Where

a contractor has a heavy accident toll behind him, he should stand a lower chance of winning the contract than his colleague with a better performance. This of course presumes an accurate and true record for every contractor, and one that provides an objective criteria which can be applied to gauge all contractors on the same basis, such as the number of injuries occurring on sites. This will call for a higher degree of vigilance on the part of the inspectorate and cooperation on the part of labour force which will be relied upon to maintain an up to-date record by reporting all accidents occurring to the safety officer or inspector.

The scope of the current legislation seems to cover only the work place environment. Express protection seems to be given to the workers on site only leaving out other parties who may suffer damage arising one way or another from the activities being carried out on site. Here one can single out visitors to the site and members of public as potential victims who need to be protected by law. Adjacent property can also be damaged by the site operations. With the current legislation such parties can rely more on common law (negligence) than on the Factories Act when seeking redress in courts. This aspects should be rectified by an amendment of the current legislation.

In summarising, the study recommends a multidisciplinary integrated approach as a necessary prerequisite to a long term solution to the safety problem on site and in industry in general. All parties and institutions must contribute their rightful parts towards making the life of the construction worker

long, healthy and safe and also in avoiding all concomitant ill effects of industrial accidents. With the aim of the construction projects being the improvement of the general well being of society at large, the participants to the construction process should consider this noble goal as having been met only when the well being of the people engaged in the project construction is preserved and perhaps even enhanced.

FOOTNOTES

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APPENDIX 1

SITE SAFETY PERFORMANCE ASSESSMENT

QUESTIONNAIRE

SITE SAFETY BASIC CHECKLIST

Site Details:

1. Name of site (project) .....
2. Plot Number .....
3. Street Name .....
4. Division of city where site is located
  - a) Eastern
  - b) Central
  - c) Western
5. Nature of works
  - a) New works
  - b) Alterations and Extensions
6. Stage of construction reached as time of site visit .....

Site Access and Egress

1. Clear unobstructed access and egress
  - a) clear
  - b) obstructed

Site Tidiness

1. Materials storage on site
  - a) Well stacked
  - b) Scattered on site
2. Tools Handling
  - a) Kept in tool kits
  - b) Scattered on site
3. Spoils heaps for waste disposal on site:
  - a) Available
  - b) Not available

Safety Protective Equipment

1. Safety helmets
  - a) Available
  - b) Not available
2. Hand gloves for workers
  - a) Available
  - b) Not available

3. Hard boots:
  - a) Available
  - b) Not available
4. Safety glasses:
  - a) Available
  - b) Not available
5. Overalls:
  - a) Available
  - b) Not available

Precautionary Equipment

1. First Aid Kit
  - a) Available
  - b) Not available
2. Qualified first-aider
  - a) Available
  - b) Not available
3. Fire extinguishers:
  - a) Available
  - b) Not available

Mechanical Hazard Elimination

1. Timbering of excavations exceeding 1.2m deep:
  - a) Timbering done
  - b) No timbering
2. Complete Hoarding around site:
  - a) Constructed
  - b) Not constructed
3. Barriers around excavations:
  - a) Constructed
  - b) Not constructed
4. Ladders used on site
  - a) Soundly constructed
  - b) Inadequately constructed
5. Complete scaffolding (i.e. with guardrads, toe boards and decking).
  - a) Soundly constructed.
  - b) Inadequately constructed
6. Electric cable layout around site
  - a) Safe
  - b) Unsafe

Safety Propaganda

1. Posters around the site:
  - a) Posted
  - b) Not posted
2. "Tool Box" meetings:
  - a) Held
  - b) Not held



APPENDIX II

SITE MANAGEMENT PERFORMANCE SURVEY

QUESTIONNAIRE TO SITE MANAGERS:

SECTION 1

1. Among the following aspects of construction work indicate the ones that are included in your firm's management policy:
  - i) Recruitment of labour
  - ii) Labour /management relationship
  - iii) Safety of the works
  - iv) Manner of acquiring jobs
  - v) None of the above
  
2. Which among the following functions in the construction firm are the responsibility of the board of directors/ principal partners or the proprietor of the company?
  - i) Financial matters of the works
  - ii) Tendering for jobs
  - iii) Acquiring labour and materials
  - iv) Safety of the works
  - v) None of the above
  
3. During the planning stage of the project before commencing work on site which among the following matters do you take into consideration?

- i) Labour and material availability
- ii) Weather conditions during project duration
- iii) Nature of client as regards payment
- iv) Safety of the work
- v) Non of the above

4. Listed below are four types of personnel and their corresponding functions in a contracting organization. Indicate the ones that are employed in your firm.

- i) Contracts officer (contract administration)
- ii) Safety officer (safety of works)
- iii) Quantity surveyor (Estimating)
- iv) Accountant (Accounts)
- v) Non of the above

5. Among the following functions of site management indicate the ones that are performed by a committee

- i) Purchase of site requisites
- ii) Recruitment of workers
- iii) Safety of works
- iv) Budgetary allocations
- v) Non of the above

6. (a) Does your firm offer any training, either on the job or otherwise, to its workers?

- i) Yes
- ii) No

- (b) If any training is offered which category of workers are covered?
    - i) Tradesmen
    - ii) Supervisors
    - iii) Management
  - (c) Which of the following aspects are included in the training programmes?
    - i) Competence in worker's specialised area
    - ii) Labour-management relationship
    - iii) Safety of works
7. (a) Does the site management team in your site hold periodic meetings with the foremen/supervisors to discuss various matters regarding the project?
- i) Yes
  - ii) No
- b) Among the following aspects of the project which ones are discussed in the meetings?
- i) Progress of work
  - ii) Material and labour requirements for various gangs and trades
  - iii) Safety of the works

iv) Problems facing various gangs

v) None of the above

8 a) Do the directors/principal partners/owners of the firm make visits to the site?

i) Yes

ii) No

b) How often are these visits if any?

i) Daily

ii) Weekly

iii) Monthly

iv) Occasionally

c) Which among the following aspects of the project do they inspect during such visits?

i) Progress of works

ii) Material and components stocks

iii) Safety of the work environment

iv) Quality of work

v) None of the above

9. a) Are you required by your superiors in the firm to prepare periodic report about the site you manage?

i) Yes

ii) No

b) If you are required to submit a periodic report which of the aspects listed below are included in the report?

- i) Financial statement
- ii) Progress of works
- iii) Any accidents that have occurred on site
- iv) Labour recruitment on site

10. Under which circumstances among the ones listed below is a supervisor/foreman in your site authorised to stop work to facilitate necessary steps to be taken to remedy the situation

- i) Delay in material delivery
- ii) Instruction from designer
- iii) Where workers are at risk of injury
- iv) Severe weather conditions
- v) None of the above

Section 2

1 a) Listed below are four situations which may arise on a site at one time or another. Indicate the ones that are likely to delay your progress by their occurrence.

i) Variation order from designer

ii) Delay in the delivery of materials being imported from a foreign country

iii) Injury to workers caused by site accidents

iv) Lack of skilled labour

v) None of the above

b) Do the factors you have indicated in (a) as causes of delay also involve you in costs that may increase your total operational costs?

i) Yes

ii) No

2 a) Of the following aspects of construction work which ones are governed by a statutory or other legislation which you are aware of?

i) Safety of the works

ii) Client-contractor relationship

- iii) Labour-employer relationship
- iv) Health of the work place
- v) None of the above

b) If any of the aspects in (a) are governed by legislation, does the legislation have any shortcomings you know of?

- i) Yes
- ii) No

c) If the answer to (b) is Yes state the aspects and the corresponding shortcoming in the legislation.

.....  
.....

3. In the contractual agreement between the contractor and the client, which of the four areas listed below do you feel are not currently well covered?

- i) Training of workers
- ii) Preliminary works on site
- iii) Contractors overhead costs
- iv) Safety of the works
- v) All the aspects above are well covered

4. In your opinion which among the following areas of construction work are not well covered by insurance?

- i) Delay of work due to material shortage
- ii) Safety of the works
- iii) Delay of work due to adverse weather conditions
- iv) Delay arising out of worker unrest
- v) All the above are well covered

5. From among the following aspects indicate the ones which you feel trade unions should participate in

- i) Safety of the workers
- ii) Labour-contractor relations
- iii) Recruitment of workers
- iv) Training of workers
- v) None of the above

6. Designation of person completing the questionnaire.



APPENDIX III

RAW DATA OF SITE SCORES AS EXTRACTED  
FROM CHECKLIST ADMINISTERED TO SAMPLED SITES.

Site Serial Number	Score (out of 20)	Percentage score
01	7	30%
02	7	35%
03	5	25%
04	2	10%
05	3	15%
06	1	5%
07	5	25%
08	1	5%
09	3	15%
10	9	45%
11	2	10%
12	4	20%
13	3	15%
14	1	5%
15	2	10%
16	2	10%
17	7	35%
18	3	15%
19	3	15%
20	2	10%
21	1	5%
22	3	15%

Site Serial Number	Score (out of 20)	Percentage score
23	4	20%
24	2	10%
25	6	30%
26	4	20%
27	5	25%
28	2	10%
29	1	5%
30	3	15%
31	6	30%
32	2	10%
33	4	20%
34	15	75%
35	1	5%
36	2	10%
37	12	60%
38	14	70%
39	7	35%

APPENDIX IV

L. D. BCR 14

MINISTRY OF LABOUR,  
FACTORIES INSPECTORATE,  
P.O. Box 40326,  
NAIROBI.

THE FACTORIES ACT CAP 514

Building Operations and Works of Engineering Construction  
Rules L. No. 40 of 1984.

General Inspection Report Form

1. Name of the Site .....
2. Name of the street where situated/Plot No.....  
.....
3. Number of stories to be built ..... in (Phases)  
.....
4. Name of the clerk of Works (Site Agent) .....
5. Name(s) of the Proprietor(s) (owner(s) of the  
building .....  
Address .....
6. Name of the Main Contractor(s) .....  
Address ..... Tel. ....  
Number of people employed by main  
Contractor.....  
Name of his Safety Supervisor .....
7. Appointed on .....  
Number of Sub-Contractors .....
8. Contractor for (foundation concrete walls).....  
..... Address .....  
No. of people to be (are) employed by  
this Contractor .....

- Name of this Contractor's Safety Supervisor.....  
..... Appointed on .....
9. Contractor for Mechanic Air Conditioning ventilation,  
refrigeration .....
- Address .....
- No. of people to be (are) employed by this  
Contractor .....
- Name of the Safety Supervisor (officer) employed  
by this Contractor .....
- .....  
Appointed on .....
10. Contractor for Electrical Works .....
- Address .....
- No. of people to be (are) employed .....
- Name of his Safety Supervisor (officer) .....
- ..... Appointed on .....
11. Contractor for Plumbing Works .....
- ..... Address .....
- Name of his Safety Officer (Supervisor).....
- 12 (A) Forms and Certificates
- Abstract of the Rules L. D. BCR 1 .....
- General Register L.D BCR 2 .....
- Abstract of the Factories Act L.D. 255 .....
- Notice of works BCR 5 .....
- Appointment of Safety Officer BCR 13 .....
- L.N. 44/1978..... L.N. 160/1977.....
- L.N. 160..... L.D 250/1 .....

Notice to Medical Officer of Health of the area .....  
.....

Notice to the Director of Medical services  
(in Nairobi) .....

12 (B) REGISTRATION

Recommendation of registration of the site L.D BCR 15  
.....

Certificate of registration of this site  
L.D BCR 16 .....

REGISTERS

Register of shared Welfare BCR 3 .....

13. Certificate of Test and examination of:

- a) Chains ..... b) Chain slings .....
- c) Rings ..... d) Rope slings (except fibres).  
rope sling ..... e) Links .....
- f) Hooks ..... g) Plate clamps .....
- h) Shackles ..... i) Swivels .....
- j) Eye bolts .....

Certificate of Test Thorough Examination of  
Cranes BCR 10 .....

Certificate of Test and Examination of Wire Rope  
BCR 9 .....

Certificate of Test and Thorough Examination of:

- a) Crabs ..... b) Winches .....
- c) Pulley Blocks .... d) Gin wheels .....

14. Certificate of Test and Thorough Examination of  
Host BCR 7 .....
- /or Records of Thorough Examination of:- BCR 4 III/II
  - a) Chains ..... b) Ropes and Lifting Gear....
  - c) Heat treatment of Chains ..... (Hoist for  
persons ..... e) Hoists for carrying  
goods ..... g) Trestles .....
  - h) Ladders .....
15. Reports of Results of Inspection of:-
  - a) Scaffolding..... b) Boatswain's chairs.....
16. Reports of results of weekly Thorough Examination  
of:-
  - a) Excavation ..... b) Cofferdams .....
17. Results of Weekly Reports of:
  - a) Cranes ..... b) Anchoring .....
  - Ballasts .....
18. Records and Results of Tests and Exams of:-
  - a) Hoists used for carrying people .....
  - b) Controls for hoists .....
19. Records and Results of Tests for:-
  - a) Automatic Safe Load Indicators .....
  - b) Automatic overload cut out devices .....
20. General Provisions
  - a) Fencing of the site ..... b) Timber used .....
  - c) Strength of the Structure itself - tunnel -  
excavation etc..... d) Means of egress....  
.....

- e) Control of explosives ..... (f) Control of  
Dust and fumes .....
- g) Ventilation .....
- h) Control of Moving Machinery .....
- i) Electrical work safety .....
- j) Demolition .....
- k) Fencing of machinery .....
- l) Strength of Temporary structure .....
- Strength of formwork .....

21. Work Places

- a) Strength of Scaffolding .....
- b) Alignment of the Scaffolding .....
- c) Strength/measurement of Platforms .....
- d) Strength of Planks .....
- e) Measurement of planks .....
- f) Guardrails ..... Safety nets .....
- ..... g) Construction of Ladders.....
- h) Strength of ladders .....
- i) Loading on ladder .....
- j) Scaffolding and planks .....
- k) Loads on structure generally .....

22. Mechanical plants (Safety) .....

23. Lifting Operations

- a) Strength of the lifting machinery .....
- b) Strength of the anchoring .....
- c) Strength of the supports .....

- d) Is there slewing motion .....
- e) Precaution during slewing motion .....
- f) Is a qualified signaller provided .....
- g) Welfare and safety of drivers/operators .....
- h) Interlock for derricking jibs .....
- i) Stability of rails .....
- j) Marking of Safe Working Loads .....
- k) Safe load indicators .....

24. Transport Generally

- Rails and Tracks .....
- Maintainance of plants schedule .....
- Automatic/manual warning devices installed on  
plants and vehicles .....
- Operators for plants .....
- Operators' certificates .....
- Mechanical condition of vehicles .....
- .....
- Position of plants from edges of excavation, tunnels,  
etc.....

24. Workshop

- Cleanliness ..... overcrowding .....
- Ventilation ..... lighting ..... floors ....
- Sanitary conveniences w/c closets etc .....
- Prime movers ..... Guards of M/Cy.....
- Petroleum/L.C. G containers .....
- Fire fighting equipment .....



25. A Pressure vessels

Steam boilers ..... steam receivers .....  
Air receivers ..... ICE installations .....

25. B Health/Safety and Welfare

Drinking water ..... washing facilities .....  
Accommodation for clothing .....  
First Aid Box ..... First Aider.....  
Dust/fumes .....  
Place for taking meals ..... Eye protection .....

26. Demolition

Access to working places .....  
Verification e.g. existing supply of electricity  
cables ..... water pipes.....  
gas pipes ..... sewer lines .....  
Asbestos .....  
Fire and flooding estimate .....  
Other observations .....

27. General Safety measures

Fencing of M/Cy ..... Electric Rules .....  
..... Falling of objects .....  
Tee-boards ..... hand-rails .....  
Lighting generally.....  
Support of structure .....  
Strength of structure under construction .....  
Avoidance of collapse.....  
Weights being lifted on the site .....

ILO conventions/recommendations compliance.....  
.....  
Use of personal protective wear .....  
Use of helmets, boots, overalls .....

28. Health

Provision of First Aid Boxes .....  
Provision of First Aid Rooms .....  
Provision of First Aid Clinic  
Provision of First Aider(s) ..... Doctor.....  
Provision of Ambulance ..... Stretchers.....  
Washing facilities .....  
Living labour lines .....  
..... size of houses .....  
Number of sanitary facilities at the  
Labour lines w/cs..... water points .....  
Public health facilities .....  
House keeping .....  
Drainage .....

29. Welfare

Recreation facilities .....  
Canteens .....  
Cleanliness of Welfare facilities at the Labour lines  
.....  
Provisions for transport to and from work  
.....  
Workers' motivation oriented activities.....  
Number of shifts and their duration .....

240  
12

30. Radiation

Is the storage of radiation source well designed?  
.....

What are radiation dose monitoring facilities  
available .....

Where is blood count done .....

31. Comments and Recommendations

Immediate action to be taken by site management  
.....  
.....

Recommendations by Inspector of Factories  
carrying the inspections .....

32. c.c                    The Chief Inspector of Factories,  
                              P.O. Box 40326,  
                              • NAIROBI.