

ACCIDENTS AND SAFETY VIOLATIONS IN THE NIGERIAN CONSTRUCTION INDUSTRY

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ABSTRACT

This paper deals with safety in the Nigerian construction industry. Three aspects of safety were identified as paramount in the study and include accident causations, accident prevention and the most violated safety rules and regulations. The various factors that affect these aspects were identified and questionnaires were used to collect information related to these factors which were analyzed using the 2-step ordinal scale analytical procedure. Only factors relating to causes of accidents and the violation of safety rules are discussed due to limitation in scope. However the majority of factors identified as being responsible for the safety situation in the Nigerian construction industry were found to be human factors and their solutions will involve the prudent management of both men and material resources by the contractor.

Keywords: *Accident causations, Safety violations, Construction Industry, Human factors.*

INTRODUCTION

A large proportion of the Nigerian working population is employed in the construction industry and a great majority of them are exposed to varying levels of risks to their health and lives. Construction takes place in the open, exposed to the weather and for limited periods of time, in comparison to the production industry. Consequently most welfare facilities on site are of necessity temporary in nature. The present day construction is also marked by rapid execution of projects and extensive use of machinery and complicated production processes. All these

imply a greater exposure of workers to risks of hazards and accidents and thus require a strict compliance of all participants to the various labour protection, industrial sanitary and safety regulations (Napier, 1980).

The construction industry is held to be one of the most dangerous industries ranking 3rd after mining and fishing industries in terms of fatal accidents (Ward 1979). And each of these fatal or non fatal accidents cause suffering to the victim (s) and waste money and time to the industry. It is true that insurance can be taken to protect the industry from certain direct costs resulting from

construction accidents however some accidents do involve substantial costs that cannot be insured against such as loss of trained manpower, loss of production through other operatives stopping work out of curiosity, sympathy or helping the injured party etc. Although accurate statistics are not available in Nigeria the cost of accidents to the construction industry in terms of direct and indirect financial losses are enormous.

An accident is usually an unplanned and unexpected event, which results from a mistake somewhere, somehow and by somebody. Some of these mistakes result from easily recognizable hazards, which can be equally easily prevented. The mistake may be made by the designer or contractor or even the workers (Ward, 1979). The need for safety is of necessity important to the governments, consequently various laws and regulations have been instituted to protect the health and lives of all those who use or are involved in construction of structures and those who may be affected by work activities.

In Nigeria almost all the legal requirements for safety in the construction industry was received from the English legal system with little or no modifications. The basic concept of safety and their provisions are not necessarily directed towards the existing conditions. Thus some of these provisions are not relevant while others are impracticable in the Nigeria context. The general trend in Nigeria is an acute lack of awareness by professionals of their legal responsibilities and an apparent lack of enthusiasm by government towards their enforcement (Aniekwu, 1989).

Safety, Health and Welfare in the Nigerian Construction Industry

By the provisions of Workers Act, the responsibility for enforcement lies with the Health and Safety commission. This has representatives of both the industry and other interested Ministries which include the Ministries of Employment, Labor and Productivity, the Ministry of Health, the Ministry of Works and Transport and the Ministry of Internal Affairs. The regulations made by the Head of

Service, may provide for the appointment in prescribed cases of recognized trade unions of safety representatives from amongst its membership (Federal Republic of Nigeria, 1991).

In a previous work carried out in the then Bendel State of Nigeria, involving 20 civil/building engineering contractors with experience ranking from 10 - 30 years, show that only 25% of the contractors have heard of the safety health and welfare at work acts of 1974, without necessarily knowing what it entails. Only about 5% are familiar with the provisions of these acts and none has ever met or made use of the services of a safety inspector or officer (Umoh and Aniekwu, 1996). This is a very disturbing state of affair, which implies that these requirements are not taken seriously or are even completely ignored.

For a variety of reasons some of which are structural in nature, the government, contractors or labour employers in Nigeria do not attach much seriousness to the provision of safety measures in work sites. Work currently being carried out by the authors also show that injured person in a construction site can obtain compensation based mostly on the management generosity. What constitutes the compensation is determined by the management, since the position of the worker in relation to the contractor is similar to that of the contractor when he is dealing with government, as a client. This is a situation of helplessness associated with under-development (Umoh and Aniekwu, 1996).

Research Methodology

An exploratory research was conducted in Nigeria, to give an insight into some of the factors that affect safety in the construction industry. A critical look at the phenomenon of accidents on site showed that 3 aspects are paramount in understanding its occurrence and implications and are as follows:

- a) Causes of accidents
- b) Safety measures taken to prevent accidents
- c) Violation of these measures despite their obvious consequences.

Through literature search the various factors that affect each of these aspects were identified as follows:

Causes of Accidents Factors

1. Use of faulty tools and equipments
2. Non compliance to standard safety rules and regulations
3. Improperly maintained and or inadequate scaffolding
4. Lack of experience
5. Improper handling and storage of flammables, explosives and combustibles
6. Improper handling of tools and equipments
7. Workers fatigue and boredom
8. Improper supervision
9. Management attitude and action on safety matters
10. Workers operating environment
11. Natural causes
12. Inadequate management of work environment
13. Faults in design, detailing and specifications
14. Faulty construction techniques
15. Workers physical condition
16. Lack of job satisfaction by workers
17. Monotony (constant exposure to a particular job).

These 17 factors were identified as being responsible for accidents at construction sites.

Most Violated Safety Rules Factors

The following 12 factors were identified as the most violated safety rules which result in accidents.

1. Improperly maintained and or inadequate scaffolding
2. Lack of qualified first aid attendant on site
3. Failure to wear personal protective equipment
4. Unsafe crane operations
5. Improper and unsecured ladder
6. Absence of or inadequate guard rails on wall, floor and on openings
7. Improperly shored or sloped excavation
8. Poor general site conditions

9. Ungrounded and unguarded portable electrical tools
10. Failure to backfill holes and trenches promptly
11. Improper handling and storage of flammable explosives and combustible
12. Absence of or inadequate fencing of site perimeter.

Accident Prevention Factors

These 7 factors are measures that could be taken to prevent the occurrence of accidents on site.

1. Provision of safe storage of flammables, explosive and combustibles
2. Use of experienced field supervisors for enforcing safety rules on site
3. Encouragement of strict compliance to company safety rules for workers
4. Conducting periodic safety seminars
5. Safety campaigns using posters, safety instruction cards, warning signs etc
6. Special safety instructions for particular tasks
7. Responsibility of trade foremen for safety measures as applied to their group.

A questionnaire on a five points scale, incorporating all these factors was designed and sent to members of the professions in the construction industry (Architects, Engineers, Builders, and Quantity Surveyors). A total of 200 questionnaires were distributed in Edo, Delta, Oyo, Osun, Ogun, Lagos, Ondo, Ekiti, Cross River, Akwa-Ibom, Bayelsa and Rivers states. Although the choice and distribution of questionnaire were limited by financial constraints, it is believed that these locations are fairly representative of the southern part of Nigeria. Apart from weather variables which may differ in the North the result may form a near accurate projection of what could be obtained in the whole country. The general response rate to the questionnaire was 62%.

Data Analysis

A 2-step ordinal scale analytical procedure was adopted which aims at establishing the relative

importance of the factors affecting each aspect of safety as previously identified. There are 2-opportunities for a respondent to show that a particular factors makes an important contribution and these are marked by the responses, "strongly agree and "Agree". For each factor the percentage of respondents giving these responses is called the severity index (Baldwin *et al.*, 1971) and used to rank the factors.

$$SI = \frac{\sum_{w=1}^5 R_w W}{R_t} \dots (1)$$

Where

Rw = No of respondents

W = weight or point assigned

Rt = Total number of response obtained for that factor.

These rankings make it possible to cross-compare the relative importance of the factors as seen by the different groups of professionals. In order to measure the agreement in ranking between the groups, a rank agreement factor as given in equation 2 is used (Okpala and

Aniekwu, 1988). This represents the average absolute difference in rank of factors and is defined as;

Where for any 2 groups the rank of i^{th} factor by

$$RA = \frac{\left(\sum_{i=1}^N |R_{i1} - R_{i2}| \right)}{N} \dots (2)$$

The percentage disagreement is

$$\frac{\sum_{i=1}^N (R_{i1} - R_{i2})}{\sum_{i=1}^N (R_{i1} + R_{i2})} \times 100 \dots (3)$$

$$\text{Percentage agreement } RA = 100 - R_D \dots (4)$$

group 1 is R_{i1} and group 2 is R_{i2} .

$$i = 1, 2, \dots, N$$

$$j = N - i + 1$$

The full derivation of these equations is fully detailed in (Okpala and Aniekwu, 1988).

Table 1: Cross comparison of the relative importance of the items responsible for Causes of Accidents in the Nigerian Construction Industry

Groups	Rank Agreement Factor	% Agreement
1 Engineers and Architects	4.15	51.4
2 Engineers and Quantity Surveyors	3.76	55.56
3 Engineers and Builders	2.82	66.67
4 Architects and Quantity Surveyors	4.82	43.06
5 Architects and Builders	4.23	50.0
6 Quantity Surveyors and Builders	3.53	41.67
	AVERAGE	51.39%

Table 2: Cross comparison of the relative importance of the items responsible for Safety Rules that are most frequently violated in the Nigerian Construction Industry

Groups	Rank Agreement Factor	% Agreement
1 Engineers and Architects	2.83	52.78
2 Engineers and Quantity Surveyors	3.75	37.50
3 Engineers and Builders	3.58	40.28
4 Architects and Quantity Surveyors	3.08	48.61
5 Architects and Builders	3.33	44.44
6 Quantity Surveyors and Builders	4.42	26.39
	AVERAGE	41.67%

Table 3: Cross comparison of the relative importance of the items responsible for Accident Prevention in the Nigerian Construction Industry

Groups	Rank Agr. Factor	% Agreement
1 Engineers and Architects	2.50	37.50
2 Engineers and Quantity Surveyors	2.25	43.75
3 Engineers and Builders	2.00	50.00
4 Architects and Quantity Surveyors	2.38	40.63
5 Architects and Builders	1.50	62.50
6 Quantity Surveyors and Builders	2.25	43.75
	AVERAGE	46.36%

DISCUSSION

The most striking feature of the result is the very low level of agreement between the general sample and the respective classes of professionals (Table 1) on the level of importance of the various factors that affect the different aspects of safety at the construction sites. This poor level of agreement may be indicative of the general confusion and lack of awareness of the importance and legal requirements for safety in the construction industry in Nigeria. A close look at the rank agreement factors and the percentage agreement on all aspects as presented in Tables 1, 2, and 3 indicate a general poor level of agreement with a general average percentage agreement of only 46.36%. Also, no consistent pattern of agreement or disagreement was observed, suggesting an arbitrariness that can only derive from pure chance or ignorance.

On factors that affect, "causes of accident", quantity surveyors disagreed most with contractors with a percentage agreement of only 41.67%, while engineers agreed most with contractors with a percentage agreement of 66.67%, with an average percentage agreement of 51.39% for this category. However, on factors related to "the most violated safety rules", quantity surveyors disagreed most with contractors with a percentage agreement of only 26.39% while engineers and architects agreed most with a percentage agreement of 52.78%. The average percentage agreement for this category is 41.67%. On factors related to "accident preven-

tion", architects and engineers who had agreed most on factors relating to the most violated safety rules disagreed most with a percentage agreement of only 37.50% while architects and contractors agreed most with a percentage agreement of 62.50%.

The general average percentage agreement is 46.46% and apart from the consistent very poor agreement between quantity surveyors and contractors on the first 2 of the 3 categories, the pattern of agreements exhibited can neither be explained in terms of professional bias and training nor role in the construction industry. The very strong agreement between engineers and architects on one category and the very strong disagreement between the same groups of professionals on another category defies professionals' bias as the underlying reason. It can at best be described as random.

The three most important factors identified as being responsible for causes of accidents in the Nigerian construction industry and as agreed by all the professions are:

- i) use of faulty tools and equipments
- ii) non compliance to standard safety rules and regulations
- iii) use of improperly maintained and or inadequate scaffolding

Also the following 3 factors were identified by all the professions as being the most frequently violated safety rules

- i) use of improperly maintained and or inade-

Table 4: Summary of Responses Based on Professional Area

No	Accident Variables	Engr	Arch	Qty. Suv	Build.	General
Causes of Accidents Variables						
1	Use of Faulty tools and equipment	85.72	100	83.33	100	92.25
2	Non compliance with standard safety rules and regulations	61.91	100	100.0	100.0	90.48
3	Improperly maintained and adequate scaffolding	95.23	66.67	83.33	100	86.30
4	Lack of experience	90.47	66.67	83.33	100.0	85.13
5	Improper handling of tools and equipment	80.96	100	83.33	75.0	84.82
6	Improper handling and storage of flammables, explosives and combustibles	90.47	100	66.67	75.0	83.04
7	Workers fatigue and boredom	76.16	100	50.0	50.0	69.05
8	Improper supervision	80.95	66.67	50.0	75.0	68.16
9	Management attitude and actions on safety matters	42.85	100	50.0	75.0	66.96
10	Workers operating environment	76.19	66.67	33.33	75.0	62.80
11	Natural Causes (Rainstorm, Flood etc)	38.09	66.67	66.67	75.0	61.61
12	Inadequate management of work environment	71.43	66.67	50.0	50.0	59.53
13	Faults in design, detailing and specifications	71.43	66.67	50.0	50.0	59.53
14	Faulty construction techniques	76.19	100	33.33	0.0	52.38
15	Workers physical conditions	38.06	66.67	16.67	75.0	49.11
16	Lack of job satisfaction by workers	23.81	66.67	66.67	0.0	39.29
17	Monotony (constant exposure to particular job)	14.28	0.0	0.0	0.0	38.57
Most Violated Safety Rules Variables						
1	Improperly Maintained and adequate scaffolding	66.67	100	66.67	75.0	77.09
2	Lack of qualified first aid attendant on Site	66.67	100	50.0	75.0	72.92
3	Failure to wear personnel protective equipment	52.38	100	83.33	50.0	71.43
4	Unsafe crane operations	71.43	100	33.33	75.0	69.94
5	Improper and unsecured Ladder	61.91	100	33.33	75.0	67.50
6	Absence and or inadequate guard-rail on wall, floor and roof openings	61.91	100	50.0	50.0	65.48
7	Improperly shored or sloped excavation	66.67	100	33.33	50.0	62.50
8	Poor general Site cleanliness	61.91	100	33.33	50.0	61.31
9	Ungrounded and unguarded portable electric tools	61.90	66.67	33.33	75.0	59.23
10	Failure to backfill holes and trenches promptly	33.32	100	33.33	50.0	54.16
11	Improper handling and storage of flammables, explosives and combustibles	57.15	66.67	16.67	75.0	53.87
12	Absence of or inadequate fencing of Site perimeter	52.39	6.67	16.67	50.0	46.43

quate scaffolding

- ii) lack of qualified first aid attendant or site
- iii) failure to wear personal protective equipment

Use of faulty tools and equipments Ranking = 1st

Use of improperly maintained and or inadequate scaffolding Ranking = 3rd

“The use of faulty tools and equipments” was identified as the most important cause of acci-

dent while the "use of improperly maintained and or inadequate scaffolding" was identified as the 3rd most important cause of accidents and also the most violated safety rules in the industry. The circumstances of the 2 factors are similar and will therefore be discussed together.

Most technologies in Nigeria are imported and consequently the skills and knowledge required for operating and maintaining them need to be acquired. However where the technology is acquired faster than the skill and knowledge to operate and maintain them, then the maintenance and operation of such technologies suffers. Even when these skills have been acquired there is also a dependence on the foreign market for the tools and spare parts for the maintenance. Since the market is foreign the availability of these items cannot be guaranteed and the costs are comparatively high (Umoh and Aniekwu, 1996). The net effect is that operatives of such technologies do not either have the items available or they do not have the funds to pay for its high cost. This leads to the tendency to cling to whatever is available for as long as it is practically possible. This tendency is carried to the point where the basic specifications for the operation and maintenance of such technologies are ignored. At such points the continued use of such technologies becomes a health hazard. Since there is no apparent government effort to control this, workers are inordinately exposed to these undue hazards.

The use of improperly maintained and or use of inadequate scaffolding is ranked as the most violated safety rule by all the professionals. This problem is a part of a bigger one bedeviling maintenance services in low technology environments. In Nigeria as in most developing countries there has been a deep seated ignorance of the importance of maintenance in the development of a nation's economy. Thus maintenance as a service had been neglected and the necessary infrastructures required for its effective operation are not available (Ovuworie, 1985).

Maintenance the world over is plagued by problems ranging from lack of awareness to lack of organizational and managerial expertise, economic and technical problems (Gupta, 1975). In Nigeria these problems are further complicated by complex socio-cultural and environmental factors. There is insufficient manpower, materials, lack of knowledge, and inadequate organizational competence and discipline to do what is required. The culmination of these problems makes the proper operation of maintenance services in Nigeria very difficult and the organizations that are engaged in its activities very few. Companies having huge stock of equipment usually maintain an in-house maintenance organization with all the skills and tools required for maintaining their equipment. This is considered a cost effective approach to maintenance in Nigeria. Companies with smaller stock of equipment i.e. not enough to justify investments in an in-house maintenance organization, are forced to rely on the services of equipment dealers for the maintenance of their equipment. Apart from this, the only other alternatives are the services provided by a few local mechanics, who probably were once workers with some dealers. They not only lack the basic equipment for such services, their professional integrity cannot be relied upon. They also have no access to spare parts except through the dealers (Aniekwu and Okpala, 1989).

Non compliance to standard safety rules and regulations Ranking = 2nd

Lack of qualified first aid attendant or site Ranking 2nd

Failure to wear personal protective equipment Ranking = 3rd

Non compliance to standard safety rules and regulation was identified as the 2nd most important factor responsible for causing accidents on site. Lack of qualified safety first aid attendant on site is ranked the 2nd most violated safety rule while failure to wear personnel protective equipment is ranked the 3rd most violated rule by the respondents. All the variables involve not com-

plying with the rule and will therefore be treated together.

Problems arising from non conformity of the workers to standard safety, rules and regulations may be as a result of the lack of awareness of these safety rules and regulations. Where they are aware, contractors don't really make efforts to enforce it, more so when the cost of enforcing it will be borne by them. For those companies that enforce safety rules, compliance of the workers to its provisions may not be a problem since it is even to the advantage of the worker to do so, coupled with the fact that the worker cannot afford to loose his job, due to non-compliance to safety provisions. More so when the workers are aware that he gets little or nothing when he is involved in an accident, irrespective of who is at fault (Aniekwu, 2002). Neither would they be interested in flouting standard safety rules and regulations, if they do exist in the company, which in any case is for the worker's interest.

However, it has been known from the time of the industrial revolution that lack of technological awareness and indiscipline go together (Ezenwa, 2001), an aversion towards adhering to rules of behaviour in an industrial environment. These factors are all human problems typical of a low technology environment. These factors apply both to small, medium and large sized construction companies in Nigeria and consequently is not related to poverty or profit levels. Even some large scale foreign firm who are fully aware of the legal requirements for safety and practice them in their overseas branches, find it financially expedient to ignore them, since there is no fear of sanctions (Aniekwu and Okpala, 1989).

These factors involve the non compliance to standard safety rules which mostly endanger the welfare of the worker without threatening the operations of the company. Most construction workers in Nigeria have limited education and do not know their rights. Where these rights are known, in the midst of growing unemployment, the worker is apathetic about them. The labour

unions who are supposedly protecting the workforce concentrate on issues of salaries. This is not surprising in an environment where the majority of the inhabitants are poor.

CONCLUSION

The majority of the issues raised in this discussion are mainly human factors and therefore their solutions will involve the prudent management of both men and material resources by the contractor. Solutions to these problems which should include contractor's positive attitude towards his work force would offer a more lasting solution to the problem. If workers are seen as partners in progress, their attitude towards complying with safety regulations may change.

Some of the problems highlighted are part of the Macro problem of maintenance in Nigeria. Thus its solution cannot be dealt with in isolation of other maintenance problems. These problems arise from the low technology nature of the Nigerian environment which has resulted in the death of the required technical skills and tools for this service. For a variety of reasons some of which are structural in nature, both the government and or labour employers in Nigeria do not attach much seriousness to the legal provisions for safety in the Nigerian construction industry. It would seem that this trend would remain for a long time, until perhaps labour organizations and employees begin to take more interest in the legal provisions for their own safety at work. Training programs for both the contractor and his workforce, on management policies and practices would help to reduce this and some other problems.

While there is need to protect the contractor against inefficient policies, unproductive practices and adverse business environment, there is also the need to protect the worker from contractors' excessive exploitation. As such, it is suggested that: specific provisions should be made with respect to the safety, health and welfare of the workers within the standard form of contract. Perhaps also a standard clause with a prime cost should be in-

cluded in the standard form of contract to encourage compliance.

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