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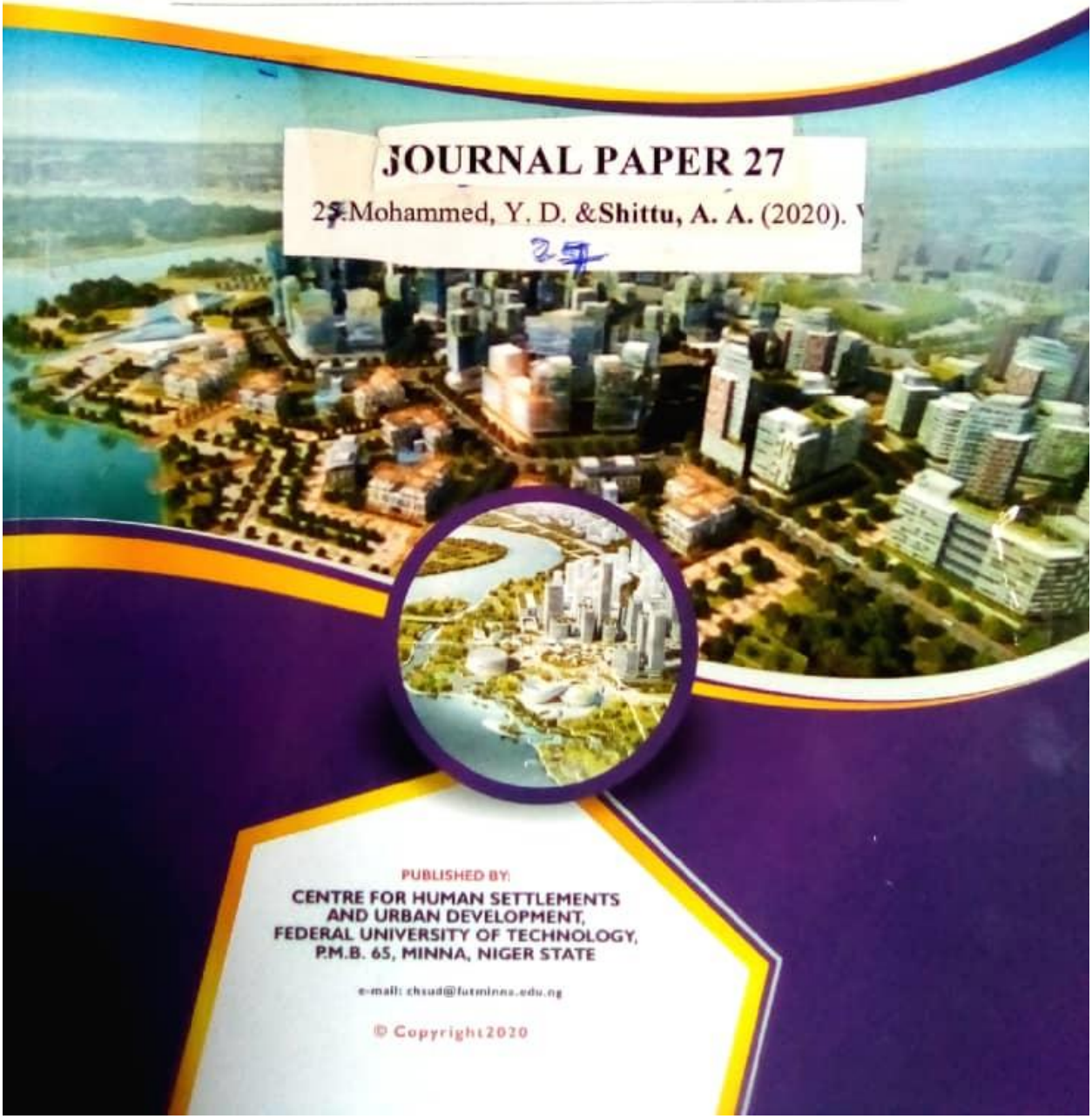

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Editorial Committee

Editorial Remarks

Dear Reader,

CHSUD Journal of Settlement Research and Development (CHSUDJ) in the last one year focused its article on contemporary issues that aimed at problem-solving and the dynamics in increase knowledge particularly in the face of new normal in the era of COVID 19. This edition would fill some gaps experienced between the last and current edition.

The Editorial team has been jiggled in line with the recent changes at CHSUD in order to inject more resourcefulness nationally and internationally with highly motivated academia, professionals and technocrats in order to bridge the gaps between practice and theory while improving on our outputs and service delivery.

The current edition presents well researched papers which our peer-reviewed assessors have reviewed without bias. It covers a range of topical issues' within the built environment as it relates to sustainability of urbanization and cities: climate change, housing, safety in buildings, urban transformation, land use change and land value, planning and land governance, among others, targeted at socially inclusive, resilient, productive and self-sustaining cities and settlements.

This edition would be better informed, more research motivated and with international touch.

Prof. M.B. Nubu, FNIVS, MRICS, MNES, MNIM.
Editor in-Chief
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ASSESSMENT OF SAFETY PERFORMANCE FACTORS OF BUILDING MAINTENANCE CONTRACTORS WORK IN ABUJA, NIGERIA

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Abstract
Despite the existence of modern day technology in building construction such buildings deteriorate over a period of time. As such there is need of maintenance of such buildings. The task of maintaining, and improving the deteriorate building is the responsibility of the building maintenance contractor and this demands for safety consideration on the side of the contractor. This study is aimed at assessing the building maintenance contractor's safety performance level. The study is criteria based and twenty- five (24) construction maintenance contractors (medium – size) were identified that meet the study criteria through snowball sample techniques. Data collected from well-structured questionnaires were analyses through safety performance level index. The results of the analysis show that 3 contractors score A – excellent, 4 contractors score B – excellent and 5 contractors score C- average level while the rest scores below average level. It can be concluded that the level of safety performance implemented by the selected contractors is at average (58.5%). This means that some of the building maintenance contractors selected for this study implements the safety factors consider in this study at an average level. Contractors need to be more active in safety programme and where possible his representative on site should always determine their safety performance on their project. There is need for a documented engineering standard and safety codes and procedures applicable to the maintenance of buildings and related projects.

Keyword: building, contractors, maintenance, performance level, safety.

Introduction

The complexity in modern building is evidence that high technology is being employed. Despite the existence of such technology in building construction such building deteriorate over a period of time. As such there is need of maintenance of such building. Maintenance is normally influenced by the climatic condition which is the effect of external condition (weather) to the building elements, effect by the user activity and effect by changing standard and tastes which create a demand for work to be carried out more frequently. In any case, it presents a more demanding safety consideration. The task of maintaining, and improving the deteriorate building and existing buildings is the responsibility of the building industry. Historically, in both public and private sectors, maintenance was seen by many as an avoidable task, which was perceived as adding little to the quality of the working environment, and expending scarce resources that could be better placed (Higher Education Backlog Maintenance Review2015). In Nigeria, according to Mohammed (2017) there are challenges faced by building maintenance contractors, such challenges ranging from the need of high-technological equipment, to efficient and well trained artisans. It also includes work space environment friendly materials, expertise and ingenuity of the contractors in the area of coordination and administration and the design done by the architect (Mohammed 2017). As such the possibility of accidents

occurring is high. Tam *et al.* (2004) revealed that the behaviors of contractors on safety management are of grave concern including the lack of provision of personal protection equipment, regular safety meetings and safety training. Haslam *et al.* (2005) claimed that the key factors in the accidents were problem arising from workers or the work team, workplace issues, shortcoming with personnel protective equipment, problems with suitability and condition of materials and deficiencies with risk management. In Nigeria construction industries lose 5 – 7 % of its workforce annually to construction accidents (Olatunji *et al.*, 2007). Also, Kadiri *et al.* (2014) work revealed that workers are the main causes of accident in construction firm in Abuja and as well the major victims and the main impact of accident in site are loss of time in project processes. Bala *et al.* (2012) outline the high rate of accidents in Nigerian construction industry to the following factors:

i. The high ratio of small firms and of self-employed construction workers.
ii. The variety and comparative short life of construction sites.
iii. High turn-over of workers.
iv. Exposure to the weather, many trades and occupation.

Safety assessment is a process used to determine a contractor's compliance with or ability to meet specific safety rules and requirements set by the government safety regulations or by safety and environmental organizations (Ismail 2006). According to Ismail (2006) safety rules or criteria are needed to accomplish the work with high overall performance and that any deviation from these safety requirements will affect the contractor's overall performance.

Safe acts and safe conditions in performing maintenance and construction works have been receiving wide attention in the safety engineering and management literature. The summaries of safety engineering and management literature finding were highlight below:

1. Knowledge and understanding of safe and healthy work practices: employees must be trained to identify present and potential hazards not only in the job they are performing, but in jobs being performed nearby.
2. A strongly shared belief that top management is truly committed to safety and health: workers must know that top management is willing to devote resources to improve safety and health in the workplace.
3. Management's recognition and support for changes in work behavior to achieve the desired safe work behaviors will stimulate workers to take responsibility for change.

Safety practices are important in the building maintenance industry. However, as in other types of industry, it is unknown to what extent contractors comply with safety practices. In addition, in Nigeria, there is little or lack of knowledge of variables that can be used to assess the safety level of building contractors. It was based on the literature findings that this paper seek to assess the level of safety performance of building maintenance contractors work in Abuja.

Safety Performance Assessment Factors

The assessment process of building maintenance contractors, according to a given set of safety factors, is to evaluate the safety practices and the level of compliance with safety rules and requirements in performing maintenance work. The literatures have been investigated to find out the most important factors for the safety assessment process. These main factors are as follows

The Use of Safety Programme or Manual

Safety programme is more than a set of rules, regulations and procedures; it is a cooperative effort between employees and management. In order to be successful in safety program

implementation, James and Roughton(2008) said that there must be an understanding of the operation "linking pin" of the management commitment, leadership, and the employee participation. A safety programme manual mainly outlines specific essential measures that will be taken by the contractor to prevent human injuries and property damage. In other words, Fernández-Muñiz*et al.* (2011) argued that safety policies and programmes constitute in themselves important components in employees' perceptions about the importance of safety in their workplaces, and consequently contribute to safe behaviours. Jaselskis *et al.* (1996) indicated that management commitment and involvement in safety is the most important factor for a satisfactory safety programme. Safety programme is an important area in planning for accident free at construction sites. Adequate and well-articulated safety program can cut down the rate of accident, which could help in promoting the image of the companies most especially as regard to safety and health of construction sites.

The Existence of Safety Professional / Department

Most large and some medium contractor must have a safety department or at least one safety professional per shift. According to Suraji et *al.* (2001) that in Hong Kong, all the safety officers of companies have been re-designated as safety advisors. This change was in part to remove the inference of "policing" that is associated with the word "officer" and more important to reflect that the responsibility for safety lies firmly with the Project Director, Project Manager, and their line managers. The Safety Advisor is there to provide advice on actions to be taken in order to ensure a safer working environment. Such type of action by the company indicates that safety management has now been integrated in to project management

Clear Management Safety Policy

The contractor must have "total management commitment and total management involvement in safety", which is the establishment of quality and safety standards and the development of safe work procedures for his organization. Total management commitment and total management involvement in safety is the major controlling influence in obtaining success (Dial 1992). According toVredenburgh (2002) the commitment of the management toward safety management system can manifest itself through job training program, management participation in safety committee, consideration of safety in job design, and review of the pace of work, for example, people working for a supervisor that never mentions safety will make people perceive that safety is not an important issues and they will not place more emphasis on safety at the workplace. Therefore, the degree to which management value safety is expressed in its style and level of assumable risks. The management of organisation provides support to the kind of organisational structure that will ensure effective site safety management. The company's management will ensure that training; personal protective equipment and other resources are provided to the project management team in order to demonstrate its commitment

Top Management Concern in Decreasing Frequency Rate

Management can implement several safety measures to decrease frequency rate of accident and protect their workers. Ahmed *et al.* (2000) describe that establishing a clear, complete, and practicable site safety plan is one of the most effective methods for ascertaining site safety and minimizing potential hazards. Regular safety audits provide an effective way to review and refine site safety plan, thus improving safety in the jobsite.

The management provides all kinds of support to ensure effective site safety

management.Roughton and James(2002), provides seven guiding principles for effective site safety management systems:

1- Management commitment and leadership responsibility for safety. The responsibility for safety and the behavioural process is led by management with a shared involvement from knowledgeable employees. All levels of the organization are involved in an effective behavioural process.

2- Clearly defined roles and responsibilities must be in place with job functions defined within the management process. These responsibilities must be performed at the proper level and must be integrated and adapted to fit the organization.

3- Competence commensurate with responsibilities. An effective behavioural process ensures that the skills needed to perform the tasks and functions associated with the job (steps and tasks) in a timely manner are present and provides the opportunity to use those skills on a regular basis. It provides for coaching and interaction with other people and organizations.

4- Effective use is made of Balanced Safety Data (BSD). The behavioural process provides a stream of safety data that enables managers to balance safety effectively within production and other operational needs.

5- Safety standards and requirements are identified and followed. Existing safety standards and requirements aid in developing the list of behaviours and definitions used in the behavioural process.

6- Hazard controls are tailored to work being performed via a Job Hazard Analysis (JHA). The observation process along with observation data provide on-going monitoring of processes so that hazard controls reflect the risks associated with work being performed in changing environments and conditions.

7- Operations authorization. The behavioural process helps provide the behavior-related safety information necessary to make informed decisions prior to initiating operations.

8-

Continuous Practising of Safety by Top Management

The poor performances record of safety and health in construction industry is because the OSH (Occupational Safety and Health) management system is a neglected area and a function that has not been pursued systematically in the construction industry (Bakri *et al.* 2006). Radhalinah (2000) as cited by Bakri *et al.* (2006) reveal that the construction industry can benefit from an improved attitude change that cultivates a vision for the future which elevates safety concerns and effectively integrate them into the overall management mix. Davies and Tomasin (1996) were of the opinion that application of effective management can lead to safer system of construction and reduce the incidence of injuries and work related diseases. The implementation of OSHMA by the main parties involved in the construction process (owners, designers, supervising company, contractors, etc) is an important step that required real adaptation toward accident free site. This view was expanded further by (Hinze 1997) as the need to take the perspective and the contribution of each of those parties to OSH into account as this implementation of the Occupational Safety and Health Management System (OSHMS) must be applicable to all level of organizations, it must conform to the existing law and regulations related to safety and health at workplace. Also, Hinze (1997) that "managing safety involves three levels, the

company policy level, project management level and individual level". Failure at each level is a reason for the occurrence of accident

Conducting Safety Inspections

Good inspection aid in reduction of accidents at workplace. According to Ismail (2006), the mechanism of an inspection must support the programme objectives, and these objectives are to assist contractor management in attaining the safest possible work media. Safety inspection program should aimed at

1. Eliminate Hazards at workplace.
2. Encourage Contractor Management Commitment and Total Involvement on issues relating to accidents prevention on sites.
3. Provide on the Job Training for Safety Inspectors
4. Assess the Effectiveness of the Safety Program at workplace.
5. Measure the Supervisor's Performance in Safety implementation at workplace.

Availability of Hazards Recognition and Control Procedures

A hazard is anything or condition that has the ability to cause injury, illness, death or damage to properties. Hazard control is any means of eliminating or reducing the risk resulting from a hazard.

Hazards may come from insufficient, delayed and improper maintenance and repair. According to Ismail (2006) that many plans or designs fail to recognize hazards during setup, for example, in doing maintenance work, poor access to service points or the need to do servicing with high levels of energy present can be dangerous. Hazards during or resulting from maintenance must be recognized. Failure to perform maintenance work with the proper safety procedure can introduce hazards, which can lead to accident occurrence at workplace. Gregory (1991) reported as cited by Ismail (2006) that in order to minimize hazards four steps must be accomplished

1. Recognize hazards.
2. Define and select preventive actions.
3. Assign responsibility for implementing preventive actions; and
4. Provide a means for measuring effectiveness.

According to Ismail (2006), the hazard control process consists of a set of priorities:

1. Eliminate the hazard.
2. Reduce the hazard level.
3. Provide safety devices.
4. Provide warning devices.
5. Provide safety policies and procedures and
6. Provide protective equipment.

Provision of Personal Protective Equipment

The Personal Protective Equipment (PPE) Regulations 1992 of Factory and Machine Act (FMA) require the employer to provide without charge, 'all equipment (including clothing affording protection against the weather) which is intended to be worn or held by a person at work and which protects him against one or more risks to his health or safety, e.g safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses (Stranks, 1999). The provision of PPE can be argued to be the most significant element in term of costs of accident prevention and prevention of accident on construction site.

Providing Instructions on Accident Investigation

Investigating accidents is the process of conducting accident investigation in such a way which will provide facts rather than faults. The aim of an investigation is to prevent recurrence of similar accidents. The most important things in an accident investigation are:

1. When an accident happens, the most important thing is taking care of the victim or victims.
2. After that, the most important thing is finding the causes of the accident.

3. Employers, employees and the safety personnel need help and advice to identify the causes of accidents.

All supervisors should be trained to recognize a serious accident and take the proper steps to prepare for or conduct an investigation and they should have a general idea of the need for accident investigation and its basic principles and components (Ismail, 2006).

Providing Safety Training

The existence of safety training program is important for safe working practice. It is mainly the integration of safe working practice by teaching workers the facts about accident causes and indicating the preventive measures to be taken. Equally important, however, is the requirement of further training programs for the skilled supervisor or worker, whose techniques may need bringing up-to-date and into whose earlier training accident prevention may not have been integrated to the extent now realized to be essential (Petersen, 1984). Exposure to safety training is a development of a safety training program for all employees potentially exposed to safety during hazardous maintenance operations, and they must receive training on how to respond to expected emergencies. Maintenance employees must not performed any operation unless trained to the level required by the job function and responsibility. They must also be certified by a qualified instructor as having completed training (Grimaldi and Simonds1989).

Research Methodology

The problem of the study as well as the objectives of the study determines the research methodology to be adopted in any research work. As such this study derives a quantitative approach in assessing the safety level performance of building maintenance contractors in Abuja, Nigeria. The study is a criteria – based study, in which certain criteria were outline for the selection of the construction maintenance contractor's. Those criteria are:

1. The construction maintenance contractors must be built/civil engineering, project.
2. The construction maintenance contractors must be more than ten (10) years in civil/building project maintenance work.
3. The location of the study is Abuja, the Nigeria federal capital.

The twenty- five (24) construction maintenance contractors (medium – size) were identified that meet the study criteria through snowball sample techniques. According to Mohammed, (2018) snowball sampling technique consists of two steps.

1. Identify potential target in the population often one or two target can be found initially.
2. Ask those target to recruit another target (and ask those target again to recruit another target) etc.

Based on the extensive review of the related literature conducted, ten (10) factors that contributed to the safety performance were identified. These factors and methods were used to develop the questionnaire survey in order to collected data from the targeted respondent. Analysis of the questionnaires is based on safety attitude score value calculated for each contractor (the sum of the weight of the safety factors evaluated by the particular contractor) and the average value and the importance index calculated of each safety factors. The safety factors then ranked according to their importance index. The method of calculating the average value and importance index are as example given in (Dominowski, 1980).

Safety Performance Assessment

It is expected to calculate the contractor frequency rate, the contractor safety attitude score and the contractor safety performance level for each contractor. The contractors'

safety performance levels were then used to calculate the safety performance level indexes for each contractor

Method of Calculating the Average Value and Importance Index

Table 3.1Method of Calculating the Average Value and Importance Index

S/No	Safety Factor	4 Always/Yes	3 Most of time	2 Sometimes	1 Rarely	0 Never/No
		No. of Participants Marked				
9	Conducting safety inspection	0	2	9	5	5

Source: (Dominowski, 1980)

Average Value = $\frac{(0x4) + (2x3) + (9x2) + (5x1) + (5x0)}{(0 + 2 + 9 + 5 + 5)} = 1.381$

Importance Index = $\frac{1.318}{4} \times 100 = 34.52\%$

Frequency Rates

The frequency rate is the number of disabling (lost-time) injuries per million employee-hours worked. Mathematically, the formula to calculate frequency rate is expressed as derived by Dominowski, (1980) is as follow:

$$\text{Frequency Rate} = \frac{\text{Number of disabling injuries} \times 1{,}000{,}000}{\text{Employee-hours worked}}$$

Where;

- Number of disabling injuries: are lost-time or lost-day cases where the injured worker needs medical attention and one or more days off work subsequent to the date of injury. There are four types of disabling injuries.
  1. Death
  2. Permanent Total Disabilities
  3. Permanent Partial Disabilities
  4. Temporary Total Disabilities

Employee-hours worked: are the hours of exposure or the work order hours. 1,000,000 is a calling number used to keep a common base for all rates

Contractor Safety Attitude Score (SAS)

The Contractor Safety Attitude Score (SAS) was determined for each contractor. It is the sum of the weight of the safety factors evaluated by the particular contractor.

Contractor Safety Performance Level (SPL)

Contractor Safety Performance Level (SPL) is a computed value used to measure contractor safety performance. It is computed by dividing contractor frequency rate (FR) by the contractor safety attitude score (SAS). The safety performance level will be calculated by the following formula:

SPL = SAS / FR

Where;

- SAS = the Safety Attitude Score computed for each contractor.
- FR = the Frequency Rate, the number of disabling (lost-time) injuries per million employee-hours worked

According to Dominowski, (1980), if the frequency rate for a particular contractor is zero, then the SPL will be undefined. The undefined values of SPL will be replaced by a maximum value of 1.50 which will be used

later on to calculate the safety performance level index

Contractor Safety Performance Level Index

The Contractor Safety Performance Level Index will be used as a measure of variation of safety for each contractor. The contractor's calculated safety performance level (SPL) will be used to compute a safety performance level index for each contractor. The safety performance level index will be calculated in the same format as that of by Dominowski, (1980):

$$\text{Safety Performance Level Index} = \frac{\text{SPL}}{\text{Maximum Safety Performance Level Value}} \times 100$$

Results and Discussion

The questionnaires administered on 24 building maintenance contractors were statistically analyzed to calculate the average value for the purpose of ranking these safety factors according to the highest average value and important index. The average value of each safety factors for the 24 contractors were calculated as shown in Table 4.1.

Table 4.1 Average Value of Safety Factors

S/no.	Safety Factors	Always/yes 4	Most of time 3	Sometimes 2	Rarely 1	Never/no 0	Average value	Important index
		Evaluation						
1	The use of safety program or manual.	7	0	0	0	17	1.17	29.25%
2	The existence of safety Professional department.	0	0	0	0	24	0.00	0.00%
3	Clear management safety policy	0	3	4	17	0	1.42	35.5%
4	Top management concern in decreasing frequency rate	1	1	7	15	0	1.52	38.5%
5	Continuous practicing of safety by top management	0	4	8	12	0	1.67	41.75%
6	Conducting safety inspection	0	0	2	10	12	0.58	14.5%
7	Availability of hazard recognition and control procedure	1	3	4	4	12	1.04	26%
8	Provision of personal protective equipment	4	4	8	4	4	2.42	60.5%
9	Providing instruction on accident investigation	1	2	2	3	16	0.71	17.75%
10	Providing safety training	2	4	4	6	8	1.42	35.5%

Source Researcher analysis, 2017

From Table 4.1 the most important safety factors indicated by building contractor performing maintenance work in Abuja are provision of personal protective equipment (2.42, 60.5%). Continuous Practicing of Safety by Top Management (1.67, 41.74%), top management concern in decreasing frequency rate (1.54, 38.5%), etc. The less important safety factors indicated by contractors are the Existence of Safety Professional / Department (0.00, 0.00%), conducting safety inspection (0.58, 14.5%), providing instruction on accident investigation (0.71, 17.75%) etc.

The lowest frequency rates are associated with contractor's number 9, 11 and 23 etc, while the highest frequency rates are associated with contractor's number 4, 3 and 14 etc.

Table 4.2 Summary of Safety Assessment Results

Contractor Number	Frequency Rate	Safety Attitude Score	Safety Performance Level	Safety Performance Level Index
1	200	78	0.39	26%
2	86	82	0.95	63%
3	292	101	0.35	23%
4	303	80	0.26	17%
5	169	120	0.71	47%
6	138	115	0.83	55%
7	236	98	0.42	28%
8	110	79	0.72	48%
9	0	106	1.30	100%
10	205	88	0.43	28%
11	0	91	1.30	100%
12	147	89	0.61	40%
13	109	106	0.97	63%
14	250	113	0.45	30%
15	203	118	0.58	38%
16	126	105	0.83	53%
17	76	75	0.99	66%
18	102	78	0.75	50%
19	64	60	0.94	62%
20	114	99	0.87	58%
21	159	100	0.63	42%
22	144	120	0.83	55%
23	0	117	1.30	100%
24	200	119	0.60	40%

Source: Researcher Analysis, 2017

From the analysis table 4.2, the highest frequency rate was 303 and the lowest frequency rate was 0 while the maximum safety attitude score was 120 and the minimum was 60. There exist a great diverse this is due to the fact that some contractors pay more emphasis on safety procedures than orders. The safety performance level Index for building maintenance contractors vary greatly. The maximum is 100% (Excellent) and the minimum is 17% (very poor). The difference between maximum and minimum scores is (100 – 17) i.e83%. This difference could have been lower if there is a competent implementation body to implement safety laws as contain in the country (Nigeria) Factory and Machinery Act (FMA). Also the absences of Occupational Safety and Health Act (OSHA) could assist in closing the difference

Conclusion and Recommendation

In assessing the safety performance level of building maintenance contractors in Abuja, safety performance level index was used and it can be concluded that the level of safety performance implemented by the selected contractors is at average (58.5%). This means that some of the building maintenance contractors selected for this study implements the safety factors considered in this study at an average level. Assessing the maintenance contractor on an individual level, it can be observed from table 4.6 that only 3 contractors scores A – excellent i.e contractors 9, 11 and 23 respectively. Four (4) contractors score B – excellent i.e 2, 12, 17 and 19 respectively. While 5 contractors qualified for C – average level, i.e 6, 16, 18, 20 and 22 respectively. The rest contractors score below average. These sets of contractors constitute 50% of the contractors under study. As such modern construction and maintenance works are dangerous by its nature and increased emphasis needs to be placed on occupational safety and health in order to reduce the frequency of accident rate as perceived from the results. There is need for effective safety management by the maintenance contractors, as effective management can lead to safer work operation and reduce frequent incidence of injuries. Contractors need to be more active in safety program and where possible his representative on site should always determine their safety performance on their project. Safety programs are more effective when workers and the contractor/or his representative on site are involved. As a result of half of the contractors considered for this study score below average in their safety performance there is need for the building maintenance industry in Nigeria to have a documented engineering standard and safety codes and procedures applicable to the maintenance of buildings and related projects. Maintenance workers should also be aware that they have a duty to remain safe at workplace and at the same to ensure that their co – workers and the general public that may be affected with the action are also safe from any form of injuries or illness as stipulated in Factory and Machine Act (FMA).

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