

Assessment of Risk in Maintenance and Repairs of Elevators in Nigeria

Adekomaya, S.O.* Akinyemi O.O. Samuel O.D.
Department of Mechanical Engineering, Olabisi Onabanjo University, Ibo gun

Abstract

Elevators are potential sources of serious injuries and deaths to the general public and to workers installing, repairing, and maintaining them. State and local authorities recognize such hazards and require periodic inspections of elevators and escalators. Organizations such as the Nigeria Society of Mechanical Engineers (NSME) have set standards for the construction and maintenance of elevators and escalators and for their safe operation. This paper examines the the elevators installation industry and come up with statistical frequency of accident which tends to reduce the energy efficiency among workers. The methodology involves data analysis of elevator's accident in Nigeria focusing on the activity of the elevators repairer's and installer's and use these data to develop a template that will potray the risk prevalence on every activity of elevators installation process. The result shows that various death were recorded at every stages of elevators installation. The results were demonstrated at every periodic occurence as illustrated in the yearly interval of prediction.

Keywords: accident, death, elevators, harzards, injury, risk, workers.

Introduction:

An elevator is vertical transport equipment that efficiently moves people or goods between floors (levels) of a building, vessel or other structure. Elevators are generally powered by electric motors that either drive traction cables or counterweight systems like a hoist, or pump hydraulic fluid to raise a cylindrical piston like a jack[6]. Elevator installers and repairers, also called elevator constructors or elevator mechanics, were by far the largest occupation affected, accounting for 36% of the deaths during work on or near elevators [3]. The main causes of death for elevator installers and repairers was being caught in/between elevators and elevator shafts or other elevators, followed by falls, being struck by objects (mostly elevators), and collapses (also mostly of elevators. Although elevator installers and repairers are divided roughly equally between construction and general industry, about 80% of the deaths in this group affected employees of construction contractors[12]. In fact, construction elevator installers and repairers have the sixth-highest rate of work-related deaths of all construction trades. The average death rate for elevator installers and repairers in construction was 29.1 per 100,000 full-time-equivalent workers (FTE) in 1992-2002, more than twice the death rate for all construction workers combined. The rate for elevator installers and repairers, however, is based on small numbers of deaths and thus may not be statistically reliable[13].

Methodology

The methodology involves processing of information available through Fatality Assessment and Control Evaluation (FACE) reports in Nigeria and additional investigative reports conducted by the researchers into the activity of elevators repairer's through Kresta Laurel Company which is one of the major player in the elevation business in Nigeria . Although the death rate for elevator installers and repairers is higher than average for construction, the injury rate is lower[10]. According to BLS data for 1994-1998, the occupational injury and illness rate for elevator installers and repairers was 244 per 10,000 full-time equivalents (FTE), compared with 349 per 10,000 FTE for all construction workers[12]. The major causes of lost-time injuries to elevator installers and repairers were being struck by an object, overexertion (especially in lifting), falls, and being caught in/between, in that order.

One seven-year study of visits to the George Washington University Emergency Department in downtown Washington, D.C., by construction workers from 1990 through 1997 included 24 elevator installers, repairers and mechanics[2]. The two most frequent causes of the traumatic injuries were cuts and sprains and overexertion. The most serious injuries were crushing of the fingers or hands (resulting from "caught in" injuries) and head injuries (falls)[7].

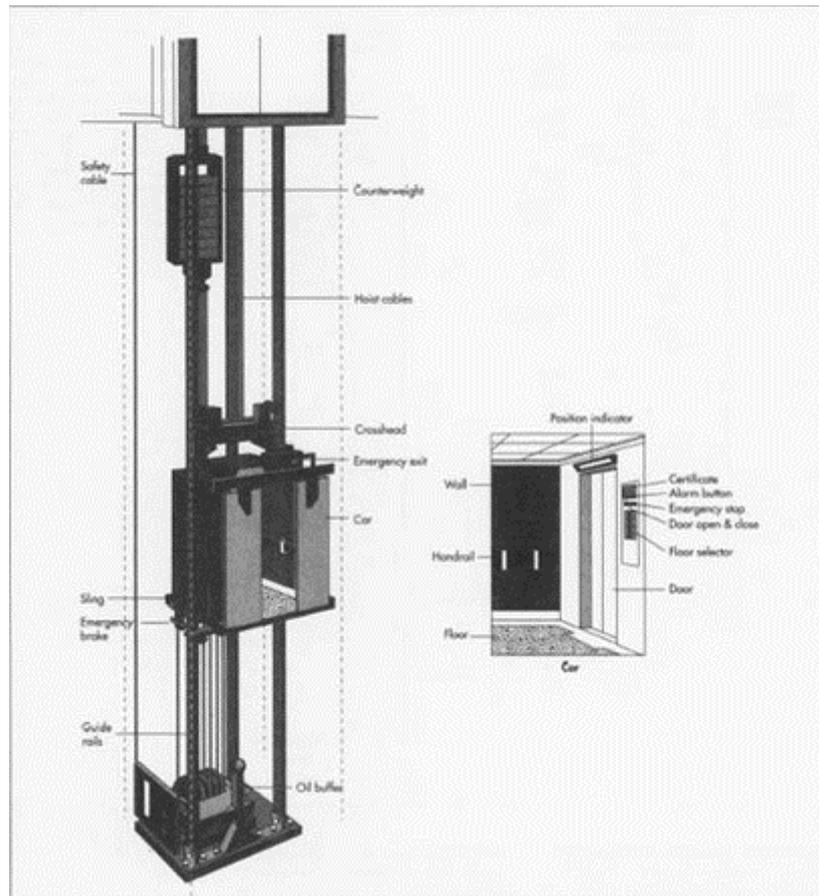


Fig.1. Diagram of an elevator.

Result and discussion.

During the nearly 21 years of installation of elevators throughout Nigeria, the KLL reported 56 non-work related deaths of elevator passengers – about six per year – in 21 states and the Federal Capital Territory, Abuja: Ogun (6 deaths), Abuja (5), Port Harcourt (4), Osun (10), Delta (1), Kaduna (6), Anambra (4), Ondo (7), Oyo (13), Niger (11), Kano (7), Yenagoa (6), Lagos (12), Kogi (2), Calabar (4), Jos (7), Abia (6), Adamawa (4), Bauchi (2), Akwa Ibrom (1), Benue (1), and Yola (1). Thirteen of the deaths involved children age 10 or younger[12]. In 2000, KLL estimated that there were 7,300 escalator and 9,800 elevator injuries requiring hospitalization. The data were based on a nationwide survey of 90 hospitals. Based on the number of elevators and escalators in Nigeria, KLL estimated that there were 0.021 accidents per escalator and 0.0015 accidents per elevator annually. The KLL estimated that 75% of the escalator injuries resulted from falls, 20% from entrapment at the bottom or top of an escalator or between a moving stair and escalator sidewall, and 5% "other." The "caught-in" incidents generally resulted in more serious injuries than did falls. Of particular concern is the fact that half of the approximately 1,000 sidewall-entrapment injuries involved children under age five[10]. The children's injuries were mostly caused when a child's hands or footwear (including dangling shoelaces) became caught in an escalator comb plate at the top or bottom of an escalator or in the space between moving stairs and an escalator sidewall.

In 2001, KLL estimated that there are 28 hospital emergency room-treated injuries associated with escalators each year.

Table1. Deaths involving work on or near elevators or escalators, by cause and activity, 1994-1998

Activity Cause	Installing & Repairing	Working in elevator shaft/carelevators	Working near	Total	
				No.	Percent
Falls	26	11	47	84	49%
Caught in/between	28	6	-	36	21%
Struck by	15	8	-	26	15%
Collapse	14	-	-	16	9%
Other	10*	-	-	11	6%
Total	93	28	52	173	100%

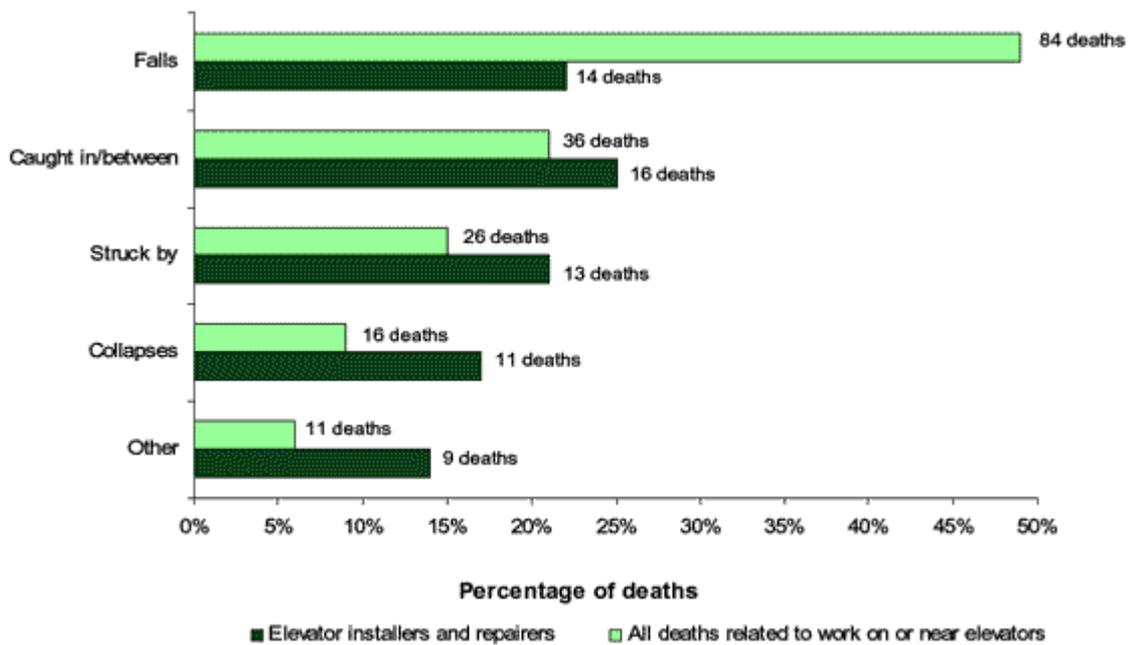


Figure2. Deaths related to work on or near elevators, by cause, 1994 -1998

Table2. Deaths related to work on or near elevators, by occupation, 2001- 2003

Activity Occupation	Deaths No.	Percent
Elevator installers & repairers	63	35%
Laborers (construction & others)	26	15%
Janitors/cleaners & supervisors	14	9%
Supervisors/managers	6	3%
Ironworkers	7	4%
Other workers & supervisors	57	34%
Total	173	100%

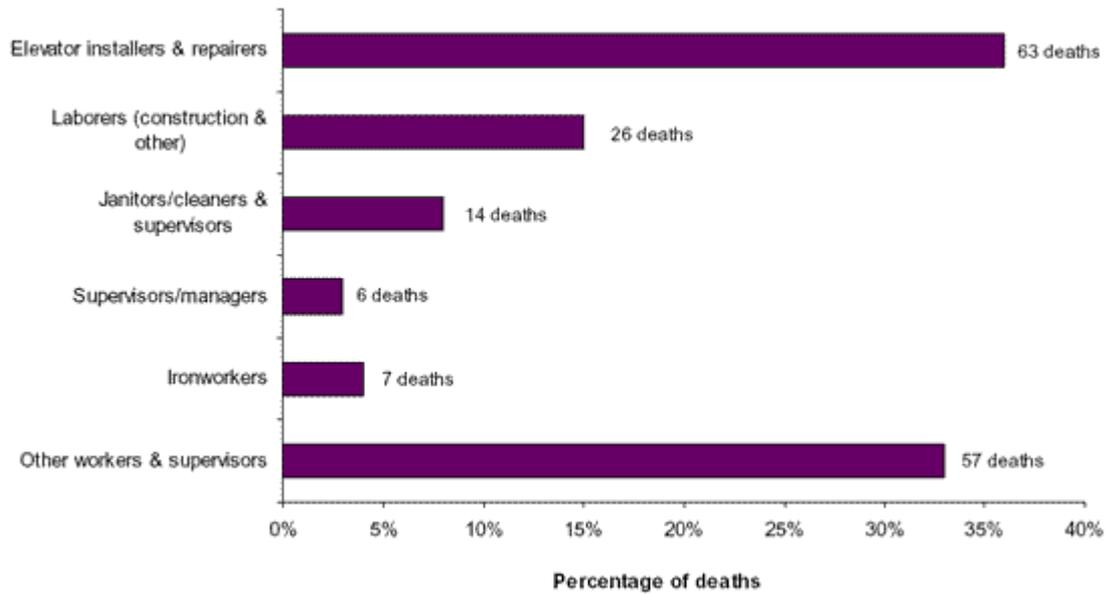


Figure3. Deaths related to work on or near elevators, by occupation, 2001-2003

Table3. Deaths related to work on or near elevators, by occupation, 1994-1998

Activity		
Occupation	Deaths No.	Percent
Ironworkers	63	25%
Electrical power installer	26	15%
Construction laborers	14	9%
Welders & cutter	6	3%
Roofers	7	4%
Elevators installers/repairers	57	34%
All construction		10%
Total	173	100%

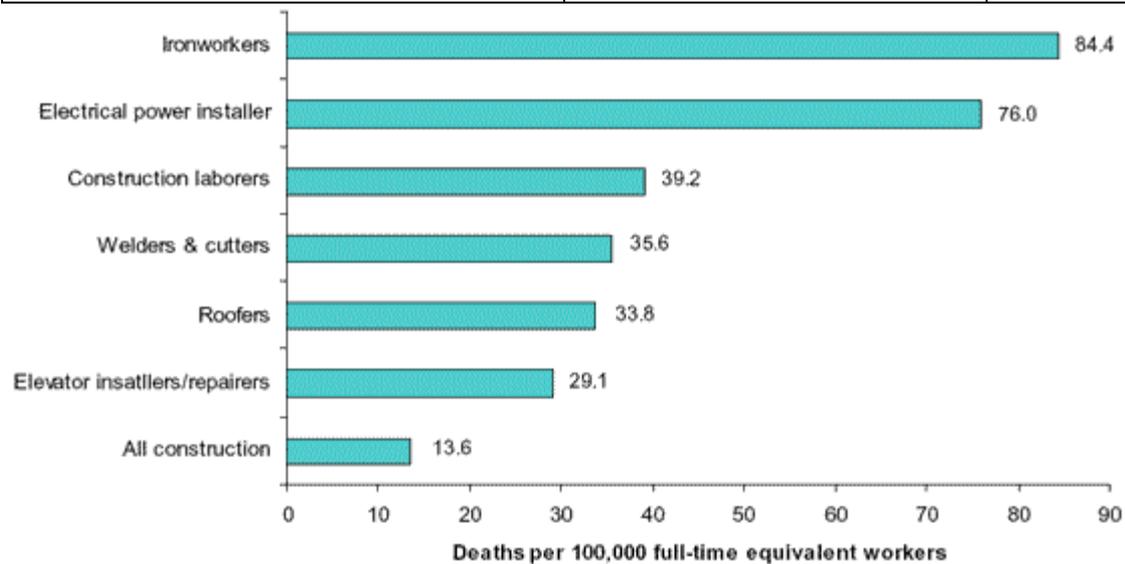


Figure4. Construction occupations having the five highest death rates for work-related injuries, 1994-1998

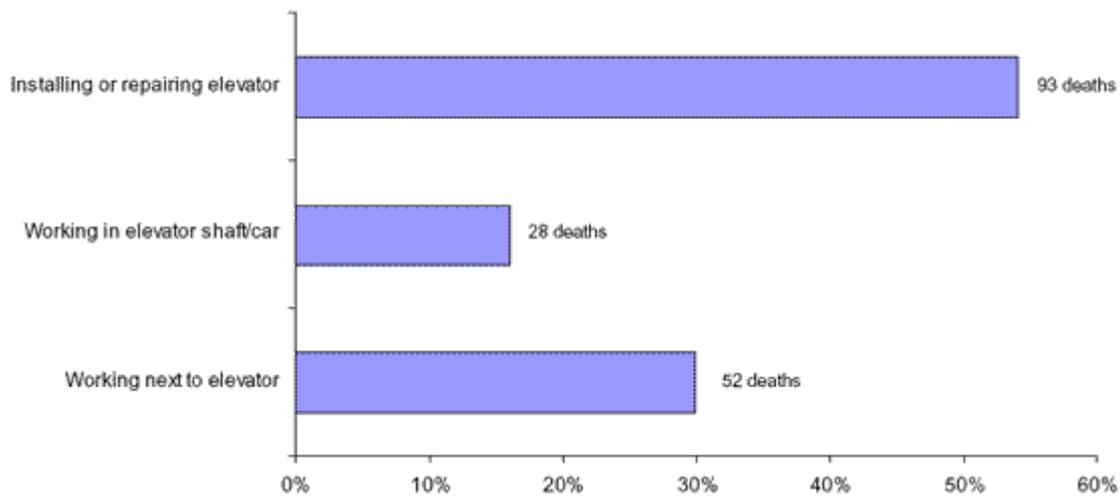
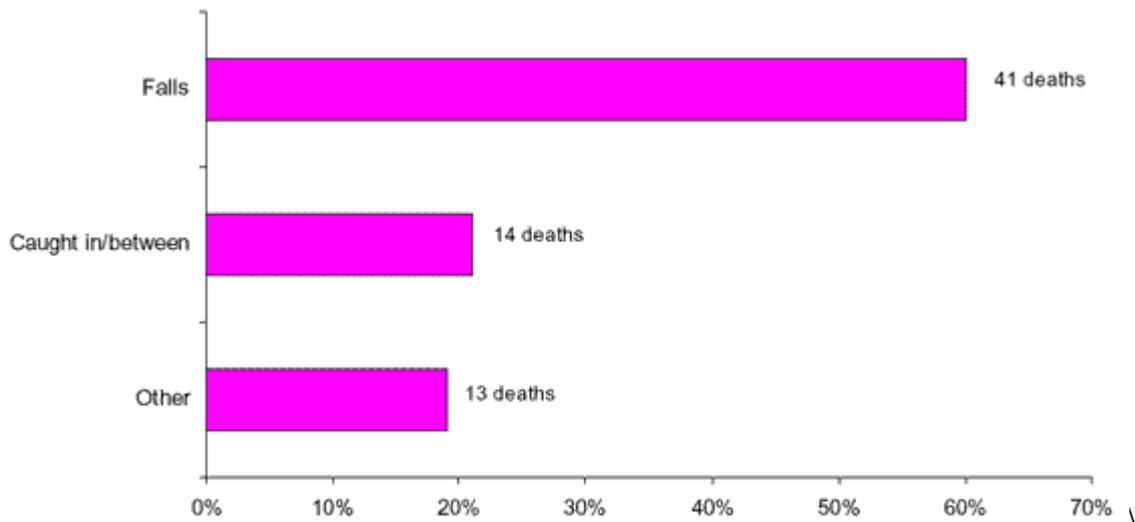


Figure5. . Construction occupations having the five highest death rates for work-related injuries, 1994-1998



Note: Total of 68 deaths. An example of a passenger death while at work is a salesman in a warehouse or a messenger in an office building. "Others" includes being struck by an elevator or closing elevator doors..

Figure6. Deaths among passengers using elevators while at work, by cause, 1994-1998

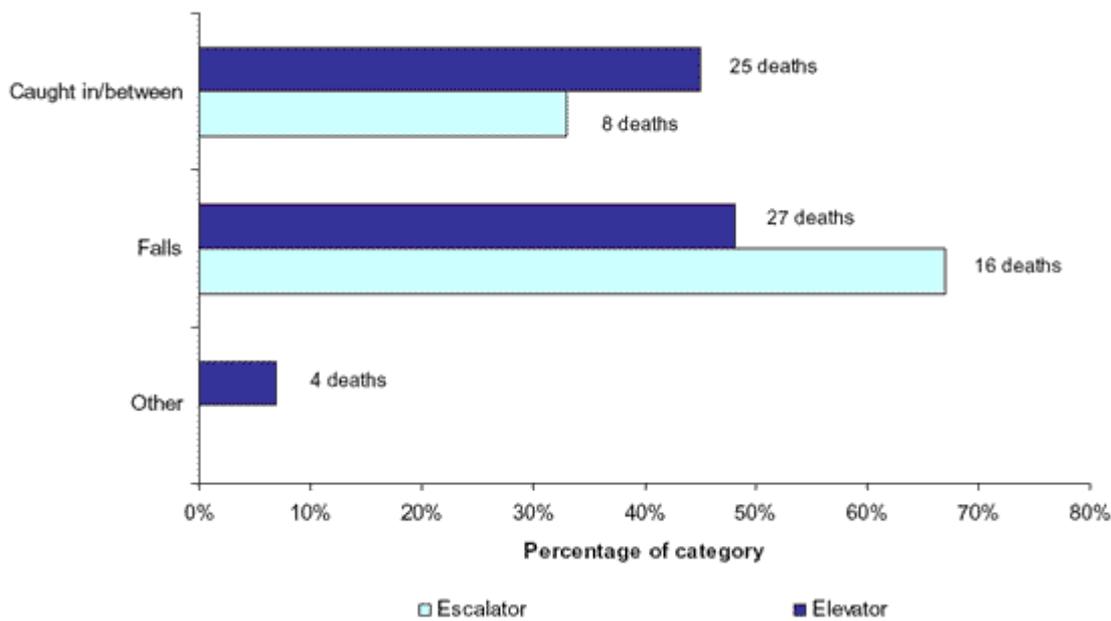


Figure7. Deaths among elevator or escalator passengers while not at work, by cause, 1997-1998

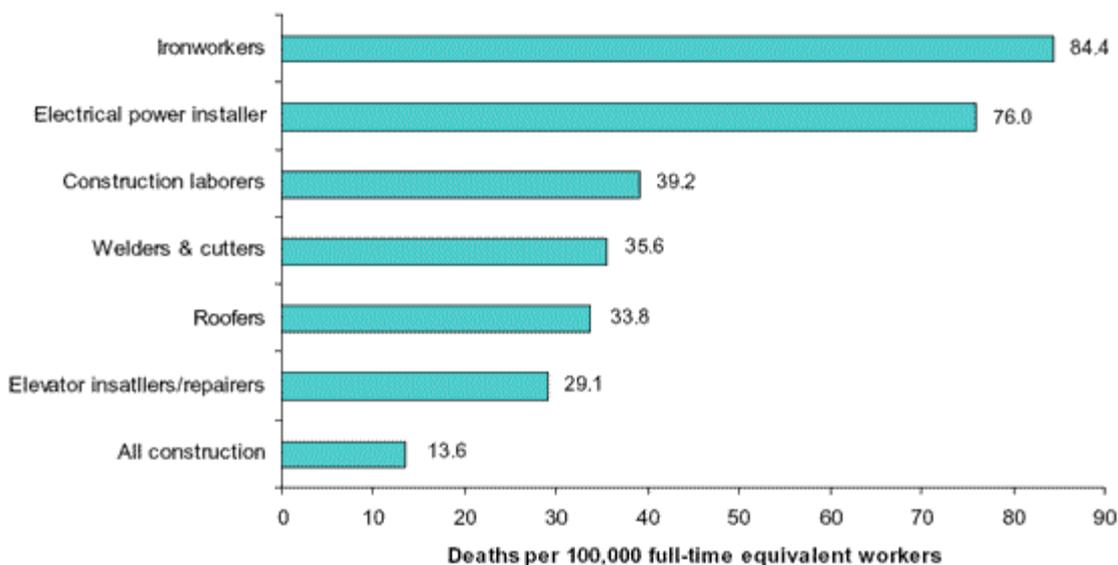


Figure8. Construction occupations having the five highest death rates for work-related injuries, 1992-1997

Conclusion

As the installation of elevators continue, the probability of accident will occur will also increase. This fact was established using various experiences demonstrated in this research. There are two types of period of accident and they are pre safety period and safety period. From the range of days accident may occur, interlock and appropriate regulation must be put in place to check the the occurrence of these accident which may result in human death.

References

[1] Jonathan C and Andrew W. (1995).Shepherd Inventory Credit – An approach to developing agricultural markets, FAO, Rome.
 [2] Hax, A.C. and Candea, D. (1984). Production and Operations Management. Prentice-Hall, Englewood Cliffs, NJ, pp. 135, <http://catalogue.nla.gov.au/Record/772207>.
 [3] Blazewicz, J., Ecker, K.H., Pesch, E., Schmidt, G. und Weglarz J. (2001). Scheduling Computer and Manufacturing Processes. Berlin (Springer). ISBN 3-540-41931-4.
 [4] Fleischmann, M., (2001). Quantitative Models for Reverse Logistic, Lecture Notes in Economics and Mathematical Systems 501. Springer-Verlag, Berlin.

-
- [5] Schrady, D., (1967). A deterministic inventory model for repairable items. *Naval Research Logistics* 14, 391–398.
- [6] Silver, E.A., D.F. Pyke and R. Peterson,(1998) *Inventory Management and Production Planning and Scheduling*, Third Edition, John Wiley & Sons, New York.
- [7] Tersine, R.J (1994), *Principles of Inventory and Materials Management*, Fourth Edition, Prentice Hall, Prentice Hall, Englewood Cliffs, NJ
- [8] Miles John. (1994). Elevator Industry Employees Working In and Around Pits and Equipment. 9/19/94. OSHA Standards Interpretations and Compliance Letters. OSHA .
- [9] National Population Commission (NPC) [Nigeria] and ORC Macro. *Nigeria Demographic and Health Survey 2003*. Calverton, MD: National Population Commission and ORC Macro; 2004
- [10] Department of Community Medicine, University College Hospital, Ibadan, Nigeria. (1993). FACE Report 93CA00301: Manufacturing Supervisor Falls and Dies in an elevator Shaft

The IISTE is a pioneer in the Open-Access hosting service and academic event management. The aim of the firm is Accelerating Global Knowledge Sharing.

More information about the firm can be found on the homepage:

<http://www.iiste.org>

CALL FOR JOURNAL PAPERS

There are more than 30 peer-reviewed academic journals hosted under the hosting platform.

Prospective authors of journals can find the submission instruction on the following page: <http://www.iiste.org/journals/> All the journals articles are available online to the readers all over the world without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. Paper version of the journals is also available upon request of readers and authors.

MORE RESOURCES

Book publication information: <http://www.iiste.org/book/>

Academic conference: <http://www.iiste.org/conference/upcoming-conferences-call-for-paper/>

IISTE Knowledge Sharing Partners

EBSCO, Index Copernicus, Ulrich's Periodicals Directory, JournalTOCS, PKP Open Archives Harvester, Bielefeld Academic Search Engine, Elektronische Zeitschriftenbibliothek EZB, Open J-Gate, OCLC WorldCat, Universe Digital Library , NewJour, Google Scholar

