Analysis of Electrical Residential Installation Protection Scheme in Lagos State; Ketu, Kosofe Local Government Area as a Case Study.

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Abstract
Electrical fires are the easiest and most neglected means leading to fire outbreaks in homes; these are due largely to a lot of factors some of which includes: poor sizing of cables, poor electrical installations, overloading of electrical circuits, substandard use of electrical accessories and fittings etc. This study investigates residential electrical installation protection scheme in Lagos State. Primary and secondary data were employed to achieve the aim of this study. Closed ended questionnaires were administered to fifty-one (51) residents of Kosofe Local Government to address the research questions. The sources of secondary data were from Lagos State Fire Service Department and Lagos State Emergency Management Agency (LASEMA) covering 2013 to 2017. Descriptive statistics were employed to analyze data. Results obtained from the findings revealed that there are no deliberate design considerations put in place to provide protection against electrical fire and electrocution. Majority of fire outbreaks in Kosofe local government is due to lack of compliance. 82.32% of the respondents lack thunder arrestors on the building where they live. The level of exposure to impact of lightening is very high. RCDs are additional protection device provided to give supplementary protection against electric shocks, current leakages and electrical fire. 70% of the respondents don't know what RCDs are and 82% do not have a RCD installed in their homes. In addition, the study revealed that 98% of the residents, who participated in the survey, don't have a smoke detector or smoke alarm installed in their homes. This percentage is high and it further shows how exposed they are to fire outbreak. Based on results of this study, a few recommendations have been provided.

1.0 Introduction
Over the past ten years, Lagos state has witnessed different fire outbreaks leading to loss of lives and millions worth of properties. These are largely due to a lot of factors some of which includes: poor sizing of cables, poor electrical installation on the part of technicians, overloading of electrical circuit, substandard electrical materials, short circuits faults, poor protection scheme, defective breakers, inexperience technicians and engineers and lack of electrical safety/energy audit etc.

In Kosofe Local Government Area of Lagos State alone, out of 32,469 numbers of identified properties according to report published by the Lagos State Government, there were over 24 cases of fire outbreak within Kosofe Local Government Area between 2016 to 2017 according to a report from Lagos State Emergency Management Agency (LASEMA). It shows that Kosofe Local Government Area had 88 cases of fire outbreak between 2013 to 2016. Preliminary findings also show that 80% of these fire accidents were caused by failure in the electrical installations on the residential buildings. Kosofe Local Government Area continues to experience high cases of fire outbreak most of which are claimed to be caused by electricity. A very common cause of fires includes over-current, earth leakage fault, e.t.c.

Over-current is further grouped into overload, short circuit and over voltage.

An overload occurs when a current flow that is too high (usually 50% to 100% too high) for the system. Overloads do not normally cause immediate, catastrophic damage. Instead, the likelihood of damage increases gradually as the duration of the overload increases. If the fault is not resolved, cables will overheat and melt, exposing bare conductors. The heat generated may be sufficient to cause a fire.

1.1 Aims and Objectives

The aim of this paper is to investigate residential electrical installation protection scheme in Lagos State using Ketu, Kosofe Local Government Area as a case study.

The objectives of this study includes to:

- Determine the causes of electrical fires in homes and industries and subsequently providing workable remedial measures.
- Provide relevant research and analysis on the electrical failures that can lead to fire outbreaks.
- Provide adequate guides and practical design selection criteria of low voltage protection schemes for residential applications.

2.0 Literature Review

2.1 Common Causes of Electrical Fire

From literature reviews, field investigations and data gatherings, the following are some of the reasons there are electrical failures leading to possible electrical fire outbreaks:

- Continuous use of burnt electrical socket and overused appliances
- Use of appliances that exceed the permissible wattage
- Plugging multiple appliances into extension cord
- The use of heaters near combustible materials
- Increase in electrical load

2.2 Warning Signs Your Home Is In Danger of an Electrical Fire

Like most systems, the electrical system in your home or office will usually give some warning signs before the outbreak of an electrical fire. Often times, these signs are usually ignored. Below are some of the noticeable signs:

- Circuit breaker keeps tripping
- Persisting burnt smell with no identifiable source
- Several discolored or charred outlets and switches

3.0 Research Methodology

The major source of data used for this work was the deployment of a paper questionnaire to fifty-one (51) residents across different parts of Kosofe Local Government Area.
Two years data from 2016-2017 for only Kosofe Local Government Area were collected from the headquarters of Lagos State Fire Service Alausa, Ikeja (LSFS).

Four years data from 2013-2016 for the entire Lagos state were collected from he Lagos State Emergency Management Authority (LASEMA), while Electrical Safety Policy and Guidelines for Lagos state was collected from the Lagos State Safety Commission (LSSC).

3.1 Data Presentation

The sample questions formulated to conduct the field studies are presented. These set of questions are divided into two major sections; section one examines the bio-data of the residents and it consists of five (5) questions.

Section two examines the electrical maintenance history of the homes, examination of basic knowledge of electrical protection and mechanical protection measures for homes against fire outbreaks and it consists of sixteen (16) questions. A total of twenty-one (21) questions were formulated to thoroughly assist in this study.

3.2 Method of Data Analysis

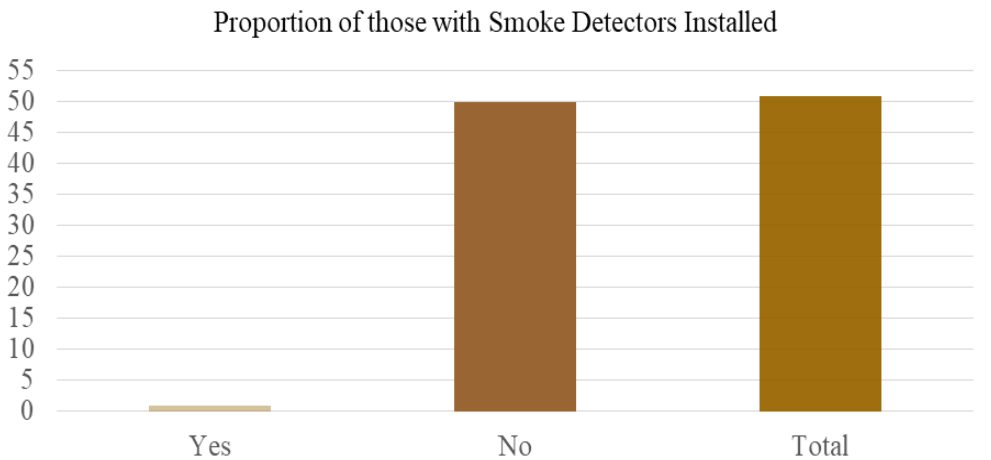
The data from the fifty-one (51) respondents were collated and analyzed with Microsoft Excel. A compilation of the responses of each question was done and also analyzed into relevant charts. Find below the sets of questions used during the survey.

	PRESENTATION OF SURVEY RESULT ON ELECTRICAL FIRE OUTBREAK DEPLOYED AT KOSOFE LOCAL GOVERNMENT AREA				
S/N	DESCRIPTION	YES	NO	NOT SURE	TOTAL
1	Did you ask to know about the electrical maintenance history of the building where you live in?	18	33		51
2	Since you have been living in this building, have you ever request for the creation of an additional socket(s) or light point(s) aside from the one existing in the building	25	26		51
3	Do you have surge protector installed in your house?	15	36		51
4	Have you ever call for a technician to test all the circuit breakers in your home so as to be sure they are tripping off accordingly?	24	27		51
5	Is your house fitted with smoke detector or smoke alarms?	1	50		51
6	Is the building where you live fitted with thunder arrestor?	9	42		51
7	Do you insist on the use of recommended Miniature Circuit Breaker or Fuses in your fuse box?	21	31		52
8	Are you aware that electrical wires fitted into your home can expire?	28	23		51
9	Do you know if your home is electrically earthed / grounded?	8	14	29	51
10	Have you ever replaced, repaired or reinforced your earthing system?	5	45	1	51
11	Do you know how long the earth / ground done for your home has been in existence?	3	48		51
12	Are you aware that the earth/ground system done for your house can expire?	15	36		51
13	Do you know what RCDs are?	14	37		51
14	Is your house fitted with Residual Current Devices (RCD)?	8	42	1	51
15	Do you have a fire extinguisher in your house and not your car ?	14	37		51

4.0 Data Analysis and Discussion

Proportion of those with Smoke Detectors Installed

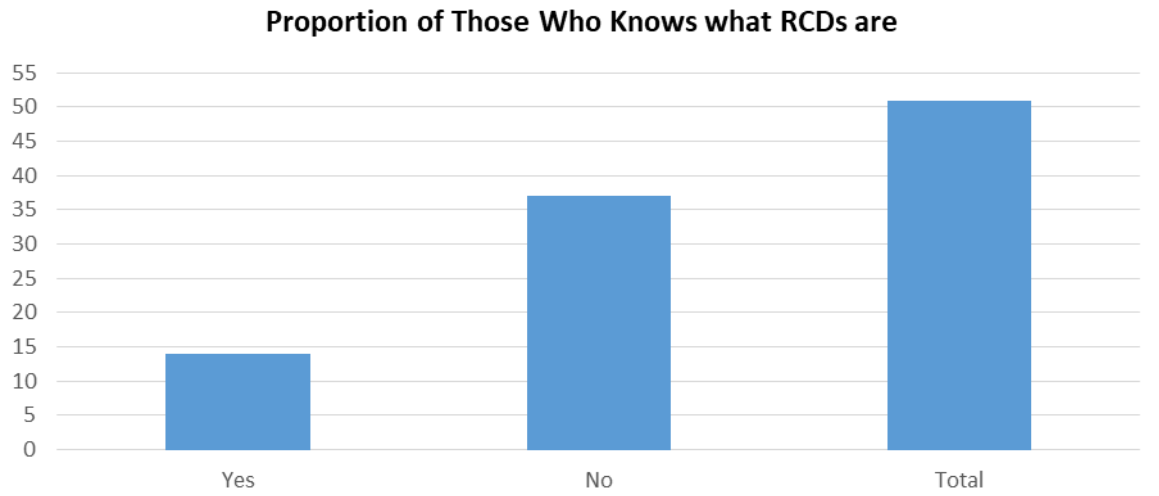
	PRESENTATION OF SURVEY RESULT ON ELECTRICAL FIRE OU TBREAK DEPLOYED AT KOSOFE LOCAL GOVERNMENT AREA				
S/N	DESCRIPTION	YES	NO	NOT SURE	TOTAL
5	Is your house fitted with smoke d etector or smoke alarms?	1	50		51



4.1 Proportion of those who know what RCDs are

	PRESENTATION OF SURVEY RESULT ON ELECTRICAL FIRE OUTBREAK DEPLOYED AT KOSOFE LOCAL GOVERNMEnT AREA				
S/N	DESCRIPTION	YES	NO	NOT SURE	TOTAL
11	Do you know what RCDs are?	14	37		51

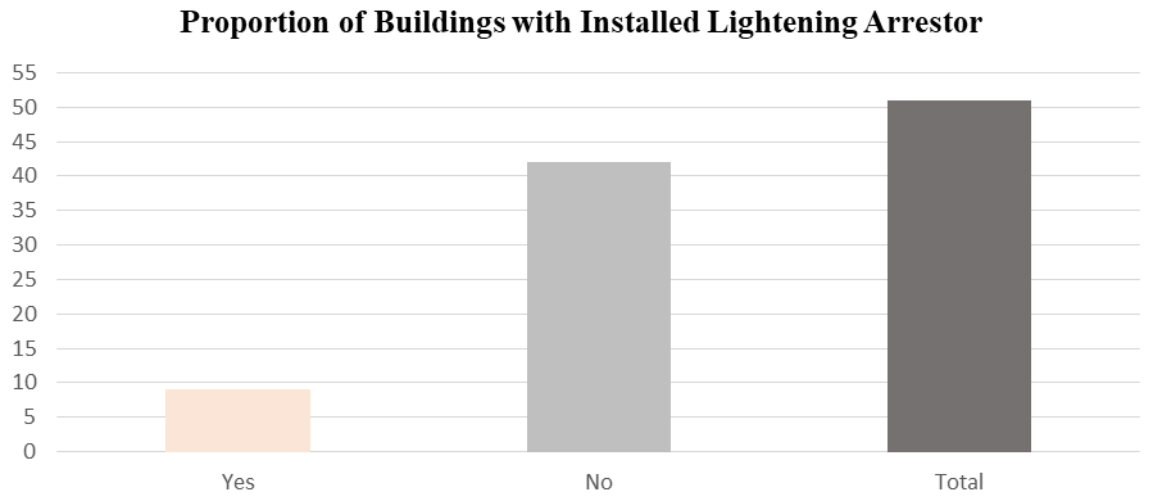
Proportion of residents who knows what RCD are



4.2 Proportion of buildings with a Lightening Arrestor

	PRESENTATION OF SURVEY RESULT ON ELECTRICAL FIRE OUTBREAK DEPLOYED AT KOSOFE LOCAL GOVERNMENT AREA				
S/N	DESCRIPTION	YES	NO	NOT SURE	TOTAL
6	Is the building where you live fitted with thunder arrest or?	9	42		51

82.32% of the participant lacks thunder arrestors on the building where they live. The level of exposure to impact of lightening is very high as shown in the result above. There are several factors that could lead to this high percentage, this is completely out of the scope of this study. However, according BS 7671, the effect of lack of lightening arrestor could lead to fire, structural damage and electrical interference.



5.0 Conclusion and Recommendation

5.1 Conclusion

Lagos state is one of the most developed states in Nigeria and the fifth largest city in Africa yet, lags behind in terms of educating her population on the best practices of electrical installations in the residential sector. It can be inferred that ignorance is the major factor that has aid the spread of electrical fire outbreaks whenever it occurs in Lagos State. There are no deliberate design considerations put in place to provide protection against electrical fire and electrocution. The following test procedures should be applied where appropriate, in order to ascertain the safety of electrical installation:

- Continuity - to ascertain that the earthing is continuous throughout the circuit.
- Insulation Resistance - to test whether there has been any breakdown in insulation to the installation.
- Polarity - to check that the installation is correctly wired.
- RCD testing - to check that Residual Current Device disconnects the supply in the event of a fault.

5.2 Recommendation

a. The government of Lagos state has a major role to play towards policy formulations, monitoring and enforcement.
b. Regular and periodic inspection and testing must be carried out from time to time.
c. Upon completion of the electrical testing, a detailed Periodic Inspection Report is supplied.
d. All occupants of the house must know how to use a fire extinguisher and should be trained to her proper usage.

e. Electricians and engineers must be made to undergo relevant electrical verification, certification and re-certification training periodically. This will help to educate various electrical professionals on best practices.
f. Mandatory-testing and verification of electrical installations should be ensured before commissioning and approvals.
g. Wiring regulations should be adequately obeyed. It is clear that increased use of correctly selected RCDs, in addition to good wiring practice, can reduce the effects of electric shock and the possibility of fire risk significantly. RCD protection also provides an additional level of protection where the wiring complies with BS 7671 but the integrity of the wiring system has been damaged.

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