

Comparative Assessment of Fire Resistivity of Roofing Materials in Kano Markets in Nigeria

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Abstract

Fire outbreaks in Nigerian markets is a problem that have been significantly rated very high especially in Kano State. To reduce this problem, a research was conducted on the three major markets in Kano with the aim of comparatively assessing the fire resistivity of their roofing materials, in order to generate guidelines for designing roofs of market buildings in Nigeria. The research focused on desktop study as the instrument for data collection. Hence, the data were analyzed and checked via contents analyses technique, so as to validate the results. The findings are: roofing sheets, wooden structural members of roofs, wooden fascia and canopy roof covering of the market buildings are not resistance to fire. Among the recommended guidelines are: all the roofing sheets of market buildings must be resistant to fire; for example, the use of clay roof tiles, concrete roof tiles, profiled metal sheet and other roofing sheets with high fire resistivity should be considered by the Architects. In addition, all the wooden structural members of roofs of market buildings must be resistant to fire; for example, the use of steel structural members of roofs should be considered by the Architects. Moreover, all the wooden fascia of market buildings must be resistant to fire; for example, the use of metal fascia of buildings should be considered by the Architects.

Keywords: Designing Roofs, Fire Outbreaks, Guidelines, Culture, Urbanism.

INTRODUCTION

The importance of markets in Nigeria and other nations of the earth cannot be over emphasised. According to Academy of Urbanism (2022), [1] markets are vital spaces for economic activities; they are places where people can find business spaces and the finance networks obtainable in markets are fascinating. Fire outbreaks in Nigerian markets have been significantly rated very high (Federal Fire Service of Nigeria, 2016). [3] Particularly, fire incidences in markets in Kano State of Nigeria have been a serious problem over the years. For example, the fire incident at the Sabon Gari market in Kano State in 2016 was the worst market fire disaster in Nigeria with the loss of 3,800 shops and goods estimated at two trillion Naira (Nigerian currency) and barely a few hours after, another fire incident occurred at a neighbouring furniture market in Gwarzo in the same Kano State (Thisday Newspaper, 2016) [23]. According to Sulaiman (2014), [20] the causes of fire outbreaks in Kano vary

from markets to markets; however, the major causes of fire outbreaks in Kano markets are electric related faults, refuse burning and storage of flammable materials. To reduce this problem of market fires in Kano State, a research was conducted on the three major markets in Kano with the aim of comparatively assessing the fire resistivity of their roofing materials, in order to generate guidelines for designing roofs of market buildings in Nigeria.

According to Nigeria Gallery (2021a) [12] and Google Arts and Culture (2023), [6] Kano which is

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the area of this study is a city in the northern part of Nigeria and the capital of Kano State; it is the second largest city in Nigeria after Lagos in Lagos State, with over four million citizens living within 449 kilometre square of land located in the Savanna, south of the Sahel and it is a major route of the trans-Saharan trade. The city has been a trade and human settlement for millennia. (Figure 1) shows Nigeria revealing Kano State as highlighted; its other 35 states and the Federal Capital Territory, Abuja.



Figure 1. Nigeria showing Kano State as highlighted; its other 35 States and the Federal Capital Territory, Abuja [Source: Premium Times, 2021 (<https://www.premiumtimesng.com/regional/nwest/471794-suspension-of-kano-anti-corruption-commission-chairman-illegal-group.html>)].

METHODS AND PROCEDURES

This research generated qualitative data via the use of descriptive survey method. According to the National Population Commission (2022) [10] and Nigeria High Commission (2022), [14] it was opined that Nigeria is made up of 36 states and the Federal Capital Territory (FCT). The research considered comparative assessment of fire resistivity of roofing materials in Kano markets because the city has been a trade and human settlement for millennia (Google Arts and Culture, 2023; [6] Nigeria Gallery, 2021a) [12] with previous cases of fire outbreaks as reported by the Federal Fire Service of Nigeria in 2016 [3]. According to Nigeria Galleria (2021b), [13] there are eight popular markets in Kano; they are Dawano market, Enlemu market, Galadima market, Kantin kwari market, Kofar wabe market, Kurumi market, Abubakar Rimi (Sabon gari) market and Yankura market. Out of these eight markets, three markets: Abubakar Rimi (Sabon gari) market, Dawano market and Galadima market were randomly selected for this study because all the eight popular markets are

located in Kano metropolis and according to Sulaiman (2014), [20] the causes of fire outbreaks within the Kano metropolitan markets are broadly categorised into three major causes.

According to Prashant and Supriya (2010), [15] Steve (2011); [19] Suresh and Chandrashekara (2012), [21] in a study, 20% size of the sample of a population is a good suggested size of the sample. The three selected markets for this study are more than 20% of the sample size and these in turn have made the sample size to be acceptable. The research data were collected via desktop study; reviewed different literature, information from media and Internet search. The analyses of the research data were made and checked via contents analyses technique by comparing the extracted data with the raw desktop (secondary) data, so as to get the validation of the results. The results of the analyses were employed in generating the architectural research guidelines.

DATA PRESENTATION AND DISCUSSIONS

The roofing materials that were found in Kano markets include zinc roofing sheets, non-fire resistant wooden structural members of roof, none-fire resistant wooden fascia and tarpaulin roof covering. (Table 1) shows the distribution of different roofing materials that were observed in Kano markets. Zinc roofing sheets were found in all the three markets and non-fire resistant wooden structural members of roof were found in only Abubakar Rimi (Sabon gari) market, while none-fire resistant wooden fascia were found in only Dawano market, whereas canopy roof covering was found in only Galadima market.

Table 1. Distribution of Different Roofing Materials as Observed in Kano Markets.

| S.N. | Market | Roofing Material |
|------|-----------------------------------|--|
| 1 | Abubakar Rimi (Sabon Gari) Market | Zinc Roofing Sheets and Non-fire Resistant Wooden Structural Members |
| 2 | Dawano Market | Zinc Roofing Sheets and None-fire Resistant Wooden Fascia |
| 3 | Galadima Market | Zinc Roofing Sheets and Canopy Roof Covering |

Source: Reviewed Work, 2022.

Abubakar Rimi (Sabon Gari) Market

Examples of roofing sheet that have high fire resistance are: clay roof tiles, concrete roof tiles and profiled metal sheet (Fire Centre, 2017; [4] Fricklas, 2015; [5] Neufert and Neufert 2000) [11]. However, the use of zinc roofing sheets were found in Abubakar Rimi (Sabon gari) market; this type of roofing sheet is not resistant to fire. According to Building and Construction Authority (2017); [2] Neufert and Neufert (2000) [11] and Quarles (2013), [16] materials for designing buildings against fire outbreaks should be able to resist surface flame spread. However, there is no fire resistivity with regards to the use of wooden structural members of roofs in the market. (Figure 2) shows the use of zinc roofing sheets and none-fire resistant wooden structural members of roof in Abubakar Rimi market.



Figure 2. Abubakar Rimi Market showing Zinc Roofing Sheets and None-fire Resistant Wooden Structural Members of Roof [Source: Office of the Vice-president of the Federal Republic of Nigeria, 2018 (<https://www.yemiosinbajo.ng/vp-osinbajo-inaugurates-fgs-solar-project-at-sabon-gari-market-launches-kano-msmes-clinics-interacts-with-sip-beneficiaries/>)].

Dawano Market

The use of zinc roofing sheets were also found in Dawano market; this type of roofing sheet is not resistant to fire. According to National Fire Academy (2000), [9] Sikazwe (2015) [18] and Tan (2007), [22] combustibility of building materials is a prime factor to consider when designing buildings against fires. However, it was observed in this market that there are buildings that are made up of non-fire resistant wooden fascia; these can easily burn and increase the rate of spread of fire when there is fire outbreak. (Figure 3) shows the use of zinc roofing sheets and none-fire resistant wooden fascia in Dawano market.

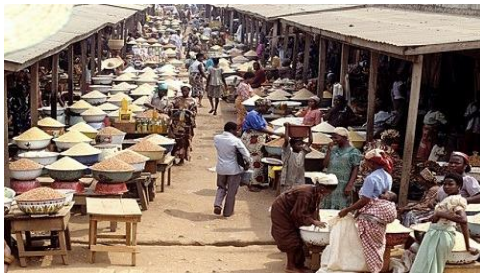


Figure 3. Dawano Market showing Zinc Roofing Sheets and None-fire Resistant Wooden Fascia [Source: YNaija, 2021 (<https://www.facebook.com/YNaija/photos/a.442632445770680/4023643884336167/?type=3>)]

Galadima Market

Likewise, the use of zinc roofing sheets were found in Galadima market; this type of roofing sheet is not resistant to fire. From the information obtained from Huntington Beach Fire Department (2010), [7] Mitsopoulos and Dimitrakopoulos (2007); [8] Recalls and Safety Alerts (2019), [17] canopies are not resistant to fire. However, the use of canopy roof covering was observed in this market. (Figure 4) shows the used of zinc roofing sheets and canopy roof covering in Galadima market.



Figure 4. Galadima Market showing Zinc Roofing Sheets and Canopy Roof Covering [Source: Jujufilms, 2015 (<https://jujufilms.tv/2015/07/23/galadima-village-market-5/>)].

CONCLUSION AND RECOMMENDATIONS

Owing to problem of frequent fire outbreaks in Nigerian markets, this research comparatively assessed the fire resistivity of roofing materials in Kano markets in Nigeria as an avenue to generate guidelines for designing roofs of market buildings in Nigeria. The research findings show that roofing sheets, wooden structural members of roofs, wooden fascia and canopy roof covering of the market buildings are not resistance to fire. Having considered these findings, the following guidelines are therefore recommended for designing roofs of market buildings in Nigeria:

Guidelines for Designing Roofs of Market Buildings in Nigeria

- i. All the roofing sheets of market buildings must be resistant to fire. For example, the use of clay roof tiles, concrete roof tiles, profiled metal sheet and other roofing sheets with high fire resistivity should be considered by the Architects.
- ii. All the wooden structural members of roofs of market buildings must be resistant to fire. For example, the use of steel structural members of roof should be considered by the Architects.
- iii. All the wooden fascia of market buildings must be resistant to fire. For example, the use of metal fascia of buildings should be considered by the Architects.
- iv. Canopy roof covering should not be used in the markets. Otherwise, they must be treated to resist fire before they can be used.

This research only considered the roofing design of market buildings without considering the design of other parts of the market buildings in Kano and this is a gap in knowledge. Therefore, in subsequent research of this kind, this gap should be filled.

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