Contemporary Building Collapse in Modern Society: A Case Study of Buildings in Kogi State of Nigeria.

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Abstract: The main purpose of this study is to find out the contemporary building collapse in modern society: a case study of buildings in Kogi State of Nigeria. The instrument used is structured questionnaires. The target population for this study are all the cities, towns, villages in Kogi State. The sample was drawn from all the cities, towns, and villages in Kogi State. The method used was the mean and standard deviation to answer the research questions. It was discovered that instability can lead to building collapse or failure in Kogi State of Nigeria. According to Arayele & Adam, (2001) the selecting of materials, components and structures that will meet the expected buildings standard and aesthetic value is paramount. Similarly, it was discovered that defective materials lead to fractures. So, Fredricks & Ambrose (1989) quipped that the overturning of structures owing to heavy wind load, sliding of structures due to lateral loads are major types of failures of building.

Introduction

According to (Arayela & Adam, 2001) the need to provide shelter to man and his daily activities has always been an utmost priority. Buildings are constructed to serve as shelter for man, his properties and other activities. Buildings therefore must be properly planned, designed and erected to obtain desired satisfaction from environment.

Building collapse or failure of structure is not a strange thing in the construction industry all over the world with particular reference to the developing countries, but it is never designed to happen. Cases of collapsed buildings, collapsed bridges or other structures of various types are not peculiar to Nigeria particularly to Kogi State alone. Arayela & Adam (2001) affirmed that an informal survey conducted by Nigeria Institute of buildings (NIOB) has revealed more buildings may have collapsed during construction in Lagos State that in the rest of the Country put together over the past forty five years (1955 – 2000).

A nation's development is usually measured by the strength of the building and construction sector of the economy; as such building industry must be properly monitored (Manohar, S.N (1985). The factors to be observed in buildings should include adequate stability to prevent failure or discomfort, deformation, to the users, durability, stability, economies, resistance to weather, fire outbreak and other forms of accidents. As new materials are being constantly discovered, so also is the style of building construction changing. According to (Arayela & Adam, 2001), selection of materials, components and structures that will meet the expected building standards and aesthetics value is paramount.

1. Choice of materials, shapes, size.
2. Instability – geometry, design or materials. This could be because of fatique or corrosion, deformation or facture.
3. Manufacturing errors – This may be because of improper selection of materials, incorrect sizing, improper heat treatment, and failure to adhere to design or shoddy workmanship.
4. Defective materials.
5. Lack of consideration of unexpected problems, vandalism, sabotage and natural disaster can all over stress a structure to a point of failure. (Manohar, S.N 1985).

According to Chapman, (2000) failure in construction can be seen as negative consequences arising from risk or actions resulting in obstruction of any or all of the appropriate benefits derivable from construction project. A building failure can be considered as occurring in a component when those components can no longer be relied upon to fulfil its principal functions (Roddis, 1993). Building failure could be of two types namely: a cosmetic failure that occurs when something has been added to or subtracted from the building, thus affecting the structure outlook while structural failures affects both the outlook and structural stability of the buildings.

In the same vein, in Nigeria, especially Kogi State building collapse has been attributed to so many factors ranging from the use of substandard materials, poor workmanship, low quality of blocks, concrete and other factors. Oyewande, (1992) stressed that buildings deformation, fracture or failure are attributed to: design faults (50%), fault on construction site (40&), and product failure (10%). Akinpelu, (2002) categorised the followings as major causes of structural failures: environmental changes, natural and man-made hazards, improper presentation and interpretation in the design. Failure could occur in the form partial or total collapse of the structure.

In addition, effect of low quality sandcrete blocks on structural wall can cause deformation. Due to the high demands of blocks in the building industry, the block industries in Nigeria have equally increased the quantity thereby compromising the quality in the bid to most number of blocks per bag of cement; they use more sand than necessary which eventually result in moulding weak blocks (Ayininula & Olalusi, 2004).

Furthermore, concrete is a very versatile materials that can be cast in place with or without reinforcement to achieve any required strength. It is used for construction of foundation footings, mass concrete slabs, beams, floor slabs, columns, lintels and decking composes of cement, sand and stones, when iron rods are introduced into it, it become reinforced concrete. Oyewande, (1992) observed that the strength of reinforced concrete depends on the proportion of cement, sand and stones and f iron rods. These constituents are always used in the design of high rise structures. The structural analysis is done by structural engineer who calculates the weight of the building, number and size of iron rods that will be put into the beam and columns to strengthen them for carrying the weight.

Richard, (2002) opined that deterioration of reinforced concrete could occur as a result of corrosion of the reinforcements caused by carbonations and chloride ingress, cracking caused by overloading, or basic design faults, and construction defects.

Purpose of the Study:

This study examined the extent of building collapse in Kogi State, Nigeria. As a result of incessant collapses, reformation instability failure and structural defects.

Specifically the Study:

1. Determined whether fractures and deformation are due to instability.

2. Examined whether fractures and deformations are due to manufacturing errors.

3. Find out whether fractures are due to defective materials.

Research questions.

The following research questions were raised:

1. To what extent does instability lead to building collapse in Kogi State.

2. To what extent does a defective material lead to collapse?

3. To what extent does manufacturing errors lead to building collapse in Kogi State?

Research Design

The research design adopted is ex-post facto research–design. This is adduced as a result of collection of data and opinions and analyzing their categorical behaviour and so collected as of the time of this research.

Further, variable and their effect like urban, semi-urban, rural areas and other variables used had already been in existence.

Population of the Study

Population for this study are all the Cities. Towns, Villages which can be captioned as Urban, Semi-Urban, Rural Areas in Kogi State of Nigeria.

Sample and Sampling Technique

Random sampling technique was used to elicit unbiased selection from the East, West and Central Senatorial Districts of Kogi State. Twenty (20) buildings were sampled each from the Senatorial Districts of Kogi State. It was furthered noticed or sampled that their were materials soil texture, and topography and hordes personnel differences.

Instrumentation

The major instrument for data collection was the structured questionnaire. The questionnaire has two sections: A and B, Sections. A consists of general questions that are related to the research questions that elicited information on the research questions.

Each item has four point likert scale of Strongly Involved (SI), Moderately Involved (MI), Involved (I) Never Involved (NI).

Reliability of Instrument

To measure the reliability index of the instrument, it was administered twice on the respondents different from the sample, 60 Contractors, 40 Civil Engineers, 40 Builders. The method of test- retest which spanned a period of two weeks was used. The two tests were then correlated through the use of Pearson Product Moment Correlation Coefficient. The result of r=0.85 was obtained.

Method of Data Collection

The researcher personally went to the selected cities, towns and villages to administer the copies of the questionnaires on the respondents. He collected immediately filled copies of the questionnaires from the respondents for processing.

Method of Data Analysis

The data collected were analyzed using mean and standard deviation to answer the research questions.

Data Presentation

Research Question One: To what extent is instability (geometry, design or materials) lead to building collapse?

Ɛ×	Ɛx^2	Df	SL	CV	ctv
72	362	4	0.05	11.4	2.776

X = mean

Ɛx = standard deviation

SL = significance level

CV =calculated value

Ctv = critical table value

CV > ctv

11.4 > 2.776

Hence; r(11.4) > p (0.05) of degree of freedom

⇨ Null hypothesis (H_{o1}) is rejected

Inference; therefore instability (geometry, design or materials) lead to building collapse in Kogi State.

Research Question Two: To what extent is manufacturing errors (improper selection of materials, improper sizing or failure to as were to design or shoddy workmanship) can lead to building collapse, failure and deformation?

Ɛ×	Ɛx^2	Df	SL	CV	ctv
36	306	4	0.05	7.74	2.776

CV> ctv

7.774 > 2.776

Hence r (7.774) > p(0.05)

=>Null hypothesis (H_{o2}) is rejected

Inference = manufacturing errors (improper selection of materials, improper sizing or failure to as were to design or study workmanship) van lead to building failure and deformation in Kogi State.

Research Question Three: To what extent are defective materials lead to fracture?

Ɛ×	Ɛx^2	Df	SL	CV	ctv
39	327	4	0.05	7.99	2.776

CV> ctv

7.99 > 2.776

Hence, r (7.99) > p(0.05)

⇨ Null Hypothesis (H_{o3}) is rejected

Inference; therefore, defective materials can lead to fracture in Kogi State.

Summary of Findings

This is to state that according to the inference drawn from research questions one to three; there is building collapse in Kogi State of Nigeria.

Discussion of the Study

In analyzing the research question one, it implies that calculated value was greater than critical value. Hence, the hypothesis (H_{o1}) is rejected. According to Arayela & Adam, (2001) the selecting of materials, component and structures that will meet the expected building standards and aesthetic value is paramount. But if these are non–occurrence, non–performance, breaking down, ill sickness and unsuccessful things or attempt in building exhibility any of the above characteristics failure can be said to occur, which can lead to building collapse.

In addition, in analyzing research question two, it was found that calculated value was greater than critical table value. Therefore, null hypothesis (Ho) was rejected. Hence, manufacturing error can lead to building collapse, failure or deformation in kogi state, Nigeria.

Chapman, (2000) defined building failure as an act of omission or occurrence or performance. Failure could also be defined as non-occurrence, non performance, running short, breaking down, ill success, insolvency and unsuccessful attempt. Arayela & Adam, (2001).

In Nigeria, building failures have been attributed to so many factors ranging from the use of sub standard materials, poor workmanship, low quality of blocks, concrete and other factors, Oyewande, (1992), stressed that building failures are attribute to the following causes; design fault (50%), fault on construction site (40%) and product failure (10%) while Akinpelu, (2002) categorized the followings as major structural failures ; environmental changes, natural and man made hazards; improper presentation and interpretation in the design. Failure could occur in the form of partial or total collapse of the structure.

Similarly, in analyzing research question three (3); it was found out that calculated value was 7.99 while the critical value was 2.776. Hence, the calculated value was greater than critical table value, then the rejection of (H_{o3}). Inference therefore drawn is that reflective materials can lead to fracture in Kogi State, Nigeria.

Conclusion

Based on the discussion so far, its opined that instability (geometry, design or materials), manufacturing errors (improper selection of materials, improper sizing or failure to adhere to design or shoddy workmanship), defective materials and other plausible and probable reasons adduced can lead to deformation, fracture, failure and total building collapse in Kogi State, Nigeria.

Recommendations

The followings were the recommendations made as a result of the conclusion drawn:

1. Very stiff penalties should be drawn against any collapse building especially when it leads to loss of lives.
2. Town planning authorities should be adequately staffed and equipped with professionals in the construction industry for effective monitoring of project during and after construction.
3. Government should screen those getting involved in housing projects.
4. Government at all levels should intensify public enlightment, placing emphasis on how building disaster could be prevented rather than managing situation which might be costlier.
5. Government should come up with professional policy outlawing indiscriminate building construction by non-professionals at all the regulatory bodies in the building industry to comply strictly with their professional ethics. Stable policy on building approval should be enforced.
6. In order to stop this ugly trend in the building industry, competent professionals like the Nigeria Institute of Architects (NIA), Architect Registration Council of Nigeria (ARCON), Nigeria Society of Engineers (NSE), Council of Regulation of Engineers in Nigeria, (COREN), Nigeria Institute of Builders, (NIOB), Nigeria Institute of Quantity Surveying, (NIQS), Nigeria Institute of Estate Management and Values (NIEMV), Nigeria Institute of Town Planners (NITP) and Government should jointly work together to achieve common goals.

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