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## **A REVIEW OF BUILDING COLLAPSE IN NIGERIA: CAUSES, EFFECTS AND CONTROL MEASURE**

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### **Abstract**

*The paper examined building collapse in Nigeria: causes, effects and the control measure. Building collapse is a common phenomenon all over the world, but more rampant and devastating in the developing countries like Nigeria. The sources of data for the study were mainly from the secondary sources, which include both published and unpublished materials from the library, journals, textbooks and some other relevant materials. Building collapse could be as a result of human errors and ignorance, when incompetent personnel are in charge of design, construction and inspection of the building project. There are natural forces outside the control of man that could also be responsible for building collapse; such as earth quakes and tremors, landslide, flooding, high wind velocities like hurricane and so on. The effects of building collapse are; loss of human life, loss of properties, it could leads to discouragement of property development and scarcity of property and so on. Building failure or collapse can be control if all building design are carried out by qualified professional Architects and Engineers and other relevant professionals. Qualified Town planners should always inspect and approve building plan appropriately. The paper thereby concluded that professional and everyone involved in the building project must ensure there is strict adherence to the required standards, specifications and method of construction without compromise.*

**Keywords:** *Building, building collapse, causes, effects, control measure, Nigeria.*

## INTRODUCTION

Building collapse is a common phenomenon all over the world, but is more rampant and devastating in the developing countries like Nigeria. The incidence of building collapse has become major issues of concern in the development of Nigeria, the frequencies of their occurrence and the magnitude of the damage in terms of lives and properties are now becoming very alarming. Infact, building collapse has now become a familiar occurrence, even to layman on the street in Nigeria (Adebowale, *et al.*, 2016). Building collapse could be as a result of human errors and ignorance when incompetent personnel are in charge of design construction and inspection of building project. There are natural forces outside the control of man that can also be responsible for building collapse such as earth quakes and tremors, landslide, flooding, high wind velocities like hurricane and so on.

The menace of building collapse in Nigeria may not be attributed to incompetence of the nation's building community of professionals responsible for designing and monitoring of construction works at building sites. This is because, owners of building under construction derail from their approved plans and also, the approving authorities are known to fail to monitor compliance with approved plans, some developers shun professionals in order to cut costs, the high cost of building materials has led greedy contractors to patronize substandard building materials. These short cut measures have contributed immensely to the occurrence of building collapsed in Nigeria (Alamu and Gana, 2014).

The concentration of population incities due to rural-urban migration created the specific problems of providing adequate building structure. The effects of this is the upsurge of various building projects from various contracting firms of doubtful competencies (fadamiro, 2002 cited by Adebowale, *et al.*, 2016).

Also the development control units in most states play a limited role as they lack staff with expertise to supervised the developments In progress in across their areas of Jurisdiction.

### **Forms of building Collapse.**

Structural failure in buildings comes in various forms and categories, the worst of which is a collapse. In which, deterioration or decay, especially of vigour or usefulness of a building, can be categorized as a failure of some sort but a total

loss of bearing strength resulting in a sudden break down, physical depletion and or falling apart is termed a collapse.

Basically, there are three forms of collapse as observed by Olusola *et al* 2011 cited by the Nigerian Town planner Registration council (TOPREC) in 2013.

1. Partial Collapse: This is one of the major forms of building collapse, this occurs when a part of the building is affected. For instance, when only a small proportion of the building or one side of it falls down.
2. Progressive Collapse: This is another form of building collapse. In this type of collapse, there will be signs of weakness noticeable as cracks which become widening with time or by hearing unusual sound in the building due to structural parts gradually separating.
3. Total or sudden collapse: This is the complete breakdown of the building it may be sudden, as it may not give any sign prior to disintegration.

A building is essentially a space that is protected from the natural environment and is constructed for a specific purpose. Structures are part of a building and cannot be conceived in isolation but must be conceived as part of the whole design like architectural, structural and services. The structure of the building gives the building sufficient strength to withstand the loads to which the whole building is subjected by carrying the load and transferring it safely to the foundations and hence the ground. Structural failure is caused by the imposition of loads in excess of the capacity of structural components, which results in over stressing (Olusola *et al.*, 2011). Over stressing is indicated by evidence of distortion, deflection. If a structure is well designed and constructed in accordance with the design principles, overstressing may indicate some other inadequacy such as use of an unsuitable material. Structure failure may also occur when a designed and constructed structure fails to perform the function its constructed for. From this development, Olusola *et al.*, (2011), observed some basic requirements that a structure must satisfied as follows:

- Each member of a structural system must possess adequate strength. The materials of the structure must be adequate to resist the stresses generated by the loads and the shape and size of the structure must be adequate.
- The stiffness of a beam or column is a measure of its resistance to bending or buckling. The component should be strong and not stiff.

- Every component of a structure must be stable, otherwise the whole structure is assumed to be unstable. This is needed to maintain shape.



**Plate 1 Showing:** A Cross Section of a Collapse Building in Lekki Area of Lagos

**Source:**[www.google.com.ng](http://www.google.com.ng).



**Plate 2 Showing:** The Scene of a Recent Building Collapse in Ikotun Area of Phase 1 Area of Lagos on March, 2016, Leaving at Least 5 Persons Dead

**Plate 3 Showing:** Another Recent Collapse Building in Lekki Lagos Belonging to the Synagogue Church of All Nations.

**Source:**[www.google.com.ng](http://www.google.com.ng).

**Source:**[www.tori.ng](http://www.tori.ng)



**Plate 4** Showing a Collapsed 2 Storey Building within a Residential Estate in Lagos, due to lack of maintenance.

**Plate 5** showing 3-storey building collapses in Lagos

**Source:** Vanguard News 25<sup>th</sup> July, 2020

**Source:**<http://2.bp.blogspot.com/>

## **CAUSES OF BUILDING COLLAPSE IN NIGERIA**

Building collapse is a state of complete failure, when the structure has literally gives way and the building can no longer stand as originally built thereby leading to the inability of the structure to perform its intended functions. Building collapse may be as a result of natural occurrences such as earthquakes, floods, tornadoes, windstorm, volcano, and landslide and so on (Kolawole, 2018). Apart from the aforementioned natural occurrences, there are some of factors responsible for building collapse in Nigeria. These are;

### **Inadequate preliminary site investigation**

These are operations carried out to determine the suitability of the site for the purpose of use and more importantly, for the proposed structure. It includes the investigation of site topography, the nature of the soil, load-bearing capacity of the soil, tendency of the site to flooding, information about existing structures or features on the site and so on. In a situations where this investigation is executed wrongly, there is tendency of building collapse. Adequate site

investigation prevents the issue of foundation problem because it would ensure that the most appropriate foundation is recommended.

### **In adequate structural Analysis / Design**

The structural design should be adequate enough to support the loads the building would be subjected to and the building should be strong enough to carry the load and transmit it evenly to the supporting ground when the load a building is subjected to is heavier than what it was designed to carry, the building is set to fail structurally. At every stages of the construction, the structural stability of the building must be tested. A holistic building design not only includes the Architectural design, it also includes structural, mechanical, electrical and engineering designs. A building without an accurate structural design would not stand the test of time, it would eventually collapse.

### **Poor concrete mix Ratios**

Concrete mix ratios differ depending on what is to be constructed and the mode of the construction. Many constructions are done with the use of wheel barrows or other sizeable containers by workers as measuring gauges instead of using actual measuring gauges to measure cement. In Nigeria, concrete is being widely used as a construction materials. Therefore, the need to achieve a functional concrete cast is of utmost important. To achieve this, the cement, sand and stone must all be sound and have the types and qualities specified. The consequences of poor concrete works is building collapse.

### **Over loading in structures**

These occurs when the dead load and life load on the structure exceeds the projected estimation of load the projected estimation of load the structure was designed and constructed to carry. Many building collapses has resulted from cases where the foundation of a structure was designed to carry a two-storey building and overtime, the property owners or developers decides to add more floors to the building. Chendo, *et al.*, (2015) assume that imposing additional floors beyond original design provision is a common practice in Nigeria due to greediness among the developers.

### **Illegal Alteration or conversion of Existing Building.**

To carryover building conversion scheme, expansions, Renovations on an existing building, the structural members and their locations within the building must be identified and avoided in the demolition exercise to avoid jeopardizing the structural integrity of the building. This is to be done by a structural engineer. For example, in the case of a conversion of a residential to an industrial building; refurbishment, renovations, extension and expansion schemes may be put in place to match the new use of space. These schemes might require that some buildings in components like the walls be demolished, therefore, it is necessary to carryout a structural analysis of the building to identify the main structural members of the building failure to do this could lead to the costly errors of demolishing structural members which would jeopardize the structural integrity of the building and thereby lead to a collapse of the building. A structural Engineer is in the best position to certify the structural integrity of a structure, especially, when it comes to changing its use.

### **Quackery**

This is a fraudulent person who pretends to have skill, knowledge, or qualifications he or she does not possess. Such people have no recognition by any of the existing professional bodies of their professed profession. Amadi, (2012) observed that due to high cost of consultancy fees needed to engage the services of these professionals, most Nigeria prefer to cut cost by engaging the services of non-professionals (quacks) who lack the needed experience in construction sector. Clients who in a bid to cut cost employ quacks and thereby puts the structural and functional integrity of the building in danger and thereby put the lives of the prospective building users in danger. Jobs done by quacks are usually substandard as they lack the technicality to achieve design and construction goals, therefore, to avoid building collapse, Registered and qualified professional bodies should be commissioned to execute the project.

### **Inadequate supervision by professional.**

Lack of adequate supervision by the qualified professionals is another factor responsible for building collapse in Nigeria. Sometimes firms resort to use of unqualified staff to act as principals on construction sites in order to save cost and the unqualified staff many not be competent enough to fraudulent practices

of smart contractors. Professional supervision allows for smooth performance between all involved in the construction process. The building professionals must also give room for the input of other professionals when it's necessary to do so. Onyemachi and Uji (2005) Discovered that architects sometimes contribute to building collapse by not involving engineers at all stages of construction. Currently in Nigeria, it is very common to find architects undertaking the entire construction of building projects alone without the consultation of engineers.

### Lack of Maintenance

Lack of adequate maintenance is another factor of building collapse in Nigeria. Buildings need active periodical maintenance works as building and physical developments deteriorates as a result of several factors overtime, thereby, making it impossible for them to fully perform the functions as initially designed. Making structures have weakened over time because of lack of maintenance and repair works as at the time when needed thereby making the building to be dilapidated. Okuntola and Okaiye (2012) cited by Kolawole, (2018) assume that adequate maintenance of building is necessary for the safety and durability of the structure and poor management and maintenance in buildings leads to development of cracks on the walls and premature ageing of the structure.

Table 1: List of selected Building Collapse in Nigeria between 1999 – 2020

S/No	Property Description	Location	Status	Date of Collapse	Possible Cause	Casualty
1.	Three-Storey residential building	Lagos state	In use	1999	Carelessness, substandard materials	4 deaths
2.	Three-Storey building	Lagos state	In use	1999	Structural failure	None
3.	Three-Storey residential building	Lagos state	In use	1999	Structural failure, Rainstorm	35 deaths
4.	Two-Storey building	Ogun state	In use	1999	Rainstorm	20 deaths
5.	A Storey residential building	Lagos state	In use	1999	Rainstorm	N.A



6.	Residential storey building	Lagos state	In use	2000	Faulty design, careless	N/A
7.	Three-Storey residential building	Lagos state	In use	2000	Incomplete	5 deaths
8.	St. Dennis Catholic Church building	Lagos state	In use	2000	Structural failure	3 deaths
9.	State High School building	Lagos state	In use	2000	Crowd pressure, overloading	1 death, 2 injured
10.	Two-Storey building	Lagos state	In use	2000	Deteriorated slab	2 deaths
11	Building at Isako	Lagos state	In use	2000	Structural failure	5 deaths
12	Two-Storey residential building	Lagos state	In use	2001	Unauthorized conversion	7 deaths
13	A storey residential building	Osun state	Under construction	2001	Structural failure	7 deaths
14	Two-Storey residential building	Lagos state	In use	2004	Dilapidated structure	N/A
15	Building on Three floors	Lagos state	In use	2004	Not disclosed	N/A
16	Building on Two floors	Lagos state	In use	2004	Not disclosed	N/A
17	Commercial building on four floors	Lagos state	In use	2005	Not disclosed	N/A
18	Three-floor commercial building	Lagos state	In use	2005	Not disclosed	1 death
19	Commercial building on Two floors	Lagos state	In use	2005	Not disclosed	1 death
20	Four-floor residential/commercial building	Lagos state	In use	2006	Ignorance, greedy landlord	7 deaths
21	21-Storey Bank of Industry building	Lagos state	In use	2006	Aftermath of fire, heavy wind and rain	2 deaths, 34 injured
22	Four-Storey block of 36 flats (The Titanic Buildin)	Lagos state	In use	2006	Faulty construction	28 deaths

23	Multi-Storey Building	Kano state	In use	2007	Faulty design, structural failure	Several people
24	Building used as primary school	Oyo state	In use	2007	Use of substandard material, poor workmanship	13 deaths
25	Five-Storey shopping complex	FCT	Under construction	2008	Structural failure bad workmanship	2 injured, 100 trapped
26	Two-Storey residential building	Ogun state	Under construction	2008	Violate planning approval	2 deaths
27	Six-Storey teaching complex	Oyo state	Under construction	2008	Use of substandard material, poor workmanship	3 deaths
28	Uncompleted building	Ogun state	Uncompleted	2009	Substandard material, hasty construction	3 deaths, 11 injured
29	Building under construction	Lagos state	Under construction	2010	Use of substandard material	4 deaths, 12 injured
30	Uncompleted 3-Storey building	FCT	Under construction	2010	Undisclosed	3 deaths, 11 injured
31	Four-Storey building	Lagos state	In use	2010	Structural overload	3 deaths
32	Two-Storey Zenith Bank building	FCT	Not ascertain	2011	N/A	N/A
33	Four-Storey Hospital building	FCT	In use	2011	N/A	N/A
34	Five-Storey Hotel building	Lagos state	In use	2011	N/A	N/A
35	Three-Storey Block of Flats	Enugu state	In use	2012	Structural defects	N/A
36	One-Storey residential building	Anambra state	Uncompleted	2012	Defective material	N/A
37	Two-Storey School building	Plateau state	In use	2013	Structural failure	10 deaths

38	Three-Storey building	Lagos state	In use	2013	Dilapidated structure	7 deaths
39	Six-Storey Guest house building	Lagos state	In use	2014	Structural failure	115 deaths, 131 injured
40	Three-Storey building	Lagos state	In use	2015	Weak structure	Nil
41	Residential building	Lagos state	In use	2015	Gas explosion	3 injured
42	Five-Storey building	Lagos state	Under construction	2016	Violation of approved number of floors	32 deaths
43	Four-Storey Shopping Plaza	Ogun state	Under construction	2016	Under investigation	1 death
44	Three-Storey building	Rivers state	Uncompleted	2017	Structural failure	Nil
45	A Storey building	Lagos state	In use	2018	Deteriorated structural framework	2 deaths
46	Itafaji school building collapse	Lagos state	In use	2019	Structural defect	45 person survived the incident
47	Two storey building at No. 8, Freeman street Lagos	Lagos state	In use	2020	Weak structure	1 death, 5 rescued

Source: Kolawole (2018)

## HOW TO CONTROL THE MENACE OF BUILDING COLLAPSE IN NIGERIA

The danger of building collapse in Nigeria can never be over emphasized, building collapse has many effects on the economy of nations as a whole, it can also leads to loss of lives and property, waste of properties, discouragement of property development and scarcity of proper and so on.

Building collapse in Nigeria are man-made and not natural disasters, therefore, they are avoidable. Building collapse can be control if all building design are carried out by qualified professional Architects and Engineers and other relevant professional. The prospective developers must be enlightened on the respective roles of foreman, Civil Engineers, Builder, Architects and in

addition, qualified Town Planners should always inspect and approve building plan appropriately. Moreso, Architects should restrict their activities preparation of drawing and verification, visits to sites and should not be involve in Jack – of – all – trade by insisting in supervision of building (Adewumi, 2009 cited by Akande, *et al.*, 2016).

There should be mutual respect among professional bodies. There should be massive sensitization and awareness campaign amongst the professional in the building industry on the danger in the use of inferior and substandard building materials and standard organization of Nigeria (SON) should mandated that substandard material are not sold in the market, while the COREN, CORBON and NSE should come up with a Nigeria Local Code of Practice rather than “Copy and Paste” of the existing foreign base ones that might not be appropriate in Nigeria. Based on the discussions above, if the following steps are followed, it will ameliorate the menace of building collapse in Nigeria.

#### **Discouragement of unapproved construction:**

Building developers should be compelled to comply with approved building regulations before the construction of their buildings and that all building construction works should be well designed and supervised by a registered member of Architects Registration council of Nigeria (ARCON), Council for the Regulation of Engineering in Nigeria (COREN) and council of Registered Builders of Nigeria (CORBON).

#### **Engagement of Competent Professional.**

The employment of the qualified personnel is key to the success of any construction project. Government and other concerned agencies should screen those getting involved in housing projects. Professional in the building industry should maintain their integrity and professional ethics. Construction work should only be carried out by registered and competent professionals rather than engaging unskilled contractors.

#### **Frequent maintenance**

Maintenance culture in Nigeria is nothing to write home about, Even majority of the basic infrastructures in the country lack proper maintenance not to talk of the structures.

Maintenance should be carried out in building periodically, to keep the building in good condition always to make it last long.

### **Lubrication soil test**

This is very necessary so as to know the strength of the soil, if it can bear load or not and to determine the type of foundation to be used since the foundation design is the strength of the building.

### **Appropriate Design**

The building design must be given to the professional. The plan drawing to the Architect, the structural, electrical and mechanical drawing should be done by the Engineers. And the drawing should have good drainage and ventilation openings that is well positioned, to enable the building to have good strength, durability, stability and to achieve thermal comfort.

### **Quality Materials**

Quality materials should always be used and must be tested before usage. Cost should not be minimized to get a quality and standard building materials. To prevent dangers.

### **Conclusion**

Building collapse in Nigeria is very disastrous and devastating causes were identified as mainly man-made but less often by forces of nature. Corruption as man-made factor manifest in greedy Contractors and the tendency of client or developers to fraudulent resulting to the use of inferior and substandard building materials, use of quacks and unskilled personnel for building works and services, even building without plan approval. There should be a review of existing building laws that should guide standard code of practice to guarantee safety of buildings.

Professionals and everyone involved in the building project must ensure that there is strict adherence to the required standards, specifications and method of construction without compromise. The Government at all levels should also intensify public enlightenment, placing emphasis on how building failure could be prevented rather than managing situations which must be dangerous. And also see to it that building laws and codes are strictly adhered to before and

during construction and throughout the life cycle of the building. This would enable everyone involved in building and construction industries to do their jobs appropriately.

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