

Incessant Collapse Of Buildings In Nigeria: An Architect's View

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Abstract

Collapse in Buildings could be total or partial failure of one or more components of a building leading to the inability of the building to perform its principal function of safety and stability. Collapse of buildings is a universal problem that has eaten deeply into the fabrics of the construction industry, of which very little has been done to curb the menace. Nigeria like many other countries is witnessing building collapse at alarming rate. In Abuja, the Federal Capital Territory, Lagos, Lagos State, Port-Harcourt, Rivers State, Ibadan, Oyo State and Kaduna, Kaduna State to mention but few, many cases of collapsed buildings have been noted. The incessant collapse of buildings in Nigeria is a major concern not only to the professionals that are associated with construction industry, but also to the clients and the eventual users. In an attempt to find lasting solution to some of the causes and effects of building collapse, this paper examines types of collapse, some of the major causes of building collapse, such as bad design, faulty construction, foundation failure, and fire problem as well as remedial measures. Finally, useful suggestions were proffered towards successful implementation of the corrective measures.

Key Words: architect, buildings, collapse, construction, design

Introduction

The place and priority of buildings to man's existence and survival as he lives and carries out his activities within them is important. Despite this fact, maintenance of the existing housing stock in habitable condition still remains a great problem to be solved in Nigeria among other countries in the World, (Olagunju, 2011). Buildings, either as temporary, permanent or monumental structures needs to be properly planned, designed, constructed and maintained to obtain the desired satisfaction, comfort and safety. The desired satisfaction, comfort and safety tend to be threatened when the building failed to perform any of its principal functions of satisfaction, safety and stability. Building failure may be as a result of a total or partial failure of one or more components of a building structure.

Building failure is a defect or imperfection, deficiency or fault in a building element or component. It may also be as a result of omission of performance. The degree of building failure can therefore be related to the extent or degree of deviation of a building from the "as – built" state which is in most cases represent the acceptable standard within the neighbourhood, locality, state or country. (Ikpo, 1998). Failure in building could also be of two types, namely, cosmetics and structural failure. The former occurs when something has been added to or subtracted from the building, thus affecting the structural outlooks. The later affects both the outlook and structural stability of the building (Ayininuola and Olalusi, 2004). In line with the above assertions, building collapse can simply be defined as a total or partial/progressive failure of one or more components of a building leading to the inability of the building to perform its principal function of comfort, satisfaction, safety and stability.

In Nigeria like any other countries in the world, building collapse menace is growing at an alarming rate, seemingly uncontrollable or beyond easy control. Example of these are abound, namely Multy-storey building, Mokola, Ibadan, Oyo State (1974), Barnawa Housing Estate, Kaduna, Kaduna State (1980), Mosque building, Osogbo, Osun State (1986), Uncompleted Two-storey building, Isinkan, Akure, Ondo State (1998), Two-storey residential building, Funbi Fagun street, Abeokuta, Ogun State (1998), On-going construction of one-storey building, Benjamin Opara street, Port-Harcourt, River State (2006), Nigeria Industrial Development Building (NIDB), Lagos (2006) – see plate

1, and a two-storey market plaza in Oshodi, Lagos (2010), killing at least four persons and leaving many others wounded.

Plate 1: Collapsed Nigeria Industrial Development Bank (NIDB), Lagos Island, Lagos.



Source: Author, 2006

The incessant buildings collapse in Nigeria has become a great concern to all the stakeholders – the professionals in building industry, government, private developers, clients and users, as well as the neighbourhood residents. Fall out of the author's concern about the increasing incidents of collapse building nation-wide form the basis for this paper to find out the major causes and probable remedial measures to collapse of buildings in Nigeria.

Causes of Building Collapse In Nigeria

In Nigeria, building failure have been attributed to the causes such as design faults (50%), faults on construction site (40%), and product failure (10%) (Oyewande, 1992, Ayininuola and Olalusi, 2004, Ayuba, Olagunju and Akande, 2012). In agreement with the above, Hall (1984) equally ascribed faulty design, faulty execution of work and use of faulty materials to be major causes of building collapse.

Generally, causes of building collapse can be classified under seven major factors, namely,

- i. Bad design
- ii. Faulty construction
- iii. Poor quality of materials and construction methods
- iv. Foundation failure
- v. Fire problem
- vi. Natural phenomena
- vii. Inadequate Maintenance

i. **Bad Design:** Bad design does not only mean poor architectural design, but it involved some other professional's design inputs. The Architect may contribute by starting design without adequate visibility study. This may include the authenticity of the land and nature, soil adequacy, site inventory and analysis. Others may include, inadequate or poor design details, poor supervision, sub-standard material specification and faulty or lack of maintenance schedule. Engineers may also contribute through failure to carry required tests such as foundation and soil analysis. It may also be through errors of computation, use of inaccurate data, improper choice of materials and ignorance of the effects of repeated stresses.

ii. **Faulty Construction:** Studies have revealed that faulty construction contributed up to 40% to structural failures in building collapse occurrences. In many occasions, failure of contractors to build according to the plans and

specifications or poor mixing and placement of concrete contributes largely to structural failures. Others may include formworks vertical or lateral overloading, unstable bearing support and premature removal, all these often leads to collapse of many on-going construction projects. Example of this is the collapse of the on-going construction of one-storey building, Benjamin Opara street, Port-Harcourt, River State (2006) as a result of failure of structural members. These actions are often attributed to contractors' inexperience, lack of care or high profit pursuits.

On the other hand, poor inspection of construction materials and mix ratio by the Engineers may also aid the contractors to perpetrate some of their evils that often lead to incessant structural failures. In this case, contractors may use salty sand to make concrete, substitute inferior steel for the original specified, bad riveting or improper tightening of nuts, bad welding and so on, and all these may lead to collapse of building, if not properly done.

iii. **Poor Quality of Materials and Construction Methods:** Use of inferior material is said to be up to 10% contributory factor to building collapse cases in Nigeria (Oyewande, 1992). Likewise, the use of blocks made by most block industries in Nigeria needs to be discouraged, due to failure of many block industries to use required measures. Mohammed (2004), asserted that while it is good to mix a certain quantity of cement by weight with an appropriate quantity of sand, also by weight, most block moulding industries in Nigeria prefer to mix these materials by volume. He further stated that most block making industries in the country use the same mixture of sand and cement to produce different sizes of blocks.

In some cases, the steel reinforcement used for some project construction may be substandard. For instance, a batch of structural steel, which appear sound might have evaded the quality control checks and in fact could be of substandard quality. (Onyemachi and Uji, 2005). This attitude though very bad, but it is very common among the contractors who likes to cut corners by not using adequate materials as specified. The use of inferior materials and untested local building construction methods often leads to structural failure and eventual building collapse, if not adequately checked.

iv. **Foundation Failure:** A building structure can collapse, if constructed on faulty foundation. Foundation of a building is that part of walls, piers or columns in direct contact with and transmitting loads to the ground. Building collapse as a result of foundation failure can be caused by construction of foundation on poor sub-soil, building not uniformly loaded/inadequate foundation, soil erosion and earth movements.

v. **Fire Problem:** Today, most of the available building materials in the developing countries are not only flammable but also encouraging the spread of fire (Adedoyin, 1983, Olagunju, 2002). This situation often makes a little fire ignition to spread very fast into a large scale fire development in buildings. Fire when fully blown out, both the structure's reinforcements and concrete will be weakened. It is even worse, when the steel reinforcements are exposed to the naked fire, they may fail in the process to provide the necessary support for both the live and dead loads. In the event, it may lead to partial or total collapse of the building. It is therefore pertinent to use high fire resistant materials for building construction and for professionals in building industry to be fire safety conscious, most especially in material specification.

vi. **Natural phenomena:** These may occur in the form of storm, flood, exceptionally high wind or hurricane, thunder, lightning, volcanic eruption and earthquake. These natural phenomena are referred to as "natural disaster" or "the act of God" (Onyemachi and Uji, 2005). Some of the aforementioned are possible factors that are largely responsible for most of the building collapse cases in Nigeria. From a newspaper survey conducted by Arayela and Adam (2001) on the reported cases of incidents of collapse buildings in Nigeria, it was revealed that many buildings collapsed as a result of rain storm. Example of these include, residential building, Ojuelegba road, Lagos (July, 1986), commercial building, ikorodu road, Lagos (September, 1987), 3-storey residential building, Iju-Ishaga, Lagos (September, 1999) and so on.

No one has power or control over natural occurrence, but may be minimised if Environmental Impact Assessment (EIA) is made mandatory to be made available by all developers or building approval applicants before commencement of any building project construction. This will help to determine the feasibility of constructing the building on the proposed site.

vii. **Poor Maintenance:** Buildings start to deteriorate from the time they are completed and from that time begin to need maintenance in order to keep them in good condition. This process of gradual deterioration is unavoidable, but the speed at which it proceeds can be reduced through the manner in which buildings are maintained, (Olagunju, 2011). Thus, the rate of building deterioration depends largely on nature and manner of maintenance. Poor building maintenance can cause weakening of the building structure, most especially when unplanned maintenance type is the building maintenance culture or practice of the building owner/user.

Implications of Building Collapse

Physical damage and psychological trauma are the aftermath effects of building collapse, the degree of which is often beyond easy prediction. Depending on the nature and extent of damage of building collapse incidents, the effects are felt almost in all human endeavours. These effects sometimes include loss of human life, and loss of materials and capital investments, as well as psychological pains.

i. **Loss of Human Life:** Loss of human life has become a common report of most of the collapse building incidents in Nigeria. From the newspaper survey conducted by Arayela and Adam (2001), about two hundred and seventeen (217) people were reported dead with many injured from only fifteen selected cases of building collapse between 1974 and 2001. It is an irreparable loss to both the victims' relatives and the nation at large and thus called for the need to find a lasting solution to forestall its incessant occurrence.

ii. **Loss of Materials and Capital Investments:** When building collapsed, most of its structural components and materials will be damaged often beyond re-use, while capital investments in most cases are not recoverable. This kind of situation, more than often leads to bankruptcy on the part of the investor and high economic implications on the nation's economy. Typical example of this is the collapse of the two-storey building at Bola street, Ebute Meta, Lagos (see plate 2).

Plate 2: Collapsed 2-Storey Building, Bola Street, Ebute Meta, Lagos.



Source: Author, 2006

Remedial Measures

The incessant collapse of buildings in Nigeria can be minimised if not curbed through adherence to some of the following measures, namely,

- i. Soil test, Environmental Impact Assessment (EIA) and structural analysis needs to be made mandatory to be submitted along with the building plans to planning authorities by all the developers or building approval seekers/applicants, especially for all institutional, commercial and industrial buildings.
- ii. All plans for approval must be made to pass through all the professionals associated with building industry working in every State/Local Government Development Control Boards before its final approval.
- iii. All plans for approval must be ensured to be in compliance with the Nigeria's new building code and all the affected local government's byelaws.
- iv. Inspection team must be made to regularly be on the move to inspect all construction works in their locality with the aim of enforcing the building code and the local byelaws.
- v. All the professional bodies associated with the building industry in Nigeria, should jointly embark on enlightenment campaign for the public to be aware of the evils behind quarks involvement in building construction activities and the use of low quality materials, untested building materials and local construction methods.

Recommendations

To achieve a lasting solution to the associated problems with the ceaseless incidences of building collapse in Nigeria, some of the following recommendations should be taking into consideration by all the stakeholders in building industry in Nigeria. These include,

- i. The Federal government and the private sector should jointly encourage further research into causes of structural failures in buildings and standardization of local construction methods in respect of unique traditional building materials available in Nigeria.
- ii. Technical education should be encouraged by both the Government and the private sectors, so as to ensure training of competent skilled labour for building industry in Nigeria.
- iii. Training of new generation professionals and re-training of the practising professionals in building industry about new developments in building industry should be jointly encouraged by all the professional bodies associated with building industry in Nigeria.
- iv. All the professional bodies associated with the building industry in Nigeria, such as Nigerian Institute of Architects (NIA), Architect Registration Council of Nigeria (ARCON) and Nigerian Society of Engineers (NSE) as well as Council of Registered Engineers (COREN) should find a way of curbing, if not to stop quarks operations in building industry.
- v. All the three-tiers of Government in Nigeria should enforce building regulations, byelaws and construction health and safety regulations. This may be done through employment of qualified professionals associated with building industry to properly control building developments and enforce planning laws.
- vi. Government and private sectors should provide enabling environment for proper training of competent skilled professionals in building industry.
- vii. All the stakeholders in construction industry in Nigeria should jointly form construction monitoring team with the planning authority at all the three-tiers of government levels, to monitor all the on-going constructions' adherence to the new national building code and byelaws. Any developer found guilty of negligence should be disciplined appropriately.

Conclusion

Despite the high degree of unbearable and unavoidable physical damage and psychological trauma, the aftermath effects of building collapse, and the efforts of the government and stakeholders, very little has been achieved from the attempts made to curb the menace of building collapse incidents in Nigeria. In an attempt to find a lasting solution to the persistent losses and unpleasant experiences from collapse buildings cases, this paper examines some of the major causes of building collapse, such as bad design, faulty construction, poor quality of materials and construction methods. Other includes fire problem and natural phenomena as well as remedial measures. Finally, useful suggestions were offered towards successful implementation of the corrective measures.

Reference

- Adedoyin, O. (1983). Fire Protection in Buildings, *Nigerian Institute of Architects journal*, Lagos, pp. 5 – 9
- Arayela, O. and Adam, J. J. (2001). Building Disasters and Failures In Nigeria: Causes and Remedies, *Journal of the Association of Architectural Educators in Nigeria (AARCHES)*, Vol. 1, No. 6, September
- Ayininuola, G. M. and Olalusi, O. O. (2004). Assessment of Building Failures in Nigeria: Lagos and Ibadan Case Study, *African Journal of Science and Technology (AJST), Science and Engineering series*, Vol. 5, No. 1, pp. 73 – 78
- Ayuba, P., Olagunju, R. E. and Akande, O.K. (2012). Failure and Collapse of Buildings In Nigeria: The role of professionals and other participants in building industry, *Interdisciplinary Journal of Contemporary Research Business (IJCRB)*, Vol. 4(6), pp1267-1272, ISSN 2073-7122
- Hall, G. T. (1984). Revision Notes on Building Maintenance and Adaptation, Butterwrths and Co., England.
- Ikpo, I. J. (1998). Application of the Weibull Distribution Technique in the Prediction of the Times between Failures (MTBF) of Building Components, *Nigerian Journal of Construction Technology and Management*, Vol. 1, No 1, P. 79 – 87
- Mohammed, S. M. (2004). Appraisal of Sandcrete Block As Walling Unit in Nigeria, *Environmental Watch Journal*, Federal Polytechnic, Bida, Vol. 1, No. 1, pp. 251 – 257.
- Olagunju, R. E. O. (2002). Fire Safety Problems In the Tropics: A Study of The Pharmaceutical Industry in Nigeria, *Journal of Science, Technology and Mathematics (JOSTMED)*, Federal University of Technology, Minna, Vol. 5, No. 1
- Olagunju, R. E. (2011): Development of Mathematical Models For The Maintenance of Residential Buildings In Niger State, Nigeria, Ph.D (Architecture) Thesis, Department of Architecture, Federal University of Technology, Minna, Nigeria.
- Onyemachi, T. C. and Uji, Z. A. (2005). Building Failure and its Implication On Real Estate Investments In Nigeria, *Journal of the Association of Architectural Educators in Nigeria (AARCHES)*, Vol. 4, No. 1, pp. 57 – 63
- Oyewande, B. (1992). A Research for Quality in the Construction Industry, *Builder's Magazine*, June/July Ed., Lagos.

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