

# Curbing the menace of building collapse in Nigeria

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## ABSTRACT

Marcus Vitruvius polio, the Roman writer, Architect and Engineer, was famous for asserting in his book *De Architectura* that a structure must exhibit the three qualities of *firmitas, utilitas and venustas* – that is, it must be strong or durable, useful and beautiful. Hugo Alvar Aalto the Finnish Architect and designer, argued that the responsible designer/Architect must “do no harm” on the end users of such a building nor provide environments unsuitable for their use. Part of the federal Government of Nigeria’s transformation agenda is the *provision of quality and affordable infrastructure* through Housing and Urban Development. But the spate of collapsed buildings in the country has reached an alarming rate. The incessant cases are enough reasons to declare a state of emergency in the construction industry. A building collapse could be a total or partial failure of one or more components of a building leading to the inability of the building to perform its principle function of safety and stability. In an attempt to find a solution to this menace, this paper therefore tries to examine some of the major causes of building collapse and tries to proffer remedial measures that may curb its devastating effects. The paper also briefly outlines its implications on real estate investment and also briefly tries to advice on procedures for rescuing people from collapsed buildings.

**Keywords:** real estate investment; urban development; Marcus Vitruvius; Hugo Alvar Aalto

## Preamble

*“The Federal Government has said that the success of its transformation agenda depends on infrastructure development. It added that though it has three other priorities in the next five years, including good governance, human capital and real sector development, premium is placed on infrastructure projects funding to impact positively on the realisation of the other priorities”* (Chuka Uroko, Bussinesday, Friday, 15 March 2013).

## 1. INTRODUCTION

The pursuit of shelter for all mankind and his activities has always been a paramount issue. Buildings are constructed to serve as shelter for man, his properties and other activities therefore they must be properly planned, designed and erected to obtain desired satisfaction from the environment, (Ayuba, 2007; Olagunju, 2007; Akande, 2007).

However, recent events in places like Abuja, Lagos, Port Harcourt, Enugu, Aba, and other places in the country have seen these buildings as a growing cause of death, loss of property, and has left many people injured, (Ayuba, 2007).

In just 2005, more than 10 buildings collapsed in Lagos and Port Harcourt alone, not to mention those in Abuja, Kaduna and other places not publicized, (Agba, 2005; Awojobi, 2005; Salau, 2005; Sanni, 2005). These buildings either collapsed at construction stage or after habitation (during the building life span), but studies have shown that some buildings in Nigeria collapses during construction stage, (Sanni 2005).

However, it is very important to note that buildings collapse due to a variety of reasons such as bad design, faulty construction, foundation failures, and extra ordinary loads, (Calvert, 2007; Onyemachi, et al, 2005). Earthquakes, hurricanes, tornadoes, floods, avalanches and other weather phenomenon have shown a far greater capacity for destruction, than society has for building structures that will withstand the weather or earth disruptions, (Haruna, 2007). So inasmuch as weather has a role to play as a natural cause for collapsed structures, the September 11<sup>th</sup> shocker on the twin towers in New York City can be termed as a man-made destructive force. In ensuring qualitative housing and urban development, the federal government will do well by ensuring that the menace of collapsed buildings is completely dealt with, or it will simply be providing death traps for its citizens.

## **2. CASE STUDIES FROM AROUND THE COUNTRY**

Building collapse is not peculiar to a state or region alone it's a common problem encountered all over the world. In Nigeria it is widespread in all major cities. It is, however, predominant in the south west and Lagos in particular.

*“Lagos is worst hit. Barely seven months into the year, not less than 15 cases of building collapse had been recorded with about 30 lives lost and properties worth billions of naira lost. Scores are also rendered homeless each time a case of a collapsed building is recorded. The recent incident recorded in Lagos, penultimate Sunday, coming barely two weeks after a similar occurrence claimed eight lives in Ebutte Metta area of the state, was perhaps one collapse too many”* (Daily Independent, Tuesday 5<sup>th</sup> of November 2013).

Cases of building collapse are not restricted by climatology or level of urbanization as they cut across cultural and ethnical barriers. Many cases of building collapse have been reported in Nigeria. For instance, Folagbade (2001) and Chinwokwo (2000) enumerated forty-two (42) cases of building collapse as occurring between 1980 and 1999 in Nigeria while Makinde (2007) listed fifty-four (54) cases occurring between January 2000 and June 2007 alone. Building collapse has also been observed to cut across the different categories of building – private, corporate or public. Folagbade (2001) showed that of the twenty-five (25) reported cases of building collapse between 1980 and 1999 in Lagos State, private (76 %), corporate (12 %) and government or public buildings (12 %) accounted for these proportions. Also, building collapse is no respecter of size of the structure. Amusan (1991) reported that Barnawa flat disaster in 1977 was a three-storey building, a public building (Secondary School) which collapsed in March 1988 at Ibadan was two-storey building, and the collapsed show-room for cars in Lagos in 1987 was just a storey building while that of the Primary School in Iioabuchi, River State in July 1991 was a bungalow building.

**Table 1.** Some of the Reported Cases of Collapsed Buildings in Nigeria (1974-2010).

| S/N | TYPE OF BUILDING STRUCTURE                           | LOCATION OF BUILDING                               | DATE OF COLLAPSE                | SUSPECTED CAUSE(S)                   | REMARKS (LIVES LOST)               |
|-----|--|--|---------------------------------|--------------------------------------|------------------------------------|
| 1.  | Multi-storey Building under construction             | Mokola, Ibadan, Oyo State                          | October 1974                    | Excessive loading/structural failure | 27 people                          |
| 2.  | Partial collapse of an Hostel Building               | O.A.U., Ile-ife                                    | 1976 (1975/76 Academic Session) | Structural Failure                   | Nil                                |
| 3.  | Residential Building                                 | Barnawa housing Estate, Kaduna, State              | August 1977                     | Faulty design                        | 28 people                          |
| 4.  | School Building                                      | Government Secondary school, makarfi, Kaduna State | July 1977                       | Carelessness                         | 7 people                           |
| 5.  | 3-Storey Residential Building                        | Barnawa Housing Estate Kaduna                      | 1980                            | Faulty Structural design             | 6 people                           |
| 6.  | Storey Residential Building                          | Allen Avenue, Ikeja Lagos                          | January 1985                    | Excessive Loading                    | Nil                                |
| 7.  | Residential Building                                 | Adeniji Adele, Lagos                               | February 1985                   | Excessive Loading                    | 2 people                           |
| 8.  | Residential Building                                 | Ojuelegba Area, Lagos                              | May 18, 1985                    | Rainstorm                            | Nil                                |
| 9.  | Residential Building (Uncompleted 4 Storey Building) | Iponri, Lagos                                      | May 20, 1985                    | Structural Failure                   | 13 people                          |
| 10. | Residential Building                                 | Victoria Island, Lagos                             | July 18, 1985                   | Excessive Loading                    | 13 people (all of the same family) |
| 11. | Residential Building                                 | Gboko, Benue State                                 | September, 1985                 | Carelessness                         | 1 person                           |
| 12. | Residential Building                                 | Allen Avenue                                       | 1985                            | Carelessness                         | Nil                                |
| 13. | Residential Building                                 | Adeniji Adele, Lagos                               | 1985                            | Faulty design/ Carelessness          | 2 people                           |

|     |  |  |                    |  |                     |
|-----|--|--|--------------------|--|---------------------|
| 14. | High Court Building  | Isala Area, Imo State                      | February 1986      | Structural Failure   | 2 people            |
| 15. | Mosque Building  | Oshogbo, Osun State                        | May, 1986          | Structural Failure   | 2 people            |
| 16. | Residential Building   | Ona Street Enugu, Enugu State              | 1986               | No Investigation   | 2 people            |
| 17. | 2-Storey Building under construction   | Agege, Lagos                               | May 9, 1987        | Structural Fault   | 2 people            |
| 18. | Residential Building   | Idusagbe Lane, Idumota Lagos               | September 14, 1987 | No Structural Design   | 17 people           |
| 19. | Commercial Building  | Ikorodu Road, Lagos                        | September 1987     | Rainstorm  | 4 people            |
| 20. | Residential Building   | Calabar, Cross River State                 | October 9, 1987    | Rainstorm  | 3 people            |
| 21. | 6-storey Hotel Building  | Akinwunmi street, Mende Village, Lagos     | October 1989       | Faulty design  | Nil                 |
| 22. | Bungalow School Building   | Port Harcourt, Rivers State                | June 15, 1990      | Ignorance of the owner and absence of structural design      | Nil                 |
| 23. | 6-storey Hotel Complex   | Okupe Estate Maryland, Lagos               | 1993               | Structural Failure   | Not Known           |
| 24. | Multi-purpose Indoor Sports Complex Storey   | Area 10, Abuja                             | March 1993         | Structural failure/Poor workmanship                          | Not reported        |
| 25. | Multi-storey Building NICON-NOGA Staff Housing Project   | Karo, Abuja                                | March 25, 1993     | Structural failure/use of incompetent people for Supervision | Not reported        |
| 26. | A Mosque Building under construction   | Abeokuta Ogun State                        | 1995               | Structural failure/use of incompetent people for Supervision | 2 people            |
| 27. | Storey Building (under construction)   | Central Lagos                              | October 5, 1995    | Poor workmanship/ structural failure                         | 10 people           |
| 28. | 3-storey Church Building   | Lagos                                      | October 30, 1995   | Structural failure   | 6 people            |
| 29. | School Building  | Alagbado Area, Ibadan Oyo State            | October 1995       | Poor workmanship   | Nil                 |
| 30. | 3-Storey Building  | Oke Igbala Area, Ibadan Oyo State          | October 1995       | Structural failure   | 6 people            |
| 31. | 1-storey Building under construction but being used as church (Earlier approved as a bungalow) | Olowookere street, Mafoluku, Oshodi, Lagos | June 1996          | Structural Weakness  | 7 people            |
| 32. | Storey Building under construction   | Lagos State                                | March 13, 1996     | Structural failure   | People only injured |

|     |   |   |                 |   |                |
|-----|---|---|-----------------|---|----------------|
| 33. | 6-Storey Building under construction (being used as Nursery/Primary School) | Lagos State   | October, 1996   | Use of quacks/Structural Failure                                  | 1 person       |
| 34. | 2-Storey Building   | Amu Street, Mushin, Lagos                               | June, 1997      | Use of poor materials/structural failure                          | Nil            |
| 35. | Duplex Building   | Gwarinpa Area, FCT, Abuja                               | 1998            | Structural failure  | 2 people       |
| 36. | 3-Storey Residential Building   | Ibadan, Oyo State                                       | 1998            | Faulty, Design/Poor workmanship                                   | Several people |
| 37. | 4-Storey Church Building (under construction)                               | Akure, Ondo State                                       | October 1, 1998 | Structural failure/Poor Supervision                               | 8 People       |
| 38. | 2-Storey Residential Building   | Rd 3, Plot 10, Funbi Fagun Street, Abeokuta, Ogun State | November, 1998  | Use of poor materials/structural failure                          | Nil            |
| 39. | 3-Storey Residential Building   | Ojuelegba, Western Avenue, Surulere, Lagos State        | 1999            | Carelessness/use of poor materials                                | 4 people       |
| 40. | 1-Storey Residential  | Adeola Odeku Street, Victoria Island, Lagos             | 1999            | Rainstorm   | Not reported   |
| 41. | 3-Storey Residential Building   | Charity Road, Oko-Oba, Lagos                            | June 1999       | Structural failure  | Nil            |
| 42. | 3-Storey Residential  | Four-square Gospel Church Abuja                         | October, 1999   | Faulty design/Implementation                                      | Not Available  |
| 43. | 1-Storey Residential Building   | Obawole street, Iju, Agege, Lagos                       | October, 1999   | Structural failure  | Nil            |
| 44. | 3-Storey Residential Building   | Iju-Isaga, Lagos  | August, 1999    | Structural Faulty/Rainstorm                                       | 35 people      |
| 45. | 2-Storey Residential Building   | Dawodu street, Ifo, Ogun State                          | October, 1999   | Rainstorm   | 20 people      |
| 46. | Residential Storey Building   | Idi-Oro, Mushin, Lagos                                  | 2000            | Faulty Design/Carelessness  | Not Available  |
| 47. | Estate Building   | Ajah, Along Lekki Road, Lagos                           | April, 2000     | Structural Failure  | Nil            |
| 48. | 2-Storey Mosque Building  | 21, Buhari Street Mushin, Lagos                         | April 2001      | Unauthorized Conversion of former Bungalow to 2-Storey Building   | 7 people       |
| 49. | 1-Storey Residential Building (under construction)                          | Iwoye-Ijesa, Osun State                                 | 2001            | Structural failure/ use of quacks for supervision                 | 7 people       |
| 50. | Multi-storey Commercial Residential Building                                | Ebute-Meta, Lagos                                       | 2007            | Unauthorized conversion/poor supervision/use of quality materials | Several people |

|     |   |   |                                  |   |  |
|-----|---|---|----------------------------------|---|--|
| 51. | Multi-Storey Building   | Kano  | 2007                             | Faulty design/structural failure  | Several people                           |
| 52. | A Building being used as Nursery/Primary School               | Olomi Area Ibadan, Oyo State                    | March 25, 2008                   | Use of poor materials carelessness  | 13 pupils                                |
| 53. | 5-Storey Shopping Complex Building under construction         | Wuse Area, Abuja                                | 2 <sup>nd</sup> August, 2008     | Structural failure incompetency/bad workmanship   | 2 people injured and 100 people trapped. |
| 54. | 2-Storey Residential Building under construction              | Asero Area, Abeokuta Ogun State                 | 30 <sup>th</sup> August 2008     | Contravening the given planning Approval, use of substandard materials incompetency, etc.   | 2 people                                 |
| 55. | 6-Storey LAUTECH Teaching Hospital Complex under construction | Ogbomoso, Oyo State                             | 19 <sup>th</sup> February, 2009  | Use of substandard materials, poor workmanship/supervision  | 5 people                                 |
| 56  | A wall fence  | Aghaji crescent, GRA, Enugu                     | 10 <sup>th</sup> August, 2009    | No proper drainage  | 1 person                                 |
| 57  | Uncompleted Building  | Oke Padre Street, Ita-morin, Abeokuta           | 18 <sup>th</sup> October, 2009   | Use of substandard materials, hasty construction  | 3 people, 11 injured                     |
| 58  | Building under Construction                                   | Isopakodowo Street Cairo, Oshodi, Lagos         | 26 <sup>th</sup> April, 2010     | Use of Substandard building materials   | 4 people, 12 injured                     |
| 59  | Uncompleted Storey building                                   | Adenike Street off New market, Oniru Estate, VI | 2 <sup>nd</sup> June, 2010       | Use of Substandard building materials, Non-compliance of house-owners and developers with approved building plan and weak structure | 1 person, 2 injured                      |
| 60  | Uncompleted 4-Storey Building                                 | 2 Okolie Street, off Gimbiya Street in Abuja.   | 11 <sup>th</sup> August, 2010    | Substandard materials and disregard for building regulations  | 23 people, 11 injured                    |
| 61  | 4 Storey Building   | 24 Alli Street off Tinubu Street, V. I.         | 28 <sup>th</sup> September, 2010 | Structural Defects/overloading  | 3 people                                 |

Source: F. I. Olabosipo and O. O. Adedamola, 2010.

Folagbade (2001) also reports that the Abuja building which collapsed in March, 1993 and the one at Ojuelegba in 1999 were both multi-storey buildings. The memory of the incidents of two separate building collapses that occurred at Ebute-Meta area of Lagos State and Kano State which killed several people in 2007 still lingers on. Also reported was the fence of a Nursery and Primary School that collapsed at Olomi area, Ibadan, in March, 2008, thereby killing thirteen (13) pupils of the School. The death of over 50 students of Saque Comprehensive College, Port Harcourt in 1990 was as a result of the owner attempting to construct additional floors on structurally unsafe walling. Similar trends of conversion were observed in a collapsed Mosque building in Mushin area, Lagos in 2001 and multi-storey

commercial/residential building in Ebute-Meta also in Lagos state in which several people were killed. Some of the cases of building collapse are also as a result of ignorance on the part of developers and unauthorized conversion of buildings. Amusan (1991) asserts that the 1988 building collapse at Mushin, Lagos occurred when an attempt was made to raise the existing building by another floor. Also, operational conversion caused the collapsed school building at PortHarcourt. Fagbenle and Oluwunmi (2010).

### Nigerian Building Collapses In 2011

| STATE          | Date           | Storeys  | Location            | Deaths | Injuries | Constuction Ongoing/Old |
|----------------|----------------|----------|---------------------|--------|----------|-------------------------|
| Enugu          | April/May 2011 | Up to 4  | Three (3) locations | -      |          | Ongoing                 |
| Sokoto         | 20/6/11        | Mud wall | Sokoto Wall         | 2      |          | Old                     |
| Abuja Outskirt | 29/6/11        | 2        | Mararaba Bank       | 2      |          | Ongoing                 |
| Abuja          | 19/8/11        | 3        | Mpape Hospital      | 2      |          | Ongoing                 |
| Oyo            | 2/7/11         |          | Ibadan              |        |          |                         |
| Anambra        | 5/8/11         | 2        | Awka Residential    |        | 17       | Ongoing                 |
| Lagos          | 13/3/11        | 5        | Ikeja Hotel         |        | 1        | Ongoing                 |
|                | 5/7/11         | 4        | Idumota Residential | 5      |          | Old                     |
|                | 15/7/11        | 2        | Ketu Residential    | 2      |          | Ongoing                 |
|                | 20/6/11        | 3        | Island cold-room    |        |          | New                     |
|                | 7/10/11        | 3        | Ajao Estate         | -      |          | Ongoing                 |
|                | 20/8/11        | 3        | Lagos Isl           |        | 4        |                         |
|                | 26/8/11        | 6        | Aderigbe str        | -      |          | Old                     |
|                | 26/10/11       | 6        | Maryland            | -      |          | Old                     |
|                | 29/11/11       |          | Ikeja               | -      |          | Old                     |
|                | 5/12/11        |          | Badagry School      | -      | 3        | Old                     |

Source; Danladi Matawal, 2013.

### 3. CAUSES OF BUILDING COLLAPSE

In Nigeria building failures have been traced to the root causes which includes;

- Design faults – 50 %
- Faults on construction site – 40 %
- And product failure – 10 %

(Oyewande, 1982; Ayininuola and Olalusi, 2004)

Hall, (1984), agreed and equally ascribed faulty design, faulty execution of work and use of faulty materials to be major causes of building collapse. Causes can then generally be classified under six major factors;

1. Bad design: these include architectural designs and other professional inputs. Starting a design without proper feasibility studies, soil tests and analysis etc. Also, inadequate or poor design details, poor supervision, substandard materials specification and faulty or lack of schedules.it also includes errors of computations, use of inaccurate data etc.

2. Faulty construction: studies have revealed that faulty construction contributes up to 40% to structural failures in building collapse occurrences. These may arise due to failure of contractors to build according to the plans and specification or also due to poor mixing and placement of concrete. It may also include unstable bearing support for formwork or early removal.
3. Poor quality of materials and construction methods: the use of inferior materials probably has a 10 % causative effect on the collapse of buildings (Oyewande 1992). Most block industries in Nigeria prefer profit to safety hence the precarious desire to mould as many blocks as possible from a single bag of cement. In some other cases you find out that most contractors prefer to use substandard steel for reinforcements.
4. Fire outbreak: 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 is the reason why a little fire ignition spreads very fast into large scale fire development in buildings. When the fire is blown out it weakens the structures reinforcements and concrete. It becomes even worse when the steel reinforcements are exposed directly to the 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 makes it very important then to use materials with high fire resistant characteristics for building constructions. Also professionals should be conscious of this and apply the right specifications to them.
5. Natural phenomena: this includes the occurrence of floods, storm, exceptionally high wind or hurricane (Katrina, Ike, Gustav, Anna, Norbert, etc.), thunder, lightning, volcanic eruption and also earthquakes. These are factors that greatly affect building collapse, though most of them cannot be related to the Nigerian experience.

#### **4. REMEDIAL MEASURES**

- a. Soil tests, Environmental impact assessment (EIA) and structural analysis needs to be made mandatory to be submitted along with the building plans to planning authorities by building approval seekers.
- b. All plan for approval must be made to pass through all the registered professionals associated with the building industry before its final approval.
- c. All plans for approval must be ensured to be in compliance with the new building code and all the affected local government's bye laws.
- d. Inspection teams must be made to regularly inspect all construction works in their locality with the aim of enforcing the building code and local bye laws.
- e. All professional bodies related to the construction industry should embark on enlightenment campaigns jointly for their members and also the public so as to create awareness on the evils and risks involved in the use of unqualified hands or better known as quacks.

#### **5. IMPLICATIONS ON REAL ESTATE**

The implication of building collapse on real estate investments are numerous. The effects are felt in virtually all sectors of human endeavour in particular as it affects real estate investment are as follows;

1. Cost in real terms
2. Cost in relation to materials
3. Loss of human lives
4. Loss of capital invested in the property
5. Loss in rents return /profits etc.
6. Loss of interest on capital used for investing in the property;
7. Depreciation of value in the property
8. Loss of title to land.

## **6. RESCUE FROM COLLAPSED BUILDINGS**

As many as one third of all building collapse victims, that are rescued, are found in spaces created by the way that building materials generally fall (Staten 2007; Mendis, 2007). Most of the collapse configurations that occur create voids in which people may be trapped and remain alive.

Most rescue experts agree that building collapse extrication must be a process of vertical removal, rather than horizontal movement or reduction. The safest way to remove debris from someone that is buried should involve carefully lifting the debris from above the victim and continually shoring the sides of the entrance hole or excavation to ensure against additional collapse.

In the case of building collapses, the magnitude of the shoring efforts and the type of equipment necessary to perform the rescue may be very different from the normal extrication. In order to facilitate vertical removal of debris, it may be essential to quickly locate and utilize various types of cranes and other types of overhead lift capabilities.

It is strongly suggested that every rescue system have previous knowledge of and training for the use of heavy construction equipment. Emergency dispatchers should have access to a list of construction companies and other businesses that could provide this type of equipment on a 24 hour a day – seven days a week basis.

## **7. CONCLUSION**

Government's failure to implement reports and the sanctions recommended on collapsed buildings has been blamed for the growing rate of building collapses in the country. Since the first cases of building collapse was recorded up until the latest one in Lagos, no single individual or group has been indicted in any of them. If the government is serious and not actually playing lip service, to its transformation agenda, it must provide and ensure that the private sector also provides safe structures for people to dwell in.

### **Recommendations**

1. The government at all levels should evolve the right policy framework for transformative urban development especially with regards to quality control at the construction stages of buildings.
2. More awareness campaigns should be carried out by the three tiers of government and their agencies on the need for compliance with the appropriate building regulations (e.g. among contractors, professionals, stakeholders and the general public) and the danger associated with their non-compliance/evasion.

3. The town planning authorities should maintain competent professionals in the relevant areas for design approval and from a long term perspective, provide the necessary training moreover; there should be regular monitoring visits to all the construction sites with a view to ensuring compliance with the approved building plans.
4. More attention should be focused towards the private or informal sector, with a view to curbing their excesses.
5. Policy makers in the country should be less suspicious of professional advice as such advices are based on predetermined principles and deviation which may result in predictable consequence in the near future.
6. There is a need to for further awareness-raising on the dangers in patronizing incompetent people for construction activities.
7. Government should be ready to tackle the problem of building neglect in the form of legislation, enforcement, support and assistance, publicity and education.
8. Stiffer penalties (such as jail or death sentence) should be placed on owners of collapsed buildings and the project handlers in the country, especially where loss of lives is involved. It will serve as a deterrent to the practices of carefree developers in the country.

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