



**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH  
TECHNOLOGY**

**THE COSTS AND EFFECTS OF BUILDINGS STRUCTURE FAILURES IN A  
DEVELOPING SOCIETY (THE NIGERIAN EXPERIENCE)**

**Gana. A. J\*, Dr. Engr.**

\* OREN Regd, MNSE, MNICE, Istructure Lond (U.K.), ICE Lond (U.K) Civil Engineering Department  
College of Science and Engineering Landmark University Omu-Aran, Kwara State.  
Engr. Okoye. S. S. C. Civil Engineering Department Federal Polytechnic Bida  
P. M. B. 55 Niger State

---

**ABSTRACT**

The incidence of buildings structural failures leading to the collapses of buildings in Nigeria in the recent past, leading to huge cost and its effects has become vexatious, menacing and embarrassing to the public and the individuals. This paper examines the cost implication and the effects of building structural failures on human's lives, material resources and the development of the country. The paper also discussed the causes of building structural failures and recommendation.

**KEYWORDS:** Building structural failures, costs, effects.

---

**INTRODUCTION**

The impact of building structural failures in a development society like Nigeria has been accepted as a major factor that has led the country into diverse losses for some decades now. Experts and many professionals have done a lot in the area of Research findings to Ascertain what the country and individuals usually gain any time buildings that are Structural Build collapse, but the end result usually proved negative and worrisome. This is to prove that the cost and effects of building structure failures has nothing to add to the development and growth of the country than a waste of human's lives, material resources and huge amount of money invested in the erection of such buildings either for public, commercial and residential usage. The above phenomenon certainly call for quick and fast attention, if only the government at federal, state, local government, co-ordinate bodies will have a re-visitation and individuals to the damages that have been done to the economy of the nation, lives and properties wasted without proper accountability on the cost and effect of building structural failures in many parts of the country in few decades past.

**AN OVER VIEW OF BUILDING  
STRUCTURAL FAILURES IN NIGERIA**

Buildings are generally structures that serves as shelters for man's living, his properties and his daily activities. It is believe that buildings are properly planned, designed and constructed to attained the

desired satisfaction from the environment. The factors to be observed in building that are constructed includes durability; adequate stability to prevent it's failures or discomfort to the users, resistance to weather, fire out break and other forms of accident.

Structural failures in buildings are unaccepted difference between expected and observed performance. A structural failure can be considered as occurring in a component when the said component can longer be relied upon to fulfill its principal functions. F. Alime (2012) states that limited deflection in a floor that causes a certain amount of crack and distortion in portions could reasonably be considered as defeat, but not a failure, whereas excessive deflection resulting in serious damage to partitions, ceilings and floor finishes could be classified as a failure. Structural failures in buildings is therefore the failure of all or substantial part of a Building, where full or part of a Building, where full or partial replacement may be required. By relevant agencies or experts.

**DISCUSSION**

**Some main causes of structural failure towards  
collapse of buildings**

A Building generally comprises of the following structural elements (components):- Beams, Slabs, Staircase, Columns, Foundations, etc. each of these structural elements are of different types and shapes,

and failures with each of the above elements are discussed below:-

- i. A good structural design must satisfy three basic requirements, which are **strength**-The strength requirement is to ensure that the structure is capable of carrying the applied loads.
- ii. **Serviceability** – This is related to deflection, excessive vibration, fatigue, fire resistance, durability, etc. suffered by the structure. The condition of the complete structure must be such that the users should not be afraid of the structure being constructed for use.
- iii. **Economy**- This is the final aim of the designer, and the aim would be of maximum strength at minimum cost within the bounds of specified serviceability conditions. Among the several factors influencing economy are:-
  - a. The cost of the materials
  - b. The types of the structure
  - c. The condition of the site-soil types and wind loads.

The factors used in design calculations take care of the foreseeable but non-assessable circumstances. Where all the factors are NOT properly considered by the Engineer, structural failures are inevitable.

#### **Non-conformity with quality control standards**

Quality control (QC) is a continuing process that is part of a quality assurance (AQ) program. Good Engineering practice requires procedures to be established and checking material product quality. The various codes of practice outlined the procedures for checking quality of construction materials for different periods and seasons. Where the civil Engineer did not comply to current standards, the end result of his structural design will be a failure

#### **Wrong Analysis:- A structural analysis is usually aim at determining the following**

- i. The types of shape of element to use in the design
- ii. The forces and moment on the structures
- iii. The appropriate types and sizes of reinforcement required for structural Elements.

#### **Over loading of the structure**

All structural components in a building are usually design with specific loading consideration. The

consideration for this is on dead and live loads. The dead loads include the self-weight of the structure element being. Considered, plus all the self weight of permanent fixtures of the elements. The live loads includes the weight of stored materials (movable material) and liquid, load imposed by vehicle and moving equipments. They also includes such things as furniture, human beings, books, water etc. Failures usually occur in structural elements when the Engineer assumed any loading value more for the structural element (e.g. Beam) can carry, without consulting specific codes (.g British standard) during the design period. Sometimes, failures can occur during the life use of the structure by the users when it is over loaded.

#### **The use of every weak and poor quality construction materials on site:-**

Structural failure occur in building where poor quality building materials are been used or wrong techniques is employed by the supervisor on site. A poor quality materials and workmanship can only be employ where it has been wrongly specified and used by incompetent hands or where there is a deliberate attempt to compromise quality for cost. Accounting to Nurudeen (2003), the use of wrong materials directly influence by the construction personnel on site can result in structural failures. Therefore, the caliber of people in-charge of construction site calls for attention.

#### **WRONG USE OF THE STRUCTURE**

Buildings are usually designed for specific uses and loading conditions. The use and conditions for residential buildings (e.g, self contained dwelling units, houses, schools, hotels, etc.) places of public assembly (e.g, Factories, workshop, etc) and commercial and industrial buildings (e.g, Factories, workmanship, etc) are all for different uses, and are always designed with specific loading conditions. The moment the change of use and loading conditions are violated, with time failures will occur in the structural components of the building that will lead to collapse.

A similar situation occurred at iddo in Lagos main land government area on 6<sup>th</sup> July, 2009, The news papers report has this to say;

*“One of the corporations ware houses turned to two-story residential building without improving on the structure collapsed,*

*claimed eight lives and thirty-six people injured”*

**The consultant’s Role:-** The architects Civil / Structural Engineers, Electrical Engineers, mechanical Engineers, quality surveyors and other specialist are professionals that constitute the consultant office for any project. Some of their functions are as follow:-

- i. Preliminary investigation for the proposed project
- ii. Designs, drawings and specifications necessary for the practical execution of project
- iii. Professional advice to the client on cost, materials, contract documents and project progress
- iv. Administration of the contract between the contractor and the client
- v. Advisor as regards construction issues and solving them.
- vi. Regular visit to the projects sites. Failures in the above functions can affect the successful completion of the project

**The supervising Engineers:-** Then question that is always asked is this: Are there always qualified and registered civil/ structural, Mechanical Engineers, etc on construction site? If they are available, are they committed to the supervision under their care? If they are committed, are they well paid by those who employed them? It is only in the absence of the above very important professionals will such incident of structural failures will be experienced.

**The main contractor in site:-** The main contractor on site is not there to execute the construction project alone, but also to make profit for himself. His first loyalty is not to the client or the organization that owns the project. If serious supervision is not given to the contractor’s workers, especially with the use of construction materials on site, the execution of the project can be done anyhow, and this can lead to the failure of the structure.

**The sub-contractor on site:-** The sub contractor is the person who receives part of the project to be executed from the main contractor on site. Where this happens, the sub-contractor can decide to execute this work anyhow without following the guidelines for project. He may decide not to take any instruction from the supervisor on site. This sometimes happens when there is misunderstanding between him and the main

contractor on site. The misunderstanding can lead to a poor performance of work which can result into project failures.

**Desire for project Execution by the client:** Execution of the construction procedures is primarily the duties of contractor. There are cases where some clients would want to execute the project, select **sub-contractors, control cost, expedite equipment** and materials, delivery to site, and also keep the records of work on site. “A similar situation occurred where the client became **all and in all** on the two-storey building project that collapsed on 20<sup>th</sup> July, 2009, as reported by Nigerian Tribune, and ended up claiming four lives with several others injured.

**The use of Unqualified professionals:-** There are professionals within the Engineering circle that can not handle some Engineering projects. This is as a result of their professional training and education in their professional training and education in their chosen field. There are those who claimed to be experts as a result of years of experience on job, but they are not even registered or licensed to practice according to the level of their training. Where a bricklayer becomes an Engineer overnight in a construction site, there will be trouble with that project. This was one of the points mentioned on the two-story that collapsed above.

**Involvement of Non-professionals:** we have had cases in Nigeria where those in Authority and holding big positions had to decide when a construction project should stop and continue without proper judgment. Implications of their judgment. Final decision is sometimes taken on the project without the proper consultation to the professionals on the project. A similar situation occurred in Asokoro Abuja on 30<sup>th</sup> July 2009, when a two-storey building collapsed completely, and with the mercy of God eleven people were rescued alive from the building.

**Insincerity, fraud and corruption:-** Failures in building projects can easily be summarized as fraudulent activities and corruption. The contractor is usually the facilitator as he collides with the Consultant and other representatives of the Client on the Project to cheat the client. Corruption or fraud has become one of the easy ways to make it both in the public and private sectors of the economy. The only way out of this menace is a complete reorientation of our value system.

**Extraordinary loads:-** There are often natural, such as repeated heavy snowfalls, or the shaking of an earthquake, or the winds. A building that is intended to stand for some years should be able to meet these challenges. Earthquakes may cause foundation problems when most filled land liquefies.

F. Atume (2017) attributed Building structures failures to the following :-

- Corruption
- Lack of supervision
- Bad governance
- Misuse and abuse of Authority by those in Authority especially some of the professionals
- Insufficient quality control and standards
- Lack of sanctions against earning professionals and landlords
- Law less ness and our presumptions that any Engineer or professional in the built environment can assume all forms of responsibility in a building process without the basic skill required for it
- Illegal conversion of buildings which often lead to structural deficiencies
- Non adherence to approval regulations
- Lack of solid investigation and improper interpretation of site conditions
- Negligence
- Unethical dealings between project promoters and the relevant planning Authorities
- Non-involvement of registered professionals in one or more stages of the project
- Poor bad construction practices
- Incompetent and low quality workmanship
- Greed
- Corner cutting by client or the contractor
- Hasty construction
- Use of poor quality materials
- Construction by all corners due to the perception of Engineering as an easy access window to make quick money.

D. Jambol (2017) also attributed Building structural failures to the following conceptions:-

- Poor inadequate designs
- Quackery
- Poor workmanship

- Incorrect methods of construction
- Lack or inadequate skilled craftsmen or artisans fakes and adulterated building materials
- Fakes and adulterated building materials
- Inadequate quality of supervision

### EFFECTS OF BUILDING STRUCTURAL FAILURES

The effects of building structural failures cannot be overstated. Ede (2010) believes that “each collapse carries along with it a tremendous effects that cannot be easily forgotten by any of it victims. The consequences are usually in the form of economic and social implications. These includes loss of human lives, injuries, Economic waste in terms of loss of properties, investments, jobs, incomes, loss of trust, dignity and exasperation of crises among the stake holders and environmental disaster. It should be noted that in the event of such causality, the reputation of the industry to deliver quality products becomes questionable, with the committed. Consequence of the government resorting to the employment of the foreign professionals and the contractors that are involved in such contracts.

The collapse of any building during the working hours of the day impose the dangers against construction manager and other personnel’s who would be inside or around the building. There is a high probability that a number of them would have been trapped under the debris. It is also possible that a number of those trapped inside the building would have died. The community around the site is most likely open to danger and making alarming noise, but must probably not daring to initiate any rescue action. It is likely that it would take a considerable time for someone to set the attention of the local police station for quick action. In the mean time, chaos would have supreme, those who must have been trapped but still alive might panic, suffer from shock and finally die. The relatives of the causalities would be thrown into deep and painful sorrow due to their losses.

### Economic Losses

The economic losses of such building includes the following:-

- (i) Financial losses that is incurred in erecting the building up to the stage of failure or collapse
- (ii) Time value or the funds expended to date

- (iii) The life expected labors input of the injured and dead to the economic
- (iv) Cost of removal of the collapse debris
- (v) Cost of disaster response services as a result of the collapse
- (vi) Opportunity cost of depriving the community of the use of the building for the extra period of replacement.

**Land Environmental degradation**

With the collapse of any multistory building, the said site would not be accessible for an appreciable length of time. After the collapse, dust pollution of the environment would be observed, until the site is properly managed. This will pose a source of danger to the said neighborhood.

**Loss of life**

It is certainly true that both the community and the families of the dead ones would have been deprived of the lives lost.

The table below actually shows a number of losses of human’s lives and the building that have failed and collapsed in Nigeria some decades ago.

*Table1: some of the Reported cases of Collapse 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	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 (uncompleted4 storey Building)	Iponri, lagos	May 20, 1985	Structural failure	13 people
10.	Residential Building	Victoria Island, Lagos	July 18,1985	Excessive loading	13 (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	Osogbo, osun state	May, 1986	Structural failure	2 people

16.	Residential building	Ona streer Enugu, Enugu state	1986	No investigation	2 people
17.	2 storey Building under construction	Agege, Lagos	May 9, 1987	Structural faulty	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	Akinwumi 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.	Multipurpose indoor sport complex storey	Area 10,Abuja	March 1993	Structural failure/poor workmanship	Not reported
25.	Multistorey building NICO-NOGA staff housing project	Karo, Abuja	March 25, 1993	Structural failure/ use of incompetent people for supervision	Not reported
26.	A Mosque Building uner 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 ooy state	October 1995	Poor workmanship	Nil
30.	3storey Building	Oke igbala 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 use 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	October1, 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.	1storey Residential Building	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 Building	Four-square Gospel church Abuja	October 1999	Failure 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 failure/Rainstorm	35 people
45.	2-storey Residential Building	Dawoldu 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 peoples
50.	Multi-storey Commercial Residential Building	Ebute –meta, Lagos	2007	Unauthorized conversion/poor supervision / use of quality materials	Several people
51.	Multi-Stirey Buildin	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 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	Agbaji 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 building material 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 person, 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 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

### RECOMMENDATION

- 1) Buildings are generally unique in characteristics. It is therefore essential that building experts are allowed to advise on the peculiarity of design and construction of the building. This will actually limit the extent of hazard to both rescue workers and the trapped victims during the failures and collapse of Buildings.
- 2) Medical doctors and other health practitioners are essential to the life preservation of victims during collapse of buildings.  
Ambulance unit would be needed to evacuate serious cases to the nearby hospitals. Buildings that are properly documented for production should have hospitals nearby to support the operation on site. This would always be in the health and safety management plan for the project. The hospital would always be ready to receive unexpected cases of injuries from the site.
- 3) There is always an inordinate economic loss to the owners and any community as a result of Building structural failures and collapse. The solution for this is to engage the services of qualified, registered and license professionals for building design, documentation, production and operation. This action will eliminate or put out quack from the profession, and also provide to the owners of the Building and the community at large that their Building would not fail or collapse.

### CONCLUSION

Infrastructure is generally the principals' drivers of the country economy, especially in developing countries. The present state of existing infrastructure and the rate of maintenance and addition of new ones strongly influence the rate of economic growth of the country. All buildings therefore, no matter their size are economically important, whether in the private or public sector. The issue of cost and effect of Building structural failures in Nigeria is every body's concern. The way out of the problem is for every body to pull their weight together. We need to join forces together and tackle this menace and the right time is now!

### REFERENCES

1. Gana A.J (2010) Civil Engineering Construction Management and Economics.
2. Gana A.J (2001) Failure and Collapse in Structure. An M.Sc Research Thesis in Civil Engineering.
3. Engineering Regulation Monitoring (ERM) – Council for the Regulation of Engineering in Nigeria (COREN) Daily sun, Monday 24th September, 2012.
4. K.B Osifala (2013) Inaugural lecture on Building Collapse at Yaba Tech. Daily sun, Tuesday July 23rd, 2013.
5. Salau .M.A (1996) structural failure in collapse Building:- causes and prevention – seminar on collapse structures in Nigeria organize by Lagos state government and the Nigeria society of engineers in Lagos, Nigeria, 22nd 23rd august 1996, pp5-10
6. Atume. F (2012) causative factors of building collapses in Nigeria



7. Jeumbol. P (2012) building collapse phenomenon sanctions, liabilities and legal implication