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Spatial Analysis of Building Collapse in Nigeria: A Study of the Causes and Problems

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Abstract
The study examines the incidences of building collapse in Nigeria. Data for the study were derived from both primary and secondary sources. The method of collection of primary data included field investigation and site inspection. Relevant qualitative and quantitative methods of analysis of data were employed. The study attributes building collapse to structural defect, poor supervision/workmanship, use of substandard materials, faulty structural design or absence of structural design, carelessness, rainstorm or heavy downpour, weak and faulty foundation, excessive loading, illegal conversion/ non compliance with approved building plans/ disregard for building regulations/plans, hasty construction/ faulty construction, ignorant/greedy clients, and dilapidation and absence of drainage. The study also reveals that one hundred and forty (139) are the recorded number of buildings that have collapsed between 1974 and 2012. Over seven hundred and ninety eight (798) lives have been lost during the period. 54.17% of the reported cases of collapsed buildings are residential buildings 15.83% are residential buildings under construction. 10.00% of the buildings are used for commercial purpose. 8.33% of the buildings are educational institutions. 5.00% are used for religious purpose (churches and mosques). Hotels, courts, hospitals and sport buildings account for 2.50%, 1.67%, 1.67% and 0.83% respectively. The locational distribution of the collapsed building shows a high prevalence in Lagos and Abuja. The study concludes by suggesting appropriate possible measures to avert the growing incessant cases of building collapse.
Keywords: Housing, Building Collapse and Structure

Introduction

Housing is widely ranked among the most critical factors that determine the quality of life and welfare of people and societies. It is critical to meeting the social, cultural, economic and environmental needs of the people and influences the wellbeing, health and security of both the present and future generations. Housing is therefore central to the concept of sustainable development, given its complex web of relationship with the four factors of sustainability, namely social, economic, cultural and enviromental. The question of housing is of paramount concern to governments across the globe. In Nigeria for instance, all successive governments since independence highlighted housing as a major priority. Unfortunately for over 54 years of its independence, Nigeria is still grabbling with housing crises. The ever mounting crisis in the housing sector of Nigeria has been in various dimensions, which range from absolute housing unit shortages, to the emergence and proliferation of the squatter settlements and slums, the rising cost of housing rent and the building collapse.

The incidence of building collapse in Nigerian is reaching an epidemic proportion. Adebayo (2013) wrote:

> *"The spate of building collapse and failure has become an endemic problem that has defied all attempts at providing solutions in the recent past. These incidences have resulted in the loss of lives and property, which have also infringed permanent disabilities to many".*

Though building collapse is not peculiar to Nigeria, the trend in the country is becoming quite worrisome and a source of concern to stakeholders. According to Ayedun, Durodola and Akinjare (2012), the spate and frequency of occurrence have become a major source of concern not only to the governments but to all meaning Nigerians and most especially the stakeholders in the building industry as the magnitude of the incidents are becoming very unprecedented. That building collapse incidence is still regularly occurring despite the fact that there has been the increasing diffusion of engineering knowledge over the years have brought to question whether these stakeholders have critically examined the reasons for building failure and the roles they can play or the strategies they can articulate that would help to arrest the incidents. This seeming gap portend the reason for this article, thus this article examines the spatial distribution of the building collapse in Nigeria with the desire to finding out the causes, problems and the possible ways of arresting the situations.

Conceptual Clarification and Literature Review

Collapse, according to the dictionary of Architecture and Construction refers to mechanical failure. Collapse is a state of complete failure, when the structure has literally given way and most members have caved-in, crumbled or buckled; the building can no longer stand as originally built (Dimuna, 2010). A structure is a whole building, complex framework or essential part of a building. According to Fakere et al (2012), Marshall and Nelson (1981) defined structure as a body capable of resisting applied loads without any deformation of part relative to one

another. The structure of the building is therefore that part of the building construction which gives the construction sufficient strength to withstand the load to which the load is subjected. A building structure does this by carrying the load imposed by it and transferring same safely to foundation hence, into the ground. Buildings are utilized primarily for living, working and storage and are categorized into three: First, is the monumental structure which comprises of the churches, sport arena and city halls. Second, is the institutional structure comprising of structure such as the block of flats, tertiary institutional buildings for academic and administrative purposes. Third category comprises of industrial structures like the ordinary small scale industrial types (MacGinley, 1998).

Building collapse can simply be defined as a total or a 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 (Olagunju Aremu and Ogundele, 2013). A building may collapse when one or more of its essential components fail (Fakere, Fadaro and Fakere, 2012). Building failure is defined as an act of omission or occurrence or performance. Failure could also be defined as non-occurrence, non-performance, running short, breaking down, ill-success, insolvency and unsuccessful attempt (Ayuba, Olagunju and Akande, 2012). Building failure is also defined as an unacceptable difference between expected and observed performance in a building component when that component can no longer be relied upon to fulfill its principal function. Limited deflection in a floor which causes a certain amount of cracking/distortions in partitions could be considered a defect but not a failure. Whereas excessive deflection resulting in serious damage to partitions, ceilings and floors finishes could be referred to as failure, but sudden dislocation or given way of a structure is classified as building collapse (Abimbola and Rotimi, 2012).

Building collapse has so often been associated with structural failures. A structure is a whole building, complex framework or essential part of a building. The structure of the building is that part of building construction which gives the construction sufficient strength to withstand the load to which the whole building is subjected. The structure is that which carries load and transfers the load from the point of load application to the point of load support. A building structure carries the load imposed on it and transferring same safely to foundation hence, into the ground. There are two broad subdivision of the structure. The first is the frame Sstructures which resist the applied loads by virtue of their geometry. The second type is the mass structures which resist applied loads by virtue of their weight (Fakere, Fadaro and Fakere, 2012). Generally, structures do fail over time as a result of human factors such as negligence, design flaws, ageing, material fatigue, extreme operation and environmental conditions, accidents, terrorists, attacks and natural hazards. Building failure could be of two types namely; Cosmetic failure that occurs when something has been added to or subtracted from the building, thus affecting the structures outlooks while structural failures affect both the outlook and structural stability of the building (Aayuba, Olagunju and Akande, 2012). The structural function of a building is therefore to transfer the loads of human beings, furniture, goods, wind, etc, including its own weight safely down to the foundations and subsequently into the ground. Hence, failure occurs when a building is not able to perform the function (Ukpata, 2006).

CAUSES OF BUILDING COLLAPSE

In Nigeria, building failure have been attributed to the causes such as design faults (50%), faults on construction site (40%) and product failure (10%) (Ayininuola and Olalusi, 2004). Hall (1984) also attributed faulty design, faulty execution of work and use of faulty materials to be major causes of building collapse. Yusuf (2006) classifies the causes as physical factors, ecological status of the site, composition of technical components, social factors, economic factors, engineering factors, human factors, government policies, and political factors. Those who investigate and report on failures of engineering facilities are in a good position to identify trends leading to structural safety problems and to suggest topics for critical research to militate against this trend (Ibrahim, 2013). Akinpelu (2002) categorizes the following as major causes of building collapse.

They are; environmental changes, natural and manmade hazards, improper presentation and interpretation in the design. Building collapse occurs when the structural frame of a building breaks up, when the loads on it are beyond its carrying capacity. Common causes of building collapse have been traced to: bad design, faulty construction, foundation failures, extra-ordinary loads, use of unqualified contractors and poor monitoring; and above all, lack of enforcement of building codes by the relevant town planning officials (Consumer News, 2012). Building collapse is caused by the desperate attempt of the residents to get out of the hook of terrible and shylock landlords by getting a roof over their heads at all cost, coupled with the eagerness of developers, both professionals and quacks, to get quick returns on their investments often lead to a situation where regulations are deliberately or ignorantly circumvented thereby compromising standards at the expense of people‘s lives. Unfortunately, Nigerian is a place where illegality thrives. As such, people build structures without necessary authorizations, such as approved plan, building permit, survey, necessary soil test, and so on while estates spring up without approved layout plan and provisions for contingency plan in case of emergencies. It is estimated that more than 60 percent of structures across the country fall within these categories (Ojo, 2013). Akinpelu (2002)

categorized the following as major causes of structural failures: environmental changes, natural and man-made hazards; improper presentation and interpretation in the design. Ayuba, Olagunju and Akande (2012) listed the following as causes of building failure and collapse; ***effect of low quality sand crate blocks on structural wall***; quality of concrete used; effects of improper concrete curing and bracing of form work; poor compaction and consolidation of foundation soil, effects of weak soil, modification in the use of a building; use of non-professionals in building construction; collapse of buildings induced by fire; and the role of professionals and other participants in the building industry. The causes of building failures have been attributed to; poor structural design by non-professionals (quacks), lack of structural design, use of substandard materials, negligence of the use of appropriate personnel in building construction supervision, poor workmanship and supervision (Ukpata, 2006). Apart from the above known causes, the Nigerian factor becomes a prominent issue to contend with. The Nigerian factor in the building industry comes in various dimensions such as corruption, lawlessness and our presumptions that any engineer or professionals in the built environment can assume all forms of responsibility in a building process without the basic skills required for it. Corruption is made manifest in greed and tendency to cheat in virtually every aspect, starting from poor materials and quality of work to the quantities we adopt. As disobedience to civil laws is common in Nigeria, the case in the building industry cannot be different. For this, lawlessness finds a fertile ground in our non-adherence to the building codes and hasty construction. The use of unskilled labour, inexperienced professionals, tendency of some professionals to cross-carpet to lucrative specialists' duties where they lack skills, ignorance and the abundance of quacks in the building industry are all facts to contend with (Ede, 2010). Global corruption Report (2005) identified corruption as one factor that has caused high cost of building materials and reduction in standards of construction works in the developing economy. It stated that corruption may be at different stages namely, at contract award, planning and design state, construction stage, and when the building is completed. It may take different forms like bribery, deception and collusion, the end products of which are lowering of construction standard, increasing cost of repair and maintenance, defects on building that may not be discovered until its eventual collapse.

Many buildings in Nigeria have collapsed due to some of the following reasons; inadequate preliminary works, adoption of wrong foundation; poor concrete mix ratio; improper walling; lack of approved structural design; poor building material specification, ineffective supervision and climate (Fakere, Fadairo and Fakere, 2012). Dimuna (2010) casts a slur on the competence of the nation's building community of architects, structural engineers and builders – who are the professionals responsible for designing sites. These professionals are being attacked from all angles because of the recurring incidents of building collapse. But the building professionals should not bear the blame alone. This is because, firstly, it has been proved that owners of building under construction derail from their approved plans relying more on imagination and fantasy. Secondly, the approving authorities are also known to fail to monitor compliance with approved plans. Thirdly, some building owners shun professionals in order to cut costs. Fourthly, the high cost of building materials has led greedy contractors with eyes on profits, to patronize substandard materials. These short-cut measures have contributed immensely to the occurrence of failed buildings in the country. Deficient structural drawing, alteration of approved drawings, absence of proper supervision, building without approved building drawings, approval of technically deficient drawings, illegal alteration to existing buildings, absence of town planning inspection or monitoring of sites, clients penchants to cut corners, use of substandard materials, inefficient workmanship (labour), use of acidic and salty water, the activities of quacks, and clients' over ***reliance on contractors for making on sites.*** Ayedun, Durodola and Akinyare (2012) attributed building failure to either natural or materials phenomena. A natural phenomenon may be attributable to earth quakes, storm/wind and typhoons while man-made phenomenon consist of disaster which may be borne out of man's negligence in areas such as soil type, building design and planning for extra loads and stress from winds and earthquake for tall buildings, foundation works, quality of building materials, lack or inadequate monitoring of craftsmen and poor quality of workmanship. Frederick and James (1989 suggest that the overturning of structures due to heavy wind loads, sliding of structures due to high wind, roof uplift or sliding, and building sway due to lateral loads are major factors of failures of buildings.

Theoretical Framework

According to Ede (2010), activities necessary for the realization of efficient structures take place in the following fundamental stages: conceptual and design stage, construction-supervision stage and post construction service stage. Every part of these stages is extremely important in the life of the structure as a mistake in any stage can have a far reaching effect in the whole building process. The conceptual design stage: The conceptual phase is the stage of planning and feasibility studies in professionals such as the planners, Architects, Engineers and project Managers may assist in evaluating the technical options for the realization of the structure. The design phase is the stage for the technical preparations of the project where the planner order the use of the land and siting of buildings, the architects design aesthetic form of the structure while the engineers design the structural frames. Thus, the basic requirement of safety, aesthetic, economy and constructability must be put into

consideration during the design process. This stage cannot be complete without the estimation of the resources needed for the execution and the approval by the relevant authorized government agencies.

One fundamental principle of building design is that a building should be designed and constructed to meet its owner's requirements and also satisfy public health, welfare and safety requirement, such that no part of such building should pose a hazard to its occupants. A structure must be economical, safe, serviceable and aesthetically adequate (Dimuna, 2010). Any building, whether temporary, permanent or monumental structure must be properly planned, designed, constructed and maintained to realize the desired satisfaction, comfort, safety. In order to ensure these, Moseley and Bungay (1985) posited that the design of a structure must ensure that (i) under the worst loading the structure is safe and (ii) during normal working conditions the deformation of the members does not detract from the appearance, durability or performance of the structure. Moseley and Bungay identified the following three basic methods for designs using factors of safety to achieve safe workable structures; permissible stress method in which ultimate strengths of materials are divided by a factor of safety to provide design stresses which are usually within the elastic range. Load factor method in which the working loads are multiplied by a factor of safety. The limit state method which multiplies the working loads by partial factors of safety and also divides the materials ultimate strength further partial factors. When a structure is rendered unfit for use it is said to have attained a limit state.

The construction supervision stage is a stage for a lot of conflicting activities meant to be handled only by trained professionals. It involves the physical construction and overseeing the structure designed including compliance of the quality with design and specifications. The stage is completed with the issuance of certificate of fitness to the client to authorize the usage of the structure after the completion of the construction work. The post construction service stage is the stage in which the facility services the purpose for which it was built without curing form of discomfort to the user. While the structure must be communal maintained in a good state so as to perform the function for which it was built, the usage must be in conformity with the purpose of its design otherwise, any variation of usage must be authorized by competent professionals.

Research Methodology

Data for the study were derived from both primary and secondary sources. Primary data were derived from fieldwork, which involved observation and direct interview technique. With the direct interview and interaction held with the some of the workers met on some of the sites visited, information about the factors responsible for the collapse of buildings were sought. The secondary data were extracted from the review of published and unpublished records by government officials and the administrative authorities at local, regional and national levels. Books, newspapers, and internet were other sources of secondary data used for this study. Relevant qualitative and quantitative methods of analysis of data were employed to show past and present situation.

Analysis of Results

Table 2 shows the thirteen various major causes of building collapse in Nigeria. The table shows that structural failure or structural defect accounts for the 25.16% of the total causes of building collapse. Incompetence, poor supervision/poor workmanship account for 14.19%, use of substandard building materials (12.90%), faulty structural design/and or no structural design (9.68%), carelessness (7.10%), rainstorm/heavy downpour (7.10%) and weak/faulty foundation (5.81%). Other causes are excessive loading (5.16%), illegal conversion, non compliance with approved building plans/disregard for building regulations/plans (5.16%), hasty/faulty construction (3.87%), ignorant/greedy clients (1.94%), dilapidated building (1.29) and absence of drainage (0.65%). Thus, structural failure or structural defects rank first, and in the order of presentation above, no drainage rank the least of the causes of building collapse in Nigeria. Table 3 presents the recorded analysis of the building collapse in Nigeria. The table reveals that about one hundred and thirty nine (139) buildings have collapsed between 1974 and 2012. Over seven hundred and ninety eight (798) lives have been lost during the period. The number of lives lost in the building collapse incidents gives an indication of the severity of building collapse, and where lives have not been lost, high level of physical injuries are recorded. Besides the loss of lives and physical injuries, the incidents of building collapse in these periods have also resulted in the loss of many properties worth several billions of naira. The affected Landlords, Families and Developers have lost their hard earned savings, died of high blood pressure as a result of being traumatized. Table 4 shows the locational distribution of the incidents of building collapse in Nigeria. The table shows that seventy four (74) (53.24%) of the reported cases of building collapse have occurred in Lagos, the commercial nerve centre of Nigeria. About eleven (11) (7.91%) of the reported cases of the building collapse had occurred in Abuja, the Federal Capital Territory of Nigeria. Ten (10) (7.19%) in Oyo State, Eight (8) (5.76%) in Ondo State, Six (6) (4.32%) in Ogun State, and Five (5) (3.69%) in Kano State. Others are Kaduna, Rivers, Kwara, Anambra, Osun, Edo, Enugu, Bornu, Benue and Imo States which have had reported cases of building collapse less than 2.88%. From the foregoing analysis of the locational distribution of collapsed buildings by locations, it is significant to note that the table does not have record of any case of building collapse in the other eighteen (18) states of the federation

of Nigeria. It is also important to note that the locational distribution of building collapse suggests a high prevalence of the incidents of building in Lagos and Abuja. This could be due to the high concentration of construction activities in Lagos and Abuja than other parts of Nigeria going by the fact that they are the commercial nerve centre and the federal capital territory of Nigeria respectively. Table 5 gives the analysis of the reported types of buildings that have collapsed over the period in Nigeria. The table revealed that 53.04% of the reported cases of collapsed buildings were residential buildings and 14.78% were residential buildings under construction. 10.43% of the buildings were used for commercial purpose, 7.83% of the buildings were educational institutions, and 6.98% were used for religious purpose (churches and mosques). Hotels, court, hospitals and sport buildings accounted for 2.61%, 1.74%, 1.74% and 0.87% respectively. The analysis shows that residential buildings are more prone to collapse in Nigeria. This makes more serious or aggravate the housing shortage which has been responsible for the increasing level and rate of homelessness in Nigeria. The interactions held with the workers in the building industry reveals that adoption of wrong foundation is a factor responsible for building collapse in Nigeria. Foundation is the part of structure in direct contact with the ground which transmits the load of the structure to the ground. Some of the Engineers thence suggested that foundation of a building must be strong to enable the structure carry all the dead, super-imposed and wind loads from the building to the soil on which the building rests so that the failure of the underlying soil is prevented. The building workers emphasized poor building materials as another critical factor responsible for collapse of building. They pointed out that building material specifications that are not prescribed or that do not relate to the intended construction and that are not adequate in standard can cause building to collapse. They emphasized on the block products of most of the block Industries, and stated that most block industries do not meet the standard requirements specified for the production of blocks. In a bid to have more number of blocks, they go far beyond the prescribed ratio of 'cement to sand' by increasing the quantity of sand more than necessary which eventually results in weak blocks that lack the strength to hold the weight of the building. Of course, the strength of blocks depends on the right proportion or the specified ratio of cement to sand used for moulding them. It was also revealed during the interaction that a lot of buildings under construction are based on false assumptions of soil strength. During structural drawings, there is nothing like site investigation to determine the properties of soil strata to know whether the soil posses land bearing capacities. Other factors identified by the building **workers** during the field investigation are approval of technically deficient drawings by the town planning authorities and the absence of town planning inspection and monitoring of sites. Town Planning Authorities seldom visit sites to inspect or monitor progress of approved work on sites. Buildings are therefore put up without the authorities knowing anything about the details of the construction. This gives the contractors and the clients the perchants to cut corners. The contractors use the opportunity to make gains at the expense and lives of the users of the building. Contractors can reduce the thickness of foundation depth, floor slabs, and sizes of reinforcement rods, to maximize profits. Clients, because of their perchants to cut corners, don't follow due process in the construction of buildings. They employ unqualified personnel to supervise the building so that they the (clients) can take all the decisions on what goes on in the site as they want to spend minimum amount of money on the construction. All these contribute to failure of building collapse in Nigeria.

Conclusion and Recommendation

In view of the above findings, the following recommendations are proffered to minimize the incidence of building collapse in Nigeria. There should be a check for policy makers to make sure that specifications are thoroughly followed by contractors. The Town Planning Authorities should maintain and have adequate competent professionals and provide necessary training for design approval. There should be an institution of Building Collapse Prevention Unit (PCPU) domiciled in all the existing Town Planning Authority in Nigeria to identify houses with weak structures liable to collapse or which have reached a level of collapse and recommend them for demolition, and also make provision for the immediate resettlement of the inhabitants. All professional bodies associated with the building industries in Nigeria such as Council for the Registration of Engineers (COREN), Nigerian Society of Engineers (NSE), Nigerian Institute of Builders (NIOB), Town Planning Registration Council (TOPREC), Nigerian Institute of Town Planners (NITP), Nigerian Institute of Architects (NIA) and the Architect Registration Council of Nigeria (ARCON) among others, should be encouraged to work on more research about the causes of building failure and research standardization of construction methodologies, including finding a way of stopping quarks and their operations in building industry. There should be a synergy among the professionals bodies in the building industries with the aim of jointly working together to achieve a common goal. The public must be willing to alert the government of buildings that are suspected to be a risk to the lives of the people within the neighborhood. The town planning authorities should be allowed by the Governments and the politicians to perform their functions unfettered. There should be a regular check of blocks industries to ensure that blocks are of good quality and highly vibrated. These blocks should be certified by the Standard Organization of Nigeria (SON).

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Table 1: Reported Cases of Building Collapse in Nigeria from 1974-2012

S/N	Building Location	Type of Building Structure	Date of Collapse	Suspected Causes of Building Collapse	Number of Live Lost	
1	Mokola, Ibadan	Multi – Storey Building under Construction	October, 1974	Excessive Loading	27	
2	Ondo	One-Storey	December, 1976	Substandard Building Materials/Structural Defect	8	
3	Oyo	Two-Storey	May 1977	Substandard Building Materials/Structural Defect	10	
4	Bamawa Housing Estate, Kaduna	Residential Building	August, 1977	Faulty Design	28	
5	Govt. Secondary School, Markafi, Kaduna State	School Building	July, 1977	Carelessness	7	
6	Borno	Four-Storey	October, 1977	Poor Performance by Contractor	10	
7	Rivers	Four Storey	March, 1978	Lack of Concrete Services to hold Foundation	16	
8	Lagos	Three Storey	March 1982	Weak foundation	10	
9	Lagos	Two Storey	June 1982	Weak foundation	7	
10	Ondo	Two Storey	June 1982	Heavy Downpour/Structural Defect	7	
11	Lagos	Two Storey	September 1983	Structural Defect	8	
12	Lagos	Four Block of Flats	December 1983	Heavy Downpour	6	

13	Western Avenue, Lagos	Three-Storey Building	December, 1978	Undisclosed	Unknown	
14	Bamawa Housing Estate, Kaduna	Three-Storey Residential Building	1980	Faulty Structural Design	6	
15	Allen Avenue, Ikeja Lagos	Residential Storey Building	January, 1985	Excessive Loading	Nil	
16	Adeniji Adele, Lagos	Residential Building	February, 1985	Excessive Loading	2	
17	Iponri, Lagos	Uncompleted Four – Storey Residential Building	May, 1985	Excessive Loading/ Carelessness	13	
18	Ojuelegba Road, Lagos	Two Storey Residential Building	May, 1985	Rainstorm (Nature)	Nil	
19	Lagos	Two Storey	May 1985	Faulty foundation and Bad Workmanship	9	
20	Lagos	Two Storey	June 1985	Weak Foundation	5	
21	Bereku Lane, Lagos Island	Three-Storey Building under Construction	July, 1985	Excessive Loading	9	
22	Gboko, Benue State	Residential Building	September, 1985	Carelessness	1	
23	Anambra State Trade fair Complex	A Central Pavilion of the Complex	September, 1985	Undecided	Unknown	
24	Allen Avenue, Lagos	A One-Storey Residential Building	1985	Carelessness	Nil	
25	Adeniji Adele,Lagos	Residential Building	1985	Carelessness	2	
26	Oshogbo, Osun State	Mosque	May, 1986	Faulty Design/Carelessness	2	
27	Beere, Ibadan	A Bungalow	June, 1986	Undecided	Unknown	
28	Lagos	Three Storey	November 1986	Faulty Foundation and bad Workmanship	1	
29	Ona Street, Unuga, Anambra State	Residential Two-Storey Building	1986	No Investigation	2	
30	Isiala, Imo State	High Court	1986	Collapsed Ceiling	2	
31	Agege, Lagos State	Two-Storey Building under Construction	May 1987	Carelessness	2	
32	Idusagbe Lane, Idumota, Lagos	Two-Storey Residential Building	September, 1987	Ignorant Client/No Structural Design	17	
33	Ikorodu Road, Lagos	Commercial Building	September, 1987	Rainstorm (Nature)	4	
34	Lagos	Three Storey	September 1987	Structural Defect/Poor Building Materials	8	
35	Akinade Village, Ikeja Lagos	A Storey Building	September, 1987	Undecided	Unknown	
36	Calabar, Cross-River State	Residential Building	October 1987	Rainstorm (Nature)	3	
37	Lagos	School Building	November 1988	Substandard Building Materials	1and others injured	
38	Kano	Residential Building	1988	Undecided	Unknown	
39	Lagos	School Building	February 1989	Faulty Foundation and Bad Workmanship		
40	Benin-City, Edo State	One-Storey Hotel Building	July 1989	Undecided	None	
41	Akinwunmi Street, Mende Village, Lagos	Six-Storey Hotel Building	October 1989	Faulty Design	Unknown	
42	Igbobi, Lagos	Uncompleted Three-Storey Building	October 1989	Undecided	None	
43	Idumota, Lagos	Three-Storey Commercial Building	February 1990	Undecided	Unknown	

44	Obasiolu- Diobu, Port-Harcourt, River State	Three-Storey School Building	June1990	Ignorant Owner/No Structural Design	55 and several injured
45	Alagbado, Ogun State	School Building	October, 1990	Undecided	None
46	Kano	One Storey	July 1991	Substandard Materials	3
47	Sokoto	One Storey	July 1991	Heavy Downpour/Structural Defect	4
48	Lagos	Two Storey	August 1991	Poor Workmanship/Structural Defect	10
49	Lagos	Three Storey	March 1992	Structural Defect	10
50	Lagos	Hotel Building	June 1992	Defective Structural Design	2 and several injured
51	Area 10, Abuja	One-Storey Multi-Purpose Indoor Sports Complex	March, 1993	Structural Failure/ Poor Workmanship	Unknown
52	Karo, Abuja	Multi-Storey Building For NICON-NOGA Staff Housing Project	March, 1993	Structural Failure/ Poor Supervision	Unknown
53	Kano	One Storey	October 1993	Dilapidated Structure	5
54	Oyo	Two Storey	March 1994	Structural Defect	4 and 11 injured
55	Lagos	Uncompleted Four Storey Building	June 1994	Bad Workmanship	1
56	Lagos	Three Storey	June 1994	Substandard Building Materials	17 injured
57	Kwara	One Storey	August 1994	Structural Defect/Poor Workmanship	2and 6 injured
58	Oyo	Two Storey	August 1994	Structural Defect/ Substandard Materials	10 and 74 injured
59	Lagos	Four Storey	June 1994	Structural Defects/Poor building Materials	4 and several injured
60	Ondo	One Storey	August 1994	Structural Defects	1 and several injured
61	Abeokuta, Ogun State	A Mosque under Construction	1985	StructuralFailure/ Poor Supervision	2
62	Maryland, Ikorodu Road, Lagos	Six-Storey Building	January, 1995	Structural defects/ Substandard Materials	1
63	Bankole Street, Apongbor, Lagos Island	Two – Storey Building under Construction	May 1995	Undecided	Unknown
64	Central Lagos	Storey Building under Construction	October,1995	Poor Workmanship/ Structural Failure	10
65	Oke-Igbala, Mosadoluwa Close, Obga, Lagos	Three-Storey Church Building	October, 1995	Faulty Design/ Carelessness	15
66	Alagbada Area, Ibadan, Oyo State	School Building	October 1995	Poor Workmanship	Nil
67	Oke-Igbala Area, Ibadan, Oyo State	Three Storey Building	October,1995	Structural Failure	6
68	Lagos State	Storey Building under Construction	March, 1996	Structural Failure	Injuries Only
69	Olowookere Street, Oshodi, Lagos	Church Building (CAC)	May, 1996	Conversion/Structural Weakness	7
70	Ijagbemi Street, Pedro, Lagos	Six Storey Classroom Building under Construction	October, 1996	Use Of Quacks / Structural Failure	1
71	Adedayo Adeniran St., Amukoko, Lagos	Residential Building	March, 1997	Undecided	None
72	Amu Street,	Two-Storey	June, 1997	Use of Poor Materials/	None

	Mushin, Lagos	Commercial Building		StructuralFailure	
73	Enugu, Enugu State	Three Storey Building under Construction	June, 1997	Undisclosed	Unknown
74	Ilorin, Kwara State	Mud Building	Sep 1997	Undisclosed	Unknown
75	Mba Street, Ajegunle, Lagos	Magistrate Court Building	January, 1998	Undisclosed	Unknown
76	Gwarimpa Area, FCT, Abuja	Duplex Building	1998	Structural Failure	2
77	Ibadan, Oyo State	Three Storey Residential Building	1998	Faulty Design/ Poor Supervision	Several People
78	Akure, Ondo State	Four-Storey Church Building under Construction	October 1998	Structural Failure /Poor Supervision	8
79	Fumbi Street, Abeokuta, Ogun State	Two-Storey Residential Building	November, 1998	Use of Poor Building Material/ Structural Failure	None
80	Ide Street, Ojuelegba, Lagos	Two-Storey Building	April, 1999	Carelessness/ Use of Poor Building Materials	4
81	Charity Road, New Oko-Oba, Agege, Lagos	Three-Storey Building	June, 1999	Structural Failure	None
82	Tokumbo Street, Off Adeniji Adele Road, Lagos	Three-Storey Building	June, 1999	Undisclosed	Unknown
83	Nigerian Air force, Aero Medical Center, Kaduna	One – Storey Hospital Building	August, 1999	Undisclosed	Unknown
84	Fagbemide Lane, Akure, Ondo	One – Storey Building	September, 1999	Undisclosed	Unknown
85	Four Square Gospel Church, Maitama District, Abuja	Three-Storey Church Building	October 1999	Faulty Design/ Implementation	Not Available
86	Obawole Estate, Iju, Agege, Lagos	One-Storey Residential Building	October 1999	Structural Failure	None
87	Salisu Street, Iju-Ishaga, Lagos	Three-Street Building under Construction	October, 1999	Structural Failure/ Rainstorm	35
88	Dawodu Street, Ifo, Ogun State	Two-Storey Residential Building	October 1999	Rainstorm	20
89	Adeola Odeku Street, Victoria Island, Lagos	One Storey Building	1999	Rainstorm	Unknown
90	Idi-Oro, Mushin, Lagos	Residential Building	2000	Faulty Design / Carelessness	Unknown
91	Oke bola, Ado Ekiti		2000	Poor quality control	Nil
92	Eleganza Estate, Ajah Lagos	Three-Storey Residential Building	April, 2000	Incompetence	5
93	21 Buhari Street, Mushin Lagos	Two-Storey Mosque Building	April 2001	Unauthorized Conversion of a Bungalow into a two- Storey Building	7
94	Odo Ikoyi Akure		2001	Foundation Problem	Nil
95	Iwoye-Ijesa, Osun State	One Storey Residential Building under Construction	2001	Structural Failure/ Use of Quacks for Supervision	7
96	Ojuelegba Akure		2003	Poor Workmanship and under Reinforcement	Nil
97	Stadium Road Akure		2003	No Structural Members	Nil
98	Oyeregbulem		2003	Poor Workmanship and under	Nil

	Market, Akure			Reinforcement of the Cantilevering	
99	Ebute Meta		2003	Structural defect	8 injured
100	Port Harcourt, River State	Two-Storey School Building	2003		Unknown
101	10, Elias Street, Lagos	Two-Floor Residential Building	2004	Dilapidated Structure	Unknown
102	22, Makinde Street, Ebute-Meta, Lagos	Three Floor Building	2004	Undisclosed	Unknown
103	11, Solola Street, Agege, Lagos	Two-Floor Building	2004	Undisclosed	Unknown
104	Iponri		2005	Inappropriate Foundation	Nil
105	Oke Suna, Lagos		2005	Structural Degeneration	1
106	40, Market Street, Shomolu, Lagos	Two Floor Commercial Building	March, 2005	Undisclosed	Unknown
107	Ibile Holding, Ikeja, Lagos	Three Floor Framed Commercial Building	April, 2005	Undisclosed	Unknown
108	Port Harcourt, Rivers State	Commercial Building	June, 2005	Undisclosed	Unknown
109	6, Princess Street, Lagos	Three Floor Commercial Building	July, 2005	Undisclosed	1
110	Mushin Lagos	Four Floor Commercial Building	2005	Undisclosed	1
111	53, Commentary Road, Amukoko, Lagos	Four Floor Residential/ Commercial Building	January 2006	Ignorance/ Greedy Landlord	7
112	Ikpoba-Okha Local Govt., Edo State.	Two Floor School Building	April, 2006	Undisclosed	2
113	Abuja	Three Floor Building Housing Office and Church	June, 2006	Undecided	None
114	Broad Street, Lagos		2006	Rainstorm	Not disclosed
115	Ebute Meta		2006	Structural Defect	37
116	Oworosonki		2006	Faulty Construction	1
117	Ebute-Meta, Lagos	Multi-Storey Commercial/ Residential Building	2007	Unauthorized Conversion / Poor Supervision/ Use of Poor Quality Building Materials	Several People
118	Kano	Multi-Storey Building	2007	Faulty Design /Structural Failure	Several People
119	Olomi Area, Ibadan, Oyo State	Building used as Nursery/Primary School	March, 2008	Use of Poor Materials/ Carelessness	13
120	Ogudu, Ojota, Lagos	Three Storey Building under Construction	April 2008	Undisclosed	Unknown
121	Wuse Area, Abuja	Five-Storey Shopping Complex Building under Construction	August 2008	Structural Failure/ Incompetency/Bad Workmanship	2 People Injured & 100 People Trapped
122	Asero Area, Abeokuta, Ogun State	Two-Storey Residential Building under Construction	August, 2008	Contravening the given Planning Approval/ Use of Substandard Materials/Incompetency	2
123	Apongbon		2008	Structural defect	3 injured
124	Ikeja Lagos		2008	Faulty construction	Several injured
125	Alade Street, Lagos		2008	Structural defect	3 and 5 injured
126	Ogbomosho, Oyo State	Six Storey LAUTECH Teaching Hospital Complex under Construction	February 2009	Use of Substandard Materials, Poor Workmanship/Supervision	5
127	Aghaji Crescent,	A Fenced Wall	August 2009	No Proper Drainage	1

	GRA, Enugu				
128	Oke Padre Street, Ita-Morin, Abeokuta	Uncompleted Building	October 2009	Use of Substandard Materials/Hasty Construction	3 People 11 Injured
129	Isopakodowo Street, Cairo, Oshodi Lagos	Building under Construction for Lagos State Government	April 2010	Use of Substandard Materials	4 Person 12 Injured
130	Ojerinde Street Idiaraba		2009	Excessive Loading /Faulty Construction	9, 3 missing & 31 injured
131	Ajegunle Apapa, Lagos		2009	Structural Degeneration	Not disclosed
132	Adenike Street, Off New Market, Oniru Estate, Lagos	Uncompleted Storey Building	June 2010	Use of Substandard Materials, Non Compliance with Approved Building Plans and Weak Structure	1 Person and 2 Injured
133	2, Okole Street, Off Gimbiya Street, Abuja	Uncompleted Four-Storey Building	August, 2010	Substandard Materials & Disregard For Building Regulations	23 People and 11 Injured
134	Ikole Street, Area 11, Abuja	Uncompleted Three-Storey Building	August 2010	Undisclosed	5 People and 40 Squatters Trapped
135	24, Alli Street, Victoria Island, Lagos	Four-Storey Building	September, 2010	Structural Defect / Overloading	3
136	Abuja		2010	Faulty Construction	Not disclosed
137	Kano		2011	Rainstorm	6
138	Abuja		2011	Overloading	100
139	Abuja		2012	Unsupervised Demolition	2

Table 2: Causes of Building Collapse in Nigeria.

S/N	Causes of Building Collapse	Freq.	Percentage (%)	Rank
1	Structural Failure/Structural Defect	39	25.16	1
2	Incompetence, Poor Supervision/Poor Workmanship	22	14.19	2
3	Use of substandard Building Materials	20	12.90	3
4	Faulty Structural Design/ Absence of Structural Design	15	9.68	4
5	Carelessness	11	7.10	5
6	Rainstorm/Heavy Downpour	11	7.10	5
7	Weak/Faulty Foundation	9	5.81	6
8	Excessive Loading	8	5.16	7
9	Illegal Conversion, Non compliance with approved building, & Disregard for Building Regulation/Plan	8	5.16	7
10	Hasty Construction/Faulty Construction	6	3.87	8
11	Ignorant/Greedy Clients	3	1.94	9
12	Dilapidated Building or Dilapidation	2	1.29	10
13	Absence of Drainage	1	0.65	11

Table 3: Recorded Building Collapse in Nigeria between 1974-2012

S/N	Year	Frequency	% Frequency	No. of Recorded Lives Lost & How many Incidents Unknown
1	1974	1		27
2	1976	1	0.0072	8
3	1977	4	0.0288	55
4	1978	2	0.0144	16/1Unknown
4	1979	1	0.0072	10
5	1980	1	0.0072	6
6	1982	3	0.0216	24
7	1983	4	0.0288	40
8	1985	11	0.0791	43/1Unknown
9	1986	5	0.0360	32/8 Injured
10	1987	6	0.0432	34/1Unknown
11	1988	2	0.0144	1/1Unknown, Many Injured
12	1989	4	0.0288	1/1Unknown
13	1990	3	0.0216	55/Several Injured/1Unknown
14	1991	3	0.0216	17
15	1992	2	0.0144	12/Several Injured
16	1993	3	0.0216	5/2Unknown
17	1994	7	0.0504	39/91 Recorded Injured. Many Unrecorded Injured
18	1995	7	0.0504	44/1Unknown
19	1996	3	0.0216	8
20	1997	4	0.0288	20/1Unknown
21	1998	5	0.0360	10/Several People Injured/ 1 Unknown
22	1999	10	0.0719	59/4Unknown
23	2000	3	0.0216	5/1Unknown
24	2001	3	0.0216	14
25	2003	5	0.0360	1Unknown/8 Injured
26	2004	3	0.0216	3Unknown
27	2005	7	0.0504	3/3Unknown
28	2006	6	0.0432	69/Several Others Undisclosed/1Unknown
29	2007	2	0.0144	Several People
30	2008	7	0.0504	21/Several People Injured & not Less Than 100 People trapped
31	2009	5	0.0360	18/1Unknown & Not Less than 54 People Injured & trapped
32	2010	6	0.0432	34/ Several People Injured & trapped
33	2011	3	0.0216	106
34	2012	1	0.0072	2
Total		139	100	842

Table 4: Locational Distribution of the incidents of Building Collapse in Nigeria.

S/N	Location	Frequency	Percentage (%)
1	Ondo	8	5.76
2	Lagos	74	53.24
3	Kano	5	3.60
4	Abuja	11	7.91
5	Kaduna	4	2.88
6	Ado-Ekiti	1	0.72
7	Borno	1	0.72
8	Rivers	4	2.88
9	Sokoto	1	0.72
10	Kwara	2	1.44
11	Benue	1	0.72
12	Anambra	2	1.44
13	Osun	2	1.44
14	Imo	1	0.72
15	Edo	2	1.44
16	Enugu	2	1.44
17	Oyo	10	7,19
18	Ogun	6	4.32
19	Cross Rivers	1	0.72
Total		139	100

Table 5: Types of Buildings that have Collapsed in Nigeria.

S/N	Types of Buildings	Frequency	Percentage (%)
1	Residential	65	54.17
2	School	10	8.33
3	Religion	6	5.00
4	Residential under Construction	19	15.83
5	Commercial	12	10.00
6	Judiciary (Court)	2	1.67
7	Health (Hospital)	2	1.67
8	Sport	1	0.83
9	Hotel	3	2.50
10	Total	120	100
11	Types of Buildings Unrecorded	19	
	Total	139	

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