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COLLAPSED BUILDINGS IN NIGERIA

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ABSTRACT

The purpose of this compendium is to survey why many buildings in Nigeria collapse, during or after completion, and find remedy against future occurrences. The method used here is the stock-taking of occurrences as reported in media. It also takes into account the field – book reports by the authors as they ventured out in the field to interview some architects. It was discovered that quite a number of these cases are never reported for fear of sanctions. The findings were that governments don't make such sanctions public. Moreover, the use of quacks in the building industry had contributed in no small measure. Conclusion therefore was that, Government must develop stiffer measures on defaulters and get consultants and contractors registered. All registered consultants (architects and engineers) must be made public and Quacks must be made to find their ways out of the building industry. Draughtsmen should not claim to be architects, engineers or builders.

INTRODUCTION

A building, well planned, designed, funded, constructed and maintained does not stand the chance of failure. However, a building is said to fail when it or any part thereof can no longer fulfill the minimum requirements for which it was designed. In other words, a building fails if manifesting defect on it or on its part exceeds allowable levels. Simple failures like excessive deflection or cracking induce panic to occupants, making them uncomfortable, while ultimate failure (total collapse) takes lives and properties, along!

Structural failures of building have become one of the most disturbing problems facing the construction industry not only in Nigeria, but also on a universal scale. Akeju (1984) has drawn attention to the lessons to be learnt from structural failures for the benefit of the construction industry. However, such may be a minor and preventive approach to the causes of failure themselves rather than corrective.

GENERAL VIEWS ON STRUCTURAL FAILURES

Ajayi (1988) has attributed building failures and collapse in Nigeria to poor design of structure and foundation detailing. While this may be true, it is to be noted that the causes of building failures and collapse are numerous, involving the action of all members of the building team, including the occupants.

Spalling of concrete is one of the biggest contributors to structural failures in buildings. Lower concrete disability occurs when corrosion product, forming on concrete reinforcement bars, builds to such an extent that it causes the concrete, surrounding it, to crack. The presence of moisture and oxygen causes corrosion where carbon dioxide reduces the alkalinity of the concrete or where chloride ions penetrate to the steel.

Common causes of spalling are poor quality concrete, insufficient curing time and lack of adequate concrete cover to reinforcing bars. According to Marosszeky et al (1987) out of 227 faults in 95 buildings surveyed in Sydney Metropolis, Australia, mean concrete cover to reinforcement was 5.45mm, which is less than the recommended minimum. When steel rusts, it expands, causing the concrete to crack.

The durability of concrete in Nigeria is seriously affected when government and developers start building projects only to

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abandon them shortly after, leaving the structure for many years, and by the time work is resumed on the projects, the strengths of concrete and exposed reinforcements would have been greatly reduced.

Hammond (1988) has blamed the collapse of buildings in Nigeria on lack of control in the marketing of cement and the production of low strength sandcrete blocks by manufacturing industries whose products are never checked to ensure that pre-determined minimum strength is maintained. He contended that the acquisition of storage shacks; buying bagged cement and bagging cement, sweeping and selling it have been proliferated. This leads to poor storage, making the cement defective and of lower strength, hence strict licensing of retailing cement in Nigeria is required to prevent building failures and collapses.

Block moulders, he suggested, should be equally licensed and crushing test performed on their products from time to time. While Hammond's views are expressed with good intentions and could reduce building failures and collapse, strict licensing of cement will place few individuals on the sale and distribution of the material, which will only hike up the price, thereby making it more expensive to build.

Testing the strength of sandcrete blocks will be difficult to achieve, because so many testing machines will be required, while block-makers will only give out stronger blocks to be tested, which might not show a good representation of the strength of all blocks produced. However, the best way of ensuring good quality cement and blocks is through effective supervision of building projects; where supervisory staff rejects defective cement and blocks on supply as this will encourage the suppliers to produce better materials, if they want to stay in business.

Apart from poor quality materials, poor supervision and construction, inadequate funding, poor maintenance and alterations of a building, without approval, all contribute to building failures and collapse in the country.

MAJOR CAUSES OF STRUCTURAL FAILURES

Besides human error and lack of adjustment in structural codes, the major causes of structural failures include:

Faulty design

The logical approach to design of a structure is the so-called limit state approach or comprehensive design. To design a structure, one must be able to predict its mechanical behaviour at each significant level of the critical combination of all actions to which the structure may be subjected during its service life. Because it is usually impractical to consider real behaviour under the actual generalized critical action to which the structure may be subjected during its useful life, it is common to base structural design on idealised conceptions of mechanical behaviour under simplified action. To assess the reliability that real behaviour could be determined only by carefully planned experimental and analytical studies.

Construction Defects

These stem from disregard to quality control measures and poor workmanship. Hence, voids become excessive from ill-compaction of concrete members. Wrong alignment of construction elements and use of impure and inferior materials also abound. Largely, poor field practices result from the lack of awareness by workers of the critical safety aspects of the operations at the site.

Lack of Maintenance

Nonchalant attitude of the owners or users of property leads to cumulative defects causing serious deterioration of fabrics and finishes of a building often reduces the life span of a building. The primary aim of maintenance is to preserve a building in its initial state, as far as practicable, so that it effectively serves its purpose. The main purpose of maintaining buildings including:

(i) Retaining the value of investment,
(ii) Maintaining the building in a condition in which it continues to fulfil its function, and
(iii) Presenting a good appearance.

The amount of necessary building maintenance work could be reduced by improved method of design, specification and construction. In addition, effective maintenance management embraces many skills. These include the technical knowledge and experience necessary to identify maintenance needs and to specify the right remedies, an understanding of modern techniques of business management, knowledge of property and contract law, and an appreciation of sociology.

Natural and Random Hazards

These are attributable to the effects of

(1) Wind

(2) Fire
(3) Earthquakes, and
(4) Moisture movement

Effective remedy to these failures requires the provision of a housing form, which in addition to meeting the client's needs and satisfying the law, gives solutions to the climate and environmental problems, facing the design and construction of a building in the area. It furnishes adequate means of controlling the environment which may be a combination of various factors such as shading, reflection and insulation devices etc.

CASES OF STRUCTURAL FAILURE IN NIGERIAN BUILDINGS

The rate of collapse of buildings in the country has become so alarming that accusations and counter accusations run wild. Different segments of the building industry have been pointing accusing finger at one another. Often, a vicious web of vulnerability is created with the industry as one group undercuts the other in the process of getting jobs or contracts. This, Hollingsworth and Brier (1977) have observed, may lead to lower quality of work, thus resulting in building failures. Government in most cases has accused professionals in the building industry of engaging in sharp practices.

Critics too have accused both government and its officials of corruption and negligence, which have made government projects suffer structural failures because most of the funds are misappropriated with a small amount really going into the project. Development planning officials in many instances are known to present structural drawings to town planning agencies and get approvals when, in fact, they are not supposed to do so by law.

Achuenu and Kolawole (1995) have blamed the rampant cases of building failures and collapses on the country. They found that one hundred uniformed buildings inspectors of Lagos State Town planning Department appointed during the Jakande regime were indicted for illegally approving buildings without proper procedures at a price. It was discovered that draughtsmen prepared many of the collapsed building plans, especially in Lagos State.

Building owners too, have not helped the situation by always looking for the cheapest ways of building even before getting the "approved plans". Curiously, people go to the best medical doctors when they get sick, but when they want to build, they look for the cheapest professionals. Greedy contractors too, cannot be left out of the blame.

EXAMPLES OF COLLAPSED BUILDINGS

1. Collapse of A 3-storey Building in Idusagbe Lane, Idumota, Lagos

House No.26 Idusagbe Lane, Idumota, Lagos, collapsed and crushed down two adjacent buildings, killing 11 people on September 14, 1987 (Hammond, 1988). The house was until 1977 a bungalow, when the owner brought in some bricklayers who did what they thought was the reinforcement of the foundation and thereafter added another floor on it. A third floor was also added since nothing happened and this led to the collapse of the entire structure. Investigation found out the there was no evidence of structural design or soil survey, let alone a foundation design.

2. Failure and Collapse of a Bungalow in Ikorodu, Lagos

On September 29, 1987, a bungalow in Ikorodu, Lagos, collapsed killing four children. It was used as a coaching class for 60 children who, fortunately had not all arrived before the collapse (Hammond, 1988). The house was built on a soil of very low bearing capacity, which developed structural cracks about two year after. This shows that there was improper design, leading to inadequate foundation for the structure.

3. Failure and collapse of Ipakodo Grammar School Hall, Lagos

On May 15, 1987, twenty students of Ipakodo Grammar School were injured when the wall of their school hall collapsed (Hammond, 1988). The materials were of low quality while the workmanship was also poor. Investigation revealed that the mortar used was excessively stronger than the blocks. Failure in masonry units occurs when the tensile stress in unit reaches ultimate tensile strength.

MEASURES OF PREVENT COLLAPSE OF BUILDINGS

Two approaches, which are preventive measures, are recommended. They are:

Fusion-Bonded Epoxy

Concrete spalling, cracking and subsequent corrosion and rusting has been

identified as one of the chief causes of building failure the world over, leading to the development of fusion-bonded epoxy. Epoxy-coated concrete reinforcing bars have been found to be effective combating concrete spalling and corrosion.

Fusion-bonded epoxy is thermosetting polymer, produced as fine powder and used electrostatically to coat reinforcing bars at a temperature of 623^0C to give a film thickness of between 130 and 300 micrometers. The only problem with this discovery is that it is an expensive technology for the developing world to afford. Therefore, engineers should lay more emphasis on good design to prevent corrosion.

Educating the General Public on Corrosion Prevention

Each year, much money is lost on corrosion and on protecting metal from it. Detected as a serious problem in building stability, steel corrosion is receiving close attention in Australia with the setting up of corrosion centre, charged with the responsibility of developing corrosion preventing strategies.

The aim of the centre is to educate industries and consumers on corrosion prevention, investigates structural failures attributable to corrosion, and provides consultancy service in corrosion prevention.

In Nigeria, efforts should be geared toward good design and construction because of our present stage of development. Although, corrosion technology is a welcome development, the duty of our engineers should still focus on providing good design and supervision.

Government has not been seen to seriously enforce building regulations to check the rampant cases of building failures. Professionals too have a role to play. They should spend time to produce accurate designs and reduce their professional charges, which scare away developers to seek the cheap services of quacks. An all-awareness campaign should be embarked upon, to educate people and developers on the dangers, inherent in compromising cost and safety of building.

CONCLUSION

The incidence of building collapse has become a recurring decimal in several parts of Nigeria. This situation raises much concern and anxiety about the safety of lives and property. Lagos especially, has recorded an alarming proportion of this tragedy. Estimation by experts shows that at least two hundred people die every year in Lagos State alone, because of collapsed buildings, most of which go unreported.

Investigation has shown that too much bureaucracy by the supervising ministries, before approvals are given tends to force would-be developers into the hands of corrupt and non-professional officials. The administrative process by which building approvals are obtained should be simplified with a view to discouraging irregularities, which in most cases, lead to these building disasters.

Specifically, to avoid further incidence of structural collapse of buildings, professional builders should be engaged in the supervision of building construction processes, while professional architects and engineers be effectively employed in designs.

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