STRUCTURAL DESIGN AS A PANACEA FOR BUILDING FAILURES IN NIGERIA

- A paper presented by Joe O. Ukpata during the occasion organized to mark the vocational service month of the Rotaract club of Hilltop, Calabar at Paradise City Hotel, Calabar, on Sunday, 15th October 2006.

INTRODUCTION

The month of October is set aside by Rotary International for members of the Rotary family to carry out programmes to encourage good vocational practice. I thank Mr president and other members of the Rotaract club of Hilltop, Calabar for the opportunity to contribute through this lecture.

In writing this paper, I had to contend with two major challenges. The first is that of addressing an audience comprising a majority of people with no structural engineering background. The second challenge is that of the need to compress this extensive topic in order to deliver it within a short time as required by the club. One basic advantage however is the fact that all of us here live inside buildings. Even this paper is being presented in a building. Whatever purpose a building serves – living, storage, hotel, office, classrooms, etc. people grieve for the losses in materials and lives whenever a building collapses.

The global concerns for sudden collapses of buildings across the world, and in Nigeria in particular demand that construction and especially design of buildings be carried out with great care. In Nigeria, news about building failures in major towns such as Lagos, Port Harcourt, Aba, Abuja and Benin have become rampant. The causes of these failures have been attributed to: poor structural designs 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/ supervision, etc. (Engr. Dr. Ephraim, 2006).

This paper identifies lack of good structural design as a major cause of building failures globally. This is because a good structural design encompasses good detailed drawings, good specifications, which in turn lead to good quality materials and good workmanships. Even the site soil condition is a pre-requisite for design of foundations. All these underscore the importance of structural design in buildings.

CONSEQUENCES OF BUILDING FAILURES

Though adequate records of building failures are not readily available in Nigeria, there have been reports of failures with their resultant losses in lives and properties worth Billions of Naira in Lagos, Benin, Aba, Port Harcourt and Abuja.

Across the world, news of the recent collapse of an airport building in France shocked everyone. In Canada, Billions of Dollars have been reportedly spent in re-building
failed buildings. According to Engr. I. O. Diyoke (2006), “one of the most fatal structural disasters in American history: the fall of the Hyatt Regency Hotel ballroom walkways in Kansas City where two aerial walkways collapsed killing 111 persons”, occurred due to design related problems.

DEFINITION OF BUILDING AND STRUCTURE

The Oxford Advanced Learners’ Dictionary defines a building as a structure such as a house or school that has a roof and walls. The same dictionary also defines a structure as the ways in which the parts of something are connected together, arranged or organized.

However, the definition of a structure from the Structural Engineer’s point of view, was given by Derek Seward (1998), “as a system for transferring loads from one place to another.” 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 above function. On the other hand, the purpose of structural design is to ensure that the building performs the above function effectively. It is imperative to note here that the structural function of a building mentioned above is directly related to other general function such as acting as cover from weather, burglars, etc.

STRUCTURAL DESIGN PROCESS

The word “design” means different things to different people and professionals. For example, the Tailor sees design as the various plans and processes to ensure that clothes are made fitting to their users; the fine Artist sees design as any plan towards ensuring a beautiful image; the Electrical Engineer thinks of how current would flow safely through appropriate wires and cables to supply power at different points. These can go on and on. But our interest in this paper is the Structural Engineer’s definition of design.

The aim of structural design according to the British Standard, BS8110: Structural Use of Concrete, Part 1 (1997), “is the achievement of an acceptable probability that structures being designed will perform satisfactorily during their intended life. With an acceptable degree of safety, they should sustain all the loads and deformations of normal construction and use and have adequate durability and resistance to the effects of misuse and fire.”

Structural design of a building involves the determination of the various types, sizes and locations of structural elements namely: Foundations, Columns, Beams and Slabs, and also the amounts of steel, which can safely combine with concrete to sustain the loads of the building – where reinforced concrete is the material being used; or the selection of suitable structural steel sections and their connections – where steel is used. The same applies when timber is used. In all these, detailed analyses of the
material strength, loads and the soil bearing capacity are carefully considered using scientific principles.

Standard professional practice is adhered to, using relevant codes of practice. In Nigeria, the British standard codes are generally used or referred to. The entire process of design is achieved through a series of calculations. The purpose of these calculations according to R. Westbrook and D. Walker (1996) includes:

\[ \text{i. To show that the design is according to good structural practice, and where appropriate, comply with the current and relevant National Standards and Building Regulations.} \]

\[ \text{ii. To demonstrate that the design is adequate in relation to stability, strength and serviceability requirements.} \]

\[ \text{iii. To aid, instruct and assist the draughtsman preparing the general arrangement and detailed drawings.} \]

\[ \text{iv. To provide a permanent record for future reference.} \]

It can be seen that in all the above, design requires creativity and proper training of anyone who must engage in it.

**WHAT ROLES FOR THE ROTARACTORS?**

Members of Rotaract clubs and indeed, all other service organizations can perform the following roles to safeguard building failures in Nigeria:

\[ \text{i. Carry out campaigns to sensitize the populace on the need to ensure that architectural drawings from registered architects are subjected to proper structural designs by registered structural engineers.} \]

\[ \text{ii. Report cases of all ‘quack’ engineers involved in structural design to the law enforcement agencies.} \]

\[ \text{iii. Report cases of building failures around their communities to COREN (Council for the Regulation of Engineering in Nigeria) and NSE (Nigerian Society of Engineers) for investigations and prosecution of culprits.} \]

\[ \text{iv. Rotaractors should see their professions/vocations as opportunities for service and therefore must not compromise professional ethics at any time.} \]

**CONCLUSION**

Most collapsed buildings in Nigeria were either built without structural designs, or with those made by unqualified structural Engineers. Therefore, in order to avoid failures in buildings, only qualified structural Engineers (those registered by the Council for the Regulation of Engineering in Nigeria, COREN) must be allowed to carry out structural designs. This can be made possible, if members of the Nigerian public and governments resolve to patronize only registered Engineers for their building needs.

Thank you all.
REFERENCES