

SOLUTIONS TO THE INCESSANT COLLAPSE OF BUILDINGS IN NIGERIA.

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The planning, approval, construction and commissioning of a building project is a dynamic process. It involves the input of various professionals, to be realized. The realization of most projects can be easily accomplished or extended over many years in some cases abandoned, with the actual executors i.e. the professionals changing hands. In order to properly suggest solutions, to reduce the incessant collapses of buildings, it will be important also to look at some of the processes involved in constructing a building and therefore the causes.

Four important groups of people are responsible for the development of any building project. **The expert consultants (Architect, Structural Engineer, Services Engineers and Quantity Surveyor), the Building Contractor, the Client and the Planning Authorities (Regulatory Authorities)**

I will limit my discussion on the role of the structural Engineer within the group of expert consultants, since his inputs are directly linked with the buildings overall structural stability and performance.

A building must be produced from a set of well prepared documents called the contract documents. These documents consist of the **architectural drawings, material specifications, contract conditions and bill of quantities.**

These documents are produced at the instance of the client by the expert professionals for the purpose of the project. These contract documents are the basis of the legal documentation and contractual obligations entered into between the client and the building contractor. The building contractor here is the one who possesses the expert knowledge to interpret these documents, and equipped to the level of assignment.

In all civilized societies there is the need to co-ordinate all urban development in order to make sure that standards are maintained, and adequate infrastructure is provided and integrated into the planning process to ensure that the environment is not overheated. Part of the developmental process in the construction of any building is the granting of permission from the relevant planning and regulatory authorities in any urban center, city or locality, to the developer to proceed. One of the functions carried out during this process is the cross checking of the structural engineers designs in the form of his calculations and drawings, to ensure they are right, and conform with the appropriate code of practice in the use in the particular area or locality.

Similarly all building contractors are registered and part of the clauses requires that an engineer with a specific minimum level of expertise is an integral resource in the firm.

What is collapse? Simply put, the building frame in whatever form has lost the capacity to sustain the loads applied to it and therefore develops various structural defects, that is it can no

longer be of use and subsequently major members break up under load, dismembered and crash to the ground.

Since the buildings process is dynamic and involves humans in all stages of planning approval, procurement, construction and commissioning, it is therefore safe to say that the solution to incessant collapse must center on the Human aspect. The solution must address the issue of why buildings collapse? When we identify the reasons then it will be easy to apply the solutions.

- i. Faulty contract documents especially deficient structural engineering input.
- ii. Faulty implementation of the contract document by the contractor, and bad construction practice.
- iii. Unprofessional interference in the construction process by the client.
- iv. Inadequate supervision of the construction work during implementation, so as to properly interpret drawings and specifications.
- v. Unauthorized change in the contract documents especially the structural drawings without due authorization from the original designers.
- vi. Defective materials, by not conforming strictly to the material specifications in the document(s).
- vii. Ignorance.

Based on the reasons given above, I propose the following solutions to tackle the problem of Building collapse in Nigeria.

1. All Structural drawings must be prepared by a qualified Structural Engineer, licensed to practice Structural Engineering by COREN, and a corporate member of the Nigerian Society of Engineers. All such drawing must carry the stamp of the Institution. The structural Engineer in preparing the documents must also have taken into consideration, the site for the project, by commissioning a soil investigation, assignment to determine the Engineering soil characteristics of the soil. Most buildings have come down because of in adequate foundations, in spite of fantastic frame.
2. Planning Approval for structural drawings must attract some degree of professional responsibility. Planning approval agencies in both state and local governments must be adequately staffed with qualified Structural Engineers, who can check the submissions of the Structural Engineers on the project. They must also share in the responsibilities for the safety and structural adequacy of the documents which have their signatures on them. If the planning authorities are short staffed, such assignments can be contracted to consultants.
3. The building contractor has the professional responsibility to execute the project according to specification, therefore the weight of responsibility on any contractor, must be properly backed up by experience in the field. The key personnel must have executed a similar project. The contractors' key staff, the site Engineer etc must be knowledgeable to the extent that he can interpret the documents. He must also be able to relate horizontally with the Structural Engineer. This will result in design intentions, assumptions and specifications properly carried through to execution. If the contractor lacks adequate experiences for the assignment, then certain quality implementations will suffer.
4. Every building project has more than one structural solution. Therefore when a particular solution is adopted by the Structural Engineer, his design and subsequent drawings are

products of all the assumptions, written and unwritten. Therefore adequate supervision to ensure that all structural elements are constructed according to the drawings is very important. It also affords the designer the opportunity to certify that the works are error free. It is very unwise to assign fresh school graduates as is common practice, the duty of supervising structural works, except in the company of his supervisor. You cannot supervise what you do not understand in building works. It is also an extension of this fact that the primary structural engineer must be involved in the supervision of his works. The practice of engineer A to design, while engineer B is asked to supervise is very dangerous, and must be stopped. The design firm must be asked to supervise the project to ensure the design consultant is not cheated out of his professional assignment.

5. During the planning approval stage, the Structural engineer signs a document of undertaken to supervise the project. This document must be made legally binding on the client. The practice today is that most clients do not take the declarations in the paper serious, and subsequently begin the construction work without the knowledge of the consultant engineer.
6. At the inception of any construction works, the Structural Engineer must be invited to verify the soil, approve the soil as appropriate at his specified depths as adequate for the building foundations.
7. No alteration to the scope of the original building works in the terms of changes to frames, floor, and building heights, must be done without the written approval of the structural engineer. The supervisory engineer unless he is the design engineer cannot alter any major structural detail. No other building professional can alter or authorize structural work except the structural engineer.
8. The client must not give direct instructions to the contractor, his intentions and preference must be directed to the architect or engineer, who can evaluate the request, before instructing the contractor accordingly. In similar manner the contractor can listen to the client, but he can not act on such directives by the client. The client must also promote discipline on his project by ensuring that no action of his undermines the authority of the supervisory professionals on his site.
9. Defective Material; It is a known fact that most of the reinforcing rods in the market are substandard and inferior in quality, some of the cements are caked and are therefore expired.
Therefore a proper certification programme must be carried out in direct proportion to the scale of the building project, to ensure that only tested materials, or whose source is sure are used for the construction.
 - *Concrete must be mixed in the right proportion specified, and water used must be drinkable.
 - * Avoid the use of open earth gravel, which are not washed, in concrete works.
 - * Avoid hand mixed concrete. Concrete must be placed at location immediately after mixing to avoid it setting.
 - * Re-mixing of set concrete must be avoided.
10. The imposition of severe sanctions on any contractor whose building project collapses. This will compel the contractor to employ the appropriate level of man power relevant to the project,

ensure without pressure that all necessary supervision and approvals are obtained at every level of the project.

11. Finally, collapse of building do not all occur during construction. Some buildings have collapsed because of the following reason including

- * Change of use.

- *Modification of existing building frame to increase or change capacity of present use.

- *Undermining of the foundation due to flood, poor drainage, and poor location of soak-away pits.

- * Lack of maintenance: Any structural defect must be promptly reported to a competent structural engineer for advice.

It is my conclusion therefore that the solution to the incessant collapse of buildings in Nigeria is more of an information/ knowledge problem than the writing of a set of rules. If all industry, the professionals, the building contractors, the clients and government agencies understand why the building process must be taken serious, then the problems of collapse would have been solved.

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