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Preparation of Structural Audit Report for Building (A Review)

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Abstract: With the ponder of current prepare of Auxiliary Review System there's have to be discover thelacunas within the current prepare and adjust the method for proficient usage of Auxiliary Review. Thisinvestigate points at finding out the lacunas on the off chance that any within the current strategy andapplying administration principals to adjust the auxiliary inspecting prepare and propose a fewadvancement measures to the overseeing body. Methodology embraced comprises of collectingspecialists surveys on current system, consider of existing auxiliary Review method in overseeing bodyand finding lacunas on the off chance that any in current system. Right now, Security of ancientbuildings is one of the basic issues in India. In spite of the fact that, there are numerous hones toconduct basic review of such buildings, the issues of basic security review remains dubious due toirregularity of such hones.The study attempts gives guidelines about preparation of structural auditreport

Keywords: Structure, Structural Audit, Impact

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INTRODUCTION

Structural audit is the general health and performance checkup of a building depending on its quality of maintenance. as the building grows old ageing and exposure to environment can affect the health of the building significantly.

Procedure for Structural Audit

1) It is imperative that we must have Architectural and Structural plans of the buildings. It will be helpful if we have detailed structural calculations including assumptions for the structural design. The assumptions can also include the allowable live loads; whether the building is designed for residential, commercial, light industry or heavy industry and whether any future provision for adding new floors is considered? What type of Earthquake loads is considered? Which I.S. Code requirements have been met?

If the Architectural plans and Structural plans are not available, the same can be prepared by any Engineer by measuring the size of the bldg. & locating the position of the columns, beams and size of all such structural elements

2) Visual Inspection of the Building

A detailed inspection of the building can reveal the following:

- Foundation settlements, if any exist.
- Cracks visible in columns, beams, and slabs

- Concrete disintegration and exposed steel reinforcements- photographs can be helpful. Slight tapping with hammer can reveal deterioration in concrete.
- Extent of corrosion in reinforcement.
- Status of Balconies – sagging, deflection, cracks
- Cracks in walls indicate swelling in R.C.C. members, distress, deflection, or corrosion.
- Water leaks from the patio and toilet blocks.
- Water leaks and humidity in the walls, causing fractures and corrosion.
- Changes that have an impact on the structure.

Toilet blocks - Added or changes made

Change of user – from Residential to Commercial to Industrial

- Status of lift and lift machine room – Type of Maintenance Contract, renewal of license.
- Status of electrical wiring from meter room to all the flats. Substation status. Any explosion in the meter room, substation
- Capacity of overhead and subsurface water tanks. Leaks, cracks, and cleaning frequency, as well as the state of the pumps.
- Protection of the plinth in the compound, including drainage, water lines, and pumps. How much water inundated the ground during the recent monsoons?
- External paint – When was the last time you painted and what kind of paint did you use?
- Repair status and latest repair. What exactly was fixed? What was the Agency's name? How much did the repairs cost?
- Do you have any building plans? When will it be approved? Is there a structural plan? Is a Certificate of Structural Stability available? Do you have any structural calculations?
- When was the last time you performed a structural audit?

1) Recommended Tests

It is critical that different testing be carried out in the historic structures. This will give you a sense of how much corrosion, distress, and loss of strength there is in concrete and steel.

Tests may include:

- Concrete Strength Assessment: Concrete Core Cutting and Compression Testing for Columns, Beams, and Slabs

- A half-cell potential test is used to determine the likelihood of corrosion in implanted steel.
- Carbonation test for determining the depth of carbonation in steel.
- Ultrasonic Pulse Velocity Test (UPV) for concrete strength assessment For simple foundations, this is a good option.
- Pile foundation integrity testing.

2) Highlight the critical areas and methods for repairs.

For example.

- The number of columns that require rapid repair, such as rusty steel treatment, new steel installation, column jacketing, and so on. - Foundations, balconies, and chhajjas need to be repaired.
- Wherever possible, pay special attention to beams and slabs.
- Waterproofing of terrace and toilet blocks should be prioritized.
- Cracks in external walls must be addressed, and appropriate paint quality must be provided. The highlighted crucial areas must be addressed right now.

3) Compliance of Audit requirements.

Audit is a necessary, but in itself Audit is not sufficient. It is important that the findings and/or recommendations of audits are implemented satisfactorily, within a stipulated time limit and are certified by Structural Engineers; Otherwise the Audit findings will remain on paper.

FORMAT OF VISUAL INSPECTION REPORT

Main Contents of Report

The following is a guide on the manner in which the Visual Inspection Report should be prepared. In addition, a checklist is to be included in and as part of the inspection report.

a) General Information of the Building -

- Name and address of the building
- Number of storeys in each block of building
- Description of main usage of the building
- Maintenance history of the building, if known

b) Structural System of the Building

- Describes the structural shapes, systems, and materials utilized in various components of the structure, such as reinforced concrete, prestressed concrete, steel, and so on.

- If known, a description of the soil condition and foundation system Identifying important structures and structures that are not redundant (Eg. transfer girders, slender columns, cantilever structures, long span structures, cable structures, etc)

c) Visual Inspection Diary and Scope

Inspection dates for various portions of the structure - Description of any areas not covered by the visual inspection, the reasons for this, and an evaluation of whether such areas are crucial to the building's overall structural integrity.

d) Loading on the Structure Structure Survey

Records and comments on loading conditions, showing usage in various portions of the building and highlighting any misuse, abuse, or departure from planned use. Industrial structures will receive special attention (eg. factories and warehouses). Determine if current use and loading conditions are consistent with the structure's intended function. Indicate whether any misuse, abuse, or departure from the authorized usage has resulted in excessive loads that might compromise the construction of the building.

Recommendations for any remedial activities that the owners should take, such as limiting usage, moving heavy machinery, and doing more inquiry into the structure's appropriateness. - Where there is a departure from its intended usage that results in overloading or sustaining a greater design imposed load than indicated in BS6399, the inspection report should propose a further design check on structural sufficiency and the display of permitted imposed loading signage.

Inspection of Building Structure Additions or Alterations – Records of any additions and alterations to the building structure, as well as comments on the findings. Visual examination, engineering judgment, questioning the management corporation, owners, and users, and verifying the drawings if accessible to the engineer can all be used to gather this information. - Describe any additions and alterations that have resulted in excessive loads or other negative consequences on the structure of the building. - Recommendations for any remedial activities that the owners should take, such as the necessity to remove the addition and alteration works.

A survey of people who have been exposed to a hostile environment – The presence of a water-immersed column(s) (eg. ground floor water tank, sea water, lakes, etc.) The presence of aggressive chemicals that might hasten the degradation of structural parts, especially in industrial structures.

e) Examine retaining walls and slope protection systems (such as soil nails, earth anchors, and shotcrete slopes). Evidence of wall movement, insufficient surface drainage, unintentional imposed loads behind the wall, corrosion of the anchor blockhead, spalling of the shotcrete protection, tension fractures, and the presence of large trees nearby, among other things.

f) Inspection of safety barriers (e.g., parapets and railings) - Corrosion, excessive deflection, spalling, cracks, and other defects were found on safety barriers, particularly in buildings with big crowds (eg. shopping malls, institutional buildings, sport halls, stadiums, theatres, etc.)

g) Other Surveys or Checks Carried Out

- Presence of heavy suspended fixtures in crowded locations, such as heavy false ceilings over high human-traffic areas like food courts, lobbies etc.
- Records of and comments on any known maintenance problems and previous rectification carried out on the building structure. Useful plans, sketches, photographs and tabulations could also be included to illustrate the findings of the inspection;

h) Conclusions - Conclusions on the structural condition shall include conclusions on loading conditions; addition and alteration works; structural defects, damage, distress, deformation, deterioration; and overall structural integrity and stability.

i) Sketches, Plans and Photographs - All sketches, plans and photographs should have proper titles, explanations and cross-references to the main body of the report. - Although photographs are often used by structural engineers as a record of their inspections, the entire collection of photographs should not be submitted indiscriminately, e.g. photographs of non-structural elements with no defects.

Generally Suggested format for structural audit report

Name of the Building: _____ Description: _____ Address: _____ Society Name: _____ Age of the Building: _____ Contact Person: _____ Tel. No: _____

Inspection Report Date: / / INSPECTED BY: _____

SR. NO.	DESCRIPTION	NOTATION	GRADE
A)	**VISUAL INSPECTION**		
1	Foundation strata		
	Settlement of columns		
	Settlement of walls		
	Cracks in columns., walls, joint at plinth		
2	Super structure inspection		
	Cracks in columns/ rusting of steel / exposed steel		

	Cracks in beams / rusting of steel / exposed steel		
	Cracks in slabs / rusting of steel , / exposed steel		
	Cracks in external walls		
	Cracks in internal walls		
3	Leakages & dampness in external walls		
4	Toilet leakages, cracks		
5	Terrace water proofing inspection		
6	Leakage & dampness on the top floor slab		
7	Inspection of water tank above terrace		
8	Inspection of underground water tank		
9	Leakages & damages in plumbing lines/waterlines, drainage lines		
10	Electrical line		
11	Details of last repairs		
	Date		
	Cost of repair work		
	What was repaired?		
12	Date of construction of building		
13	R.C.C/ load bearing structure		
14	Idea about foundation strata from surrounding areas & enquiry		
15	High flood level		
•	HFL during this monsoon		

•	HFL during last five years		
16	Any cracks observed during earthquake		
17	Architectural plans available		
18	Structural plans available		
19	Building plan approval date		
20	Occupation certificate date		
21	Building is designed for earthquake code - 1893-1984		
B)	**TESTS RECOMMENDED**		
22	Rebound hammer test		
•	Concrete core cutting & compression testing		
•	Half-cell potential test for determining the probability of corrosion in embedded steel		
•	Carbonation test for carbonation depth measurement for steel		
•	Ultrasonic pulse velocity test (upv) for strength assessment of concrete		
•	Integrity test for pile foundations		
23	Repairs / retrofit suggested		
24	Conclusion		
25	Review of repairs carried out		

Structural Engineer

License No_____

CONCLUSION

With study of Structural Audit Framework we came to the conclusion that there is gap between the uniformity of the Framework. Usually Structural Audit is done by the Structural Engineer and the result is generated only on the basis of his experience. There should be legal or Universal Procedure of Structural Audit. Moreover there is no Standard format for preparation of audit finding report as each Structural Engineer has his own format so there is no uniformity in the format. Due to these it becomes very difficult for common man to understand the Audit Report. Adding to these there the current structural Audit Framework do not have any Serviceability Index or Safety Index to say whether the building is Safe or Does it require any repair or should it be demolished. The Conclusion about the Future of the building depends completely on the Experience of the Structural Engineer.

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