Investigation of Existing Structure For Strengthening Purpose

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Abstract- *In India there are many old buildings which have reduced strength in due course of time. If further use of such deteriorated structure is continued it may endanger the lives of the occupants and surrounding habitation. Appropriate actions should then be implemented to improve the performance of structures and restore the desired function of structures. . To achieve, we analyze the existing building through observation whether any crack, or bending of beams or displacement in columns is present through tapping. Structural Audit of building is done using NDT and results are found accordingly.*

Keywords- NDT, Structural Audit, etc…

I. INTRODUCTION

In India there are many old buildings which have reduced strength in due course of time. If further use of such deteriorated structure is continued it may endanger the lives of the occupants and surrounding habitation. Appropriate actions should then be implemented to improve the performance of structures and restore the desired function of structures.

Thus, it is utmost important to perform structural audit of existing buildings and to implement maintenance repair work timely which will lead to prolonged life of the building and safety of the occupant. To act more responsible and pre-emptive towards the dilapidated buildings, the municipal corporation must issue notices to the buildings and co-operative societies which are more than 30 years old to carry out mandatory structural audit and submit the audit report. Structural audit should highlight and investigate all critical areas and recommend immediate remedial and preventive measures.

It should cover the structural analysis of existing frame and find critical elements for all types of loadings. It also helps in delivering a strong building structure with cost effective solutions and appropriate maintenance program. Structural audit study deals with the different parameter of structural audit including visual inspection, non-destructive testing, and core sampling and testing. It also emphasizes on different repairs and retrofitting measures to be used for buildings after structural audit.

Structural Audit is an important tool for knowing the real status of the old buildings. The Audit should highlight & investigate all the risk areas, critical areas and whether the bldg. needs immediate attention. It should also cover the structural analysis of the existing frame and pinpoint the weak structural areas for static, wind & earthquake loads. If the bldg. has changed the user, from residential to commercial or industrial, this should bring out the impact of such a change a revolution in the last four decades resulting in new materials having more strength and stiffness than the traditional construction material.

1.1Scope

Structural assessment can be initiated, when there has been a change in resistance. Such as structural deterioration due to time-depending processes (e.g. corrosion, fatigue) or structural damage by accidental actions. Also when there will be a change in loading e.g. increased traffic load or an extension of the design working life. The main purpose of the report is to analyse the current structural reliability. It will be further useful to make an appropriate decision by the owner to strengthen the structure else reconstruct; hence it gives the scope to the analyse the reliability of structure and further decision making process.

1.2 Objectives

1. To study the concept of structural audit in detail.
2. Structural audit of existing building through visual observation, and evaluation of collected above data.
3. Audit of existing building by assessment at site-Check of compressive strength by NDT.
4. Discussion on actual observation and assessment at site.

II. STRUCTURAL AUDIT OF EXISTING BUILDING THROUGH VISUAL OBSERVATION AND CHECK OF COMPRESSIVE STRENGTH BY NDT

2.1 General Information of the Building

1. Number of storeys: G+1 (Ground and First Floor)
2. Description of main usage of the building: Building Constructed for Industrial Purpose.
3. Type of Structure: RCC Frame Structure.
4. Year of Construction: 1984
5. Dates of inspection: 20th January 2018.

2.2 Structural System of the Building

1. Description of the structural form,: At present Footing, Column, Beam, Slab, walls and Staircase of Ground and First Floor has been constructed on Site
2. Systems and materials used in different parts of the building e.g. reinforced concrete, concrete, Brick work in walls with mortar.
3. Foundation system: RCC (Long and Short span Structure)

2.3 Actual Visual Inspection at site

Visual inspection was conducted on 11th and 12th January 2018, for observation and assessment of structural steel and material of the building. It had been observed that there are

i. Partly broken slab and beams.
ii. Cracked broken staircase .
iii. Damaged column with cracking.

2.3.1 TERRACE FLOOR

1. Strength of inverted beam is varying in different places abruptly.
2. Terrace slab are weak in tension, showing NDT reading extremely low.
3. Cracks are formed on walls of toilet units of terrace.
4. Opening of reinforcement at bottom of slab, rusting of all reinforcement it weakened Structural members in tension.
5. Structural cracks observed on walls and beams of staircase units.
6. All waist slabs are seen damaged, concreting material are spalling & deterioration at various places.
7. Strength of riser & tread are reduced due to waist slab thickness damaged.
8. R.C.C pardi of stair case unit showing average strength.
9. Columns are showing varying strength up to parapet level minor cracks are formed so strength are less as per test records.

Fig 1Terrace floor

2.3.2 FIRST FLOOR

1. All RCC Chajjas are weak & partly opening of reinforcement & spalling of RCC material, as result strength observed is zero. Strength of columns are weak in compression, at various places.
2. Major structural cracks are formed opening, of columns front & both two sides, rusting of reinforcement showing strength are zero.
3. Strength of slab beams are showing average.
4. In walls minors cracks are formed it seen outer side of projection, spalling of plasters are many places.
5. Observed junction joints of beam and columns are corrugated at various positions so strength are less measurable.

Fig 2Terrace floor

2.3.3 Ground Floor:

1. Strength of slab are reduced in tension zone as observed from NDT test reading
2. Various places at bottom sides of slab cracks are formed Strength measure uneven at various places.
3. Observed strength of column at position of entry found to be zero.

4. Observed structural cracks at entrance beam and exposed reinforcement recorded very low strength at end of beam.
5. Column at Entry of compound is having deep structural crack at entire height of column and strength recorded at many places is zero, while adjacent column is damaged at bottom with reinforcement visible and corroded.
6. Various places observed reading zero or not measurable as per NDT testing record.

III. RESULTS OF STUDY

TERRACE FLOOR

1. Strength of inverted beam is varying in different places abruptly.
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IV. CONCLUSIONS

1. Structural Audit is an important tool for knowing the real status of the old buildings. The Audit highlights & investigate all the risk areas, critical areas and whether the bldg. needs immediate attention.
2. If building is more than 15 years old. It is important that structural audit is necessary once in 5 years.
3. This will be continuous process as it is difficult to guarantee future life of old buildings however, regular audit and implementing audit findings will avoid sudden collapse of buildings and save thousands of life. This process will also increase the future life of buildings.
4. It ensures that the building and its premises are safe and have no risk.
5. For case 1, it analyses and suggests appropriate repairs and retrofitting measures are required for the buildings to perform better in its service life.

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