Assessment of Structural Parameters of RCC Structure By Structural Audit

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Abstract- *Structures can be classified as Historical, Heritage Structure, Residential, Commercial or Industrial building. Each structure has its own lifecycle and within this service-life it should stand firmly on its position. Eg. A Megalithic Temples of Malta in India which is one of the oldest structure and still stand on its position very efficiently. But that is not a condition about the now-a-days Structures. now-a-days Structures are getting collapsed before there service life is completed. Therefore, it is important to observe it periodically by taking a professional opinion. Structural Audit is a preliminary survey of a building to check its general health as a civil engineering structure. Apart from regular maintenance, many structures needs general Repair, Rehabilitation and Retrofitting. many a period of time, as these structures become older, we find in them certain degradation or deterioration with resultant distress revealed in the form of cracking, splitting, delaminating, corrosion etc. Such depreciated structures can be rehabilitated and retrofitted by using various types of modern repairing materials.*

Keywords- Structural audit, NDT method, ETABS Modelling, SEP (Structural Evaluation Program), Rehabilitation, Retrofitting, Sustainable Development.

I. INTRODUCTION

In India RCC has been used extensively since last 50-60 years of heritage old building and Structures. After the independence a rapid and vast development in multi-storied infrastructure has been seen.This structures due to continuous deterioration of material and not being timely maintained have reduced Strength. Due to increase in population, people migrating from village to cities therefore the population in cities increasing day by day and number of people living in building are occupy more than the actual design consideration. In further many old buildings which have reduced strength due to low quality material, improper techniques used in construction, the chances of failure of buiding are increased now a days, use of such damage structure is continued it may cause severe loss of lives and Property. Structural Audit is an overall health and performance check-up of a building like a doctor examines a patient. Structural Audit is an important tool for knowing the real status of the old building. It ensures that the building and its premises are safe and have no risk to occupant. Every structure has its own service life.So that it is necessary to do structural auditing that is maintenance and Repair of Existing Structure once in 5 years for whose age is more than 25-30 years.

NEED OF PROJECT

Structural audit was first introduced by Indian society of structural engineers from 1975.The need of audit is to save life and increase the life span of that structure. The major issues that come-up in structural audit is that the people are not aware about the structural audit & its importance.It is important for structure to check their safety for knowing the real health status of the heritage buildings or structure.Due to maintenance and repairs of the structure health of that structure may be increases. So that structural auditing is necessary of all old age structures.

II. OBJECTIVES

- To Examination of building to evaluate the actual strength of that structure.
- To find the dangerous areas which need to repair proximately and recognizing any modifications and accumulation in the structure.
- To increase life span of structure by suggesting precautionary and remedial measure like maintenances.

III. METHODOLOGY

Preliminary Data & structure details

Building is located in Wagholi. It is an residential building G+1 structure, and building is 28 years old. Other essential data given below:

• Name Of Structure- Matoshri Nivas
• Location- Wagholi
• Year Of Construction-1993
• Present Age Of Structure- 28 Years
• Type of structure-RCC
• Zone- III

• Number of stories-G+1
• Ground storey height- 3.1 m.
• Floor to floor height-3.1 m
• Parapet wall-250 mm thick including plaster
• Wall thickness-250 mm thick including plaster
• Total depth of the slab-180 mm
• Size of all columns- 230 × 230
230 x 380mm
230 x 450mm
• Size of all beams- 230 × 350 mm

Fig1. Selected site for investigation

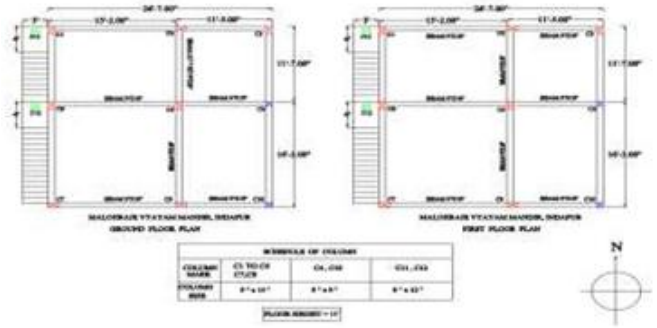

Fig2. Beam Column Layout

2: Preliminary inspection of the building:

Visual inspection: In this building is thoroughly inspected from flat to flat noting cracks, spells, crazing, seepage etc. Highlighting critical area of investigation and repair same is marked on the plan of the building.

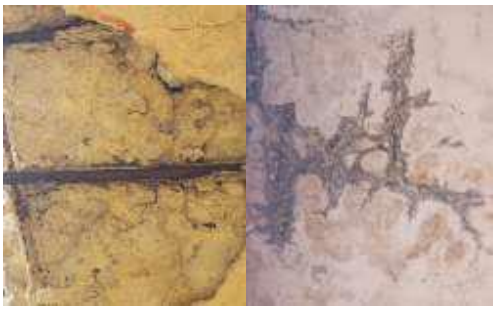

Fig3. Some areas detected during visual inspection which need immediate repair due to corrosion of steel reinforcements.

IV. EXPERIMENTAL WORK

NDT (Non Destructive Testing)

To perform NDT tests depending upon defects in structure.

Non-destructive Testing is the methods of testing allows to test the material or component without losing its usefulness and determined without damaging or making changes in the integrity of material. NDT method helps in testing veracity of concrete or structural members throughout its life span. Once the NDT tests is performed it is possible to test again the structure. NDT tests are applicable in testing the condition of the bridges, highways, building etc. NDT methods have been in use for about 4 decades, and in this period, the development has taken place to such an extent that it is now considered as a powerful method for evaluating existing concrete structures with regard to their strength, durability and quality

NDT allows users to determine following properties of the Object

1. Strength properties at site
2. Durability
4. Moisture content
5. Elastic properties
6. Extent of visible cracks

3.1.1 Method of testing:

1. Prepare the instrument for the test, remove the plunger from lock position by pushing the plunger on the surface and push it slowly against the surface.
2. Hold the plunger perpendicular to the testing surface.
3. As the body is pushed, the main spring connecting the hammer mass to the body is stretched. When the body is pushed to the limit, the latch is automatically released and the energy stored in the spring propels the hammer mass towards the plunger tip. The mass impacts the shoulder of the plunger rod and rebounds.
4. This rebound distance is measured on the graduated scale and is termed as rebound number

Experimental Analysis Results

Table -1: For Column

Sr.no	Column no	Column size (mm)	Rebound No	Hammer position	Compressive Strength (mpa)
1	C1	230*450	28	Horizontal	19.4
2	C2	450*230	30	Horizontal	20.5
3	C3	450*230	24	Horizontal	12.5
4	C4	230*230	23	Horizontal	13.9
5	C5	230*450	31	Horizontal	23
6	C6	230*450	20	Horizontal	11.5
7	C7	450*230	26	Horizontal	13.4
8	C8	450*230	32	Horizontal	22
9	C9	230*230	25	Horizontal	13.3
10	C10	450*230	21	Horizontal	13.9
11	C11	450*230	23	Horizontal	13.1

Table -2: For Beams

Sr.no	Beam no	Beam size (mm)	Rebound no	Hammer position	Compressive strength(mpa)	Average
1	B1	230*350	22 31	Horizontal Vertical	15 14.5	14.75
2	B2	230*350	27 24	Horizontal Vertical	12.8 13.5	13.15
3	B3	230*350	28 25	Horizontal Vertical	14.6 15	14.8
4	B4	230*350	31 35	Horizontal Vertical	13 13	13
5	B5	230*350	34 32	Horizontal Vertical	14.6 17	15.8
6	B6	230*350	37 25	Horizontal Vertical	23 21.6	22.3
7	B7	230*350	25 32	Horizontal Vertical	24 28.4	26.2
8	B8	230*350	20 25	Horizontal Vertical	31.5 24	27.75
9	B9	230*350	31 26	Horizontal Vertical	29.4 25	27.2
10	B10	230*350	34 31	Horizontal Vertical	30.1 21	25.55
11	B11	230*350	24 27	Horizontal Vertical	26.7 30	28.35
12	B12	230*350	30 29	Horizontal Vertical	35 24.6	29.8
13	B13	230*350	29 27	Horizontal Vertical	25 21	23
14	B14	230*350	21 23	Horizontal Vertical	17.9 15	16.45

ETABS MODELLING & ANALYSIS

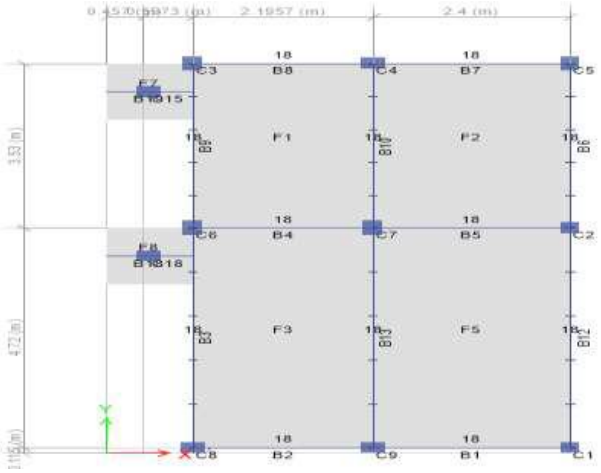

Fig.4:Planned View of Etabs Model

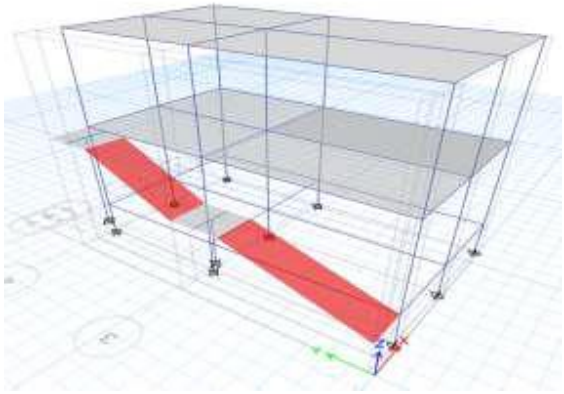

Fig.4: Planned View of Etabs Model 3D View of Etabs

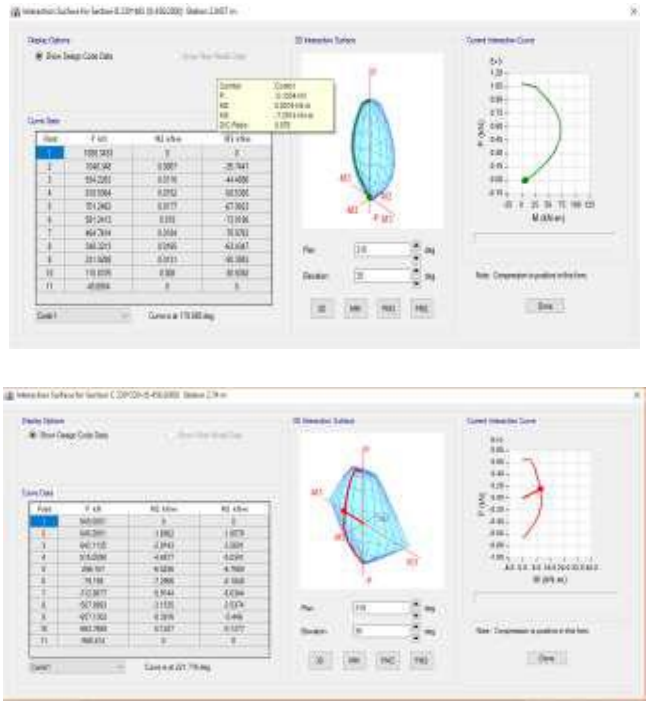

Fig.4: Planned View of Etabs Model Analysis with respect to interaction curve

V. METHOD

Step 1: Determine size of the structural members, actual reinforcement present in the members.

Step 2: Determine the actual load on the members using IS: 456:2000.

Step 3: Capacity of the structural members is determined using ETABS analysis of the members carried out in previous step.

Step 4: Compute demand and capacity ratio for the members and finding the members which needs immediate strengthening.

Step 5: Application of strengthening system FRP layer for the failed members.
Step 6: Analyse again with respect to demand and capacity ratio and comparing results.

Table -3: Result Comparison

Sr.no	Column no	Column size	D/C before strengthening	D/C After strengthening
1	C1	230*450	0.746	0.356
2	C2	450*230	0.865	0.435
3	C3	450*230	0.893	0.621
4	C4	230*230	1.032	0.68
5	C5	230*450	0.98	0.413
6	C6	230*450	1.243	0.693
7	C7	450*230	0.913	0.511
8	C8	450*230	0.654	0.57
9	C9	230*230	1.212	0.534
10	C10	450*230	1.32	0.75
11	C11	450*230	1.122	0.685

VI. CONCLUSION

As per the analysis that made by both experimental and software analysis some members found heavily depreciated and were needed immediate strengthening. Further we applied strengthening to respective members using ETABS and we got positive result towards strength regain. This result was analysed by ETABS analysis with respect to D/C ratio using interaction curve.

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