Analysis For Retrofitting Of An Existing Failed RC Column Using FEM Software's

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Abstract— Making adjustments to an existing structure to safeguard it from flooding or other risks such as high winds and earthquakes is known as retrofit. You've already seen examples of these changes, and you'll learn more about them in the future chapters. However, you may be wondering why retrofitting is so important. Building structures can be damaged for a variety of reasons, including earthquakes, cyclones, explosions, and so on. This type of loading causes the shape to pre-collapse or causes substantial damage to it. The structure can be retrofitted in the event of minor damage. A search of the existing literature indicated that there are numerous retrofitting approaches. The investigation is being conducted for the behaviour of ground floor R.C frame G+2 buildings. Assumed 3 m floor height. In addition, the attributes of the frame structure are defined. ETABS software is used to make models. Different types of loads are taken into account. For static behaviour, the building's dead load per IS 875 Part 1 and live load per IS 875 Part III are taken into account.

Keyword: RCC, Retrofitting technique, ETABS, IS456, column failure, ANSYS

1. INTRODUCTION

An existing structure can be retrofitted to protect it from floods and other risks like high winds and earthquakes by making alterations to it. A number of these modifications will be introduced in the coming chapters. However, you may be wondering why retrofitting is so important in the first instance. Why aren't homes and other structures created in a way that they don't need to be altered? For one thing, advancements in construction technology, as well as our understanding of risks and their effects on dwellings, are continuously occurring. Houses built decades ago, when nothing was known about where and how often floods will occur, or how to protect them, can benefit from upgrades based on what we learn today. Similarly, houses being built today can benefit from enhancements based on what we learn in the future. A critical risk mitigation strategy has arisen as a result of retrofitting:

Concrete with longitudinal and transverse reinforcement is used to make the cladding for the columns. An improvement in electrical conductivity is achieved through this form of strengthening without affecting the column's bending strength or beam-column connections. Sheathing columns has also been proven to be ineffective at increasing ductility. Column sheathing's key benefit is that it improves the structure's lateral load capacity in a fairly even and dispersed manner, which diverts attention away from stiffness. This avoids the need for major foundational strengthening. In addition, because this technology does not fundamentally alter the unique geometry of the building, the actual function of the structure can be kept.

1.1. What Is A Retrofitting?

- Existing structures, whether damaged or not, can be seismically strengthened through a process known as "retrofit."
- Building assessments demonstrate that a restoration alone will not be sufficient to withstand future shocks if the original strength of the walls is found to be insufficient.
- Retrofitting is the process of improving an existing structure's seismic resistance, ground movement resistance, or ground failure resistance.
- Increases in the structure's lateral stiffness and ductility, with greater gradation.
- Retrofitting rather than tearing down and rebuilding a structure is a more cost-effective and time-saving option.

2. STATE OF DEVELOPMENT

This page covers past studies on the reasons why retrofitting is used or avoided..

Akhtar, Arif, and Set. As a result of these tests, it was discovered that retrofitting performed admirably in nearly every type of loading condition. Extensive research has been done to deal with additional structural elements of various forms and sizes subjected to extreme loading conditions in the literature. Investigative work has installed a fabric that can be used for a wide range of purposes and has demonstrated its robustness as a replacement for typical building materials.

D. G. Gaidhankaret. al 2017 Construction retrofitting uses a wire mesh reinforcement soaked in mortar to produce thin, high-strength parts that are also very flexible and ductile. FEM models have recently generated important results in order to prevent these issues and directly evaluate the response of retrofitting in non-conventional situations.

Dharanidharanet and colleagues (2016) older structures should be renovated or strengthened to fulfil the same requirements as new structures erected today and in the future if they are to remain operational. When ferrocement systems are improved, this will be a thing of the past. Reinforced hydraulic cement mortar is used to make ferrocement, a type of thin-walled reinforcing concrete with a continuous mesh of relatively small diameter.

Research that provides a basis for the layout equations is done using FEM, which reduces time and costs of expensive experimental experiments and better simulates the load and support circumstances in a real structure. **Nassif and Najm** employ FEM to study the retrofitting process of composite beams under a two-point loading system to get over this problem.

3. PROBLEM STATEMENT

Buildings with a 3m floor-to-floor height were examined using the ETABS software in Zones III G+2 of the G+2 building structure in the Punavala area of Pune, Maharashtra. Seismic forces on the building were measured. The building site was selected because of its hardness.

Table 1 Parameters to be consider for ETABS model Analysis

Sr. No.	Parameter	Values
1.	Number of storey	G+2
2.	Base to plinth	1.5m
3.	Floor height	3 m
5.	Materials	Concrete M 25 and Reinforcement Fe 500
6.	Frame size	-
7.	Grid spacing	-
8.	Size of column	230 mm x 450 mm
9.	Size of beam	230 mm x 450 mm
10.	Depth of slab	150 mm

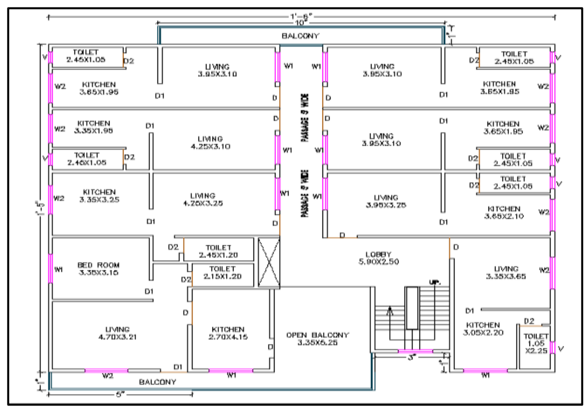

Fig 1 Floor Plan of Punavale Project

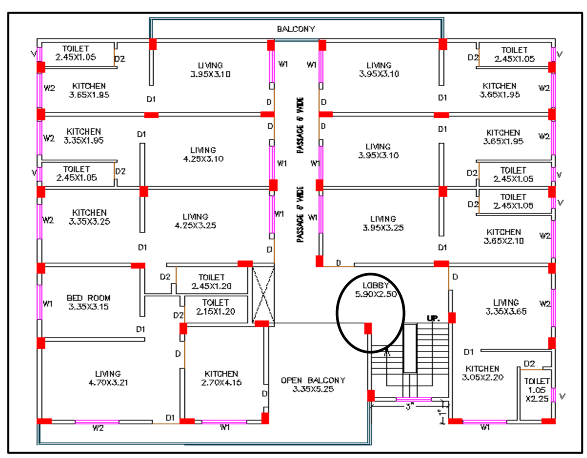

Fig 2 on site Column Positions and failure column

The highlighted column in the diagram above represents the in-situ breakdown. We will use ETABS to model the structure according to the stated column placements and loads, and then use ANSYS to calculate the total load on this failure column.

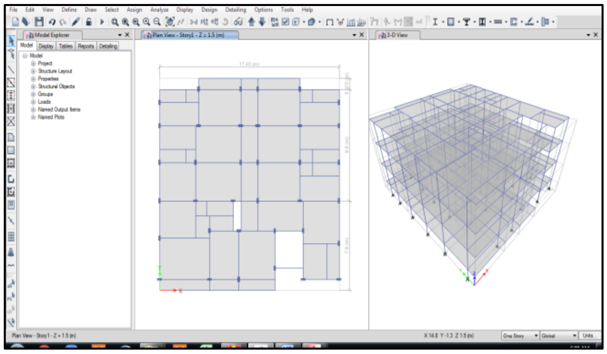

Fig 3Model in ETABS

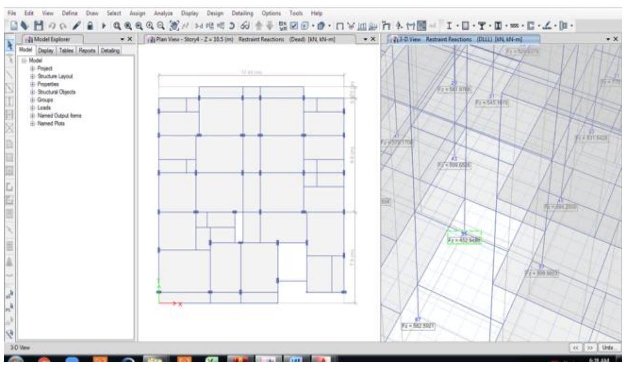

Fig 4 Total Load on Failure Column

In the above figure, the failed column, which has a total load of 452 KN, has broken. Next, we will focus on retrofitting the column with a load of 500 KN.

4. CONCLUSION

It is possible to increase the compressive strength of a concrete member by using lengthening procedures. The specimen was encased in concrete to achieve concrete encapsulation. The retention pressure exerted by the reinforcing material improved the compressive behaviour of the samples. Buildings with a 3m floor-to-floor height were examined using the ETABS software in Zones III G+2 of the G+2 building structure in the Punavala area of Pune, Maharashtra. A total of 500kN is found on this failure column after the columns are separated on site and ETABS is used to create the structure's model. The column will be evaluated in ANSYS for the same or greater load utilising various retrofitting methods.

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