A Review On Influence Of Retrofitting On Existing Building

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Abstract- *The life span of Reinforced concrete building is generally not more than 100 years, now this is crucial issue for researcher to find out the solution for this problem, retrofitting is option to adopt and gain the strength in exiting building and to minimize the rate of construction with huge material. Retrofitting an existing building is the more cost-effective than the new building construction; also retrofitting has great impact on sustainability, environment and global warming. Retrofitting is the immediate solution for earthquake affected building. Therefore considering all this fact an attempt has been made to know in detail the impact of retrofitting on building.*

Keywords- Retrofitting, Seismic earthquake, cost, sustainability, global warming, existing building.

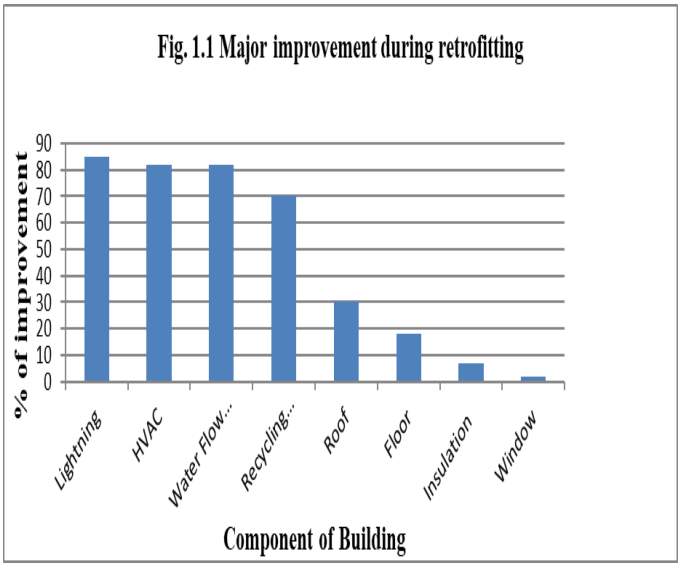
I. INTRODUCTION

The maintenance, rehabilitation and upgrading of structural members, is perhaps one of the most crucial problems in civil engineering applications. Retrofitting has become the acceptable way of improving their load capacity and extending their service lives. Infrastructure decay caused by premature deterioration of buildings and structures has lead to the investigation of several processes for repairing or strengthening purposes. One of the challenges in strengthening of concrete structures is selection of a strengthening method that will enhance the strength and serviceability of the structure while addressing limitations such as constructability, building operations, and budget. This is often required when the use of the structure changes and a higher load carrying capacity is needed. This can also occur if additional mechanical equipment, filing systems, planters, or other items are being added to a structure. Strengthening is required for loads resulting from wind and seismic forces or to improve resistance to blast loading. Additional strength may be needed due to a deficiency in the structure's ability to carry the original design loads. Deficiencies may be the result of deterioration (e.g., corrosion of steel reinforcement and loss of concrete section), structural damage or errors in the original design or construction. The majority of structural strengthening involves improving the ability of the structural element to safely resist one or more of the following internal forces caused by loading: flexure, shear, axial, and torsion. Strengthening is accomplished by either reducing the magnitude of these forces or by enhancing the member's resistance to them. Typical strengthening techniques such as section enlargement, externally bonded reinforcement, post-tensioning, and supplemental supports may be used to achieve improved strength and serviceability.

II. REVIEW OF LITERATURE

Mohammad Khairi, Aini Jaapar and Zaharah Yahya, This study carried out to know the application, benefit and challenges of retrofitting the existing building, in this study major improvement during retrofitting have been highlighted; Fig. 1.1 shows the major improvement during retrofitting as per their study. Also they have taken practical comparison between Kuala Lumpur Performance art Centre and Shah Alam Royal Theater.

From this study almost 30% cost was noticed and construction time was reduced up to 70%.



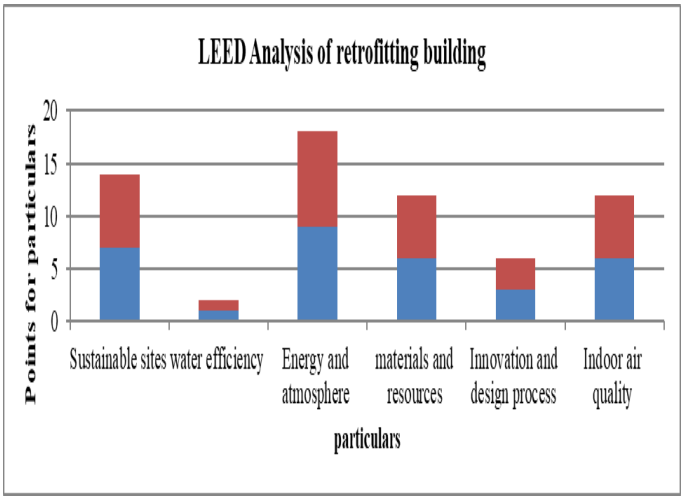
Fred Turner (2004), In this code "Retrofit provision in the international exiting building code" following point have been targeted, (1) Simple to apply (2) Cost effective (3) compliance based (4) prescriptive provisions, for improving the earthquake resistance of existing building. The aim of this study was to find the risk factor in earthquake and to reduce typical earthquake vulnerabilities.

Ashok Kumar (December 18, 2014), in this study the following point were investigated in the retrofitting circumstances, (1) Challenges and issue in retrofitting (2) Existing building stocks and its impact (3) Green building and green retrofitting (4) Assessment of suitable parameters for retrofitting. He has concluded that there is vast scope for energy efficiency improvement in existing buildings, also his studies have revealed that saving potential of 40% lightning, cooling, ventilation, refrigeration etc. In his study he has suggested the following approaches to green retrofit, designing for biodiversity, use of previous concrete, vegetative surface on roof, green walls and composting.

Soumya Gorai and P.R. Maiti (August 2016), According to this team work retrofitting is one of the best options to make an existing inadequate building safe against future probable earthquake or other environmental forces. Retrofitting reduces the vulnerability of damage of an existing structure during a near future seismic activity. It aims to strengthen a structure to satisfy the requirements of the current codes for seismic design. The Significant amount of research work has been carried out in recent years to develop various strengthening and rehabilitation techniques to improve the seismic performance of structures. This paper aims to present of overview on different innovative and cost effective techniques of retrofitting for strengthening the damaged structures.

The conclusion of this study was Seismic retrofitting has now become a crucial issue. Recent occurrences of earthquakes in different parts of the world have clearly demonstrated the urgency of repairing seismic deficient structures.

Nandish Kavani and Fagun Pathak (June 2014), in this work he has taken into account, retrofitting of exiting building into green building to improve environment performance and economic returns. The conclusion of this study is shown in fig. 1.2



According to LEED standards the analysis of this retrofitting building falls under 'Certified' category.

Abhijit Mukherjee and Mangesh V. Joshi (2001), In this study a novel technique of rehabilitation of earthquake-affected structures and retrofitting of structure against possible earthquakes using fibre composites. This technique has been successfully applied in the earthquake-affected Gujarat; it introduces high strength non-metallic fibres along with polymeric resins in repair. As non-metallic fibres are hitherto unused in structural repairs in India a brief account on these materials has been included. Design methods, field application techniques and its suitability have also been discussed.

Vijay Katariya and Hemant Salunkhe (April 2016), In this study they have focused on norms for retrofitting of existing building, they have concluded that various project have been awarded by IGBC for retrofitting. After the retrofitting reduced energy, less water consumption, less operating system, less maintenance cost and overall less impact on environment were recorded. Also they checked the IGBC and O&M rating system for site & facility management, water efficiency, energy efficiency, health and comfort and innovation category.

Augusto Gomes & Julio Appleton (2000), this study presents a synthesis of the strengthening design of reinforced concrete beam and columns by external reinforcement. The design criteria, the method of analysis and the evolution of the design resistant bending moment and shear presented with increase load carrying capacity. Construction details for this type of strengthening are also presented.

Shri. Pravin B. Waghmare (2011), Studied Seismic protection of buildings is a need-based concept aimed to improve the performance of any structure under future earthquakes. Earthquakes of varying magnitude have occurred in the recent past in India, causing extensive damage to life and property. Some recently developed materials and techniques can play vital role in structural repairs, seismic strengthening and retrofitting of existing buildings, whether damaged or undamaged. The primary concern of a structural engineer is to successfully restore the structures as quickly as possible. Selection of right materials, techniques and procedures to be employed for the repair of a given structures have been a major challenges.

Dr. Adnan S. AL-Kuaity (2010), In order to restore the strength of failed reinforced concrete columns, the cracked shell was replaced by new materials of repair: plain concrete, fiber-reinforcement concrete and cement- mortar alternatively. Three groups of reinforced concrete squared tied columns were tested

concentrically. Test results have shown that the strength of failed column can be restored by replacing the cracked shell with new shell having high compressive strength. The strength of columns repaired by these materials can reach up to 136% of their original strength depending on both the compressive strength and the condition of preloading.

III. CONCLUSION

1. Exiting building can be retrofitting into models of sustainability with the aim of reducing the energy bills and increasing the asset value.
2. Retrofitting is the easy and acceptable option to convert existing building into green building as scope of new construction is on shrunk scale.
3. Retrofitting is the only option to avoid future risk of seismic effect not only for existing building but also for other RCC structures.
4. In case of retrofitting techniques FRP jacketing is well suited for economic and architectural point of views.
5. Retrofitting playing a vital role to control global warming and other environmental impact.

REFERENCES

[1] Mohammad Khairi, Aini Jaapar and Zaharah Yahya, "The application, benefits and challenges of retrofitting the existing building" IOP Conf. Series: Material Science and engineering 271 (2017) 012030.

[2] Hari darshan Shrestha, Jishnu Subedi, Ryuichi Ytabe and Netra Prakash Bhandary, "The impact of retrofitting work on awareness raising and knowledge transfer in Aceh province, Indonesia" Int. J. Disaster risk sci. 2013, 4 (4); 182-189.

[3] Dr. Abhijit Mukherjee and Dr. Mangesh V. Joshi : 'Seismic retrofitting technique using fibre composites', The Indian Concrete Journal (2001).

[4] Fred Turner "Retrofit provision in the international exiting building code" 13th world conference on earthquake engineering Vancouver, B.C., Canada, August 1-6, 2004 paper no. 1568.

[5] International code council, International Existing building code, 2003 Edition. www.iccsafe.org .

[6] Dr. Adnan S. AL-Kuaity : 'Rehabilitation Of Damage Reinforced Concrete Columns', Al-Qadisiya Journal for Engineering Sciences (2010) Vol. 3 No. 1.

[7] Shri. Pravin B. Waghmare: 'Materials and Jacketing Technique for Retrofitting of Structures', International Journal of Advanced Engineering Research and Studies E-ISSN2249 – 8974.

[8] Augusto Gomes and Julio Appleton: 'Strengthening Design of Concrete Beams by Addition of Steel Plates' (1996).

[9] Ashok Kumar, "Green Retrofitting of exiting building: CSIR-Central Building research Institute Initiatives, Roorkee", (2014).

[10] Nandish Kavani and Fagun Pathak, "Retrofitting of existing building into a green building" International Journal of research in engineering and technology, eISSN-2319-1163.

[11] Vijay Katariya and Hemant Salunkhe, " Retrofitting of existing building as per IGBC existing building norms- A review" International journal of civil and structural engineering research, ISSN 2348-7607.