Research Paper Engineering

Retrofitting of Beam Using Different Material in Self Compacting Concrete

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ABSTRACT

It is the critical importance that the structures that need retrofitting are identified correctly, and an optimal retrofitting is conducted in a cost effective fashion. Once the decision is made, retrofitting can be performed through several methods with various objectives such as increasing the load, deformation, and/or energy dissipation capacity of the structure. For this in this paper three different material is used for wrapping of the beam and from that the flexural strength will be find out with deflection.

Keywords : Retrofitting, Different Types Of Materials And There Property

Introduction

Retrofitting is the art of making changes to an already existing structure ,re-using and recycling materials that have already been manufactured rather than spending resources on making new ones.Retrofitting of existing structures with insufficient seismic resistance accounts for a major portion of the total cost of hazard mitigation. Thus, it is of critical importance that the structures that need retrofitting are identified correctly, and an optimal retrofitting is conducted in a cost effective fashion. Once the decision is made, retrofitting can be performed through several methods with various objectives such as increasing the load, deformation, and/or energy dissipation capacity of the structure. After the earthquake in Gujarat, in 2001, there has been a concerted effort to address the seismic vulnerability of existing buildings in India.

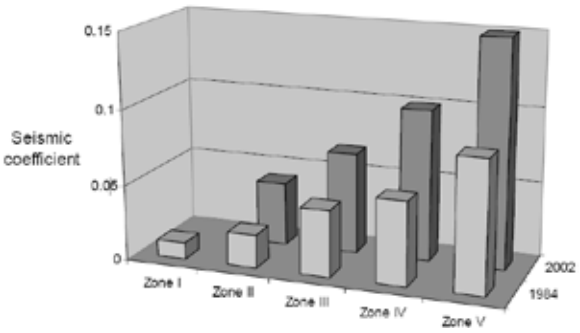
The need of Retrofitting: Strengthening measures are required in structures when they are required to accommodate increased loads. Also when there are changes in the use of structures, individual supports and walls may need to be removed. This leads to a redistribution of forces and the need for local reinforcement. In addition, structural strengthening may become necessary owing to wear and deterioration arising from normal usage or environmental factors.

Advantages of retrofitting: Customized retrofit makes maximum re-use of existing equipment and is therefore more economical than a complete new installation. With the possibility to sequence the retrofit installation, service interruptions can be minimized. At the same time, our clients' power systems get upgraded to the latest available breaker, protection and control technology, increasing functionality and improving reliability and safety. Retrofitting reduces the vulnerability of damage of an existing structure during a future earthquake. It aims to strengthen a structure to satisfy the requirements of the current codes for seismic design. In this respect, seismic retrofit is beyond conventional repair or even rehabilitation.

Three important preservation principles should be kept in mind when undertaking seismic retrofit projects:

- Historic materials should be preserved and retained to the greatest extent possible and not replaced wholesale in the process of seismic strengthening;
- New seismic retrofit systems, whether hidden or exposed, should respect the character and integrity of the historic building and be visually compatible with it in design; and,
- Seismic work should be "reversible" to the greatest extent possible to allow removal for future use of improved systems and traditional repair of remaining historic materials.

Now explanation of the need of retrofit of buildings in India. The changes of the design base shear as per the revision of IS 1893 (Criteria for Earthquake Resistant Design of Structures) is shown in Figure 1. The values of seismic coefficient (the ratio of base shear to seismic weight) as per IS 1893: 1984 and IS 1893: 2002 are shown for the different seismic zones of India. It is apparent that there is a substantial increase in the seismic coefficient for each zone. Moreover, substantial areas of the country have been upgraded to higher seismic zones.



Now Challenges In Retrofitting

- Non availability of drawings
- In-situ estimation of strength
- Variability in strength and other parameters
- Inadequate simulation tools and guidelines
- Retrofit design theory and tools

Methods of Retrofitting:

- Jacketing
- Steel bracing
- Base isolation
- Retrofitting using Innovative materials

II LITERATURE REVIEW

Literature survey is essential to review the work done in the area of performance based engineering. To take up the spe-

cific need to perform the analysis, the literature like technical papers, journals and books need to be referred. The prime important in the review was to understand the analysis and different concept of performance based engineering. Keh-Chyuan Tsai [1]. Discuss on "seismic jacketing of rc columns for enhanced axial load carrying performance". According to him Axial compression test result for square RC columns incorporating Taiwanese construction practice in the placement of stirrups and various kinds of jacketing schemes are presented. The jacketing schemes include circular, octagonal, and square shape. The jacketing materials vary from still plate to carbon fiber reinforced polymer (CFRP) COMPOSITES. Hiroya HAGIO, Hideo KATSUMATA And Kohzo KIMURA[2] have discussed on "the beam retrofitted by carbon fiber-experiment and designs". According to them structural performance and a design method of existing beams that are strengthened with carbon fiber sheets against an earthquake load. A loading test shows that shear strength of beams can be improved by transverse wrapping of carbon fiber sheets when anchoring of the sheets are provided by steel plates and bolts, even if longitudinal bars are not completely enclosed. Abhijit mukherjee,[3] publish a paper on "recent advances in repair and rehabilitation of R.C.C. structures with nonmetallic fibres" In this he finds that Cement concrete reinforced with steel bars is an extremely popular construction material. This technique of Rehabilitation is very effective and fast for earthquake affected structures and retrofitting of structures against possible earthquake. After earthquake in Gujarat this technique has been successfully applied. Ahmad Abdel Hamid, Hany Elshafie, El-Sayed Nasr, Ezat Fahmy [4] present a paper on "retrofitting of reinforced concrete beams using advanced composite overlays". There is a considerable number of existing reinforced concrete structures in Egypt that do not meet current design standards because of inadequate design and/or construction or need structural upgrading to meet new seismic design requirements. Inadequate performance of this type of structures is a major concern from public safety standpoint. They presents an experimental research program aimed at developing a retrofitting technique that utilizes locally available high strength, lightweight, corrosion resistance advanced composites for retrofitting existing reinforced concrete beams of frame structures in Egypt. The proposed technique consists of applying Glass Fiber Composite Laminates (GFCL) to the bottom surface and sides of the concrete beam to increase its stiffness and flexural strength. Giuseppe Oliveto and Massimo Marletta [5] published a paper on " seismic retrofitting of reinforced concrete buildings using traditional and innovative techniques". In this the seismic retrofitting of reinforced concrete buildings not designed to withstand seismic action is considered. After briefly introducing how seismic action is described for design purposes, methods for assessing the seismic vulnerability of existing buildings are presented. The traditional methods of seismic retrofitting are reviewed and their weak points are identified. Modern methods and philosophies of seismic retrofitting, including base isolation and energy dissipation devices, are reviewed.

III PRELIMINARY EXPERIMENTAL INVESTIGATION

To study the effect of different materials of retrofitting on flexural strength of existing beam. For that In this work the materials proposed to be used and their details are as follows.

MATERISLS COST

Glass fiber sheet 453/ per sq meter. Carbon fiber laminates 1570/ per running m Carbon fiber sheet 1998/ per sq meter.

Beams of 1000mm*100mm*150mm are cast and wrapping of on three sides of beams will be done for full length, l/3 & l/4 from the middle of the beam. After 28 days flexural strength will be find out with deflection.

REINFORCEMENT DETAIL

In this beam 2 num of 6mm diameter bar are provided at the top and bottom of the beam.

6 mm 2 lagged Stirrups are provided at 100mm spacing as per the codal provision.

PROPERTY OF CARBON FIBER SHEET

Fibre Density	2.1 g/cm3
Fibre Modulus	640 GPa
Fibre Weight	400 g/m2
Thickness	0.19mm
Tensile Strength	2650 MPa
Tensile Elongation	0.4 %

PROPERTY OF CARBON FIBER LAMINATE

Typical tensile strength	2500 MPa
Typical tensile modulus	165 GPa
Thickness	1.3 mm
Density	1.6 g/cm3
Ultimate deformation	1.3 %
Fibre content	70 %

PROPERTY OF GLASS FIBRE SHEET

Fibre Density	2.6 gm/cm3
Fibre Modulus	73 GPa
Fibre weight	175 g/m2
Thickness	0.067 mm
Tensile Strength Fibre	3400 MPa
Tensile elongation	4.5 %

S.C.C DESGN MIX

PARTICLES	QUANTITY(KN/M3)
CEMENT	350
FLY ASH	250
SAND	813.9
COARSE AGGREGATE	748.50
WATER	219.80
SUPER PLASTICIZER	0.8%
VISCOSITY MODIFED AGENT	0.31%

WORKEBILITY TEST RESULT

Trial mix	Cement content kg/m3	Fly ash content kg/m3	Slump test		V funnel test		L box test		Remark
			T-50 in sec (2-5)	dia in mm 650- 800	T0 in Sec (<5	T5 in sec (5-12	H2/h1	time in sec	
1	350	250	3.20	750	3.75	7.5	1	4.1	S.C.C

RESULT

Test	Simple beam without wrapping
Energy absorbing	148.2
Flexural strength	4.12

From above result it can be shows that the flexural strength

is increased compared to simple beam (without wrapping) as below.

1) Full carbon fiber laminate: 473%
2) l/3carbon fiber laminate : 49%
3) l/4 carbon fiber laminate : 12%
4) Full carbon fiber sheet : 226%
5) l/3 carbon fiber sheet : 41%
6) l/4 carbon fiber sheet : 7%
7) Full glass fiber sheet : 231%
8) l/3 glass fiber sheet : 34%
9) l/4 glass fiber sheet : 15%

IV. CONCLUSION:-

Looking at the result it can be conclude that the maximum increment in flexural strength is 473% when carbon fiber laminate is introduce on beam up to its full length.

When carbon fiber sheet is introduce on full beam the flexural strength increase to 226% then the simple beam.

When glass fiber sheet is introduce on full beam the flexural strength increase to 231% then the simple beam.

Maximum variation in flexural strength between all three materials is 77%

However considering the cost benefit ratio it is suggested that the carbon fiber sheet is best material for retrofitting among all three materials.

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