International Journal of Science, Technology and Management (IJSTM) **ISSN (online): 2321-774X**
Volume 10, Issue 1, 2023

Ternatives for Seismically Excited Structures: A Review

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ABSTRACT

The buildings, which had already been constructed are susceptible to face seismic risk, due to the increased seismic vulnerability. Hence, proper evaluation of the building against seismic hazards is absolutely necessary. Population explosion and increase in pollution have become the challenges of the present day for optimum use of resources available on earth and reduction in waste. The debris from the demolition of buildings by natural or manmade methods has posed enormous difficulties for engineer to dispose the wreckage. The earthquake results in a large amount of building debris. The waste could be reduced by reuse of repaired or old building. Rehabilitation and reuse of damaged building result in earthquake could reducing the pollution due to debris. The GFRP and CFRP wrapping are two of the rehabilitation methods used widely in the field.

In the last few decades, earthquakes have struck different places in the world, causing severe damage to reinforced concrete structures. Retrofitting of existing structures is one of the major challenges that modern civil engineering structures has demonstrated that most of them will need major repairs in the near future. One of the techniques of strengthening the RC structural members is through confinement with composite enclosures.

REVIEW OF LITERATURE

Lakshman (2006) has evaluated the building and structures subjected to seismic forces and the effect of retrofitting. His report was comprehensive Evaluation of typical gravity load designed low- rise.

Calvi & Magenes et al (2009) have conducted experimental study on a three storey R.C. Frame which is designed for gravity load. frame system with structural inadequacies typical of pre-seismic code

Belmouden & Lestuzzi et al (2009) have conducted investigation on an equivalent frame model for seismic analysis of masonry and reinorced concrete buildings. In this study a novel equivalent planar-frame model with openings is presented.

Chen & Teng (2003) have investigated on shear capacity of FRP- Strengthened RC Beams. The FRP de-bonding effect is also discussed in this study.

Nabil F Grace & Singh (2005) have evaluated the durability of carbon fiber-reinforced polymer strengthened Concrete Beams. The experimental Study and Design of the same is carried out. The evaluation deals with the durability of the reinforced concrete (RC) beams externally . RC beams strengthened with CFRP plates are more susceptible to aggressive environmental conditions than the beams strengthened with CFRP fabrics. The load-carrying capacity of beams strengthened with CFRP plates is reduced after long-term exposure to 100% humidity, dry heat, freezing-and- thawing and thermal expansion environmental conditioning. Delaminatingwas

Erol & Demir et al (2006) have General observations and the test results of IC-C2-1-22 showed that CFRP application only on one side of the specimen was quite effective. This is an important advantage, as CFRP application on two sides may not be always possible in practice. It should also be noted that the connection of CFRP diagonals that were on one side to the plastered wall on the other side by CFRP anchors improved behavior.

Stefano Pampanin & Davide et al (2007) have made performance-based seismic retrofit strategy for existing reinforced concrete frame systems tests on beam-column joint specimens and three-storey frame systems, designed for gravity load only and retrofitted with CFRP laminates, provided very satisfactory confirmation of the efficiency of similar solutions for the existing buildings A multilevel retrofit strategy has been proposed depending on the

In the exterior joints, the occurrence of a brittle joint shear mechanism was adequately protected and a more desirable hierarchy of strengths and sequence of events achieved, leading to a more ductile and dissipating hysteresis behavior. In the interior joints, a controlled minor cracking in the joint panel zone was accepted, in order to protect a column sway mechanism. At a global level, the implementation of a partial retrofit strategy on a three-storey three-bay frame system favored the development of a more appropriate global inelastic mechanism, preventing brittle failure in exterior joints or undesired events such as a soft storey mechanism. Ultimately, as discussed in the Introduction, issues of accessibility of the jointregion and invasiveness will have to be faced in real applications. However, itis worth noting that a typical geometrical and plan configuration of existing buildings designed for gravity load only in the 1950s–1970s

period consist of frames running in one direction only and lightly reinforced slab in the orthogonal direction, the latter being quite typical of the construction practice in Mediterranean countries.

Khaloo & Esmaili (2007) have investigated the influence of the column-to-beam strength ratio on the seismic strengthening of a column with a Fiber-Reinforced Plastic (FRP) wrapping system. FRP wrapped Reinforced Concrete (RC) columns are analyzed to obtain moment-curvature curves using FRP confined concrete characteristics. the cross diamond-braced frame specimens displayed a more considerable amount of energy dissipation capacity than the other retrofitted specimens. The experimental results demonstrated a great potential in the use of the cross diamond-bracing for retrofitting the existing in- filled RC frames under in-plane seismic loads. strengthened concrete beam exposed to cyclic temperature, humidity and sustain loading. Endurance of CFRP strengthened concrete members under itsoperating environment is one of the most important characteristics for structural elements. However, the study showed that the behaviour of composites is mainly influenced by the environmental factors such as humidity and temperature. Other important characteristic is to be able towithstand mechanical stresses that are acting on it with the variance of these environmental conditions. Therefore, the evaluation of the system performance for these effects simultaneously is one of the main requirements before recommending them. When the system is exposed to severe environmental conditions, a 75%

Sevket Ozden & Umut Akguzel et al (2011) have performed a study on Seismic Strengthening of in-filled reinforced concrete frame with composite materials. The overall performance of hollow clay tile in-filled reinforced concrete (RC) frames strengthened with carbon fiber-reinforced polymer (CFRP) materials is experimentally investigated. For this purpose, five one-third scale, one bay, two storey specimens were constructed with common deficiencies (that is, low concrete strength, insufficient lap splice length, poor confinement, and lack of joint reinforcement) observed in the existing RC frames and tested under reversed cyclic lateral loading. The test results indicated that the investigated strengthening schemes yielded a significant enhancement in both the response and the load capacity. It is also seen that the effectiveness of the strengthening strongly depends on the composite action of the infill panel, ensuring that the surface bonded fiber reinforced polymer (FRP) is provided with sufficient anchorage development length to the surrounding frames.

Jianhong Zhang & Yongchang Guo et al (2012) have explored the Seismic Performance of RC Frame Joints Strengthened with FRP. In this experiment rational and effective ways of FRP strengthening can achieve the ductility destruction of beam ends. Longitudinal direction FRP materials sharepartial stress of reinforcing steels while hooping ones play a role in anchorageand constraint, which enhance bearing capacity and ductility of nodes. But making a general survey of present researches, there exist the fact that the de- bonding failure issue of FRP isn't resolved well, which needs further study. Areasonable percentage of HFRP is better at improving comprehensive seismic performance of nodes than single fiber. HFRP overcomes limitations of single fiber mechanical properties, making high strength, high modulus and high elongation such as excellent mechanical properties jointly applied to joint reinforcement together. But the control of the emergence and location of plastic hinge together with development of plastic zone, which are related to the length and number of reinforcement layer are the key issues of seismic reinforcement. However, there is no concrete design procedure suited to the determination of the length and number of reinforcement layer, so more in- depth study is needed. As a limit of test environment and test control conditions, test approach, test coupon number and factor have a significant impact on results of purely experimental study.

REFERENCES

- Hussien Abdel Baky & Usama A Ebead 2007, 'Flexural and Interfacial Behavior of FRP-Strengthened Reinforced Concrete Beams', Journal of composites for construction © ASCE / November/December 2007, pp. 629-639.
- Huy Binh Pham & Riadh Al-Mahaidi 2006, 'Prediction Models for Debonding Failure Loads of Carbon Fiber Reinforced Polymer Retrofitted Reinforced Concrete Beams', Journal of composites for construction © ASCE / January/February2006, pp. 48-59.
- IS: 10262-1982 Recommended Guidelines for Concrete Mix Design.
- IS: 1893(PART 1)-2002 Criteria for Earthquake Resistant Design of Structures.
- IS: 456-2000 Code of Practice for Plain and Reinforced Concrete.
- Jianhong Zhang, Yongchang Guo, Yunlei Li, Yifeng Liu & Fan Dong 2012, 'Research on Seismic Performance of RC Frame Joints Strengthenedwith FRP', International Conference on Ecology, Waste Recycling, and Environment Advances in Biomedical Engineering,vol.7.
- Kaustubh Dasgupta & Murty, CVR 2005, 'Seismic design of RC column and wall Sections', The Indian Concrete Journal March 2005, pp.33-42.
- Khaled Galal & Amir Mofidi 2009, 'Strengthening RC Beams in Flexure Using New Hybrid FRP Sheet/Ductile Anchor System', Journal of composites for construction, ASCE , MAY/JUNE 2009, pp. 217-225.
- Khaloo, AR & Esmaili, A 2007, 'Strengthening Design limitations of an RC Frames using FRP Column wrapping considering column-to- beam strength ratio', Scientia Iranica, vol. 14, no. 5, pp. 405-413, c Sharif University of Technology, October 2007.
- Lakshman, N 2006, 'The seismic evaluation and retrofitting of buildingand structures', ISET Journal of Earthquake Technology, Paper No. 469, vol. 43, no. 1-

2, pp. 31-48.

- Lu, XZ & Teng, JG 2007, 'Intermediate Crack Debonding in FRP- Strengthened RC Beams: FE Analysis and Strength Model', Journal ofcomposites for construction © ASCE / March/April 2007, pp.161-174.
- Maurizio Guadagnini & Kypros Pilakoutas, 2006, 'Shear Resistance of FRP RC Beams: Experimental Study', Journal of composites for construction © ASCE / November/December 2006, pp. 464-473.
- Moataz Badawi & Khaled Soudki 2010, 'CFRP Repair of RC Beams with Shear-Span and Full-Span Corrosions', Journal of composites for construction © ASCE / May/June 2010, pp.323-335.
- Moghaddam, H & Hajirasouliha, I 2006, 'An investigation on theaccuracy of pushover analysis for estimating the seismic deformation of braced steel frames', Journal of Constructional Steel Research 62 , pp. 343-351.
- Mohammad Reza Aram & Christoph Czaderski 2008, 'Effects of Gradually Anchored Prestressed CFRP Strips Bonded on Prestressed Concrete Beams', Journal of composites for construction © ASCE / January/Feruary 2008, pp. 25-34.
- Nabil F Grace & Singh, SB 2005, 'Durability Evaluation of Carbon Fiber-Reinforced Polymer strengthened Concrete Beams: ExperimentalStudy and Design,' ACI Structural Journal/January-February 2005.
- Nadeen A Siddiqui 2010, 'Influence of flexural steel reinforcement ratio on R.C beams strengthened with externally bonded FRP sheets', Journal of Structural engineering, vol. 37, July 2010.
- Neil A Hoult & Janet M Lees 2009, 'Modelling of an Unbonded CFRPStrap Shear Retrofitting System for Reinforced Concrete Beams', Journal of composites for construction, ASCE, JULY/AUGUST 2009, pp. 292-301.
- Nihan Dogramac Aksoylar & Amr S Elnashai 2011, 'The design and seismic performance of low-rise long-span frames with semi-rigid connections', Journal of Constructional Steel Research 67, pp. 114-126.
- Obaidat, YT & Heyden, S 2010, 'The effect of CFRP and CFRP/Concrete interface models when modelling retrofitted RC beamswith FEM', Journal of Composite Structures, 2010; vol. 92,pp.1391-1398.
- Obaidat, YT, Heyden, S, Dahlblom, O, Abu-Farsakh, G & Abdel-Jawad, Y 2010, Retrofitting of Reinforced Concrete Beams using composite laminates', Journal of Construction & Building Materi.