The 2017 World Congress on
Advances in Structural Engineering and Mechanics (ASEM17)
Ilsan(Seoul), Korea, August 28 - September 1, 2017

Keynote Paper

Buckling Restrained Braces for Existing and New Reinforced Concrete Frames

* Keh-Chyuan Tsai[1)], An-Chien Wu[2)], Kuan-Yu Pan[3)], Hsun-Horng Yang[4)]

[1), 3), 4)] *Dept. of Civil Engineering, Nat'l Taiwan University, Taipei 10617, Taiwan*
[2)] *National Center for Research on Earthquake Engineering, Taipei 10617, Taiwan*

[1)] kctsai@ntu.edu.tw, [2)] acwu@ncree.narl.org.tw,
[3)] r01521219@ntu.edu.tw, [4)] r01521219@ntu.edu.tw

ABSTRACT

This paper introduces a new method of retrofitting RC frames with buckling-restrained braces (BRBs) and a novel implementation of BRBs in new RC frame. In the retrofitting system, load is transferred between the BRB and RC frame through compression bearing between an installed steel frame connected to the BRB, and high-strength mortar blocks constructed at the four corners of the RC frame. Cyclic increasing displacements were imposed on two RC frames retrofitted with different BRB strength capacities. Test results indicate that the proposed method efficiently transferred loads between the BRBs and RC frames, increasing the frame lateral strength while achieving good ductility and energy-dissipating capacity. The maximum frame lateral strength and stiffness were more than 2.2 and 3.5 times respectively the RC frame without the BRB.

For BRB application to new RC frames, seismic design and analysis methods for using a proposed steel cast-in anchor bracket (CAB) to transfer normal and shear forces between the BRB and RC members are investigated. A full-scale two-story RC frame with BRBs was tested. The BRBs were arranged in a zigzag configuration and designed to resist 70% of the story shear. Test results confirm that the BRBs enhanced the RC frame stiffness, strength, and ductility. The hysteresis energy dissipation ratios in the four hybrid tests range from 60% to 94% in the two stories, indicating that BRBs can effectively dissipate seismic input energy. No failure of the proposed steel CABs and RC discontinuity regions was observed.

REFERENCES

Pan, K.Y., Wu, A.C., Tsai, K.C., Li, C.H. and Khoo, H.H. (2016), "Seismic retrofit of reinforced concrete frames using buckling-restrained braces with bearing block load transfer mechanism," *EESD*, **45**(14), 2303-2326.

Wu, A.C., Tsai, K.C., Yang, H.H., Huang, J.L., Li, C.H., Wang, K.J. and Khoo, H.H. (2016), "Hybrid experimental performance of a full-scale two-story buckling buckling-restrained braced RC frame," *EESD*, DOI: 10.1002/eqe.2853.

[1)] Professor
[2)] Assistant Research Fellow
[3), 4)] Research Assistant