Unequal train collision flexural performance of circular RC components with CFRP shear strengthening: experimental and model assessment

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Abstract

The analysis of the dynamic response of the RC and CFRPRC under unequal span effect is provided. Unequal lateral impact tests were carried out on RC members that had been wrapped in one and six layers of CFRP. It is able to develop the deflection-time history curves of the two components under high-impact energy circumstances. In tests, CFRP increases the impact resistance of the component. It is possible to decrease maximum component deflection and change the force mode using carbon fiber reinforced polymer (CFRP). RC members shear predominantly as a result of considerable concrete damage, while CFRPRC components bend primarily as a result of slight concrete damage. When wrapped in many layers of CFRP, it is more prone to cracking. The model's calculations are consistent with the results of the tests. These studies were carried out in collaboration with numerical simulation work, which investigated the impact force exerted on members once components were subjected to unequal-lateral impacts. Regardless of the impact velocity, the lateral impact on an unequal span promotes severe shear failure of reinforced concrete members in the short span zone. CFRPRC components, on the other hand, exhibit bending deformation that is proportional to the impact velocity. Increasing the reinforcement ratio of RC members has little effect; however, increasing the impact resistance of CFRPRC components has a significant impact. Greater reinforcing ratios are utilized in order to avoid steel rupture.

Image

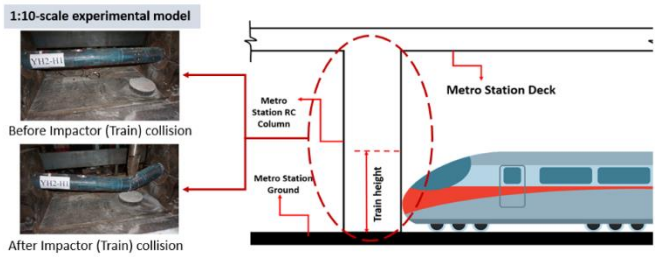


Figure 1 Schematic diagram of RC member with a train collision

Recent Publications

1. Yanhui Liu, Khalil Al-Bukhaiti, Hussein Abas, Zhao Shichun, "Effect of CFRP Shear Strengthening on the Flexural Performance of the RC Specimen under Unequal Impact Loading", Advances in Materials Science and Engineering, vol. 2020, Article ID 5403835, 18 pages, 2020. https://doi.org/10.1155/2020/5403835
2. K. AL-Bukhaiti, L. Yanhui, Z. Shichun, H. Abas, D. Aoran, Dynamic Equilibrium of CFRP-RC Square Elements under Unequal Lateral Impact, Mater. 2021, Vol. 14, Page 3591. 14 (2021) 3591. https://doi.org/10.3390/MA14133591.
3. K. Al-Bukhaiti, K. Zaidi, A. Ali, Nonlinear static analysis of Multistoried Building in Yemen, J. Eng. Appl. Sci. 1 (2017). https://doi.org/10.22496/jeas.v1i1.110.

K. AL-Bukhaiti, L. Yanhui, Z. Shichun, H. Abas, CFRP Strengthened Reinforced Concrete Square Elements Under Unequal Lateral Impact Load, (2022) 1377–1387. https://doi.org/10.1007/978-3-030-91877-4_157.

5. K. Al-Bukhaiti, H. Abas, L. Yanhui, Z. Shichun, D. Aoran, Experimental and Numerical Study on Unequal Lateral Impact Behavior of RC Square Members, (n.d.).



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Biography

Khalil AL-Bukhaiti has his expertise in evaluation and passion for improving structural engineering constructions. His evaluation model based on responsive constructivists creates new materials for improving structural members' resistances. After years of experience in research, evaluation, teaching, and analysis, he has built this model both in laboratories and educational institutions. The focus points on his direction belong to effects of impact force coming from train derailed collisions on the reinforced concrete members (i.e., columns, bridges piers), which is a methodology that utilizes the previous generations of evaluation: analysis, design, and evaluations. It allows for theories' assumptions. This approach is responsive to all field practice and has a different way of focusing. Email: eng.khalil670@hotmail.com

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