

Punching behaviour of FRC flat slabs under monotonic and cyclic actions

Summary

The application of Fibre Reinforced Concrete (FRC) in structural elements is increasingly common, not being flat slabs structures exception. However, this solution is often adopted unaware of its real behaviour under cyclic and seismic loads. The advantages of this constructive solution can be allied to a better behaviour of the slab-column connection through the application of FRC, either in terms of load but mainly of deformation capacities, being able to influence the typically brittle punching failure to more ductile.

The actual models to predict the punching shear capacity of slabs with FRC were essentially developed based on tests with quasi-static monotonic loading, disregarding the degradation of stiffness and load capacity of slabs caused by the cyclic loading, such as during an earthquake, being necessary to carry out laboratory tests to better understand the phenomena involved. Taking into account this gap, the present work was developed to present an experimental investigation, with the objective of evaluating the punching behaviour of flat slabs with Steel Fibre Reinforced Concrete (SFRC).

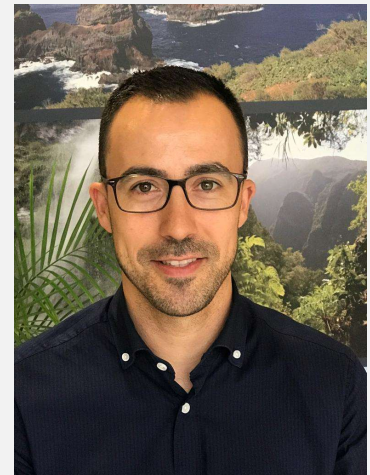
Four slab models with SFRC were designed and tested to simulate an interior flat slab-column connection of a building, being the slab delimited in the longitudinal direction by the middle span and transverse by the line of zero moment line, subject to simultaneous vertical and horizontal cyclic loading. Twelve models were also produced with SFRC that pretended to simulate the area of slab near to the column, delimited by the zero moment line, tested under monotonic vertical loading. The use of SFRC in the slab-column connecting zone is efficient, increasing the load and deformation capacities, with a significant improvement in inter-story drifts of this type of structures.

Keywords

SFRC, punching, experimental analysis, monotonic vertical action, horizontal cyclic action, seismic action.



View of the test setup and the data acquisition equipment for the cyclic tests of SFRC flat slabs under horizontal cyclic loading.



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