

ABSTRACT

During the last decades the use of fiber reinforced polymers (FRP) has been introduced in the field of structural engineering, first as external reinforcement and later as passive and active reinforcement. The emergent interest in this material is due to its many advantages compared with the steel: it is more resistant and durable against corrosion, as well as, lighter and magnetically inert. These qualities allow decreasing the complexity complex and cost of the reinforcement construction tasks while allowing the service life of structures to increase.

Nowadays, general shear resistance mechanisms in reinforced concrete are still under discussion. Specifically the use of FRP as shear reinforcement for concrete structures has not yet been deeply studied and the currently available data are insufficient to formulate rational design guidelines.

The effects of shear on the response of concrete beams with longitudinal and transversal FRP reinforcement is numerically studied in this work through a 1D non-linear fiber model accounting for the axial–bending–shear interaction. Experimental data from FRP RC beams available in literature, are compared with the numerical results. As this beam model is shear sensitive, the effects of shear in the structural response are evaluated. A good correlation in terms of ultimate loads, deflections, strains in the concrete and reinforcement is observed between the experimental data and the computed results. The numerical model is also able to reproduce the cracking widths and pattern when increasing the applied load.

Once the model is validated, it can be used to assess the accuracy of the analytical expressions present in the current codes of practice and contribute for their enhancement.

Keywords: nonlinear numerical modeling, shear, FRP stirrups, reinforced concrete.
Figure 1: Experimental tests on the beam