SHEAR BEHAVIOR OF POLYOLEFIN FIBRE REINFORCED CONCRETE

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Fibre reinforced concrete (FRC) can replace the use of steel rebars for the structural reinforcement of concrete elements in both of infrastructure and building construction [1]. This technique allows avoiding the brittle fracture behaviour inherent to concrete [2], with additional advantages such as the prevention of cracking due to initial shrinkage and endogenous shrinkage of concrete at early age [3]. In the case of shear stresses, the use of FRC can avoid the use of traditional rebars, with the corresponding savings in setting times, labour force, weights and therefore reducing the final costs of the production [4].

Nowadays, FRC stands on more than 50 years of experience with the use of steel fibres [5] randomly arranged in concrete matrix [6]. In recent years, some other fibre types have shown to be adequate for structural concrete elements and with analogous performance. The use of polyolefin fibres has proved that can meet the requirements in the standards to be considered for structural design [7]. Hence, EHE-08 accepted the use of macro-fibres (\( \phi \geq 0.3 \) mm) inorganic or polymeric source, although when it referred to the mechanical properties and constitutive models for the behaviour of polyolefin fibre reinforced concrete (PFRC) the requirements were the same as for steel fibre reinforced concrete (SFRC) [8].

The structural requirements of the codes are based on the results of flexural tensile tests in accordance with the standard UNE-EN 14651:2007+A1 [9]. A wide campaign of tests with PFRC specimens permitted assessing the tensile and flexural behaviour of PFRC with several fibre dosages and even fitting their constitutive models. Moreover, recent research showed that the use of PFRC for total substitution of steel rebars is an attractive alternative for certain applications [6]. Nevertheless, there was a lack of studies dealing with the shear behaviour of this type of FRC.

The aim of this study was assessing the performance of this type of FRC when subjected to shear stresses. Thus, an
experimental campaign to evaluate the shear behaviour of PFRC through the use of push-off tests was carried out. The push-off specimens, as the one shown in Figure 1, were obtained from the remaining halves of the specimens used for flexural tests with 6 and 7.5 kg/m³ of 48mm long polyolefin fibres. These mechanical tests, were complemented with digital image correlation (DIC) techniques and served to obtain deformation maps and the cracking patterns of the specimens.

In addition, a comparative of the push-off results and the formulations of the standards was performed. Figure 2 shows the comparison of the values following MC2010, EHE-08 and the experimental results.

The results showed that the values provided by the guidelines for small crack shear displacements (CSD) were conservative. Conversely, shear values at about 2.5mm of CSD were similar to those computed by following the standards.

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**REFERENCES**


