Abstract

The shear behavior of a specimen made of reinforced concrete is complex. Resisting mechanisms are affected by different factors such as section form, slimness of the specimen, longitudinal and transversal reinforcement arrangement, bond between concrete and steel, among others. The addition of steel fibers to the concrete improves the ductility as well as the traction behavior; providing good control during the cracking process. Fibers also enhance the shear behavior of structural elements, increasing ultimate resistance and ductility.

Push-off tests had been used to study the mechanisms of shear transfer in concrete. Concluding that, shear strength of the specimen depends on the contribution of both concrete and shear reinforcement. Aggregate interlock (framed in crack shear friction theory) has a significant contribution to the concrete shear capacity. In the last decades new kinds of concrete have been developed for industrial use, such as high strength concrete (HSC), self-compacting concrete (SCC) or fiber reinforced concrete (FRC), among others. In these new materials, aggregate interlock phenomenon may be different when compared to conventional concrete (CC). There is a lack of information in literature about the mechanisms of shear transfer in fiber reinforced concrete elements.

Self-compacting concrete (SCC) is which, as a given a studied mixing proportion and by the utilization of superplasticizer additives, compacts by action of its own weight, without the need of vibrational energy or the use if any other compacting method; without segregation, lock of the coarse aggregate, bleeding, nor exudation of the cement grout. On the other hand, the addition of fibers modifies the behavior of fresh concrete, affecting, particularly, the packing density of aggregates.

This document is focused on studying shear behavior of self-compacting concrete reinforced with Steel fibers, but at a crack level. We evaluate crack resistance capacity, using different initial widths.

To assess the latter, we designed a rigid steel frame to confine the specimens, restricting crack width, buy allowing block movement, so as to improve stability and control on crack width. We will verify functioning and sensitivity of this confinement system, so we canto know and assess displacements suffered by the specimen blocks due to manipulation after precracking.

An extensive experimental program is developed for over 60 specimens. The aims of this program are, adjusting the design and calibrate general functioning of the restraint frame; defining in detail essay methodology; and finally, evaluate the possibility to detect and interpret different behaviors related to type of material tested.

It is also described the implementation of methodologies of discreet measurement. Photogrammetry of crack width and triangulation with DEMEC are used. Meaning that, measurements are taken between precracking test and push-off test. The objective is to know the relative movements that suffer the specimen, due to manipulation between tests.

From the results obtained, it can be analyzed that the developed frame is capable of confining the specimen to effectuate the push-off test, without interfering with the slip displacement. It is evaluated that transmitted shear of the frame due to its vertical stiffness. In average, the frame effect represents 10 % of total tension theoretically calculated. It is defined a basic friction coefficient that presents higher stability during the test. This friction coefficient is affected by maximum aggregate size and aspect ratio.