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Effect of Size, Geometry and Tensile Strength of Fibers on the Flexure of Hooked Steel Fiber Reinforced Concrete

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Abstract : This research focused on the study of various parameters of fiber itself affecting on the flexure of hooked steel fiber reinforced concrete (HSFRC). The size of HSFRC beams was 150x150 mm in cross section and 550 mm in length, and the flexural test was carried out in accordance with EN-14651 standard. The test result was the relationship between centre-point load and crack-mount opening displacement (CMOD) at the centre notch. Controlled concrete had a compressive strength of 42 MPa. The investigated variables related to the hooked fiber itself were: (a) 3 levels of aspect ratio of fibers (65, 80 and 100); (b) 2 different fiber lengths (35 mm and 60 mm); (c) 2 different tensile strength of fibers (1100 MPa and 1500 MPa); and (d) 3 different fiber-end geometries (3D 4D and 5D fibers). The 3D hooked fibers have two plastic hinges at both ends, while the 4D and 5D hooked fibers are the newly developed steel fibers by Bekaert, and they have three and four plastic hinges at both ends, respectively. The hooked steel fibers were used in concrete with three different fiber contents, i.e., 20 30 and 40 kg/m^3. From the study, it was found that all variables did not seem to affect the flexural strength at limit of proportionality (LOP) of HSFRC. However, they affected the residual flexural tensile strength (fR,j). It was observed that an increase in fiber lengths and the tensile strength the fibers would significantly increase in the fR,j of HSFRC, while the aspect ratio of the fiber would slightly effect the fR,j of HSFRC. Moreover, it was found that using 5D fibers would better enhance the fR,j and flexural behavior of HSFRC than 3D and 4D fibers, because they gave highest mechanical anchorage effect created by their hooked-end geometry.

Keywords : hooked steel fibers, fiber reinforced concrete, EN-14651, flexural test
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