LABORATORY BEHAVIOR EVALUATION OF REINFORCED SELF-COMPACTING CONCRETE BEAMS CONTAINING STEEL FIBER UNDER QUASI STATIC CYCLIC LOADING

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There is a great need for experimental testing of reinforced concrete structural elements to establish their behavior when subjected to simulated earthquake loading. Parameters like stiffness, strength, ductility, ability of energy absorption and energy dissipation and damages occurred because of cyclic loading are the aspects of behavior of interest in seismic design of structural elements that connot be determined with complete confidence by analytical procedures and need to be evaluated with experimental tests. There are various methods of simulating severe earthquake such as shaking table method, pseudo dynamic method and quasi static method. slow rate of the procedure, ability to observe the test process in details and economical reasons can be pointed out as Some advantages of quasi static loading method.

For this purpose, four mixture designs of concrete beams containing steel fiber (0.1, 0.2, 0.3 by volume) and design without fiber as reference concrete have been tested and compared. For aim of comparison of parameters such as cyclic strength, cyclic stiffness, dissipated energy and equivalent viscous damping, a loading protocol in type of displacement control has applied to the specimens. This protocol includes 30 cycles with constant amplitude of 150% yield displacement. By using steel fibers in concrete, behaviour characteristics of concrete beams with each mixing design would be different from others. Hence, determination the amplitude of the loading protocol needs a monotonic test for the concrete beam of each mixing design. Result is illustrated in Figure 1.

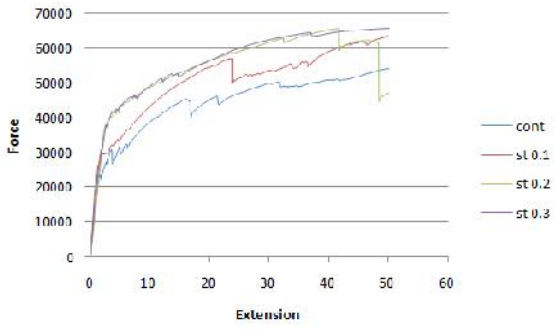

Figure 1. Monotonic test result

Loading protocol amplitudes based on the yield displacement of each mixing design is shown in Table1.

Table 1. Loading protocol amplitudes

Mix design	Yield displacement (mm)	Loading protocol amplitude (mm)
Cont	1.45	2.175
St 0.1	1.85	2.775
St 0.2	2.3	3.45
St 0.3	2.6	3.9

Finally, the parameters mentioned before would be normalized and studied. Variation of cyclic strength is presented in Figure 2 as an example.

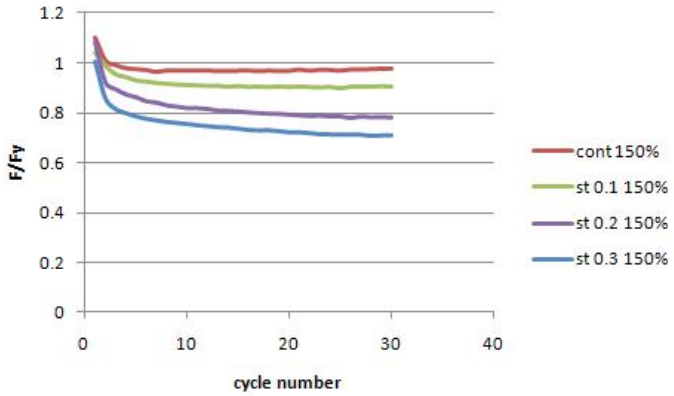

Figure 2. Cyclic strength degradation

Results of the study show that by increasing the steel fiber in concrete, element stiffness in the elastic region would decrease and also the structural element will show more flexibility and ductility. Presence of Steel fibers in concrete would significantly increase the strength of the element and energy dissipation would increase during loading cycles obviously.