Studying The HPFRCC Beams To Under Cyclic Loading

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Abstract: The fiber used in the concrete to increases the structural integrity of the member. It is one of the emerging techniques used in the construction industry. In this study the effective utilization of High Performance Fiber Reinforced Concrete (HPFRCC) beams has been experimental investigated. The experimental investigation has been conducted on different steel fibers (Hooked, Crimped and Hybrid) under cyclic loading. The behaviour of HPFRCC beams are compared with the conventional beams. Totally four numbers of specimens were cast with different content of fiber concrete and compared conventional concrete. The fibers are added to the concrete by volume base replacement of concrete. The silica fume and super plasticizers were used to modify the properties of concrete. Single point loading were carried out for all the specimens and the beam specimens were subjected to cyclic loading. The load deflection behaviour of fibers is compared with the conventional concrete. The ultimate load carrying capacity, energy absorption and ductility of hybrid fiber reinforced concrete is higher than the conventional concrete by 5-10%.

Key words: Cyclic loading, ductility, high performance, fiber reinforced concrete, structural integrity

INTRODUCTION

Now a days High performance fiber reinforced concrete is used to improve the strength, stiffness, toughness, ductility and durability in the structural applications. The efficiency of HPFRCC techniques has not been effectively studied and there is less number of studies carried out to evaluate the behaviour. The high performance fiber concrete has gained wider acceptance in the construction industry. This technique is used in construction of tall and high rise buildings, long span bridges, off shore and mega structures. In the past few decades, HPFRCC has been developed based on the structural and durability aspects by the influence of cement properties, mineral admixtures and super plasticizer. High performance concrete is designed and developed to reduce the cost. The admixture used in the concrete reduces the water content which directly reduces the porosity of hydrated cement paste. The steel fiber used in this technique reduces or

Controls the crack and deflection in the concrete. In addition to the steel fiber, HPC makes the concrete extremely ductile and improves the energy absorption capacity. FRC is used to control the cracks in water retaining structures and increases the toughness in the building which reduces the abrasion when compared to other materials. FRC is used in repairs and rehabilitation of marine structures such as concrete piling and caissons. The high performance of fiber reinforced concrete HPFRCC material consists of steel fibers, silica fume, super plasticizer, reinforcing steel and cement materials. The behaviour of HPFRCC material is studied through an experimental investigation. Totally four beams are cast with one hooked end fiber reinforced concrete beam, second crimped fiber reinforced concrete beam, third hybrid fiber reinforced concrete beam and finally conventional high performance reinforced concrete beams tested according to the standards. All the beams subjected to cyclic load. The simply supported at both ends with concentrated point loading.

Literature review: Martinola et al. (2010) conducted various researches about Reinforced beams with fiber reinforced concrete. The dimensions of the beam were 4.55 m length, 500 mm depth and 300 mm width. In the self leveling mortar the strengthening material is the maximum aggregate size. The result of the study was increasing in the ultimate load by 2.15 times.

Rauco et al. (2014) researched about shear retrofitting. The fiber reinforced jacketing looks like an efficient method for shear strengthening of reinforced concrete beams with stirrups. Load bearing capacity depends upon the strength of the beam.

Larbi et al. (2006) researched about the flexural behaviour of the beams. Beams mixed with CFRP-steel rebar are able to achieve bending stiffness comparable to the beams reinforced with traditional fitness.

Spada and Benedino (1997) conducted experiments to find out the behaviour of fiber reinforced