

Parametric Investigation on Structural Behavior of Steel Fiber Reinforced Concrete Corbels

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Abstract

The paper presents the effect of reinforcement parameters on the structural behavior of steel fiber reinforced concrete (SFRC) corbels using the general-purpose ANSYS computer program. The parameters studied herein include the effect of fiber index (I_f), ratio of the main longitudinal steel reinforcement (ρ_s), yield strength of the longitudinal steel reinforcement (f_y), ratio of the horizontal stirrups (ρ_h), yield strength of the horizontal stirrups (f_{yh}) and ratio of the vertical stirrups (ρ_v). It is predicted that increase of I_f improves shear capacity and strain ductility. Steel fiber delays the premature failure for corbels. Increasing ρ_s improves the shear capacity but reduces the strain ductility. A slight increase in shear capacity is observed by increasing f_y . An enhancement on shear capacity and strain ductility is noticed by increasing ρ_h . On the other hand, a slight increase in shear capacity and reduction in ductility for corbels is observed by increasing f_{yh} . It found that minimum ρ_v is required only to improve the shear capacity and strain ductility

Keywords: Reinforced concrete corbels; Steel fibers; Load-deflection curves; Load-steel strain curves; Crack patterns; Finite element; ANSYS.

1. Introduction

Corbels are short cantilever members that project from a column or a wall to support another beam or heavy concentrated load. The importance of these members is clear in precast buildings where corbels support beams and girders. Corbels are characterized by a shear span-to-depth ratio (a/d) lower than unity. Over the years, the contribution of steel fibers parameters has been studied on the structural behavior of concrete corbels [1-4]. It was found that steel fibers

could replace partially or fully the stirrups. In addition, using steel fiber improves the ductility and toughness of the reinforced concrete corbels.

The aim of this paper is to present the results of reinforcement parametric studies on the performance of (SFRC) corbels using ANSYS computer program **Error! Reference source not found.** Numerical model was developed **Error! Reference source not found.** and used successfully to predict the structural response of the tested SFRC corbels [1-4]. The main parameters include the effect of fiber index (I_f), ratio of the main longitudinal steel reinforcement (ρ_s), yield strength of the longitudinal steel reinforcement (f_y), ratio of the horizontal stirrups (ρ_h), yield strength of the horizontal stirrups (f_{yh}) and ratio of the vertical stirrups (ρ_v).