SHEAR RESPONSE INVESTIGATION OF HSRC DEEP BEAMS
WITHOUT WEB REINFORCEMENT
PART I: COMPARISON OF DESIGN EQUATIONS


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ABSTRACT

Currently, there is no general agreement on a theory describing the response of reinforced concrete members without web reinforcement. Many structural systems are usually performed using empirical or semi-empirical expressions provided by codes of practice that do not consider the influence of many governing parameters. In this paper, a comparison between values of current experimental shear strength and those of various international design approaches like ACI, Canadian, FIB and the method proposed by Sudheer, Zararis, Zsutty, Shah, Bazant and Russo. Eighteen simple span high strength reinforced concrete “HSRC” deep beams without web reinforcement were tested and analyzed under two static point loads at mid-span of the beam to examine the contribution of various parameters on the shear capacity of HSRC beams. The main studied parameters are $f'_{cu}=50$ MPa, three values of tension reinforcement-$p$%=(0.73%,1.21% &1.83%) and shear span to effective depth ratio-$a/d$=(2,1.5 &1). As a conclusion of this paper, ACI and FIB code provisions for shear in HSC are safe for use with the exception that CSA should be used with care. Despite numerous studies, there is still a need to develop a clear understanding of the shear behavior of HSC beams without web reinforcement. Therefore, this experimental program was arranged to evaluate the shear behavior and to increase the shear database on HSRC deep beams.

Keyword: deep beams, high strength concrete, tension reinforcement ratio, shear span to effective depth ratio, shear strength.

1. Introduction

There is a general agreement among the researchers in the field of structural engineering and concrete technology that the shear strength of high strength reinforced concrete (HSRC) beams, unlike the normal strength reinforced concrete (NSRC) does not increase, in the same proportion as the increase in the compressive strength of concrete, due to brittle behavior of the High Strength Concrete. Hence the current empirical equations proposed by most of the building codes for shear strength of HSRC beams are less conservative as compared NSRC beams. This major observation by the researcher is the main focus of this research.

Reinforced concrete is being used extensively in the construction industry all over the world. The calculation of stresses in concrete is difficult due to its heterogeneous nature and inclusion of reinforcement further complicates the situation. Extensive research work on shear behavior of normal as well as high-strength concrete beams has been carried out all over the world. The major researchers include Ferguson [11], Taylor [12], Cossio [13], Berg [14], Mathey and Watstein [15], Zsutty [16], Kani [17], Elzanaty [18], Roller and Russel [19], Ahmad and Lue [20], Barrington[21], Shin et al. [22], Kim and White [23], Tompos and Frosh [24], Ahmad

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