SHEAR FAILURE INVESTIGATION OF REINFORCED CONCRETE BEAMS WITH SWIMMER BARS

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ABSTRACT

Shear failure of reinforced concrete beams is usually sudden, occur without sufficient advanced warning. This type of shear failure is considered to be high risk type of failure. The shear failure of beams is usually sudden without sufficient advanced warning and the diagonal cracks that develop due to excess shear forces are considerably wider than the flexural cracks. The cost and safety of shear reinforcement in reinforced concrete beams led to the study of other alternatives. Designers try to avoid the shear mode of failure when designing reinforced concrete beam due to the sudden nature of shear failure. Swimmer bar system is a new type of shear reinforcement. It is a small inclined bar,with its both ends bent horizontally for a short distance and welded to both top and bottom flexural steel reinforcement. Regardless of the number of swimmer bars used in each inclined plane, the swimmer bars from plane-crack interceptor system instead of bar-crack interceptor system when stirrups are used. Several deflection measurements were taken to study the effect of using new swimmer bar system on deflection. Also the crack width of the tested reinforced concrete beams was monitored. Test results of reinforced concrete beams will be presented. The effectiveness of the new swimmer bar system as related to the old stirrup system will be discussed. Beam deformation is also measure in the laboratory.

Keywords – Swimmer bars, deflection, shear, crack, stirrup.

I. INTRODUCTION

Beams are common members in reinforced concrete structures. In case of beams tensile stresses are induced in bottom layers because of positive bending moment. Hence main bars are provided at bottom of the beam. All the tensile stresses are assumed to be taken care by reinforcement provided. The tensile strength of concrete is neglected in design process. The balanced section is obtained when strains in steel and concrete reach their maximum limits. To resist these cracks shear reinforcement is provided generally in the form of vertical stirrups, bent-up bars generally inclined at 45˚ or the combination of both bent-up bars.

A swimmer bar can be defined as an inclined bar provided to take care of shear with its both ends welded or anchored to the top and bottom longitudinal bars. The welded swimmer bars are traditionally used for decreasing the shear failure in beam or reduces the cracks and increasing the load bearing capacity.

Where: Vu is the total shear force applied at a given section of the beam due to factored loads and Vu = Vc + Vs is the nominal shear strength, equal to the sum of the contribution of the concrete and the web steel if present. Thus for vertical stirrups, And for inclined bars.The nominal shear strength contribution of the concrete (including the contribution from aggregate interlock, dowel action of the main reinforcing bars, and that of the un-cracked concrete) can be simplified as shown in Equation 4.

(1) $Vu=0.17\lambda\sqrt{fc}$ bw d

Where: bw and d are the section dimensions, and for normal weight concrete,

$\lambda=1.0$. This simplified formula is permitted by the ACI code expressed in metric units.

ADVANTAGES OF SWIMMER BAR SYSTEM

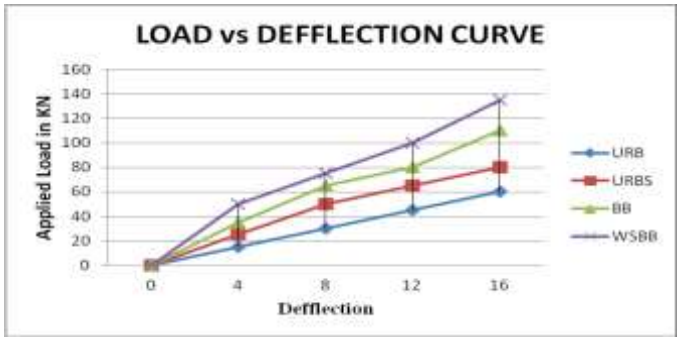
Flexibility, efficiency, Simplicity and Decrease in Time of Construction.

OBJECTIVE OF STUDY

The Deflection and Shear cracks of beams for 28 days is find out and compared with traditional RCC beams of different mix proportions. To evaluate shear failure of beams, shear failure test has been carried out at 28 days test. To study the deflection on beam load deflection test has been carried out and results are recorded. To determined shear failure by recording the cracks widths when different load is applied

RESULTS

It is proposed to check the shear failure of RCC beams with and without swimmer bars for M20, M25and M30 grade concrete



Deflection of Beams for M20

Similarly the deflection curves for M25 and M30 grade of concretes.

CONCLUSIONS

The Beams are reinforced by Welded Swimmer bars showed 25% increase in strength compare with the traditional normal stirrups beam, It is considered substantial improvement given that the same amount of steel is used for both type of beams.

The new welded swimmer bar system can be at great advantages than the traditional stirrups are less, and size of the cracks is slightly less.

Hence with lesser area for shear reinforcement in the form of welded swimmer bars, the depth can be reduce and shear strength can be increased, which reduces the cost of shear reinforcement

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