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A Review Paper on Shapes of Shear Reinforcement in Concrete Beam

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Abstract: Beam plays most important role in any structure. Beam transfer the loads of structure from superstructure to foundation. So the study of the beam is essential. There are two types of reinforcement provided in beam these are main reinforcement and distribution reinforcement. For further study of beam literature survey is carried out. Study focus on the shapes of shear reinforcement and distribution reinforcement provided in beam. Study of swimmers reinforcement along with the lattice girder is carried out .Also study focus on the sample prepare for experimental analysis of the beam.

For analytical analysis of beam various software are available. For detail analysis of beam Ansys software is used. Test for experimental analysis is studied. Lack of research area is found during the study of the literature.

Keywords: shape of shear are quite complex structures.

I. LITERATURE REVIEW

1) *Junfei Shen and Cuixiang Jiang et al (2018)*[1] *:* Author's study presents the works on the flexural performance of the steel fiber reinforced concrete structures through the change of steel fiber latticed structures, as well as the effect of altered latticed structures on the bearing capacity of steel fiber reinforced structures. The mechanical performance of steel fiber reinforced concrete was studied in this paper. The steel fibers in the concrete were processed into latticed structure. This reinforced concrete has the feature of good design ability and convenient construction. The experiment was conducted to study the influence of fiber lattice form on the bearing capacity of reinforced concrete. The results show that adjusting the included angle between the fibers and increasing the effective working length in the direction of tensile stress can retard the growth of crack.The steel fiber lattice reinforced concrete structure can efficiently increase its bearing capacity. This kind of reinforced concrete structure has great advantage of good design ability and convenient construction. Along the direction of tensile stress, the effective length of the steel fiber increases through the adjustment of the included angle θ between the steel fibers. As a result, this structure significantly reduces the crack widths and enable the concrete to sustain higher loading.
2) *N Kaarthik Krishna et al (2017)*[2]*:* In this paper, experimental results of testing six beams with respect to deflection and load bearing capacity by using normal and normal with helical reinforcements are done by comparing with each other to show the significant enhancement in load bearing capacity and ductility of the normal with helical reinforced concrete beams. All the six beams were tested under three point loading and the results were plotted.The present work explores the compatibility of normal with helical reinforcement as a whole which can be looked upon as an efficient replacement for normal reinforcement because of its ability to reinforce in all directions. The effectiveness was assessed by performing tests on the beams with respect to the cracking pattern, ductility and load defection diagrams. The obtained results were compared using ANSYS software and the values were found to be nearly accurate and hence the advantage of using helical reinforcement can be observed significantly. Therefore, reinforced beam with helical reinforcement has higher ultimate load-bearing capacity than normally reinforced beam. Hence it can be used in places where horizontal loads have higher significance.
3) *M.Tapan et al (2014)*[3]*et al:* This paper summarizes the test data obtained from an experimental investigation of reinforced concrete (RC) wide beams reinforced with lattice girders, which can also be described as one-way slabs, under low-rate (static) concentrated loading applied at their mid-span. Tests were conducted on lattice girder reinforced and traditionally reinforced beam-type specimens to investigate the effect of lattice girder on load carrying capacity. Key aspects of structural response such as the load–deflection behavior, crack patterns, strength and failure modes of the tested beams were recorded and given in this paper. A total of 6 beams with two different reinforcement arrangements were tested. Tested beams were simply supported at a span of 2250 mm. All specimens were tested under static loading and midspan deflections were recorded using a displacement transducer. Similar stiffness was displayed by the lattice girder reinforced and traditionally reinforced beams, but higher resistant capacity was shown by the lattice girder reinforced beams.Although similar initial stiffness was displayed by the lattice girder reinforced and traditionally reinforced beams, higher resistant capacity was shown by the lattice girder reinforced beams

due to the higher stiffness beyond cracking. The traditionally reinforced beams exhibited higher mid span deflection. The beams reinforced with lattice girders have three reactions against the applied load. The two reactions come from concrete and longitudinal reinforcement in bending. The third one is from the lattice girders which behave as truss elements. Truss behavior introduces higher stiffness and contributes much to the load.

4) *J. R. Figueiredo Filho et al (2014)* [4]*:* Author explains about the use of precast lattice-reinforced joist slabs in reinforced concrete structures has advanced since the 1990s. Such slabs are produced in two steps: one at the manufacturing plant where the joists are made, and the other on site, when concrete topping is applied. These slabs offer several advantages over other systems, such as reduced consumption of building materials, lower labour costs, simplicity and speed of erection, easy installation of service conduits, lower self-weight of the concrete structure, versatility in use, and economy. The procedures involved in manufacturing the joists and assembling the slabs in various types of buildings in the region of São Carlos, state of São Paulo, Brazil are described and analyzed, and the results of interviews with manufacturers, designers and builders are reported. The data collected show that in most cases this system has been executed inadequately, without taking simple precautions that would have prevented many of the problems of quality and durability that usually arise during use. The results of the survey about the design, fabrication and construction of slabs with lattice joists were presented. The opinions of manufacturers, master builders and designers responsible for calculating, dimensioning and executing these slabs were recorded. This study attempted to characterize the user groups, determine their opinions about the system's competitiveness and potentialities, compare the processes involving lattice-reinforced slabs, determine the most frequent pathologies, and put forward suggestions for studies. The visits also aimed to detect errors in the fabrication process of the elements that make up the slab and in the construction of the slabs, in order to propose solutions or procedures to correct or minimize these errors. It was found that the precast lattice-reinforced slabs supplied to clients during the period of this survey were calculated (designed) by the slab manufacturers and designers, demonstrating that the dimensioning of the other elements of the structure (beams, columns and foundations) may have been designed separately from the lattice-reinforce slab.This study collected important information to add to the existing body of knowledge about precast lattice-reinforced concrete slabs, contributing to help manufacturers, designers, engineers and construction workers to carry out their work according to the requisites of quality, durability and reliability and building codes. During its service life, the lattice-reinforced slab should perform its function without exhibiting pathologies or problems, ensuring its users' safety and comfort.
5) *Naiem M. Asha et al (2014)* [5]*:* In this paper author concentrate on the adequate safety margin of the beam, so that it will perform effectively during its service life. He find out the main mode of failure of beam. According to him diagonal cracks are the main mode of shear failure in reinforced concrete beams located near the supports and caused by excess applied shear forces. Beams fail immediately upon formation of critical cracks in the high-shear region near the beam supports. Normally, the inclined shear cracks start at the middle height of the beam near support at approximately 450 and extend toward the compression zone. Any form of effectively anchored reinforcement that intersects these diagonal cracks will be able to resist the shear forces to a certain extent. In practice, shear reinforcement is provided in three forms; stirrups, inclined bent-up bars and combination system of stirrups and bent-up bars. In this study, four reinforced concrete beams were tested using new shear reinforcement swimmer bar system and the traditional stirrups. Several shapes of swimmer bars are used to study the effect of swimmer bar configuration on the shear load carrying capacity of the beams.
6) *Moayyad M. Al-Nasra et al (2013)* [6]*:* This study focuses on the use of different types of shear reinforcement in the reinforced concrete beams. Four different types of shear reinforcement are investigated; traditional stirrups, welded swimmer bars, bolted swimmer bars, and u-link bolted swimmer bars. Beam shear strength as well as beam deflection are the main two factors considered in this study. Shear failure in reinforced concrete beams is one of the most undesirable modes of failure due to its rapid progression. This sudden type of failure made it necessary to explore more effective ways to design these beams for shear. The reinforced concrete beams show different behaviour at the failure stage in shear compare to the bending, which is considered to be unsafe mode of failure. 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. Swimmer bar system is a new type of shear reinforcement. It is a small inclined bars, with its both ends bent horizontally for a short distance and welded or bolted to both top and bottom flexural steel reinforcement. Regardless of the number of swimmer bars used in each inclined plane, the swimmer bars form plane-crack interceptor system instead of bar-crack interceptor system when stirrups are used. Several reinforced concrete beams were carefully prepared and tested in the lab. The results of these tests will be presented and discussed. The deflection of each beam is also measured at incrementally increased applied load. This study presented four different types of shear reinforcement that can be used in reinforced concrete

beams. New type of shear reinforcement system was used, which is swimmer bars system either bolted or welded to the longitudinal bars. There is improvement in shear strength of reinforced concrete beams by using swimmer bars in general. The bolted swimmers bars through U-links showed similar results as the welded. The width and length of the cracks were observed to be less using swimmer bars compared to the traditional stirrups system. The bolted swimmers bars as well as the u-link bolted swimmer bars exhibit similar behaviour under load compared to the traditional stirrups system.

7) *Ingemar Löfgren et al (2003)* [7] *:* Author's study presents the works on the flexural performance of the steel fiber reinforced concrete structures through the change of steel fiber latticed structures, as well as the effect of altered latticed structures on the bearing capacity of steel fiber reinforced structures. The mechanical performance of steel fiber reinforced concrete was studied in this paper. The steel fibers in the concrete were processed into latticed structure. This reinforced concrete has the feature of good design ability and convenient construction. The experiment was conducted to study the influence of fiber lattice form on the bearing capacity of reinforced concrete. The results show that adjusting the included angle between the fibers and increasing the effective working length in the direction of tensile stress can retard the growth of crack.

The steel fiber lattice reinforced concrete structure can efficiently increase its bearing capacity. According to author this kind of reinforced concrete structure has great advantage of good design ability and convenient construction. Along the direction of tensile stress, the effective length of the steel fiber increases through the adjustment of the included angle θ between the steel fibers. As a result, this structure significantly reduces the crack widths and enable the concrete to sustain a higher loading

II. CONCLUSION

By studying all this literature studies we came to conclusion that there is a number of published works on reinforced concrete beam. But in comparison to latticed or nodal connectivity of stirrups, very less work is done on. Experimental and analytical studies are presented in above paper. It is found that majority of the research papers on shapes of and type of shear reinforcement in concrete beam. However, a very less research effort is found on the Comparative analysis of square shape stirrups reinforced concrete beam and latticed reinforced concrete beam. Latiice girder is truss member use of this concept as a shear reinforcement in concrete beam may leads to positive result.

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