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Modelling of sample beam concrete when added fiber glass to know flexural strength

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Abstract— *Background: This research mainly consists of determining whether concrete with the addition of fiberglass helps in its physical and mechanical properties and properties on the compressive, bending and adsorption forces of concrete in Iraq. Aim of project: this paper aims to modelling of sample beam concrete when added fibre glass to know flexural strength. material and method: In this study, 4 samples were collected were distributed on (control sample - and 3 samples to which fibers were added in different proportions with dimension1000mmlength -150 width-150height).The tests applied in this experiment were based on the discipline positioning test at the age of 28 days and The L.V.D.T deviation reader was relied upon until a failure occurred the sample ,The modelling of concrete beams was based on the according blender program. Results : These obtained data were analysed using Microsoft Excel and SPSS. result showed compressive strength test of concrete beams had an increase compared to the control group when added 1.5% with 9.2%. It was noted that there were statistical differences between samples to which glass concrete fibers were added with the control group at p value <0.001 .the tensile strength achieved the highest value increase when glass fibers were added with 1.5% to become 5.3 MPA, The results of the three-dimensional modelling of concrete beams using the blender program appeared Great accuracy and convergence compared to the laboratory results of the research samples*

Conclusion: Reinforced concrete beams reinforced with glass fibers showed greater tensile and compression resistance compared to traditional reinforced concrete beams in order to achieve them and modelling the results helped in obtaining more accurate results, although there was no significant difference in the extracted result

Keywords— ***Glass fibers, L.V.D.T, modelling, CF, tension, flexural, beam, concrete, blender program, elements, distributed Load.***

I. INTRODUCTION

The presence of fiberglass in concrete elements with conventional tangential reinforcement (tapes) can significantly increase the shear strength. The aim of the study is to evaluate this effect[1,2]. The article presents experimental studies of reinforced concrete beams, including random fiberglass. Variable parameters are the distance between the clamps (50.75 and 100 mm) and the percentage of fiberglass weight (0; 0.75 and 1.5). The results of the experiments showed that the shear strength of the bundles increases significantly with the increase in the percentage of fibers. This effect reached 30%. Although the number of cracks increased in the presence of fiberglass, they became thinner.

Glass fiber reinforced concrete is a cement compound which is a relatively new type of building material that is being used at an increasing rate in different countries. Adding fiberglass to concrete increases its strength and durability[3,4,5]. This material is widely used because it has advantages over traditional counterparts, including light weight, moisture resistance, high compressive strength, low temperature deformation, and high fire resistance [6,7,8]

One way to overcome the beam problems is to reinforce them. Reinforcement can be by adding fibers, among which the addition of FRP has attracted a lot of attention, which is often used to increase the bearing capacity of reinforced concrete beams[9,10].

Ashraf Abdel-Qader and others [11] studied the effect of adding iron fibers on the crack-bending behavior of concrete beams[12]. Burt took samples with dimensions (100 x 200 x 1000 mm) and their results showed the positive effect of adding this type of fiber on reducing the number and width of cracks in the bending area, in addition to increasing the load of the first crack and reducing the deflection values. G.M. SadiqulIslam [13,14] also showed in a study published on the bending behavior of reinforced concrete beams with iron fibers that the presence of these fibers enabled the change of the fracture pattern to be more ductile than it was in ordinary concrete samples, and it also had a clear effect on increasing the fracture strength, as it was conducted Kang et al. [15,16,17] studied the bending behavior of iron fiber reinforced concrete beams, and the results of this study recorded an increase from 30% to 200% in bending strength and strength when iron fibers were added with a volume ratio of 0.5% and 0.75%, respectively. As for the researcher Alton and others [18,19,20], they studied the effect of adding iron fibers on the mechanical properties of concrete beams, and they concluded that both the maximum loads[21,22]

The bending strength of the beams has increased significantly with the addition of iron fibres. This research aims to study the structural behavior of reinforced concrete beams and the properties of concrete containing different volumetric ratios of iron fibers (0.5%-1.5%-2.5%)[23]

II. MATERIAL AND METHOD

In this study, glass fibers were relied on to know the bending behavior test in reinforced concrete beams, where the forties were collected. All laboratory analyzes related to disease resistance were conducted, in addition to knowing the bending behavior to concrete beams in engineering laboratories specialized in conducting tests in Baghdad governorate.

In this study, fiberglass was used to test the bending behavior of reinforced concrete beams, where the forties were collected. All laboratory analyzes related to disease resistance, in addition to knowing the bending behavior of concrete beams, were conducted in engineering laboratories specialized in conducting examinations in Baghdad governorate.

Glass fibers were added in different proportions (0.5%-1.5%-2.5%) and the samples were distributed on (control sample - and 3 samples to which fibers were added in different proportions with dimension1000mmlength -150 width-150height). According to the Iraqi specifications, fine aggregates were used from the quarries of the city of Baghdad, and coarse aggregates with a size of 5-19.5mm were used and reinforced concrete was a diameter of 12 mm , and secondary with 8mm

The weights of the materials used in the concrete mix in unit KG/M3 were as follows. (900 , water 540, coarse aggregate, 4260, fine aggregate 2160)

The tests applied in this experiment were based on the discipline positioning test at the age of 28 days, in which the load is graded gradually at a constant rate of 9 kN/min until collapse. The L.V.D.T deviation reader was relied upon until a failure occurred the sample

Fig.1- Concrete beam load testing device

III. RESULTS

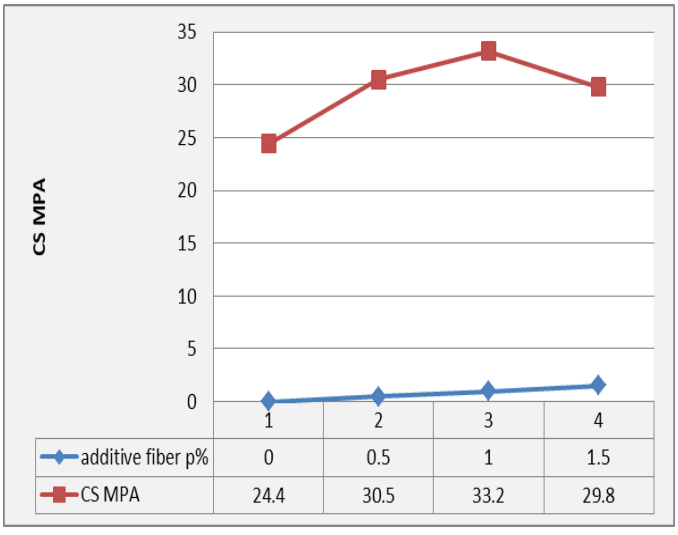

Fig.2- result of compressive strength BY unit MPA

Table 1- The percentage increase in compressive strength compared to the control group

additive percentage fiber	increase BY MPA	Increase BY P%	P Value
0.50%	6.1	25	0.001
1	8.8	36.06	0.001
1.5	5.4	9.2	0.056

Table 2-Tensile strength results for concrete beams

	Tensile strength MPA	Increase by MPA	Increase BY p%	P value
Control sample	2.6	0	0	0.00
0.5%	4.1	1.5	57.6	<0.001
1%	4.89	2.29	88.07	<0.001
1.5%	5.3	2.7	103.8	<0.001

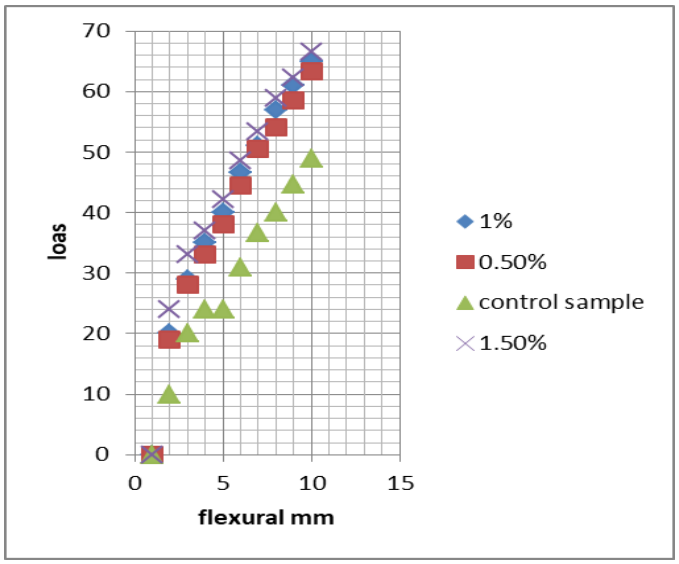

Fig.3- relationship between flexural and load

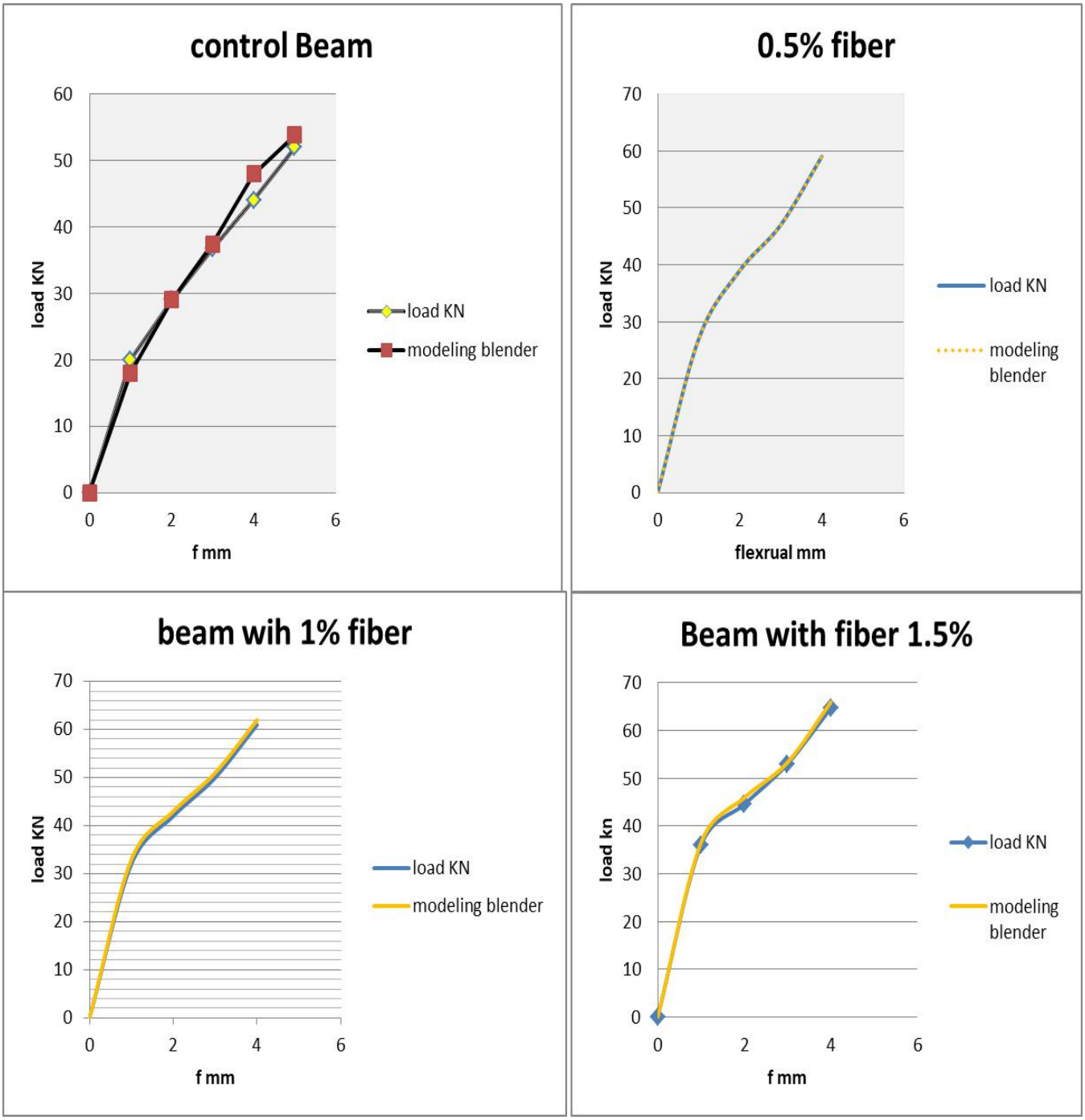

Fig 4 –modeling of sample beam concrete according blender program

IV. DISCUSSION

In this study, 4 samples were collected and all laboratory tests were performed on concrete beam in laboratories in Baghdad, Iraq. The necessary tests in this study were compressive strength in addition to tensile strength test. Concrete beams were also modelled to know the flexural behaviour relying on the modelling of concrete beams on the blender 2021 program.

In this study, the dimensions of the concrete cameras were 1000 mm long, 150 mm wide, 150 mm height , and the percentage of added glass fibres was 0.5%-1-1.5%, respectively from the weight of the concrete mixture.

The results shown in Table 2 showed that the compressive strength test of concrete beams had increase compared to the control group when added 1.5% with 9.2%.

It was noted that there were statistical differences between samples to which glass concrete fibres were added with the control group at <0.001 p value.

The tensile strength test was carried out to the concrete

cameras with the same added amounts of fibres, and a significant development in tensile strength was observed when fibres were added by 0.5 % with 57.6% - When fibres were added by 1%, the tensile strength increased to 4.89 MPA, which means it increased by 88.07, and the tensile strength achieved the highest value increase when glass fibres were added with 1.5% to become 5.3 MPA and this indicates the existence of a direct relationship between the percentage increase in tensile strength and the added glass fibres. We infer this by the presence of a direct statistical relationship when tested tensile strength with p value <0.001 as shown in Table 2.

It shows the results of the effect of adding iron fibers at different rates on the curve of the relationship between the load and the deviation of the research samples. Through these results, it is generally noted that samples containing a higher percentage of fibers than the previous ones achieved greater results in the values of the collapse load and lower results in the values of deviation, whether in the stage before or after the first crack. During the pre-cracking stage and at the load (10 kN), the comparison between the results showed that the deviation value decreased by 30%, when iron fibers were added by 1.5% to concrete. As for the post-cracking stage and during pregnancy (45 kN), the comparison of the results showed that the deviation value decreased by a greater percentage, reaching 60% in the sample containing 1.5% of glass fibres. These results confirm the great role of glass fibres in reducing cracks, limiting their width, and increasing the strength of the concrete section in the post-cracking stage.

V. CONCLUSION

1. The fibers in concrete help reduce shrinkage cracks, increase strength, increase energy absorption, and reduce dangerous cracks at high temperatures.
2. beam design uses knowledge of its primary tensile properties, compressive, bending and shear forces, combined with estimates of behaviour under secondary loading effects such as creep, thermal response and moisture movement.
3. The addition of fibers to the concrete contributed to reducing the occurrence of cracks and their expansion by creating bonding bridges within the cracks themselves, which enabled it to continue to provide additional resistance to the structural section even after the crack.
4. The results of the three-dimensional modelling of concrete beams using the blender program appeared Great accuracy and convergence compared to the laboratory results of the research samples

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