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ANALYSIS AND MODEL FOR FLEXURAL BEHAVIOUR OF CONFINED RECTANGULAR BEAMS

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Abstract: - The paper outlines a research Comparing the ductility and strength of Confined rectangular beam with Unconfined rectangular beam. The ductility and Strength of beams are of interest in earthquake resistant design consideration. The Test Programme consisted of rcc beam confined (External and internal) and unconfined with different stirrup spacing. testing is done on beams by four-point loading apparatus to check the bending behavior of confined and un confined beam.

Introduction; -

Apart from axial and torsional forces there are other types of forces to which members may be subjected. In many instances in structural and machine design, members must resist forces applied laterally or transversely to their axes. Such members are called beams. The main members supporting floors of buildings are beams, just as an axle of a car is a beam. Many shafts of machinery act simultaneously as torsion members and as beams. With modern materials, the beam is a dominant member of construction [1]. To get the Beam Sideway Mechanism, column ought to have the capacity to be have ductile. However, the adequacy in design of structural components, particularly under-reinforced pillars, is low. This is on the grounds that the concrete compression area turns out to be little contrasted with the entire concrete segment. This is since the strain on the adjust conditions will make the area of the neutral axis progressively moved towards the compression fiber, so that the littler the zone of stressed concrete. Albeit systematically moment limit builds, the beam with bigger reinforcement proportion of solid will be in the first place squashed before reinforcement yields with potentially a sudden failure [2]. This is the thing that ought to be maintained a strategic distance from as far as structural design. ductility of beams by giving extra confinement stirrup-formed in cross-segment stress zone, keeping in mind the end goal to acquire more positive conditions as far as moment limit and ductility when contrasted and the standard beam without extra confinement [3][4].

The different test used in beam first is flexural test it is Flexure tests are by and large used to decide the flexural modulus or flexural quality of a material. A flexure test is more reasonable than a tensile test and test comes about are marginally extraordinary [5]. The material is laid evenly more than two points of contact (bring down help traverse) and after that a force is connected to the highest point of the material through possibly maybe a couple points of contact (upper stacking range) until the point that the example comes up short [8].

Existing work: -

Experimental work was carried out to study the mechanical behavior of interior beam-column sub assemblage with the eccentricity between beam axes and column axes. Test specimens are four wall girder-wide column joints with large beam depth and two beam-column joints which beam depth is the same as column depth [8] The variables of the test series in girder-column joints are eccentricity, column longitudinal reinforcement ratio, and joint lateral reinforcement ratio. The variable of the test series in beam-column joints is eccentricity only. The mechanical behavior of beam-column subassemblies with one-sided eccentricity is discussed from the experimental results, and the ultimate strength of each test specimen is estimated using the proposed equation. Cantilever beams and simple beams have two reactions (two forces or one force and a couple) and these reactions can be obtained from a free-body diagram of the beam by applying the equations of equilibrium. Such beams are said to be statically determinate since the reactions can be obtained from the equations of equilibrium. Continuous and other beams with only transverse loads, with more than two reaction components are called statically indeterminate since there are not enough equations of equilibrium to determine the reactions. Understanding of the stresses induced in beams by bending loads took many years to develop[9].As will be developed below, beams develop normal stresses in the lengthwise direction that vary from a maximum in tension at one surface, to zero at the beam's midplane, to a maximum in compression at the opposite surface[1]

Preparation of Reinforced Cages

spacing of stirrups

8 stirrups 100mm

6 stirrups 200mm

4 stirrups 300mm

Confined beam (8 stirrups)

Confined beam (6 stirrups)

Confined beam (4 stirrups)

External confinement was prepared by using double layer of mesh which was wrapped outside the periphery of reinforcement cage as shown in figure 1,2 and 3

Internal confinement

External confinement

FAILURE PATTERN

RESULT: -

Sample Description:

Sample 1 –Internal confinement c/c spacing 300 mm

Sample 2- External confinement c/c spacing 300mm

Sample 3- No confinement c/c spacing 300 mm

Sample-1		Sample-2		`	
Deflection	Load (kN)	Deflection	Load (kN)	Deflection	Load (kN)
0	0	0	0	0	0
0.1	26.1	0.1	36.1	0.1	21
0.2	28	0.2	37.7	0.2	22.8
0.3	31.8	0.3	43.7	0.3	28.4
0.4	37.5	0.4	48.8	0.4	35
0.5	42.7	0.5	53.3	0.5	37.2
0.6	43.3	0.6	57.8	0.6	42
0.7	47.6	0.7	62.4	0.7	47.8
0.8	53.2	0.8	66.9	0.8	50
0.9	59.1	0.9	71.7	0.9	52.8
1	63.2	1	76	1	57.8
1.1	67	1.1	79.9	1.1	61
1.2	71.9	1.2	83.8	1.2	66
1.3	75	1.3	87.4	1.3	68.5
1.4	80	1.4	91.4	1.4	74

The above table shows the Load-Deflection Behavior. Here we can see the different three samples deflection and load value. according to these values the graphs are shown in below.

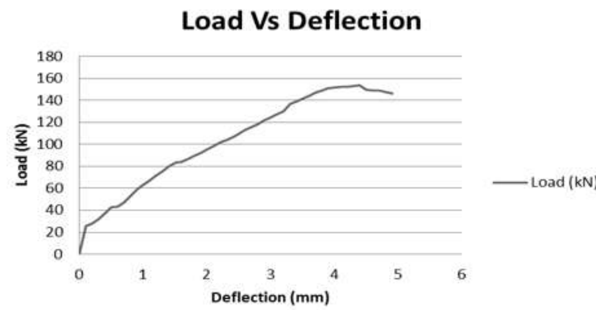

Figure 4: Load-deflection behavior of sample 1

The figure 4 shows the Load-deflection behavior of sample 1(Internal confinement c/c spacing 300 mm)

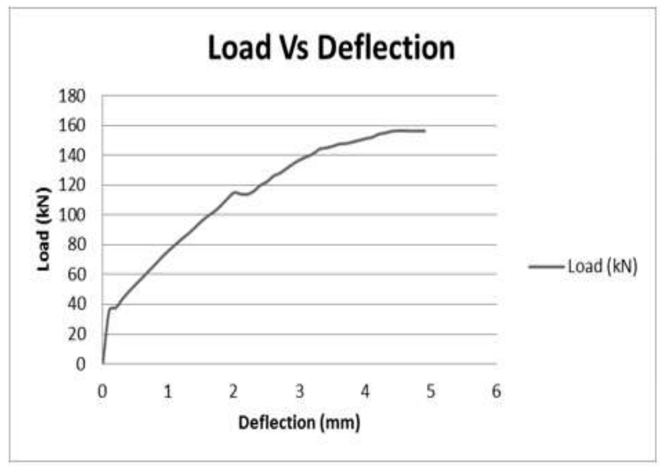

Figure 5: Load-deflection behavior of sample 2

The figure 5 shows the Load-deflection behavior of sample 2(External confinement c/c spacing 300mm)

Figure 6: Load-deflection behavior of sample 3

The figure 6 is shown the Load-deflection behavior of sample (No confinement c/c spacing 300 mm)

Table 2: Comparison of Load-deflection behavior of different samples

Deflection	Load (kN) (S-1)	Load (kN) (S-2)	Load (kN) (S-3)
0	0	0	0
0.1	26.1	36.1	21
0.2	28	37.7	22.8
0.3	31.8	43.7	28.4
0.4	37.5	48.8	35
0.5	42.7	53.3	37.2
0.6	43.3	57.8	42
0.7	47.6	62.4	47.8
0.8	53.2	66.9	50
0.9	59.1	71.7	52.8
1	63.2	76	57.8
1.1	67	79.9	61
1.2	71.9	83.8	66
1.3	75	87.4	68.5
1.4	80	91.4	74

Comparison of load Vs deflection for the different samples of beam is shown in table 2. After experimental analysis it is observed that the sample 2 contains maximum load carrying capacity whereas sample 3 contains minimum load carrying capacity under same deformation.

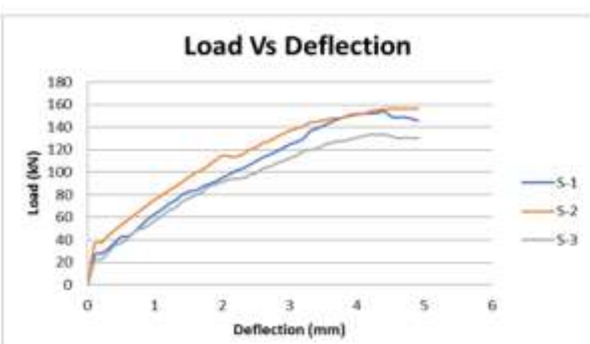

Figure 7: Comparison of load-deflection behavior of samples

The figure 7 shows the Comparison of load-deflection behavior of samples. The graph diagram shows the load verses deflection.

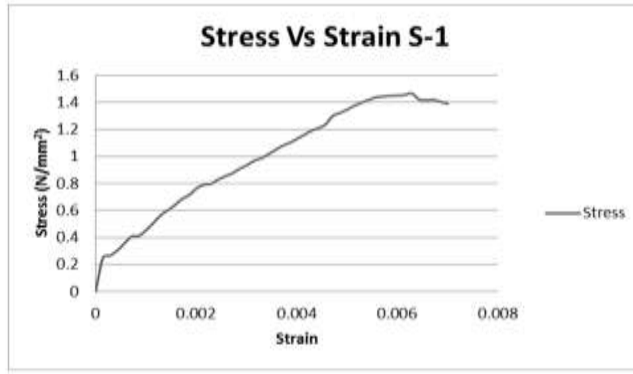

Figure 8: Stress-strain curve for sample 1

The figure 8 shows the Stress-strain curve for sample 1(Internal confinement c/c spacing 200 mm)

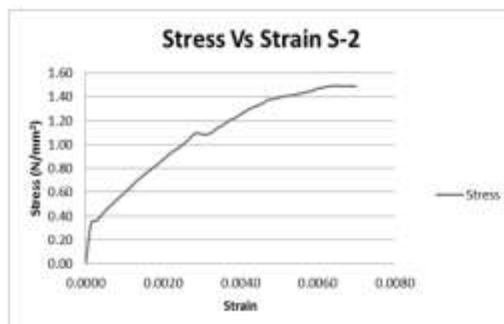

Figure 9: Stress-strain curve for sample 2

The figure 9 shows the Stress-strain curve for sample 2(External confinement c/c spacing 200mm).

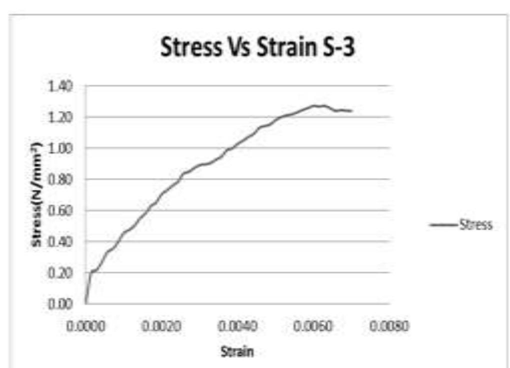

Figure 10: Stress-strain curve for sample 3

Comparison of Stress Vs strain for the different samples of beam is shown in figure 10. After experimental analysis it is observed that the sample 2 subjected to maximum strain whereas sample 3 subjected to minimum strain under same stress.

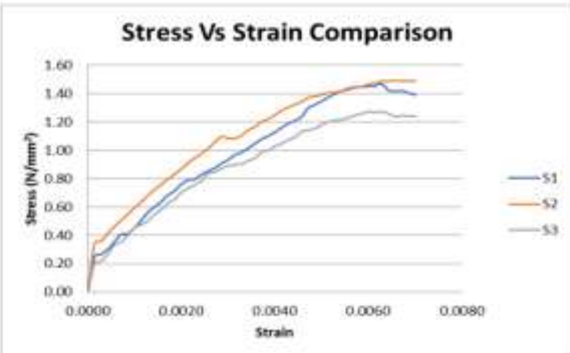

Figure 11: Comparison of stress Vs strain of beam samples

The figure 11 shows the Comparison of stress Vs strain of beam samples. The graph shows the stress verses strain.

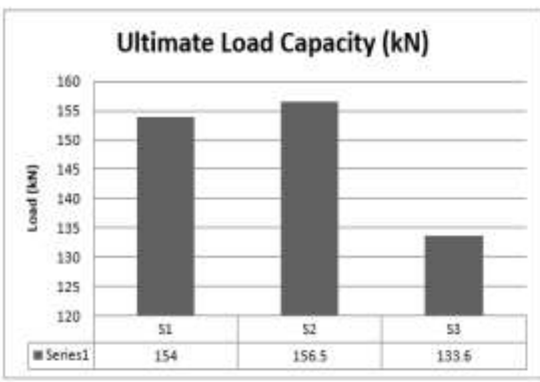

Figure 12: Comparison of ultimate load carrying capacity of beam samples

Comparison of different samples of beam is shown in figure 12 for ultimate load capacity. After experimental analysis it is observed that the sample 2 contains maximum load carrying capacity whereas sample 3 contains minimum load carrying capacity.

Conclusion; -

Hence here we are studied mechanical behavior of rectangular beams. Here we can see Bend ductility increases as the stirrup spacing diminishes following both the confinement models. Confinement proves to be more effective and external confinement is the best. Comparison of different samples of beam for ultimate load capacity is performed. After experimental analysis it is observed that the sample 2 contains maximum load carrying capacity whereas sample 3 contains minimum load carrying capacity. Comparison of Stress Vs strain for the different samples of beam is performed. After experimental analysis it is observed that the sample 2 subjected to maximum strain whereas sample 3 subjected to minimum strain under same stress.

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