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Maintenance of RCC Beams by Retrofitting Technique using steel plates

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Abstract— Huge numbers of the building structure or any fortification solid structure (super structure) harmed because of the additional heap or successive quakes. Jacketing is utilized for little breaks and little harm of beam, sections, slabs and other RCC structures.Jacketing keep the total swap for existing structure utilizing other materials.MS plates with connection (bolt, rivet) use in retrofitting, plates use one, two and three layer in all face of beams.The quake is not kidding issue for any structure.The building harms because of ground movement of soil by the earthquake, settlement of establishment, uncalled for upkeep, concrete related issues, incremental loads at structure .The cost of finish substitution of building high and if the building is authentic reproduction is unrealistic arrangement for this situation we utilized Jacketing. For Jacketing plan three beams. Area measurements of beams are 110 mm ×150 mm. The aggregate length of each beam is 1800 mm. Utilizing M-25 review of concrete. The blend proportion of M-25 is 1:1.4:3.95 of bond coarse sand, and granular total. The proportion of 20 mm and 10 mm coarse totals 60:40. The water proportion is 5.417 L for a beam. Fe-500, 2 numbers of 11 mm bar given in tension zone and 2 numbers 9 mm bar in compression zone and furthermore utilized Fe-415, 6 mm strips bar as indicated by IS-456-2000.The strips bar gave 100 c/c in beam. The beams thrown in wooden cost form. The cast beams curing 28 days. The all bars tried in UTM connected point load. The load is connected until beam failure.After break created stack from the specimen. Compute the load and deflection and plan the graphs for each beam. Then used 13 mm thickness MS plate and 15 mm dia bolts connection for jacketing.In first retrofitting used one plate at base side and one plate at upper side of beam. In second retrofitting utilized two plates at base side and two plates at upper side of beam. In third retrofitting utilized one plate at front side and one plate at back of beam no plates use at top and base side of beam. After retrofitting tried in UTM point load connected. Draw the chart among load and deflection.

Key words: RCC beam with simply supported, MS plates, Bolts connection

1. INTRODUCTION

Jacketing is utilized for the harmed basic components. Building harmed because of many reason like earthquake, soil movement, improper maintenance, concrete related issue and increment the administration stacks and live load. Seismic tremor is real issue for soil movements at building establishment. As of late time earthquake have been happened many time. Seismic jacketing is given in high seismic area to segments, bars and pieces. Seismic jacketing utilized development time. The earthquake is not kidding issue for any structure.The building harms because of ground movement of soil by seismic tremor, foundation settlement, uncalled for support, concrete related issues, increment loads at structure etc.The cost of finish substitution of building high and if the building is recorded recreation is impractical arrangement for this situation we utilized jacketing. For jacketingplan three beams. The seismic jacketing is already used in rcc building. The jacketing is provided after damage structural elements. There are many type of local jacketing methods depend on the basis of our requirements of structure.The jacketing techniques are strengthened solid, steel plates, steel link, fiber fortified, glass fiber, carbon fiber, polymer etc.Steel plates jacketing techniques is local retrofitting techniques. This method is the most well-liked retrofitting for strengthening any structural elements. The MS plates are use number of layers at all side of building damages section.Rivets, bolts and welding connection are used for the joint the section. Steel plates use for strengthening at section and number of layer use for more strengthening. Upper and lower side plates use in beams section for horizontal. For tending beam section all provide steel plates all direction. For column retrofitting also provided in all direction. Jacketing of beams column links depend on the basis of joint section retrofitting.

II.THEORY OF JACKETING OF BEAMS USING STEEL PLATES

In this retrofitting we are using plates with bolts and welding connections, The thickness of steels plates is depend upon load at the retrofitting elements. The thickness of plates at least 6mm. If more strength required then increase the layer of plates or use the different steels section (rectangular, T, L etc.).Drill machine is use for drill in beams and plates.

III. METHODOLOGY:

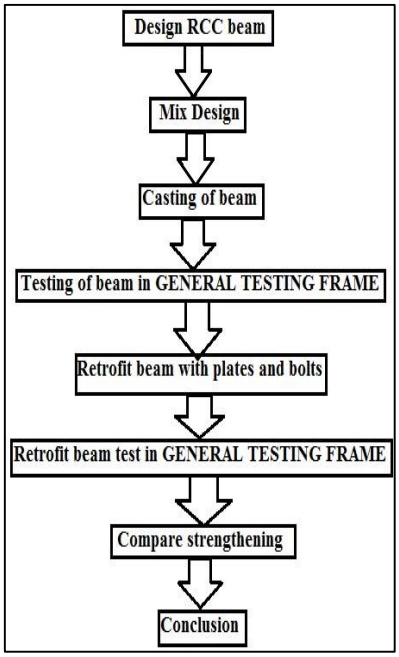

Fig. 1: Methodology

IV.MATERIALS USED IN RETROFITTING

In this jacketing less material utilized as contrast with other retrofitting techniques. The materials are as below.

a. Steel plates
b. Bolt and weld connections
c. Drill machine
d. Inject machine
e. Slurry for grouting
f. Expert worker
g. Passing sieve
h. General testing frame
i. CTM

OPC of grade 43 was used. The preliminary setting time of cement is 30 minutes and the specific gravity of cement is 3.15.Fine aggregate utilized was so clear sand passing through 4.75mm sieve with a specific gravity of 2.70. The zone III of aggregate was used. Coarse aggregate used was angular compressed aggregate with a specific gravity of 2.64. Design concrete mix is M-25. MS steel plates of 10mm thickness are used for retrofitting of beams.

V. Beam Design

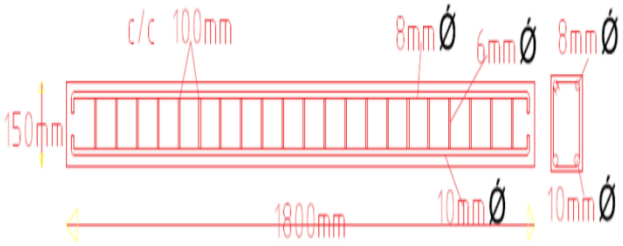

Fig. 2: Beam Design

VI. TEST OF BEAM No.1

The design beam test in general testing frame the deformation is measured by dial-gauge. The load connected by CTM. Beamone is retrofitted with one plates top and one plate base of the beam.The connected load is perpendicular to the plate width.

Fig 3: Retrofitted with one plates top and one plate base of the beam

Table 1: The control example load, control beam deflection and retrofitting deflection

Load KN	DEFLECTION	Retrofitting deflection
0	0	0
5	0.3	0.42
10	0.57	0.64
14	1.46	1.65
20	2.23	2.81
26	3.8	4.46
30	5.15	6.25
32	5.85	6.92
35	6.57	

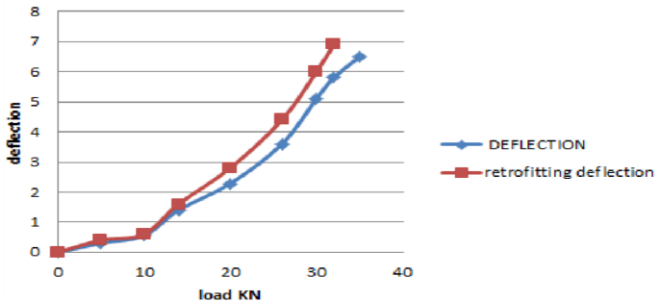

Fig. 4: The graphanalysis without retrofitting and with retrofitting single-single plate top and base.

VII.TESTING OF BEAM No. 2

The design of beam-2 is same as beam-1. The beam test in common testing frame the deflection is measured by dialgauge. The load connected by CTM. Beam two is retrofitted with double plates top and double plate base of the beam. The deflection is after the retrofitting steel plates. The connection load is perpendicular to the plates width.

Fig.5: Beam two is retrofitted with double plates top and double plate base of the beam

Table 2: The control example load, control beam deflection and retrofitting deflection values.

Load KN	DEFLECTION	Retrofitting deflection
0	0	0
5	0.28	0.30
10	0.43	0.46
15	1.13	1.19
20	2.9	3.3
25	4.7	4.9
27	5.13	5.59
29	5.95	6.65
31	6.2	

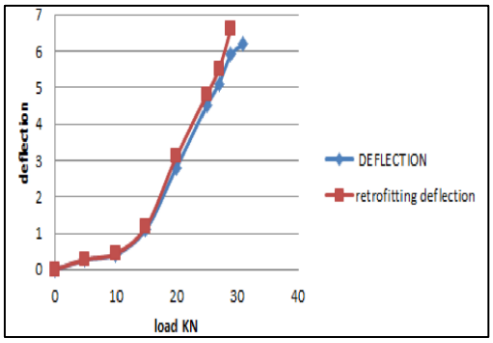

Fig. 6T The Compare graph with retrofitting and

VIII. TESTING OF BEAM No. 3

Beam one is retrofitted with one plate front and one plate backside of the beam. The applied load is parallel to the width of plates. Beam two is retrofitted with double plates top and double plate bottom of the beam.

Fig. 7: Beam retrofitted with plates front and flipside plate.

Table 3: The control example load, control beam deflection and retrofitting deflection values

LOAD KN	DEFLECTION	RETROFITTING DEFLECTION
0	0	0
5	0.35	5
10	0.44	
15	1.27	
20	2.61	
25	4.25	
30	5.50	
35	6.85	

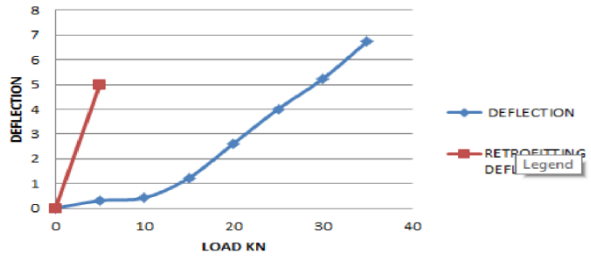

Fig. 8: The compare graph without retrofitting

IX. RESULT

Beam1 is retrofitted by one plates top and one plate base of the beam. The associated load is opposite to the width of plates. The strengtheningis 92%.

Beam2 is retrofitted with one plates top and one plate base of the beam. The associated load is opposite to the width of plates.. The strengthening is 95%.

Beam3 is retrofitted with one plate front and one plate rear of the beam. The connected load is parallel to the width of plates. The strengthening is low 13% simply because the load is not at plate just beam.

X.CONCLUSION

a. The steel plates are valuable for strengthening.
b. The number of steel plates layer is additionally builds the pickup quality additionally increase the dead load.
c. The connected load is parallel to the width of plates retrofitted with one plate front and one plate posterior of the beam not useful.
d. The connected load is opposite to the width of plates retrofitted with plates top and base of the beam is higher strengthening.

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