REHABILITATION AND STRENGTHENING OF RCC BEAM WITH INTERNAL AND EXTERNAL IMPLANTING

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Abstract -Abstract -*The present study is concentrated on the experimental disquisition and nonlinear finite element simulations of shear deficient and glass fiber corroborated plastic (GFRP) strengthened corroborated concrete shafts. Three situations of shear insufficiency are considered in the design. Two layers of GFRP fabric are used for strengthening in the shear zone. The geste of control, shear deficient and GFRP strengthened shafts under two- point monotonic lading is studied. Detailed 3Dnon-linear finite element analyses with perfect cling as well as with cohesive zone modeling are carried out to pretend the geste of shear deficient shafts. The responses, in terms of cargo- deviation geste, failure loads and crack patterns, attained from numerical simulations are validated with that of the experimental examinations. The validated numerical models are also used for studying the efficacity and effectiveness of colorful strengthening schemes using library paste saturated GFRP fabric where the number of layers, exposure and distribution of filaments are considered as parameters. Grounded on the parametric studies, the schemes which give optimum enhancement in performance for strengthening of the shear deficient shafts are linked. For all three classes of deficient shafts, topmost enhancement in strength is attained for 45 exposures in single bias, 45 – 90 exposures in double bias and 90 – 45 – 90 exposures in triadic bias strengthening schemes. In all GFRP strengthened shafts, mode of failure changed from shear to flexural failure and showed great enhancement in the ductile geste. Strengthening and restoring of RCC is an integral part of moment's concrete assiduity. Erosion of bedded buttressing sword and of concrete structures is a worldwide problem. These damages due to erosion, fire etc … reduces the service life of structures. Traditional ways for strengthening of structure are expensive and delicate. Hence, developing a implant fashion using Cold Formed Sword. External and internal implanting will be carried out. While doing internal implant, the stylish exposure of CFS strips will also be linked. M40 grade of concrete is used.*

Key Words:*(CFS)* Cold-formed steel, (ULCC) Ultra-lightweight cement composite, (FE) Finite element analysis.

1.INTRODUCTION

Fiber Corroborated polymer (FRP) compound systems, composed of filaments bedded in a polymeric matrix, can be used for shear strengthening of corroborated con crete (RC) members w1 – 7x. Numerous being RC shafts are deficient and in need of strengthening. The shear failure of an RC ray is easily different from its flexural failure. In shear, the ray fails suddenly without sufficient warning and slant shear cracks are considerably wider than the flexural cracks w8x. The objects of this program were to

1. Probe performance and mode of failure of simply supported blockish RC shafts with shear deficiencies after strengthening with externally clicked CFRP wastes.
2. Address the factors that impact shear capacity of strengthened shafts similar as sword stirrups, shear span to-effective depth rate (ayd rate), and quantum and distribution of CFRP.
3. Increase the experimental database on shear strengthening with externally clicked FRP underpinning.
4. Validate the design approach preliminarily proposed by the authors w9x. For these objects, 12 full-scale, RC shafts designed to fail in shear were strengthened with different CFRP schemes. These members were tested as simple shafts using a four- point lading configuration with two differ ent ayd rates.

2. AIM

Study the strengthening and restoring of RCC. It is an integral part of moment's concrete assiduity. Erosion of bedded buttressing sword and of concrete structures is a worldwide problem. These damages due to erosion, fire etc … reduces the service life of structures. Traditional ways for strengthening of structure are expensive and delicate. Hence, developing a implant fashion using Cold Formed Sword. External and internal implanting will be carried out. While doing internal implant, the stylish exposure of CFS strips will also be linked. M40 grade of concrete is used.

3. OBJECTIVE

To rehabilitate partially damaged RC beam by implanting technique (internal and external method) using cold formed steel. To test the performance of Cold Formed Steel in retrofitting using four point bending test. To perform the parametric studies and to suggest the best way the CFS can be implanted. To analyses the structure using ANSYS software. Load-deflection behavior, failure loads and crack patterns will be noted.

4. LITERATURE REVEW

4.1Ahmed Khalifa(2002)

study the shear behavior and the modes of failure of simply supported thickish section RC shafts with shear deficiencies, strengthened with CFRP wastes. The para measures excavated in this program were actuality of brand shear underpinning, shear span-to-effective depth rate and CFRP amount and distribution. The results confirm that the strengthening fashion using CFRP wastes can be used to increase significantly shear capacity, with effectiveness that varies depending on the tested variables. For the shafts tested in this program, increases in shear strength of 40 – 138 were achieved.

4.2Nawal Kishor Banjara (2017)

From experimental studies, it's noted that all the shear deficient shaft failed due to development of a major slant pressure crack extending from the supports to the loading point. The failure loads of the shear deficient shafts dropped with adding stirrup distance (increased insufficiency) with corresponding drop in deportation indicating brittle failure. All the tested shear deficient shafts failed in shear with conformation of slant pressure crack former to yielding of brand indicating a weak shear zone. The deficient shafts showed unlooked-for failure before brand yielding. The weight-strain plot of the control shaft shows morning of brand yielding which could be the reason for ductile behavior of control shaft. GFRP strengthened shafts displayed flexural failure mode. GFRP strengthened shaft showed improvement in weight bus carrying capacity as well as severity. Enon-direct 3D finite element models developed could simulate the factual behavior of shafts under laboratory loading conditions with sufficient delicacy. The brand plate modelled at the supports and loading points is effective in distributing the loads slightly, thus preventing premature compressive crushing fail ure of the shaft models. Mesh convergence study showed that an optimum mesh size of 25 mm is respectable to achieve delicacy. FE analyses are carried out using two styles, (i) by using perfect cleave between concrete and FRP layers and (ii) by using interfacial behavior (CZM) modelling between concrete and FRP layers. Since debonding is not observed between concrete and FRP layers (during experimental study), perfect cleave is espoused for further numerical studies. The finite element models developed could predictmid-span divagation within ± 5 variation with that of experi internal study and failure loads within ± 10 variation with that of experimental study. The mode of failure and elaboration of crack stroke terns observed from FE analysis are in good agreement with that of laboratory tested shafts. The failure patterns of shear deficient shafts observed from lab oratory tests and numerical study suggested a weak shear zone and hence U- serape strengthening fashion is proposed. Library paste impregnated GFRPU- serape fashion is factory to be effective in adding the weight carrying capacity of deficient shafts. For all three classes of deficient shafts, topmost improvement in strength is attained for 45 exposures in single bias, 45 – 90 exposures in double bias and 90 – 45 – 90 exposures in triple bias strengthening schemes. Maximum of 42, 38 and 37 improvements in weight bus rying capacity are attained for GFRP strengthened shear deficient shafts SD1, SD2 and SD3, singly, as compared to that of con trol shaft. In all GFRP strengthened shafts, mode of failure chan ged from shear to flexural failure and showed great improvement in the ductile behavior.

4.3Bjorn Taljsten (2003)

The Laboratory tests showed that concrete shafts can be strengthened for shear and that fabrics or laminates should be placed vertical to the shear crack if possible. It can be easy toover-strengthen structures and it's most likely that the compressive strength in the concrete will set the limit for shear strengthening. Strain measures show that the thinner the fiber used the better the utilization of the fabric. A comparison with proposition and test gives a relatively good agreement indeed though only two shafts were equipped with strain needles and estimated. Still, fresh tests and FE- analysis are demanded to corroborate and control the deduced proposition and the suggested use of a strain distribution rate. Nonetheless, it seems from the results presented then, that a rate of roughly0.55 of the maximum measured strain value can be recommended for engineering design. It shall also be kept in mind that harborage failure isn't considered in the presented design; then, fresh work is suggested. The field operation together with the new anchoring device presented demonstrates the simplicity by which the CFRP strengthening system can be applied in the field.

4.4M.C. Sundarraja (2009)

The provision handed in the ACI law can be used as guidelines for the use of FRP in form and recuperation of structures. All the shafts handed with GFRP strips gave the strength for which they were designed. Maximum chance of increase in ultimate strength of 50 was observed in the shafts RF3, RF4 and RF5. Also, there's further than 50 increases in strength was observed in the shafts RFU3, RFU4 and RFU5.Since the use of GFRP strips in the shear deficient shafts, the original cracks are formed at advanced loads than their separate control shafts. This shows that use of GFRP strips are more effective in the case of strengthening of structures in shear. The ultimate strength of shafts can be increased by the use of GFRP inclined strips. The ultimate loads of shafts retrofitted with U-wrapping were lesser than the shafts retrofitted by relating the GFRP strips on the sides alone. Increase in strength depends on the range of the strip that was handed to the ray.The presence of GFRP inclined strips on the ray inhibited the development of the slant cracks. A significant difference was seen in the cargo causing the original cracks. The cargo deviation geste was better for shafts retrofitted with GFRP inclined strips. For the shafts clicked with inclined GFRP strips flexural failure was prominent than shear failure. This avoids disastrous failure of shafts.The cargo carrying capacity of the retrofitted shafts were plant to be lesser than that of the control shafts, therefore the externally clicked FRPs were suitable to help in taking further cargo. It's easier to maintain a fairly invariant consistence of library paste resin throughout the cling length. Restoring or upgrading the shear strength of ray using FRP inclined strips can affect in increased shear strength and stiffness with substantial reduction in the shear cracking. Restoring the shear strength of shafts using GFRP is a largely effective fashion.

4.5M. C. SUNDAR RAJA AND S. RAJAMOHAN(2008)

Predicated on the exploration the following conclusions were made. The provision handed in the ACI law can be used as guidelines for the use of FRP strips in form and rehabilitation of structures. The perpendicular U-serape strips are better than side vertical strips. Though the weight carrying capacities in both styles were analogous, weight divagation behavior was better for U-mantle when compared to side vertical strips. The shear force handed by the GFRP strips depends on the range of the strips. Strips of lower extents were demanded for furnishing large strength. The presence of vertical GFRP strips on the shaft inhibited the development of the diagonal cracks. For the shafts clicked with vertical GFRP strips, FRP rupture failure was more prominent than FRP debonding, but in case of U-wrap crushing of concrete in the compression zone was more prominent. The weight carrying capacity of the retrofitted shafts was factory to be lower than that of the control shafts, thus the externally clicked FRPs were suitable to help in taking more weight. It's easier to maintain a fairly steady viscosity of library paste resin throughout the bonding length. Restoring or upgrading the shear strength of shafts using FRP side strips can affect in increased shear strength and stiffness with substantial reduction in shear cracking. Restoring the shear strength of shafts using GFRP is a largely effective fashion.

4.6N. Pei and K. Pilakoutas(2004)

In the study, the method for flexural analysis of FRP-plated R.C. beams based on the Eurocode 2 (or CEB-FIP MC 90) parabolic-rectangular stress-strain model for concrete in compression was presented. The derived equations can be used for the development of a series of design charts for the flexural analysis of rectangular and T-sections with bonded FRP plates. In the second part, the accuracy of the numerical procedure comprising concrete tension stiffening effect for the computation of the flexural capacity and deflections for FRPplated RC beams was verified with available experimental data. The detailed flowchart of the presented numerical procedure can serve as guidance for the computer implementation of the presented method which has the ability to capture the effect of pre-loading (applied before the strengthening with bonded FRP plates) on the poststrengthening stifles and load capacity of RC beams.

4.7 T. M. ROBERTS AND H. HAJI-KAZEMI

An analytical solution for predicting the displacements, strains and stresses in reinforced concrete beams, strengthened on the tension faces with externally bonded steel plates, has been presented. Results obtained for practical dimensions and material properties indicate that the shear and normal stresses, in and adjacent to the adhesive layer, increase rapidly towards the ends of the steel plates and depend on the shear and normal stiffnesses of the connection and on the thicknesses and points of termination of the steel plates. The predicted stress distributions are consistent with modes of failure observed in tests.

5. CONCLUSIONS

An experimental investigation was conducted to study thebehavior and to rehabilitate partially damaged RC beam by implanting technique Load-deflection behavior, failure loads and crack patterns will be noted, the modes of failure of simply supported rectangular section RC beams2.

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