

CHAPTER-6

CONCLUSIONS

6.1. GENERAL

In the present investigation, the Structural Health Monitoring and retrofitting of reinforced concrete rectangular slabs was studied. Their analytical study was also done using non linear finite element method.

The slabs were casted and the nondestructive testing was done before as well as after the loading test. The degree of deterioration was assessed on the basis of the damage index. The slabs were then tested, retrofitted and retested to achieve the objectives.

6.2. CONCLUSIONS

On the basis of research reported in previous chapters, following conclusions are drawn:

1. For repair applications of reinforced concrete slabs, test results indicated that the composite system may be designed to restore its original strength or to enhance its load carrying capacity.
2. Retrofitted slabs underwent less deflection as compared to control slabs.
3. It was found that the predicted analytical response was close to the experimental one (within $\pm 5\%$).
4. The failure of the retrofitted slabs in case of GFRP and Mild Steel was due to debonding, whereas in case of slabs retrofitted with Ferrocement the failure was in flexural mode.
5. Load carrying capacity of retrofitted slab was possible to restore to initial level or even enhance it (as compared to control slab specimen).
6. It was observed that GFRP retrofit material outshined the other laminates and showed better performance.

7. The ductility of the GFRP retrofitted slabs was highest being 43% for S1 slabs and 36% for S2 slabs
8. It was also observed that the percentage decrease in deflection for virgin and GFRP retrofitted slabs was 50% for S11 and 42 % for S21 when the deflection values against the nonlinear range were compared.
9. For Ferrocement retrofitted slabs S12 and S22 of size S1 and S2, the percentage decrease in deflection for control and Ferrocement retrofitted slabs was found to be 23 % for S1 and 17 % for S2 slabs.
10. In case of Mild Steel retrofitted slabs S13 and S23 of size S1 and S2, it was observed that the percentage decrease in the deflection was 22% for S13 and 12 % for S23 when the virgin slabs before retrofitting and Mild Steel plate retrofitted slabs were compared
11. Larger sized slabs exhibited more deflections as compared to smaller sized slabs.
12. Although the cost comparison indicated that GFRP retrofitting material was the costliest; its ability of strength restoration and ductility surpassed the economic feasibility.

6.3. SCOPE FOR FUTURE WORK

Further studies should take into account the following suggestions for better understanding of properties of RCC rectangular slabs:-

The investigation may be done on one way slabs and slab-beam members and the behavior may be observed after retrofitting with the laminates.

The experimentation can also be done on the introduction of more than one layer of retrofitting material. The understanding of the behavior of the slab by using combination of different materials may also give a better understanding about the behavior of the slabs.

6.4. RESEARCH PUBLICATIONS

Harpreet Gaba, Hardeep Singh Rai, S.P.Singh and Harvinder Singh (2011), “Health Monitoring and Retrofitting of Structures-A Review”, International Journal of Earth Sciences and Engineering, Vol. 04, No 06, October 2011, pp-681-683.

S.P.Singh, Hardeep Singh Rai and Harpreet Gaba (2012),”Strengthening of RC Two-Way Plates Using Ferrocement”, International Journal on Civil Engineering, Vol.2, No.4. September-November 2012, pp-16-24.

Harpreet Gaba, Hardeep Singh Rai, S.P.Singh and Harvinder Singh (2013), “ Retrofitting and Life Extension of Structures- A Review” Innovations in Concrete Construction Innovations and Concrete construction, Proceedings of the International UKIERI Concrete Congress, Jalandhar, India held at Dr. B.R.National institute of Technology, Jalandhar during 5-8th march,2013, pp-175.

H.K.Gaba, H.S.Rai and S.P.Singh, (2013), “Damage Identification and Behavior of Slabs using external laminates: A review paper”, Proceedings, National Conference “ Geotechnical and Geoenvironmental Aspects of Wastes and Their Utilization in Infrastructure Projects” held at Guru Nanak Dev Engineering College, Ludhiana during 15-16th February,2013, pp-343 -348.