CHAPTER-2

LITERATURE REVIEW

2.1. GENERAL

, due to significant enconomic advatages it yield.

Retrofitting and Structural Health Monitoring of Structures is gaining importance on a large scale. On one hand, SHM helps in identifying the deficiency in the structural members while on the other hand, retrofitting helps in strengthening the members by the application of various available materials.

review has been carried out

The literature survey has been done in these areas. The present chapter deals with the various researches that have been done in the related areas.

2.2. LITERATURE REVIEW

The literature survey has been done in the areas of health monitoring of structures and retrofitting of the structures. The studies have also been reported in the context of finite element modeling of the structures. The present section reports the research in this endeavor.

How this line fits here?

1st para of 2.2.1 does not support title of thesis

2.2.1. Strengthening of Structural Elements

You can't start line with brackets: Jain (2006) reported ...

(Jain 2006) reported about history of ferrocement. The first known example of reinforced concrete was a ferrocement boat. There are three different phases in the ferrocement history amongst the 1850's, 1940's, 1960's. In 1850 began the concept of reinforced concrete and ferro cement, but only concrete construction, in its massive form, was done with great success, as a natural development of masonry architecture of that times. This phase had its duration for almost 100 years, with no substantial requirements. Ferrocement application went to decay after 1960's as the labor cost increased and other competitors to thin walled components were developed. The most important property of ferrocement that emphasized it along its evolution is its high structural performance which facilitates application of the material in quite different constructions, from ship hulls to housing panels.

simply this

Masonry and concrete?

? no substantial requirement?

Kaushik and Garg (1994)

et al. comes with 3 or more authors

Except 1st paragraph, all paras should have "space equivalent to Tab" in begining.

The effectiveness of externally bonded precast ferrocement plates in strengthening reinforced beams showing shear distress was studied (Kaushik et al. 1994). The relative efficacy of the bonding media used in bonding was studied. High tensile

empty space?

strength, low weight economy in long life of treatment and precise assessment of the additional strength gained by its use made it attractive for this application. Cement sand mortar bonding medium was found to be less effective than epoxy repaired beams, which showed a 20.5 % increase ultimate strength over original beams when subjected to identical loading. This specimen showed 25 % lower deflections than the original beams at the ultimate stage. The technique proved useful for rehabilitation of RC beams failing in shear.

The results of an experimental study of the feasibility of strengthening deficient RC cantilever slabs by bonding glass FRP (GFRP) strips / sheets were presented where the slab was deliberately made deficient through the mispositioning of tension reinforcement as the compression reinforcement with a 20-mm concrete cover, which may occur due to construction errors (Teng et al. 2000). As a result, the slab was made unable to resist the load intended for it to carry. The slab was positioned with its plane being vertical so that loading could be applied more easily using hydraulic jack fixed on floor. The experimental work included seven tests on cantilever slabs. The results demonstrated significant increase in ultimate load. GFRP strips provided a simple and efficient system to strengthen deficient cantilever slab Structures.

In another investigation, the strength of RC cantilever slabs bonded with GFRP strips was analysed (Lam and Teng 2001). Four model slabs composed of a wall segment supporting a cantilever slab were prepared. Slabs I and II were intended to have the same steel reinforcement ratio and position, but the former was loaded to failure before being strengthened to explore the effect of pre cracking. Slab III was designed with steel bars located farther away from the tension face. Slab IV had a higher steel reinforcement ratio than other slabs. The GFRP strips were formed by a wet lay-up process, using a woven fabric consisting of longitudinal glass fibres and transverse aramid fibres and a two component epoxy resin.

Initially, the behavior was linear. Thereafter, with the cracks appearing near the fixed end, the curve began to deviate from the linear path. After the GFRP strips reached their ultimate strength, the load dropped rapidly from the peak to a significantly lower load level. It was found that with the sufficient anchorage of the FRP strips to the cantilever slab by fibre anchors, debonding between the slab and the GFRP strips was less likely to occur and could be arrested by the fibre anchors if it does occur.

space between 200 and 1

The results of punching shear tests on 31 square ferro cement slabs have been reported in the paper (Mansur et al. 200 1).The slabs were simply supported on all four sides and tested under a central concentrated load. The parameters investigated included mortar strength, volume fraction of reinforcement, depth of slab, and the effective span. They consist of testing a total of 31 simply supported, reinforced square slabs under a centrally applied load. Both cracking and punching shear strengths, in terms of load, resulted in significant increase.

English is not good and looks duplicate.

Is retrofitting increase cracking?

A rehabilitation method that has gained widespread acceptance over the last decade involves externally bonding fibre-reinforced polymer plates onto the tension face of a concrete beam or slab, thus increasing the beam's or slab's flexural stiffness and load capacity. The research included the examination of four different specimens identified as free plate, thin-tape, thick-tape, and epoxy specimen (Luangvilai, K. et al. 2002). The free plate specimen is simply a single, stress-free FRP plate that is not bonded to anything. The FRP plate was a 1 .2-mm thick, unidirectional, carbon fibre composite CarboDur S5 12. The thin-tape specimen consisted of the same FRP plate bonded to an aluminum half space with a 0.25-mm thick adhesive tape. The adhesive tape F-9473PC enabled bonding with a uniformly thick bond layer. The epoxy specimen composed of the same FRP plate that was bonded to a concrete half space with a 3.175-mm-thick epoxy bond layer as specified by the manufacturer. The research demonstrated that the combination of laser ultrasonic with the reassigned spectrogram was very effective in experimentally measuring the dispersion curves of FRP bonded components. The high-fidelity and broad-bandwidth nature of laser ultrasonic makes it possible to experimentally measure transient Lamb waves in FRP bonded components without any frequency biases.

Luangvilai or Luangvila

Is it 0.2 or 1.2 mm

Is it S512 or S5 12?

what is half space?

- (hyphen here)

what is this?

what is the purpose?

Another paper represented the experimental results of the long-term deflection and cracking behavior of the concrete beams pre-stressed with carbon fibre-reinforced polymer CFRP tendons with a comparison to those with steel tendon (Zhou 2003). Six full-scale beams with rectangular cross-sections 300 mm deep by 150 mm wide and with spans of 6,000 mm were fabricated.

what is this?

A particular type of CFRP tendon, lead line with a slightly indented surface, 8 mm in diameter with a guaranteed tensile strength of 2,250 MPa and elastic modulus of 147,000 MPa was used in four of the beams. Seven-wire steel strand tendon, with

Empty space