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Experimental Investigation of Polymer Coated Beam Strength Concerned To Bridge Application

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ABSTRACT: Fiber reinforced polymers was first introduced to civil engineering as a replacement of steel materials to strengthen and retrofit existing bridge structures using externally bonded FRP composites. FRP composites provide complete protection against the environment and concrete degradation. In the strengthening and retrofitting application of FRP composites, sheets and strips are employed to increase the efficiency and strength of an underperforming or deteriorated bridge. These techniques have been used for improving both shear and flexural capacity of concrete members. So far as seismic retrofitting of reinforced concrete is concerned, FRP composites can be used in the form of wrapped column. Traffic disruption is the biggest hurdle that engineers face while carrying out seismic retrofitting of bridges. One of the advantages of fiberglass rehabilitation material is that they are easy and quick to install without disrupting the flow of traffic. The use of these corrosion-free and modern construction materials can save government's millions of finances annually and can help to build a sustainable bridge infrastructure. So we have casted 2 similar beams in M30 design, compared bending strength of regular beam and glass fiber polymer coated composite beam on UTM.

Keywords- FRP Composites, Reinforced Concrete, Bending Strength, UTM.

INTRODUCTION

As a result of extensive research investigating the applicability of FRP composites in the bridge construction, advanced composite materials, especially GFRP is now being increasingly used to construct the new bridges and strengthen the existing structurally deficient bridge structures. Why should traditional materials be replaced with FRP composites? Concrete provides a solid cover for concrete, however, despite the cover, severe environmental conditions can cause the formation of oxide that can lead to the deterioration of concrete members. FRP composites provide complete Protection against the environment and concrete degradation and this is exactly why the focus of civil engineers have shifted from cement to fiberglass over the past few years. It is in the interest of a country to build bridges that can offer an exceptionally long service life with very low maintenance cost. Since FRP composites are corrosion resistance, they can be used for shear and flexural reinforcements, and tendon for pre-stressing or post-tensioning. FRP can be manufactured in multidimensional or one-dimensional forms depending on the nature of application.

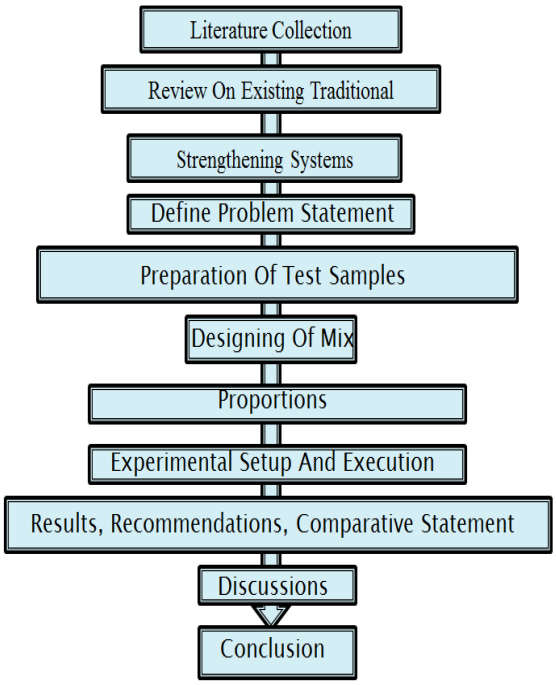
AIM:

To improve the concrete bridge strength and lifespan by proper quantity use of polymer and epoxy coating on degrading area.

OBJECTIVES:

1. To prepare and apply a proper epoxy and araldite mixture to paste on concrete beam under test.
2. To fix proper quantity of polymers in adhesive on concrete beam.
3. Conduct 3 point bending test of coated beam and normal beam on UTM.
4. To compare the strengths of regular concrete beam with coated to conclude.

METHODOLOGY:



- This project deals with the study of the strength parameters of FRP Composites
- The mix design of concrete is M30 grade of concrete with water cement ratio 0.40.
- An analytical program consisting of 3 point loading tests on glass fiber reinforced concrete and ordinary conventional concrete beams will be conducted under varying loading to obtain flexural properties.
- The beams will be cast and tested after obtaining 28 days of curing compressive strength.
- Flexural strength is checked by testing beams of size 700 ×100 ×100 mm.
- The influence of glass fiber layers on the flexural behaviour of specimens is presented through the load–deflection curves
- The first-crack obtaining loads of the specimens are compared.

Materials used

1. Portland cement (PPC)
2. Sand
3. Glass fiber
4. Water
5. Coarse aggregate

Glass Fiber Density (g/cm3)	1.8
Filament Diameter (µm)	7
Tensile Strength (MPa)	3450
Tensile Modulus (GPa)	230
Elongation (%)	1.5
Sizing	Epoxy Compatible

Table: Glass fiber properties

Fig. Fiber pasted bridges

Examples of fiber pasted bridges

- The effect of the strengthening configuration on the capacity enhancement with the conventional control specimen will be examined.
- The unstrengthen specimens, will also be tested under flexural loading
- Strengthening with FRP will limit growth of cracks, reduced the rate of increase of stirrup strain, delayed yielding of stirrup, and hence increase the beam's capacity.
- The shear strengthening system is very effective in improving the shear response and increasing the shear capacity of RC beams.

Fig:Beam casting & experimentation:

CONCLUSION:

Polymer pasted beam ruptured at 84KN and regular beam at 69KN means almost 22% increment of strength due to polymer pasting on regular concrete beam

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