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Finite Element Modelling of RC T-Beams Reinforced Internally with GFRP Reinforcements

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Abstract

Fibre reinforced polymers (FRP) are being used extensively in the rehabilitation and retrofitting of existing structures as an external reinforcement because of their properties like high strength to weight and stiffness to weight ratios, corrosion resistance, light weight and high durability. They are especially used in the reinforced concrete structure like bridges, chimney, high rise building etc. At present FRP reinforcements are available in the form of reinforcing bars and are used in the structures in place of steel, mainly the structures are constructed near the coastal areas or in the aggressive environments. The main advantage of FRP rebar is its corrosion resistance, light weight, durability and easy handing. The FRP rebars are being used worldwide for many structures including bridge structures as well, but not well explored because of its availability. The main objective of this thesis work is to assess the static load behaviour of RC T-beams reinforced internally with GFRP reinforcements using finite element analysis software ANSYS. Totally twelve numbers of specimens were considered in this study with varying parameters such as type of reinforcements, reinforcements ratio and concrete grade. Modelling of the T- beams were done with ANSYS using solid 65 and link 8 element and the same were analyzed under static loading conditions. The results obtained from the ANSYS were compared with the theoretical and experimental analysis. Based on the comparison suitable conclusions and recommendations are made in this research work.

Keywords: Highway Black Spots; Speed Study; Warning; Satisfaction; Affectability.

1. Introduction

Concrete structure reinforced with conventional steel reinforcements cause a concern in aggressive environmental conditions due to accelerating problem of corrosion. The down fall results in costly maintenance or replacement of the existing structure. Glass Fibre Reinforcement Polymer (GFRP) bars is becoming the wave of the future due to their resistance to corrosion, high strength to weight ratios and the ability to handle the material with such simplicity. Glass Fibre - reinforced polymers (GFRP) are non - metallic reinforcement utilizing high performance hybrid, the surfaces of the rods are treated with undulations to provide mechanical interlock with concrete. Their application is seen primarily as a means to avoid corrosion problems encountered in concrete structures when using conventional steel as reinforcements. Keeping this in mind, the present research was planned to study the behaviour of GFRP reinforcements for beam - column applications.

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