BOND BEHAVIOR OF GFRP BARS WITH CONCRETE UNDER ELEVATED TEMPERATURE: A COMPARATIVE STUDY WITH GFRP BARS AT AMBIENT TEMPERATURE AND HYSD BARS

Project Reference No.: *47S_MTech_0117*

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Keywords

GFRP Bars, Pull Out Test, Elevated Temperature.

Introduction

GFRP is used in a wide array of industrial including Construction, aerospace, marine, automotive infrastructure. In construction GFRP is utilized for reinforcing concrete creating structural components and producing durable panels and cladding materials that can withstand harsh weather conditions and corrosion. The performance of GFRP-reinforced concrete under elevated temperatures remains a critical area of study. Concrete structures are often subjected to varying thermal conditions, either through environmental exposure or in the event of a fire. Understanding the bond behaviour between GFRP bars and concrete at elevated temperatures is essential for ensuring the safety and longevity of structures that utilize these materials. Previous studies carried out with GFRP bars as small size bars developed higher bond strength than large size bars. The experimental results show that M10 GFRP bar can develop about 13%, 34% 45% bond strength higher than M16, M19, M25, respectively [Eliya Henin et.al, 2021].In other studies All samples failed by bar pull-out. Failure occurred through shearing off of the concrete lugs for specimens tested at temperature levels lower than Tg, whilst failure developed within the GFRP bar at higher temperatures [Sandor Solyom et.al, 2019]. In the study conducted GA bars showed a linear degradation in tensile strength, but kept 40% of their room temperature strength after exposure to 375° C. In a different manner, GB bars retained most of their strength (80%) for temperatures below 250° C but the strength reduced sharply to 35% at around 400°C. GC bars showed a linear degradation up to 250° C, and then the retained strength stayed constant up to 350° C [Hamzeh Hajiloo et.al, 2018]. This study aims to study the Bond behaviour of GFRP bars with concrete at elevated temperature of 100°, 200° and 300°.

Objectives

- To determine the bond strength of HYSD bars with concrete at elevated temperature.
- To determine the bond strength of GFRP bars with concrete at elevated temperature.
- Comparing the bond behaviour between HYSD bars and GFRP bars at elevated temperature.

- Comparing the bond behaviour between HYSD bars and GFRP bars at normal temperature

Methodology

Materials

Size of the cube used is 150 × 150 × 150 mm, Grade of concrete used is M30 and Grade of steel used is Fe500, GFRP Bars and Super Plasticizer.

Fig: Concrete mould used for Pullout test with frame

Testing Procedure

Fig: Pullout test setup

Results and Conclusions

Because the aforementioned work is on-going, final results and conclusions can be derived once the project has been completed in all respects.

Innovation in the Project

GFRP bars are typically used as a replacement for traditional steel reinforcement bars (rebar) in concrete structures. GFRP is used in a wide array of industrial including Construction, aerospace, marine, automotive infrastructure, bridges and Industrial Flooring. In construction GFRP is utilized for reinforcing concrete creating structural components and producing durable panels and cladding materials that can withstand harsh weather conditions and corrosion. The GFRP bars are corrosion resistance, lightweight, and non-conductivity, making them ideal for applications in harsh environments.

Scope for Future Work

Shall be identified after completion of the current experimental study.