

**BEHAVIOUR OF ELEVATED TEMPERATURE CURED
CARBON FIBRE REINFORCED POLYMER
STRENGTHENED CONCRETE MEMBERS
SUBJECTED TO MILD ACIDIC EXPOSURE**

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Master of Science Degree in Structural Engineering Design

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Sri Lanka

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Dissertation Submitted in partial fulfilment of the requirements for the Master
of Science Degree in Structural Engineering Design

Supervised by Prof. (Mrs). J. C. P. H. Gamage

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DECLARATION

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Date

The above candidate has carried out research for Masters Dissertation under my supervision.

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Prof. (Mrs). J. C. P. H. Gamage

Dissertation Supervisor

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Date

ABSTRACT

The use of CFRP for strengthening and retrofitting concrete structures has become famous throughout the world in the past few decades due to its advantages over conventional materials. However, the main drawback to use CFRP in the construction industry is the lack of comprehensive and validated test results of its performance under different exposure environments and curing conditions. Further, the fact that using the curing temperatures near the epoxy adhesives glass transition temperature may improve the post-curing effect of the epoxy and hence improve the bond strength is still doubted during the application of CFRP as a strengthening material.

A detailed experimental study was carried out to determine the effects of elevated temperature curing on the bond between CFRP and concrete and medium-term performance of such bonding methods when exposed to mild acidic environment. Three different curing conditions; ambient temperature, 65⁰C and 75⁰C temperature for 2 hours were selected to simulate the effects of elevated temperature curing. After fully cured for seven days, the specimens were conditioned in a sulphuric acid solution of PH=2 for 3 different time durations, 15 days, 30 days and 90 days. At the end of the exposure period, single lap shear test and Ultra Sonic Pulse Velocity test were used to assess the bond strength and the quality of the concrete, respectively.

It was observed that the exposure of the epoxy to a temperature near its glass transition temperature has increased the bond strength. The bond between CFRP and concrete was sensitive to acidic exposure and a strength loss in the range of 1.74% to 26.96% was noted from conditioned specimens even though the exposure period is very short which is not a representative of a lifespan of strengthened structure or a member. The noted strength did not indicate any sensitive relationship with the curing condition and temperature in the installation phase.

Key words: CFRP, Glass Transition Temperature, Elevated Temperature Curing, Acidic Exposure, Bond Strength

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