DURABILITY OF GFRP REBARS IN CONCRETE BEAMS UNDER SUSTAINED LOADS AT SEVERE ENVIRONMENTS

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The application of Fiber reinforced polymers (FRP) as a material for rehabilitation of concrete structures is increasing all over the world. In fact, many engineering societies are regarding them as the most promising material to rehabilitate the deteriorated structures. FRP materials are characterized by their high tensile strength and lightweight. However, durability of the material under service conditions is also essential in selecting the appropriate design allowable and is of major importance in ensuring the long-term safety and effectiveness of the rehabilitated structure.

Glass fibers are chemically vulnerable to many acids and bases and will deteriorate if in direct contact with moist concrete. The phenomenon of creep rupture, or static fracture, is the main cause for the gradual reduction of the tensile strength of glass under stress. This problem is accelerated significantly in the presence of water, acids and alkalis, and may result in sudden cracking of the fibers. In case of glass fiber reinforced polymer (GFRP) bars in concrete, the aggressors are mainly the "free" OH- ad Cl-ions. The OH-ions are, usually in large quantities, present in the pore solution of hardened concrete. There will be, however, a significant difference related to higher or lower alkalinity of the cement type used. The Cl-ions will occur in salt water, so if GFRP-reinforced concrete is used in seawater, degradation will be more pronounced.

The aim of this study is to assess the effect of sustained loads on concrete beams reinforced with GFRP bars and exposed to tap and sea-water at 40°C. The beams are exposed to the different curing conditions while subjected to service load. GFRP bars used to reinforce the beams will be tested at different ages to evaluate the their tensile strength. The results will be analyzed and compared with unstressed samples.