



Performance assessment of embedded distributed optical fiber sensors in reinforced concrete structures

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Abstract

In this paper, an experiment where distributed optical fiber sensors (DOFS) were implemented in two small concrete beams subjected to a three-point load test is outlined. Here, an optical backscatter reflectometry based DOFS is implemented simultaneously embedded in the concrete (glued to the steel rebar) and attached to the outer surface of the concrete after its hardening. For comparison purposes, three electrical strain gauges are also used in the rebar. The main objectives with this experiment, is to analyze the feasibility of installation of DOFS directly on the rebar element of a reinforced concrete beam and compare the measured strain at rebar and surface of the concrete.

Keywords: distributed optical fiber sensors, structural health monitoring, crack detection, concrete structures.

1 Introduction

The extension of the lifetime period of civil engineering infrastructures is a topic of extreme importance in the present society. These structures are affected during their service life by several external events that produce adverse effects in their current and future performance.

In order to be coherent with sustainable and environmentally friendly policies, it is mandatory that infrastructure management teams are capable of deploying measures that optimize the use of civil engineering structures without compromising the risk and safety of users.

Moreover, it is easily perceptible that the adoption of such measures increases a region's competitiveness in the current global economy landscape.

In order to better evaluate and assess the condition of any infrastructure it is then necessary to deploy damage identification strategies also known as Structural Health Monitoring (SHM).

This practice has been studied and researched in great detail and volume in the past decades but it is yet to be applied and used in a standardized and efficient way due to the lack of dependable and economical monitoring solutions.