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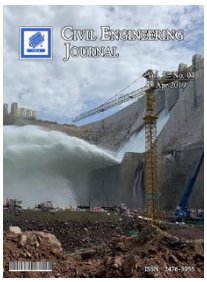

Flexural Behavior of Unbounded Pre-stressed Beams Modified With Carbon Nanotubes under Elevated Temperature

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Abstract

Since fire is one of the common reasons for rehabilitation and reconstructions during the service life of a building, it is necessary to assess the elements structural and technical conditions. The objective of the present paper is to investigate the flexural behavior in bending for unbounded full pre-stressed beams with and without the incorporation of carbon nanotubes (CNTs) under the exposure to elevated temperature in comparison with non-pre-stressed beams. The test Method was divided into two major stages where the principal stage's goal was considering the flexural behavior of fully and non-prestressed concrete beams containing CNT of 0 and 0.04% as cement replacement at ambient temperature. In the second stage, a typical group of beams was prepared and the flexural behavior was explored under the exposure to temperature of 400ºC, for 120 minutes. The major findings upon monitoring the failure mechanisms, ultimate load capacity, and deflection at critical sections, was that the CNT had shown a significant impact on the behavior and extreme resistance of fully and non-prestressed normal concrete. With CNT beams also exhibited higher imperviousness to high-temperature than that of the normal beams. Finally the significant Improvement was that the ultimate load of the non-pre-stressed beam with the presence of the CNT at the lower 50mm in the tension zone showed a gain of 13%, while the ultimate load of the fully pre-stressed beam with the presence of the CNT at the lower 50mm in the tension zone showed a gain of 21% as compared to the same beam without CNT, respectively. For the non-pre-stressed beams, the load capacity of the beam with CNT after exposure had a similar load capacity as the beam without CNT before exposure to high temperature.

Keywords: Full Pre-Stressed Beam; Carbon Nanotubes; Elevated Temperature; Unbounded Pre-Stressed; Crack Pattern.

1. Introduction

In recent years, there is an expanded utilization of pre-stressed concrete (PC) elements in buildings, bridges, towers, pressure vessels and offshore structures. In numerous structures, the architectural requirements prescribe the incorporation of a long span and slender elements in which the PC is rendered the most achievable design alternative, since it allows for the rapid erection of economical and sustainable buildings.

The use of pre-stressed concrete provides advantages over non-prestressed reinforced concrete. These advantages as that the pre-stressing permits decreased beam depths to be accomplished for corresponding design strengths. The

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