EXPERIMENTAL INVESTIGATION ON LONG-TERM DEFORMATIONS OF TENSILE RC MEMBERS

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ABSTRACT

Structural engineers for the analysis of concrete structures most often choose design code methods. Although the design code methods are simple and ensure safe design, they have significant shortcomings. These methods cannot include all important material and geometrical parameters and, therefore, are not accurate enough. Numerical techniques, as an alternative to the design code methods, are based on universal mechanical principles, but their adequacy depends on the correct assumption of constitutive laws.

Modelling of cracking behaviour and the tension stiffening effect is considered to be one of the most complex and challenging issues in the constitutive simulation of reinforced concrete structures. After cracking, due to bond with reinforcement, concrete between cracks carries a certain amount of tension stresses normal to the cracked plane. The concrete adheres to the reinforcement bars and contributes to the overall stiffness of the structure. The phenomenon is called *tension-stiffening*. Based on various assumptions, a number of tension-stiffening models have been proposed for the case of short-term loading. However, a very limited number of studies have been devoted to the investigation of tension-stiffening for the case of long-term loading [1-3].

Current study aims at assessment of long-term degradation of tensile stiffness in RC elements. Five similar RC ties have been tested under sustained loading with load duration varying from 18 to 105 days. The finite element program ATENA and the experimentally derived tension-stiffening relations were used for modelling of the ties. Good agreement of simulation results with the test measurements has been stated. Furthermore, comparative analysis of average strains obtained from elongation of reinforcement and measured at the concrete surface was conducted. Noticeable differences in stiffness assessed using these two approaches were found.

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