The influence of interface zone behaviour in reinforced concrete under tension loading: An analysis based on modelling and digital image correlation.

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ABSTRACT

Problem of durability in reinforced concrete structures is a major case of concern nowadays. Leakage problem due to cracking phenomena in critical structures such as nuclear power plants is specifically significant. In these structures, the number of cracks, their distribution and opening are needed to predict leakage possibilities. These variables depend on both behaviour law of concrete and behaviour law of steel-concrete interface.

This article intends to compare experimental and modelling results focusing on interface zone between concrete and steel reinforcement. The first step consists in performing tests to capture behaviour of reinforced concrete prismatic elements subjected to pure tension. Crack opening along these structures is investigated using digital image correlation (DIC), which allows the observation of crack propagation during loading and crack re-closure in the course of unloading.

Next, the tension test of reinforced concrete is modelled in two different ways. Firstly, the connection zone between concrete and steel bar is assumed to be perfect (none-sliding connection). Another condition considers a hypothesis of interface zone model between these two materials which allows plastic sliding [1]. An orthotropic model of concrete which is based on plasticity and damage theories is used for this modelling. The model is able to predict crack opening and manage its re-closure [2]. Finally, results of the test are compared to the both modelling. A discussion concerning the need of interface model finishes this paper.

Keywords*: reinforced concrete, interface zone, modelling, digital image correlation.*

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