BEHAVIOR OF REINFORCED CONCRETE BEAMS AND SLABS

AN INVESTIGATION CONCERNING SERVICEABILITY BEHAVIOR AND SHEAR CAPACITY

Plain concrete is a material suitable of carrying great compressive forces. If, however, subjected to tensile forces, concrete exhibits a fragile and brittle behavior, and even tension of minor magnitude will lead to the formation of cracks. In design of reinforced concrete structures this inherent weakness is, in many aspects, compensated by the provision of steel reinforcement at positions were tension is expected. The resulting material, reinforced concrete, is one of the most commonly used materials within structural engineering, and has been for decades. The popularity of it stems from it being cheap, strong and versatile.

Design of reinforced concrete structures basically involves defining the necessary geometry and strength of the concrete and amount of reinforcement. In order to do so, reliable models, capable of predicting the behaviour, are needed, taking into account the presence of cracks.

The aim of this project is to gain a better understanding and to improve already existing models on two different subjects; i) prediction of crack widths and structural stiffness in order to ensure a functional structure within the expected lifetime, and ii) prediction of shear capacity of concrete members without shear reinforcement, for instance in the case of slab-like structures.

In order to facilitate this aim, tests and subsequent analysis of results on a total of 50 tests of reinforced concrete beams will be conducted. All tests will be carried out at the structural laboratory at Aarhus University. The project is a collaboration between COWI A/S, Department 1703 (Jens-Christian Kragh-Poulsen) and Aarhus University, School of Engineering (Lars German Hagsten, Jakob Fisker and Annette Beedholm Rasmussen). The donation from COWIfonden will mainly cover the costs for production of concrete beams.

The two subjects are closely related, in the sense that, the functionality as well as the ultimate capacity is highly influenced by the early formation of cracks. Previous investigations reveal that failure is likely to develop along such cracks, which evolves into actual failure lines.

The investigation aims to systematically collect information on the influence of certain parameters, expected to be of importance for both subjects. The collected data will represent an important contribution to the otherwise limited number of tests. Additionally, a critical review of the literature reveals that many published test results must be regarded as outdated due to the natural development and improvement of materials and experimental techniques throughout the lasts decades. The test results and related analysis will be published in relevant journals in order to reach the consulting companies as well as the scientific community in general.