Connections for concrete elements

Industrial PhD project: ”Development of calculation models for looped wire connections”

For many years, construction in Denmark has involved prefab concrete elements. They secure high quality, quick installation and low costs. To make sure that elements act as a single structure, it is important to connect them using strong connections. Traditionally, so-called U-bar connections are used, which entails using overlapping reinforced steel bars sticking out at the end or side of the concrete elements as reinforcement. To crane concrete elements, U-bars must be bent prior to craning and subsequently straightened. A both troublesome and time-consuming process. Consequently, a better connection type has been developed, involving flexible looped wire rope, which ensures faster and easier installation.

The past decade has seen a lot of development activities in order to use and calculate looped wire connections. This involves, e.g., developing a calculation model for determining the anchoring capacity. However, the connections still have two important shortcomings, which limit their use:

1. There is no model for determining the anchorage capacity of the wire ropes in the actual concrete element.
2. There is no model for crack width estimations at the connection.

The purpose of this project is therefore to develop these two calculation models. Development will be based on a series of new tests and plasticity theory principles. Developing the two calculation models will close the gaps that limit the extent and application of looped wire connections.

Project organisation and time schedule

The industrial PhD project is a collaboration between the University of Southern Denmark (SDU), Civil and Architectural Engineering, and COWI A/S. The project will be carried out by Lars Nielsen, supervised by Associate Professor Henrik Brøner Jørgensen (main supervisor, SDU), Leading Specialist Søren Gustenhoff Hansen (supervisor, COWI) and Leading Specialist Bernt Suikkanen (supervisor, COWI). The project will be carried out from 1 June 2020 to 31 May 2023.