Computational Mechanics Group
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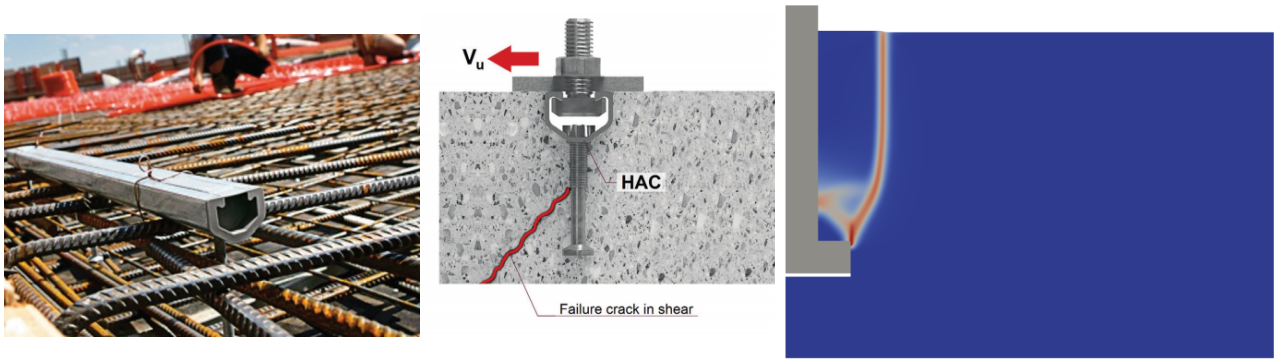
Master's thesis / Semester project

Numerical investigation on anchor applications in concrete using phase field models

The on-site assembly of precast concrete structural elements is a time-efficient technique that is more and more adopted in the common practice. The transmission of forces between members relies on anchoring systems embedded in the concrete. These must be designed to ensure an efficient stress transfer and an adequate load-carrying capacity. To this end, numerical simulations are a viable alternative to experimental tests.



Figures: cast-in anchor system (left), its loading conditions (center) and phase-field simulation of crack propagation (right).

Goal

The main aim of this project, in cooperation with HILTI, is to develop a computational tool to simulate the behavior of anchoring systems. e.g. cast-in anchor channels. To this end, the phase-field modeling approach will be used, which is known to correctly reproduce the main characteristics of fracture propagation in brittle materials. Also, the contact between anchoring system and concrete will be modeled to obtain realistic loading conditions. The code will be validated using experimental results available at HILTI.

Subtasks

1. Literature study on phase-field and contact mechanics approaches
2. Adaptation of an in-house phase-field code to the case at hand
3. Code validation with academic benchmarks
4. Comparison with experimental results and parametric study
5. Parametric study on the main parameters governing the resistance of the anchoring system

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