



Master Thesis

Concrete edge failure of single headed stud anchor after fire exposure: 3D finite element study

Concrete edge failure of fasteners is critical for many engineering structures, for instance the shear anchors for attaching curtain wall on concrete slab edge. In case of fire, the failure of the concrete edge under shear load is more critical because of fire exposure from both sides of the edge (left figure). Numerous studies have been conducted on the concrete edge failure capacity at ambient condition and the failure load is predictable. For the fire safety of structure, recently, some experimental and numerical studies have been performed to investigate the load-bearing behavior of headed stud anchors under monotonic shear loading towards free concrete edge both in the hot state (immediately after heating) and the cold state (after cooling concrete specimen). Various influencing parameters in the configuration of the anchors were considered. The load-bearing behavior of these anchors that are pre-loaded with design load and then loaded up to failure after fire exposure is of great interest and need to be investigated in the framework of the thesis.

The contents of the master thesis:

- Literature review of anchors pre-loaded in shear and exposed to fire.
- 3D Finite element analysis of single anchor loaded in shear (right figure) with the following loading regime: (1) pre-loading of anchor with design load; (2) Keep design load constant and expose the model to fire load with different durations and (3) Compute residual capacity of anchor.
- Verification of the numerical model (FE code MASA).
- Parametric study: Influence of geometry, material properties and loading history on the failure capacity of anchor edge failure.

