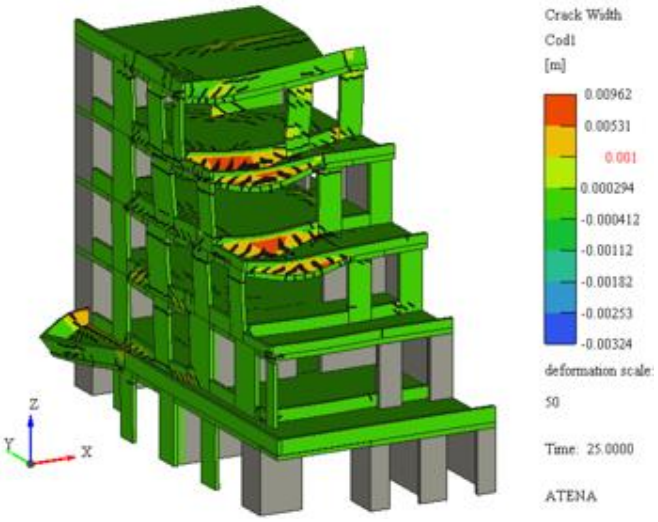
Fakultät
Architektur und Bauingenieurwesen

Juniorprofessur Befestigungstechnik

technische universität
dortmund

Master-thesis proposal

Realistic finite element modelling of cracks in concrete under seismic conditions



The use of non-linear Finite Element Modelling (FEM) for concrete structures has become an established analysis method in structural engineering. By considering plastic and fracture mechanics, this advanced analysis approach enables the prediction of damage in concrete and facilitates the design of more realistic and efficient structures that cannot be captured by simple analytical tools. For instance, this method can be used to assess the cracking of slabs subjected to severe earthquakes.

The objective of this thesis is to perform finite element modelling analyses with non-linear material laws, including plastification and cracking, for various types of slabs under extreme load scenarios. The obtained results will be compared with simplified analysis methods that rely on typical strut-and-tie and bending equations. The ultimate goal is to derive appropriate crack patterns for the design of fastenings according to currently developed European building norms.

This thesis offers an exciting opportunity for a graduate student in structural engineering to work on a practical problem using sophisticated tools. The candidate will have the chance to develop solutions that are not fully covered in current design codes, thereby advancing their engineering skills and acquiring new knowledge in FEM (particularly with the ATENA software), material behavior, and the development of safe design recommendations. This provides a challenging yet rewarding opportunity to make significant contributions to the field of earthquake engineering and fastenings, and help develop of safe and efficient buildings.

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