Finite element modeling of a two-way slab with different approaches

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This work comprises non-linear FE analysis of the behavior of two-way slabs and comparison with experimental results. Within a larger EU project, Tailorcrete, experiments of slabs with conventional reinforcement, fiber reinforcement and textile reinforcement was performed. In this study, different approaches of FE modeling will be investigated and compared to the test results for conventional reinforcement. The work presented here is a part of a project financed by the Swedish Transport Administration, with the aim to improve structural assessment of bridge deck slabs.

In the study, several approaches of modeling are going to be used to study the effect of modeling on different levels of detailing and of modeling choices. For example, the influence of different element types, mesh densities, different ways to model the reinforcement and its bond-slip condition will be investigated. In a first model, curved shell elements were employed in the modeling and the distributed load at the center of the slab was simplified to a point load so that displacement control could be used. The concrete response in tension was handled by a fracture mechanics model, based on the smeared crack formulation. A rotating crack model was adopted instead of fixed crack model since it gave a better approximation of the slab's response. The compressive strength of concrete and the tensile strength of reinforcement were determined through material testing. At the seminar, results from the analyses will be shown and compared to the test results.

In the future work, analyses on other levels of detailing will be performed with the intention to find suitable ways to model slabs. This will lead to that FE analysis can be better used to evaluate the response and load carrying capacity of reinforced concrete slabs.