

## Master's thesis project

### Design of a full-scale railway track testing facility - How to represent the moving load problem in a laboratory?

The construction of new high-speed railway lines constitutes the largest investment in Swedish infrastructure in a generation. According to the technical specification issued by Trafikverket, slab track design is to be used. This corresponds to rails elastically attached to concrete panels rather than to sleepers laid on ballast as for conventional track. The Swedish road and transport research institute (VTI) has long experience of accelerated full-scale testing of roads. The current Master's thesis forms part of the decision basis for a potential future construction of a testing facility for railway track at VTI.

This project investigates how to mimic the load applied on the track by a moving railway wheel in a laboratory facility, for example by use of hydraulic cylinders. To represent the track of the test facility, a two-dimensional finite element model of a slab track including one concrete panel of variable length and height, and a substructure modelled by uncoupled springs and dampers is implemented in the software Matlab. The vertical load is applied by time-varying prescribed forces at the locations corresponding to the discrete rail supports. Results calculated with this model are compared against those obtained using a previously developed time-domain model for the vertical dynamic interaction between a railway vehicle and a full slab track.

The two models are compared in terms of load distribution on the foundation (i.e. the interface between the track super- and substructure) and the bending moment of the slab. Further, the dynamic properties of the two models are compared in terms of transfer functions calculated and measured at the locations of the discrete rail supports of the slab. The importance to account for the high-frequency content of the prescribed forces applied at the locations of the discrete rail supports with respect to the aforementioned result quantities is of particular interest as this corresponds to requirements that should be met by the test facility.

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