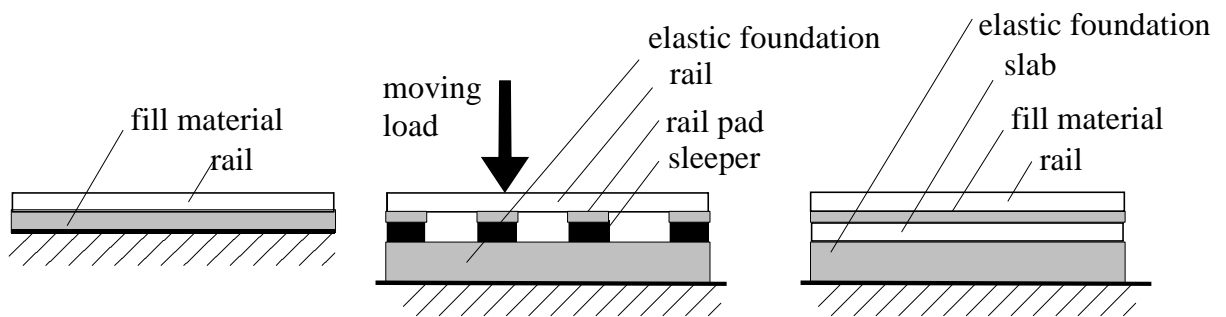


# RAIL

## Dynamic Analysis of Rail Track Structures

### RAIL: Moving loads and vehicles on a rail track structure

The program RAIL has been written for the analysis of a rail track on an elastic foundation. Rail tracks can be built up in several ways. Most well known is the classic track, built up from rail, sleepers, rail pads between sleeper and rail, and the ballast bed and formation (to be called the elastic foundation). More recent structures are continuously supported structures, using some fill material between rail and a (rigid) supporting slab. These structures, to be called embedded rail structures, are modelled by a single beam on an elastic foundation (the fill material). If the supporting slab is flexible then we have to model a two beam system with fill material between rail and slab.

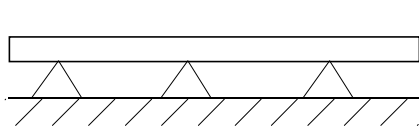


embedded rail on rigid foundation: rail and fill material

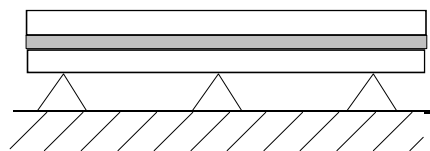
classic track: rail, rail pad, sleeper and elastic foundation

embedded rail on flexible slab: rail, fill material, slab and elastic foundation

Embedded rail structures can be supported continuously by an elastic foundation but also discretely by rigid supports (e.g. slabs on a pile foundation or experiments in a laboratory). The elastic support conditions can be varied along the track direction.



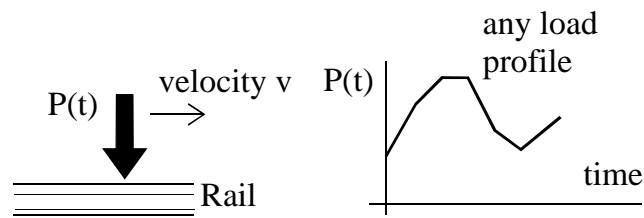
single beam on rigid supports



double beam on rigid supports

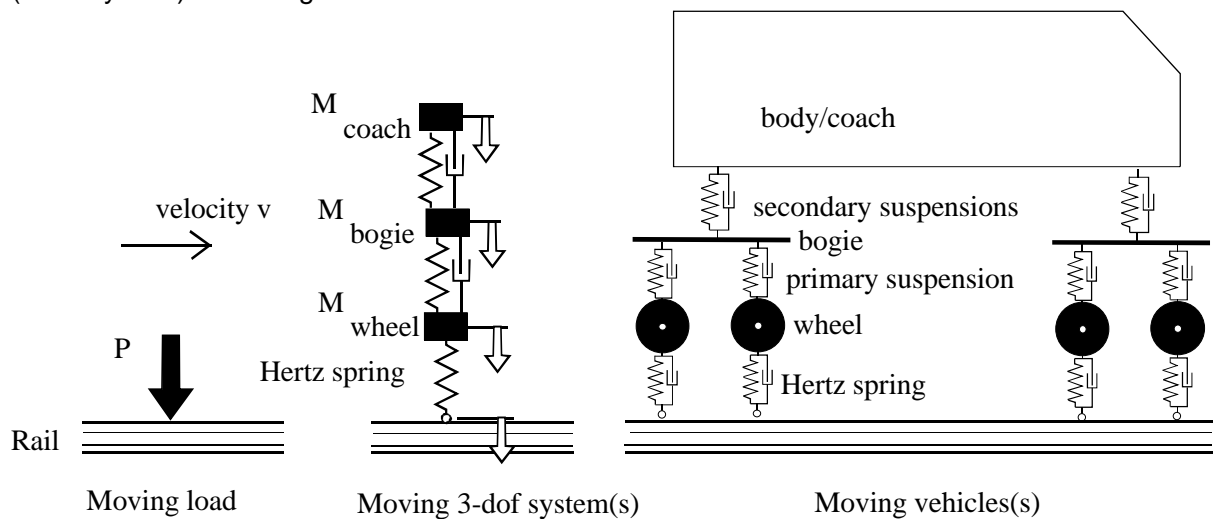
Surface deformations of the rail shape can be taken into account. The stiffness properties of the elastic foundation is modeled either by a Winkler or a Pasternak foundation; the dynamic properties are characterized by damping and inertia properties. Gapping between the ballast bed and sleepers of the classic track or elastic foundation and rail of the single beam model is one of the extra options.

These structures can be loaded by static loads such as dead weight, static point loads, static distributed loads and dynamic loads. Dynamic loads are fixed time dependent loads and moving loads.



Moving and fixed time dependent load

An interesting load case is the moving vehicle. Dependent on the level of sophistication the vehicle is modeled by a simple moving loads or moving three- degrees of freedom systems (3-dof system) or moving vehicles.



The structure is split up into a number of segments, where a segments has been built up from the structure dependent elements such as rail elements, slab elements, rail pads etc. The response to time dependent loads is calculated by a direct integration process, which evaluates the displacements at each time step. From these results stresses and forces are calculated following the common procedures of the f.e.m. techniques.

The postprocess capabilities are subdivided into print output, which lists upon request the results, and graphical output. The graphical output capabilities comprise results dependent on geometry per time point or results dependent on time per function value. Envelopes about all time points may be requested too.

A most interesting option are the ASCII output files which are used for input into a MATLAB program. Because MATLAB is used for the processing of experimental data these results can be matched directly with numerical results

