

Effects of Rail Traffic on the Existing Track Structure

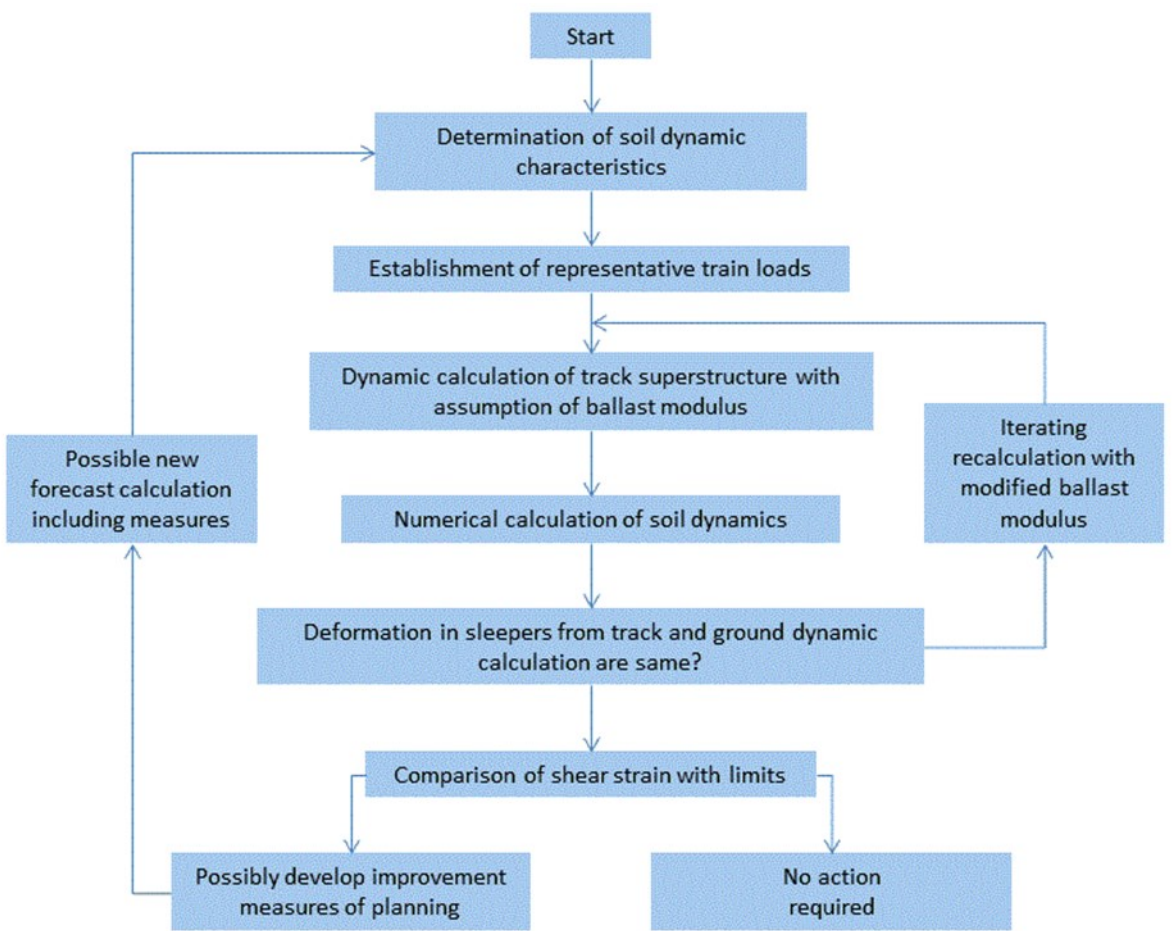
The effects of train movement on the typical ballasted track structure has been examined. Quasi-static and dynamic loading analytical determinations have been done and evaluated the deformations caused by these loadings. Track structure assumed as good quality and for dynamic impacts increase factor was used as 1.33 in model. The aim of the thesis is comparing the analytical deformations with numerical deformations result of simulation and calibrating them by using the iteration process.

For numerical model, the software Plaxis 2D was used. In order to support software, analytical calculations have been done and total loads with dynamic multipliers have been defined to software. As a constitutive model, linear elasticity was used. Damping parameters Rayleigh α and β which are playing important role for dynamic analysis were computed by using the existing laboratory test outputs.

Simulation Process:

- 1. Typical ballasted track bed with three layers(ballast, subballast and subgrade) were assigned as a geometry of model
- 2. The loads obtained from analytical calculations were applied as a dynamic loading
- 3. Dynamic parameters of materials were defined
- 4. Dynamic multiplier and time intervals were assigned
- 5. Results were evaluated comparing the deformations from analytical calculations and simulation
- 6. These iteration process was done until reaching the same deformations from analytical and numerical model by changing the ballast modulus

Iteration Process



Adapted From Vogel , W. 2013

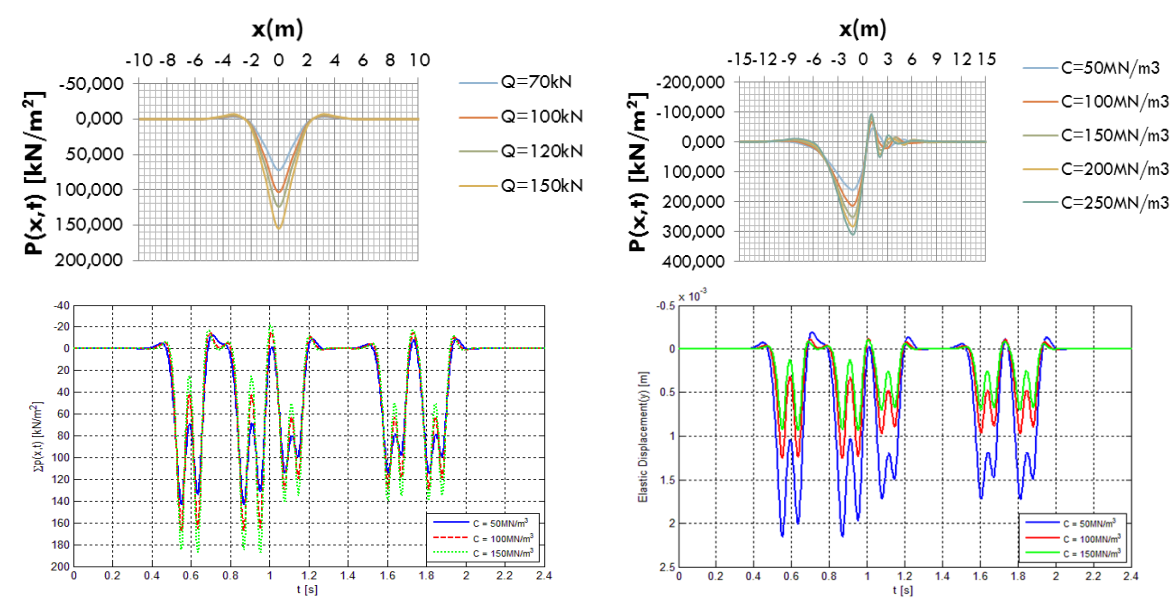
Master Thesis of Izzet Caner Dedeoglu
Supervisors: Dipl.-Ing. Sebastian Rapp
Dipl.-Ing. Johannes Aschrafi
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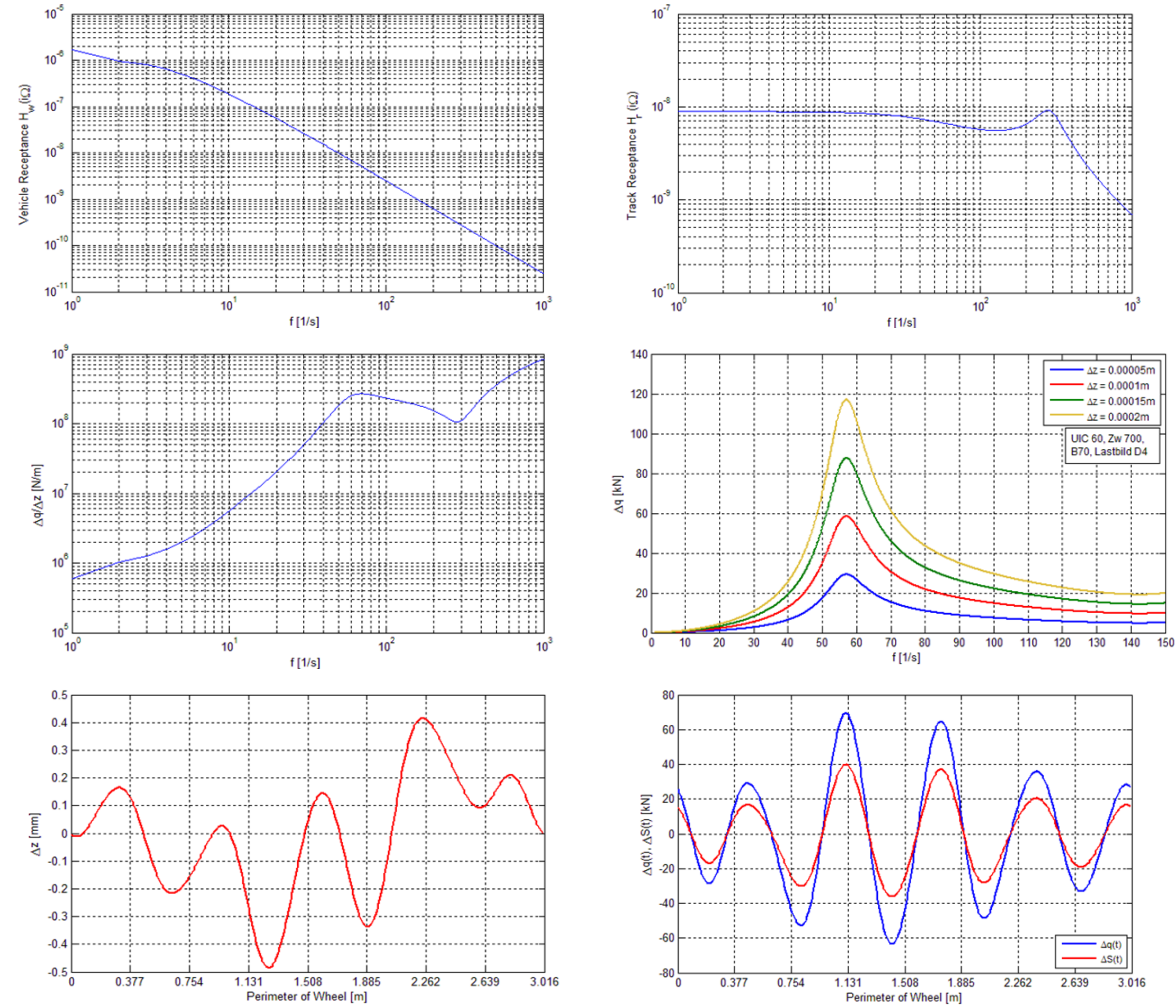
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Analytical and Numerical Results:

Quasi-Static Load



Dynamic Load



Geometry of Model in Simulation and Iteration Results

