

**APPLICABILITY OF SIMPLIFIED MODELS OF RAILWAYS TRACKS OBTAINED BY OPTIMIZATION AND FITTING TECHNIQUES**

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**Abstract:** In this paper, the range of applicability of the discrete supports model (DSM) of ballasted railway tracks is delimited and general formulas for identifying its properties are proposed and validated. To calibrate the DSM, a 3D finite element model (FEM) is implemented and validated by comparison with published experimental measurements. The equivalence between the DSM and 3D FEM is measured using the vertical displacement of the rail, which is a common element to both models and the interface between the load and the track. Following a review of the existing literature, formulas for identifying the properties of the DSM are proposed. These formulas are validated by fitting the results of the DSM to the 3D FEM using optimization techniques, covering a large range of typical properties of the track. As a result, the range of applicability of the DSM and the proposed formulas is also established. A good approximation to the 3D FEM is achieved, particularly when the load moves slower than the velocity of propagation of elastic waves in the soil. For high velocities and/or soft soils, the wave propagation becomes more relevant to the dynamics of the track, and the DSM is less reliable.