NUMERICAL SIMULATIONS OF SOIL STRUCTURE INTERACTION BETWEEN BUILDINGS AND A TRAIN USING NON-MATCHING MESHES

Gustavo A. Ríos Rodriguez[a] and Marco Schauer[b]

[a]*Centro de Investigacíon de Métodos Computacionales (CIMEC)-UNL/CONICET, Predio CONICET Santa Fe, Colectora Ruta Nac. 168, Km 472, Paraje El Pozo, Santa Fe, Argentina, e-mail: gusadrr@santafe-conicet.gov.ar - http://www.cimec.santafe-conicet.gov.ar*

[b]*Technische Universität Braunschweig,, Institut für Statik, Beethovenstraße 51,, 38106 Braunschweig, Germany, e-mail: m.schauer@tu-braunschweig.de - https://www.tu-braunschweig.de/statik*

Keywords: Soil-structure interaction, FEM / SBFEM coupling, non-matching meshes, projection methods

Abstract. A coupled finite element method (FEM) and scaled boundary finite element method (SBFEM) is presented in this work in order to analyze the soil structure interaction problem that appears when a train passes close to buildings. The FEM method is used to model the so called near-field (e.g. the building and its surrounding soil) while the SBFEM models the far-field (e.g. the infinite half-space). Since the matrices involved in the SBFEM are almost full this method is an order of magnitude more memory and time consuming than the FEM method, based on the number of degrees of freedom of the problem. Therefore, a projection method is utilized to exchange nodal velocities and forces at the interface between the different discretizations used for the near-field and the far-field problems. Nodal displacements at specific locations in the buildings are calculated for various time instants and they compared to those computed with matching discretizations at the interface. Also, memory and computation time savings are presented.