



Public University: 13 Faculties, 6 Institutes, 4 Vocational Schools

Number of Research and Application Centres: 36

Total student numbers: 58651 (B.Sc.-42059, M.Sc.-8563, PhD-1665)

Faculty members: 834 (Prof.-30%, Assoc. Prof.-20%, Assist. Prof.- % 50)



SAKARYA
UNIVERSITY

Prof. Dr. Erkan ÇELEBİ

SAKARYA UNIVERSITY, Engineering Faculty

Department of Civil Engineering

54187 Esentepe, Sakarya-Turkey

Telefon: ++902642955731

Telefax: ++902642955601

e-mail: ecelebi@sakarya.edu.tr

Web: <http://www.ecelebi.sakarya.edu.tr/en>



TUBITAK Research Project Team: In situ measurement of environmental vibrations induced by high -speed trains and mitigation of structural vibrations (duration: 2018-2021).



Committee Member of Scientific Research & Development Coordination of Engineering Faculty

Web: <http://mf.sakarya.edu.tr/en> (SAU Engineering Faculty)

Web: <http://cie.sakarya.edu.tr/en> (SAU Civil Engineering)

Cooperated with <http://inism.tf.duzce.edu.tr/Sayfa/1278/>

Linked with <https://inismuh.itu.edu.tr/en/research/laboratories/structure-and-control-eng-lab>

Interest Topic

Project proposal title:

Developing an innovative wave isolation barrier to reduce the effects of vibrations generated by railway traffic on railway track and nearby building structures

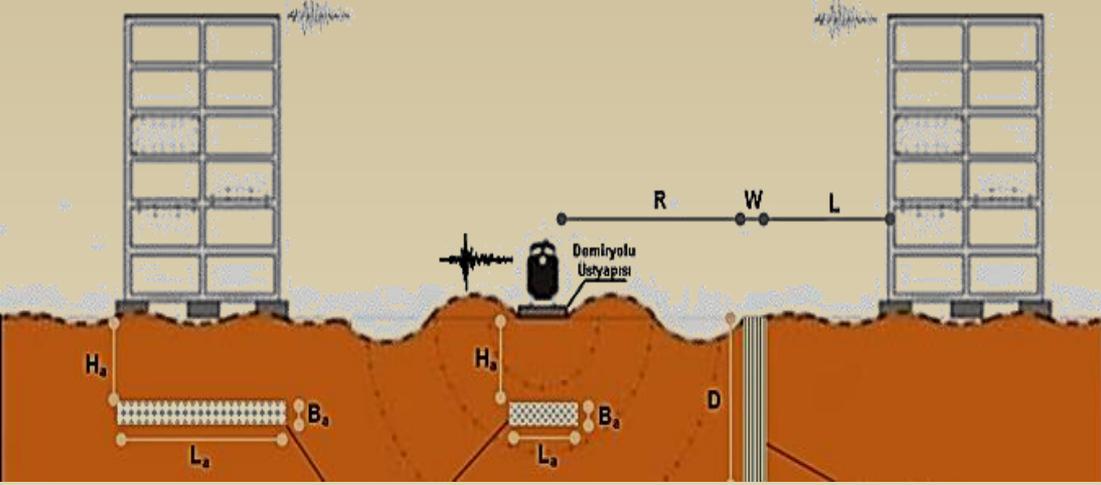
Problem statement to be addressed: *S2R-OC-CCA-01-2019: Noise & Vibration*

Project description:

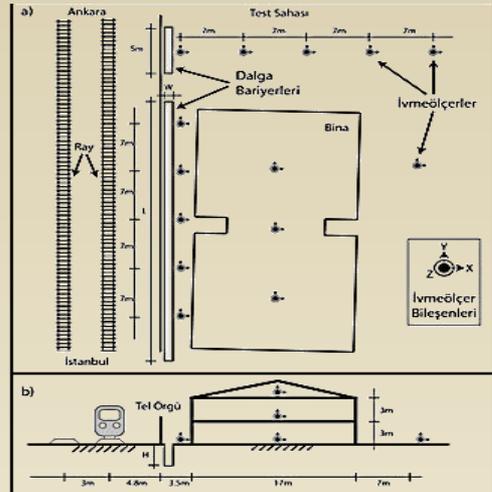
Railway induced ground motions not only can give damage to the nearby buildings and their footings but also effect the human comfort by undesired vibrations. Thus, for an effective protection of railway platforms, nearby buildings, and mitigation of strong vibrations, optimum in-situ isolation material needs to be determined by well understanding the wave propagation problems depending on soils conditions. Extensive in-situ research are still required for both recent ongoing construction projects in soft soil deposits and for planned construction projects on highly populated areas.

The goal of this research study can be summarized as to determine comfort disturbance and devastating structural vibration created by high speed trains on railway track and nearby structures and to reduce these vibrations depending on the design parameters for in-situ conditions.

The Isolation performance of wave barriers based on construction location, geometrical dimensions, filling material and various train speed will be investigated parametrically both conducting numerical and experimental studies (Figure1).



(a)



(b)



(c)

Figure 1

- (a) Problem Statement,
- (b) Experimental Site,
- (c) Mitigation Measures

Expected Impact:

Developing a cost effective wave barrier model to reduce the adverse effects of strong environmental vibrations in soft soils which can decrease the serviceability life of railway track and structural elements of building

Preparing a response spectrum curves for various soil conditions to be used in the design of industrial structures and residential buildings planned in areas close to high-speed train lines to avoid vibration affects causing discomfort in human daily life and structural damages

National and International RESEARCH and INNOVATIVE EXPERIENCE on Railway Train-induced Structural Vibrations

Know How in

- *Numerical and Experimental Investigations of Soil- Structure Dynamic Interaction for Engineering Structures*
- *Fields Experiments on Wave Propagation and Vibration Isolation*
- *In situ Investigations on Reduction Measures of Train-Induced Ground Borne Vibrations*

Research PROJECTS Funding (over €150000)

Field experiments on wave propagation and vibration isolation on track slab and surrounding ground by using wave barriers (*Financially supported by Turkish State Planning Organization (DPT) under the project number of 2003 K 120970, duration: 2004-2007*).

Novel methods for mitigation of high speed train induced structural vibrations (*Financially supported by SAU Scientific Research Projects funding under the project number of 2011-50-02-011, duration: 2011-2014*).

Experimental studies on soil-structure interaction problems by using small-scaled shaking table (*Financially supported by SAU Scientific Research Projects funding under the project number of 2013-01-04-022, duration: 2013-2015*).

In situ measurement of environmental vibrations induced by high-speed trains and mitigation of structural vibrations (*Financially supported by TUBITAK (The Scientific and Technological Research Council of Turkey) Research Project funding under the project number of 217M427, duration: 2018-2021*).

Chapters in BOOKS

S.Fırat, E. Çelebi, , G. Beyhan İ. Çankaya, O. Kırtel, İ. Vural , *Wave Propagation in Materials for Modern Applications*, VI Chapter: *Some experimental Methods in Wave Propagations*, pages 509-526, InTech, Croatia, ISBN:978-953-7619-65-7, 2010.

National and International Research and Innovative Experience on Railway **Train-induced Vibrations**



Selected PUBLICATIONS indexed in Science Citation Index

- Goktepe, Fatih; Kuyuk, Huseyin S.; **Celebi, Erkan**, “In-situ measurement of railway-traffic induced vibrations nearby the liquid-storage tank”, *Earthquakes & Structures*, Vol.: 12, Issue: 5, 583-589, May 2017.
- **Çelebi E.** and Kırteel, O., Non Linear 2-D FE Modelling for Prediction of Screening Performance of Thin Walled Trench Barriers in Mitigation of Train-Induced Ground Vibrations, *Construction and Building Materials*, Volume 42, Pages 122-131, February 2013.
- **Çelebi E.**, Goktepe F., Non-linear 2-D FE analysis for the assessment of isolation performance of wave impeding barrier in reduction of railway-induced surface waves, *Construction and Building Materials*, Volume 36, Pages 1-13, November 2012.
- **Çelebi E.**, Fırat S., Beyhan G., Çankaya İ., İ. Vural, O. Kırteel, “Field experiments on wave propagation and vibration isolation by using wave barriers”, *Soil Dynamics and Earthquake Engineering*, Volume 29, Issue 5, Pages 824-833, May 2009.
- **Çelebi E.**, “Three dimensional Modelling of Train-Track and Sub-Soil for Analysis of Surface Vibrations Due to Moving Loads”, *Journal of Applied Mathematics and Computation*, Volume 179, Issue 1 , Pages 209-230, August 2006 .
- **Çelebi, E.**, Schmid G., “Investigation of Ground Vibrations Induced by Moving Loads” *Journal of Engineering Structures*, Volume 27, Issue 24, Pages 1981-1998, December 2005.