

THE EFFECT OF DYNAMIC IMPACTS OF HIGH-SPEED RAILWAYS ON ACOUSTIC SCREENS MADE OF SANDWICH PANELS

Jolanta Pozorska¹, Jozef Majerik², Zbigniew Pozorski³

*¹Institute of Mathematics, Poznan University of Technology,
Poznań, Poland*

*²Faculty of Special Technology, Alexander Dubcek University of Trencin,
Trenčín, Slovakia*

*³Institute of Structural Analysis, Poznan University of Technology,
Poznań, Poland*

¹jolanta.pozorska@put.poznan.pl, ²jozef.majerik@tnuni.sk, ³zbigniew.pozorski@put.poznan.pl

Keywords: acoustic panels, noise barriers, sandwich panels

With the development of high-speed rail, the need arose to consider the aerodynamic effects caused by a passing train on the elements surrounding the railway track. This paper will discuss the impact of time-varying pressure acting on noise barriers. These aerodynamic issues are discussed in [1, 2]. Impacts induced by rail traffic are also regulated in the EN 14067-4 standard [3]. The greatest pressure changes and the largest pressure peaks occur in the area of the front of a passing train. First, a high pressure appears, which can affect nearby elements, and then, in a fraction of a second, the pressure changes to a similar suction force. The high dynamics of the impact changes pose a significant challenge for acoustic panel elements. On the one hand, the induced load causes significant bending and shearing of the panel. On the other hand, this type of impact must always be considered in the context of the potential for resonance effects. Additionally, the impact of dynamic and repeated loading on the integrity of the sandwich structure and the load-bearing capacity of the acoustic panels attached to the substructure should also be considered. This work developed spatial numerical models that allowed for the verification of the impact of dynamic loads on sandwich panels acting as noise barriers.

References

- [1] Assessment of potential aerodynamic effects on personnel and equipment in proximity to high-speed train operations, U.S. Department of Transportation Federal Railroad Administration, Final Report, December, 1999.

- [2] COMMISSION REGULATION (EU) No 1302/2014 of 18 November 2014 concerning a technical specification for interoperability relating to the ‘rolling stock — locomotives and passenger rolling stock’ subsystem of the rail system in the European Union.
- [3] EN 14067-4 Railway applications. Aerodynamics Requirements and assessment procedures for aerodynamics on open track