DE GRUYTER OPEN
DOI: 10.1515/ace-2015-0039
ARCHIVES OF CIVIL ENGINEERING
Vol. LXI ISSUE 4 2015
© 2015 by K.J. Kowalski, A.J. Brzeziński, J.B. Król,
P. Radziszewski, Ł. Szymański. This is an open access article distributed under
the Creative Commons Attribution-NonCommercial-NoDerivs license (http://creativecommons.org/licenses/by-nc-nd/3.0/)

TRAFFIC ANALYSIS AND PAVEMENT TECHNOLOGY AS A TOOL FOR URBAN NOISE CONTROL

K. J. KOWALSKI[1], A. J. BRZEZIŃSKI[2], J. B. KRÓL[3], P. RADZISZEWSKI[4], Ł. SZYMAŃSKI[5]

Traffic related noise is currently considered as an environmental pollution. Paper presents results of multidirectional study attempting to serve urban traffic without the need to erect noise barriers interfering urban space. Initial concept of the road expansion included construction of 1000 m of noise barriers dividing city space. Improvement in the acoustic conditions after construction completion is possible due to the applied noise protection measures: vehicle speed limit, smooth of traffic flow, use of road pavement of reduced noise emission and the technical improvement of the tramway.

Keywords: traffic noise, traffic modelling and analysis, traffic forecast, road traffic organization, environment, asphalt pavement, tire/pavement interaction, technology

1. INTRODUCTION

In recent years in Poland and around the world public expectations concerning ecology and quality of life have increased. According to the EU "Noise Directive" (2002/49/EC), noise is classified as one of the pollutants that adversely affect the environment. Polish regulations (including Regulation of the Ministry of the Environment from June 14th 2007 "On permissible noise levels in the environment") initially imposed high restrictions, contributing to the construction of a large

[1] PhD. Eng., Assistant professor, Warsaw University of Technology, Faculty of Civil Engineering, office 540, al. Armii Ludowej 16, 00-637, Warsaw, Poland, k.kowalski@il.pw.edu.pl – corresponding author.
[2] PhD. Eng., Assistant professor, Warsaw University of Technology, Faculty of Civil Engineering, office 645, al. Armii Ludowej 16, 00-637, Warsaw, Poland, a.brzezinski@il.pw.edu.pl
[3] PhD. Eng., Assistant professor, Warsaw University of Technology, Faculty of Civil Engineering, office 540, al. Armii Ludowej 16, 00-637, Warsaw, Poland, j.krol@il.pw.edu.pl
[4] PhD. D.Sc., Professor, Warsaw University of Technology, Faculty of Civil Engineering, office 544, al. Armii Ludowej 16, 00-637, Warsaw, Poland, p.radziszewski@il.pw.edu.pl
[5] M.Sc Eng., Transeko sp.j., Poland, l.szymanski@transeko.pl

Unauthenticated
Download Date | 2/20/18 5:25 AM

number of costly noise barriers. The requirements in this regard were relaxed ("Amending Regulation on the acceptable noise levels in the environment" dated October 1st 2012) as a result of protests at a substantial noise barriers interference in landscape, traffic safety risk (reduced visibility) and increased investment costs [1].

Road noise from vehicle traffic may be limited not only by the use of noise barriers [1]. The starting point in the search for mitigation solutions should be studying phenomena related to noise generation, enhancement and propagation. Noise barriers prevent noise propagation phenomena, but do not limit noise generation, associated, among other, with tires rolling on the pavement. Noise reduction at the source applies to technical solutions used in vehicles, how the vehicles operate, traffic management and road pavement surface layers.

An important factor causing traffic noise is type and condition of the pavement [2-5]. Asphalt mixtures are usually designed to ensure adequate load bearing capacity and comfort during service life, neglecting, however, their impact on traffic noise generation. Currently, it is possible to use asphalt mixtures that reduce rolling noise, such as porous asphalt (PA), some types of stone mastic asphalts (SMA) or other mixes of discontinuous aggregate gradation. Such solutions are commonly used in countries with moderate climate (e.g. the Netherlands, Belgium) [6].

Noise reduction can also be the result of measures related to the reduction of traffic in general (transfer of part of the journey on public transport and cycling), while reducing the bandwidth of the road section, limiting the traffic of selected types of vehicles (e.g. lorries) on a permanent basis at specific times of the day and appropriate traffic control (traffic flow management, speed reduction, fluidity of the improvement eliminating frequent car stops and accelerations) [7]. Furthermore it can be stated, that various strategies can be used to limit traffic-related noise, including barriers, technological solutions, traffic organization and legal regulations [8].

2. PROBLEM STATEMENT, OBJECTIVES AND RESEARCH APPROACH

The aim of the research presented in this paper was to evaluate the risk of acoustic climate deterioration during the day and night periods, due to road expansion project, involving construction of a second carriageway of Wołoska St. in Warsaw (Poland) and reconstruction of the existing carriageway as well as tram tracks modernization. An assessment has been carried out for three time horizons: current status, the year of construction completion (state after construction) and long term (year of 2030).

Unauthenticated
Download Date | 2/20/18 5:25 AM