Field investigation of low-temperature cracking and stiffness moduli on selected roads with conventional and high modulus asphalt concrete

Józef Judycki[1], Mariusz Jaczewski[1], Dawid Ryś[1], Marek Pszczoła[1], Piotr Jaskuła[1] and Adam Glinicki[2]

[1]Gdansk University of Technology, Department of Highway Engineering,
11/12 Narutowicza str., 80-233 Gdansk, Poland
[2]General Directorate for National Roads and Motorways, Bialystok Division,
2 Zwycięstwa Str, 15-703 Bialystok, Poland

E-mail: mariusz.jaczewski@wilis.pg.gda.pl

Abstract. High Modulus Asphalt Concrete (HMAC) was introduced in Poland as a one of the solutions to the problem of rutting, type of deterioration common in the 1990s. After first encouraging trials in 2002 HMAC was widely used for heavily loaded national roads and motorways. However some concerns were raised about low-temperature cracking of HMAC. This was the main reason of the studies presented in this article were started. The article presents the comparison of performance of pavements constructed in typical contract conditions with the road bases made of HMAC and conventional asphalt concrete (AC). The field investigation was focused on the number of low-temperature cracks, bearing capacity (based on FWD test) of road sections localized in coldest region of Poland. Also load transfer efficiency of selected low-temperature cracks was assessed. FWD test confirmed lower deflections of pavements with HMAC and two times higher stiffness modulus of asphalt courses in comparison to pavements constructed with conventional AC mixtures. Relation of stiffness of asphalt layers and amount of low-temperature cracks showed that the higher stiffness modulus of asphalt layers could lead to increase of the number of low-temperature cracks. FWD test results showed that the load transfer efficiency of low-temperature cracks on pavements with HMAC presents very low values, very close to lack of load transfer. It was surprising as section with HMAC road base were aged from 2 to 5 years and presented very good bearing capacity.