

EVALUATION OF THE IMPACT OF WASTE MATERIALS AND RECYCLED MATERIALS ON THE PROPERTIES RECYCLED COLD MIX WITH FOAMED BITUMEN

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Deep cold recycling with foamed bitumen (mineral-cement mix with foamed bitumen, MCAS) is a commonly used road reconstruction technology in Poland. In relation to the altered arrangement of the structural layers of the refurbished road surface, there is a change of waste and recycled material, e. g. reclaimed asphalt pavement (RAP) as well as natural reclaimed aggregate (RA) to be present in varying proportions the cold recycled material mix. It hence seems necessary to determine the influence of waste and recycled materials on the properties of the cold-recycled mix with foamed bitumen (MCAS).

The subject of the work was an evaluation of the physical, mechanical, TSR water resistance and rheological properties of the recycled substrate with foamed bitumen considering the volume of added waste and recycled materials (RAP, PA, PC). Waste materials were added to the recycled MCAS substrate at 20 % to 80 % with increases of 20 %. The research showed the potential possibility of usage of such a material in the content of the cold-recycled mix (MCAS).

INTRODUCTION

The main idea behind the technology of deep cold recycling is the maximum utilisation of materials from the destroyed layers of the road surface [1-4]. Most instances of road repair utilising the technology of deep cold recycling concern roads with a flexible and semi-rigid structure [3-5]. The volume of waste material in the form of reclaimed asphalt pavement (RAP), reclaimed concrete (RC) and reclaimed aggregate (RA) in the recycled substrate is dependent on the thickness of the structural layers. The most commonly used volume of RAP in the recycled mix amounts to between 20 % and 70 %. A RAP volume of 20 % was used by Niazi and Jallil in their research [6], evaluating the influence of Portland cement and hydrated lime on the mineral-binder mix with foamed bitumen. Chomicz-Kowalska [2], when evaluating compaction methods, utilised 50 % of RAP in the mineral mix. Godenzoni et al. [7] in turn presented in their work the influence of the volume of RAP (0 %, 50 % and 70 %) in the recycled substrate with foamed bitumen on changes of the complex modulus, using lime mineral material with granulometry values of 0/5 mm, 5/10 mm and 10/14 mm for soil gradation improvement.

One needs to remember, however, that local conditions, e. g. the arrangement of existing structural layers determines the percentage share of the individual ingredients in the mix of the recycled substrate. In this regard, the recycled substrate may include: bound mixes in the form of enriched base layers [8] or cement concrete [9], non-bound mixes or layers of mineral-asphalt mixes [5], [10]. In case of wrong granulometry of the mineral mix from existing layers, required is the introduction of aggregate for soil gradation