Problems in Assessment of a Fine Aggregate Quality for the Subbase Layers Related to the Changes of Standard

Olivera Đokić[1], Marijana Nikolić Ivanović[1], Simo Tošović[1], Suzana Stefanović[1], Bratislav Milić[1]
[1]The Highway Institute, Belgrade, Serbia (e-mail: o.djokic@highway.rs, m.nikolic-ivanovic@highway.rs, simo.tosovic@highway.rs, suzana.stefanovic@highway.rs, b.milic@highway.rs)

INTRODUCTION

The first requirements for the sand equivalent testing (SE) for base and subbase layers in Serbia appear in projects after 2010 with criterion $SE_4 \geq 60$ for high traffic loads and $SE_4 \geq 50$ for medium or low traffic loads. During the construction of the subbase layers of Corridors X and XI, a problem was detected regarding the evaluation of the quality of available materials, according to this criterion. The European Standard for Sand Equivalent (EN 933-8) from 1999 to 2015 has been undergone by a number of changes related to the test procedure (reference fraction 0/2 mm, optionally 0/4 mm, corrected fraction 0/2 mm, uncorrected 0/4 mm; both corrected). Corrections consist of replacing the part of the fines with a large, rinsed material (0,063/2 mm or 0,063/4 mm). Thus formed test sample usually yields high values of the sand equivalent, which often exceeds the limit of 50 and 60, and from the stand point of the Technical Specifications, aggregates are considered clean. The problem is that on the same samples, using other methods like methylene blue (MB) or plasticity index (Ip), a presence of clay particles above the allowed values is confirmed.

PROBLEMS IN PRACTISE

- Changes in the test procedure led to the problems in the overall quality assessment of base and subbase aggregate.
- Engineers in Serbia have a lot of experience with American standard (ASTM D2419).
- Relaxed limits of sand equivalent criteria were found $SE_4 \geq 45$ (without correction of fraction) in some corridor sections.

	mm	Without correction		With correction		Methylene blue	fines	Aterberg borders		
	0/D	SE	SE_4	SE(10)	SE_4	MB	MB 0/D	f	WI	Wp	Ip
1	0/63	22,2	24,1	57,4	-	4,8	0,9	4			
2	0/63	-	27	56,7	62,2	-	-	6	24,2	15,7	8,5
3	0/32	-	23	54	59	10,4	3,12	8	19,1	14,2	4,9
4	0/32	-	32,5	64,1	-	3,0	0,54	4	No plastic		
5	0/32	-	24,7	55,9	-	3,3	0,7	4	No plastic		

Without correction SE_4=27%;
With correction SE_4=62.2%, SE(10)=56.7%
w_i=24.2%, Ip=8.5%

NEW RESEARCH AND OBJECTIVES

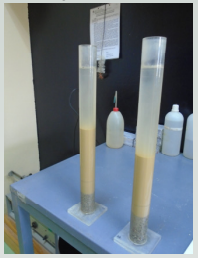
- To perform parallel SE testing on 0/2mm and 0/4mm fractions, as well as MB testing (chemical clay testing) in order to categorize aggregates according to European regulations.
- To get better experience with domestic material and confirm or correct existing boundary values.
- To collect the experiences of EU countries in connection with assessment of fines.

SAMPLES AND METHODS

0/4 test sample

- Limestone aggregate
- EN 933-8: SE 0/2
- EN 933-8: SE 0/4
- EN 933-9: MB
- f (0-13,20)

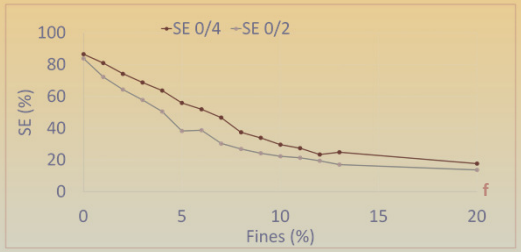
0/2 test sample

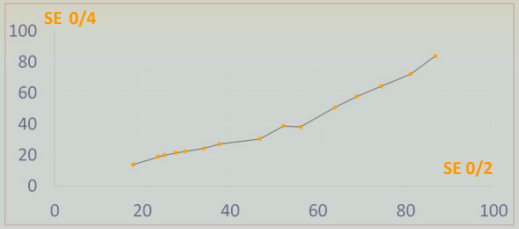


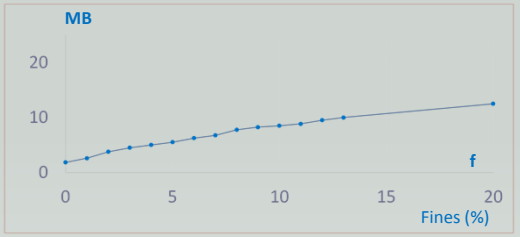
sand equivalent testing

methylene blue testing

RESULTS







CONCLUSIONS

- **There are SE correlations between 0/2 mm and 0/4 mm fraction.**
- **SE values for the fraction 0/2 mm are generally lower than for the fraction 0/4mm. For vales of SE 0/2mm ≥ 50%, differences between measured values fraction 0/4mm are ≤20%, while for the values of SE 0/2mm < 50 differences between measured values fraction 0/4mm are > 20%.**
- **High polynomial dependence between the MB and the percentage of fine particles <0.063 mm raises this method to the top for assessment of a fine aggregate quality for the base and subbase layers.**