

## Effect of Silica Fume on High-strength Concrete Performance

Judita Gražulytė, Audrius Vaitkus, Ovidijus Šernas, Donatas Čygas

Vilnius Gediminas Technical University, Road Research Institute

Linkmenu str. 28, LT-08217, Vilnius, Lithuania

judita.grazulyte@vgtu.lt; audrius.vaitkus@vgtu.lt; donatas.cygas@vgtu.lt; ovidijus.sernas@vgtu.lt

**Abstract** - Concrete is one of the most widely used construction and building materials. To produce high-strength concrete (compressive strength higher than 40 MPa) water/cement ratio has to be reduced up to 0.4 and more. Mineral admixtures (supplementary cementitious materials) are used as alternative to the increase in cement content. They either partially replace cement or is added additionally. The conducted studies show that silica fume is superior to other admixtures. However, there is lack of knowledge on overall mechanical performance of concrete mixtures with silica fume in terms of compression, tension, bending and cyclic loading and dependency between these characteristics. In addition to this, controversial findings regarding the optimal amount of silica fume exist. Therefore, the objective of this research is to comprehensively determine the effect of silica fume on high-strength concrete, which could be used for road pavement construction, performance. Three, the same type, concrete mixtures with different amount of silica fume (0%, 7% and 10%), but the same water/cement ratio (0.4) were produced and tested in compression, tension, bending and cyclic loading. In addition to this, density was determined to identify the difference in concrete microstructure due to presence of silica fume. The results showed that silica fume significantly enhances the performance of high-strength concrete in terms of compression, tension, bending and cyclic loading and 7% is an optimal amount.

**Keywords:** Silica fume; Microsilica; Concrete; Admixture; Compressive strength; Flexural strength; Indirect tensile strength; Fatigue