Self-compacting concrete in bridge construction on federal trunk roads

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Summary

Several structures already built demonstrate the advantages of self-compacting concrete in constructing bridges. However, this can only be achieved by fulfilling the special requirements posed by this building material. The technological, logistical and economic expenditure involved in the production and processing of self-compacting concrete is pronounced compared to conventional vibrated concrete. Important criteria when estimating costs and benefits are the expected high quality of workmanship, elimination of noise and vibrations resulting from compaction, and self-acting consolidation and deaeration during the flow of self-compacting concrete over lengths of up to several metres, also through poorly accessible cavities.

Keywords: self-compacting concrete, bridges, structural members.

1. Introduction

Self-compacting concrete (SCC) is a highly fluid concrete which, unlike its normal counterpart, does not require extra compacting power to flow into structures while at the same time deareate them automatically and fully surrounding the reinforcements. Self-compacting concrete is a relatively recent building material for which there is still no standard. In Germany, self-compacting concrete may be used for general civil engineering applications in accordance with the Guideline of the National Committee for Reinforced Concrete [1]. When used in the construction of bridges forming part of federal trunk roads, SCC additionally requires the approval of the owner, i.e. the Federal Ministry of Transport, Building and Urban Affairs.

In addition to improving surface quality, increasing resistance to environmental influences, optimizing the corrosion resistance of reinforcements by fully surrounding them and perfectly bonding steel to concrete – even in structures high reinforcement ratios – self-compacting concrete is highly advantageous in terms of its handling, which dispenses with physically stressful, noisy and time-consuming compaction in structures.

A use of self-compacting concrete can improve the quality and durability of structures and make construction techniques more economical. However, special technologies are needed to manufacture and process self-compacting concrete. In contrast to normal concrete, the quality of a structure made of self-compacting concrete depends essentially on the flowing properties and viscosity of the fresh concrete. Even slight changes in the consistency of the initial concrete can impair flowing properties and viscosity. This, in turn, can spoil the quality of visible structural concrete and worsen the serviceability or even the load-bearing capacity of the installed components.

Selected structures were used to determine suitable areas of application for self-compacting concrete in bridge construction on federal trunk roads and draw cost/benefit comparisons [2].

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