



## Rehabilitation of transportation infrastructures: the potential of new materials

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### Abstract

In Switzerland, a considerable number of transportation infrastructure rehabilitation projects are expected till 2020. In this new context of mobility, rehabilitation projects have become increasingly complex under various constraints, such as the traffic maintenance under reconstruction and the rapid facility delivery with the minimum cost. This paper brings insights from our practice on how new technologies such as the Ultra-High Performance Fiber Reinforced Concrete (UHPFRC) and the fiber composite sandwich decks could be leveraged for the best satisfaction of these macro constraints. The assessment is based on two criteria of the facility delivery time and the traffic control under reconstruction. The application of UHPFRC is discussed both as a waterproofing layer integrated to the pavement layout and also as a promising reinforcement technology for concrete deck rehabilitation. A project is also reviewed highlighting a fiber composite sandwich deck as a replacement solution enhancing a rapid facility delivery.

**Keyword:** rehabilitation, strengthening, transportation infrastructure, traffic maintenance, pavement layout, UHPFRC, fiber composite sandwich deck

### 1 Introduction

#### 1.1 Motivations

**The need for rehabilitation:** till early 1990s, the most of infrastructure-related projects have been devoted to develop new facilities in order to comply with the expanding motorway traffic demand. According to a popular opinion, the existing infrastructure rehabilitation was not a priority concern since they have been designed to last for a long period of service. Nowadays, it is well-known that those structures considerably deteriorate over time. This mostly happens due to vehicle dynamic loads, environmental effects, chemical agents, aggregate expansion and accidental situations (e.g. fire and crash), among others. The deterioration process, although slowly progressing at the beginning of the service, will be increasingly accelerated over time and may lead to important loose of serviceability if not rehabilitated. Short time intervention savings may

indeed finish up into an important improvised reconstruction cost, times more than expected. It is also the question of safety. If not prevented, the deterioration might considerably reduce the serviceability aspects (e.g. deteriorated pavement, expansion joints etc) or even cause a collapse risk with the load-bearing capacity undermined.

**The Swiss context:** the motorway traffic on Suisse road network is considerably growing. According to the Swiss Federal Statistical Office, the transport performance (both private and transport of goods) is increased by 27% during 1995-2012. (1) The Swiss Federal Office for Spatial Development (ARE) also estimates a traffic increase of 25-30% on national roads until 2020. Most of the existing highway infrastructures have been erected in 1960s and nowadays attain their rehabilitation age, with some of those requiring a considerable rehabilitation. The Swiss Confederation has recently released 20.8 billion CHF of investment during 20 years in order to finance specific road traffic projects aiming for an