Non-invasive interventions on three concrete structures of high cultural and aesthetic value

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Abstract

This contribution reports on the restoration of three concrete structures of high cultural and aesthetic values located in Switzerland. The three case studies highlight the importance of understanding cultural values of engineering structures and concrete architecture in particular, in view of interventions to satisfy demands of modern use. Non-invasive interventions for re-establishing durability and for structural strengthening were developed and realized. In all cases, UHPFRC (Ultra-High Performance Fiber-Reinforced Cement-based composite material) has been applied. It is shown how non-invasive and thus low cost interventions can be performed on "old" concrete structures with adequate respect of cultural and aesthetic values in order to improve them in view of a second service duration.

Keywords: existing structures, early reinforced concrete structures, examination, updating, UHPFRC, strengthening, cultural values.

1 Introduction

Structures of high cultural and aesthetic values deserve a respectful preservation when the need arises to re-establish their durability or to respond to contemporary use requirements through strengthening intervention.

This contribution reports on the restoration of three concrete structures of high cultural values located in Switzerland: (1) Goetheanum Theatre building built in 1928, (2) the Guillermaux Road Bridge built in 1920, and (3) the Chillon Highway Viaducts in service since 1969. The author was involved in all three cases as consulting engineer, expert of the Swiss Federal Office of cultural heritage and expert in UHPFRC technology.

The three case studies are meant to highlight the importance of understanding cultural and aesthetic values of engineering structures and concrete architecture in particular, in view of interventions to satisfy demands of modern use.

Current methods of intervention on structures to rehabilitate and strengthen structures also of high cultural and aesthetic values are often invasive and costly. The result of such outdated technology (still considered by many to be "state-of-the-art"!) not seldom are high costs, disfiguration of structures and thus loss of cultural and aesthetic values.

The objective of the interventions presented in this paper is to perform so-called non-invasive or "soft" methods of rehabilitation, protection and strengthening of reinforced concrete. Yet, preservation of cultural and aesthetic values can be on a par with social, economic, environmental and technical demands, and therefore in clear accordance with the principles of sustainable development.

This goal of non-invasive interventions can only be achieved by using advanced engineering methods (as allowed in standards valid for existing structures [1,2]) and intervention technologies specifically suited for existing structures [3].

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