Concrete repair system for highway viaduct pillars and a case history

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Summary

In today's world, the issue of how to repair damaged concrete is becoming more and more important in order to extend the service life of concrete structures. Chemical and physical attacks are very common and often occur together with poor quality concrete that inevitably cause major damage.

A special system for concrete repair has been studied in the Mapei R&D laboratories. This system is based on shrinkage-compensated structural repair mortars protected with a polymer modified cementitious elastic membrane in order to improve the durability and the service life of concrete structures. This paper shows the main properties of this repair system and describes a case history of its efficiency for the reparation of an important highway viaduct.

Keywords: concrete, corrosion, mortar, protection coating, durability, service life, viaduct

1 Introduction

The main problem of reinforced concrete structures is the corrosion of the reinforcement that limits the duration of the structure. There are two main types of corrosion: caused by carbonation and caused by chlorides

In the first case, the alkalinity of the concrete is neutralised by the CO_2 coming from the environment, causing the depassivation of the reinforcements and, successively, general corrosion. In the second case, the Cl^- ions penetrate the concrete reaching the reinforcement and, when they exceed a critical concentration, chlorides determine the corrosion of the steel rods. In both events the corrosion can only happen in cases where water and oxygen are present (Neville, 1995).

During the service life of the constructions two phases can be identified: time of initial corrosion, in which the aggressive substances penetrate the concrete cover (the reinforcement are not yet corroded) and the time for corrosion propagation, when the corrosion attack proceeds, starting from the moment at which reinforcement begins to corrode (Bertolini, 2003).

In order to increase the service life of concrete constructions different solutions can be implemented.

A special system for concrete repair has been studied and it has been often used in real construction sites. This system is based on 3 products:
- a corrosion-inhibiting cement mortar as a coating for the protection of reinforcing rods
- a concrete repair structural mortar (thixotropic or fluid)
- a protective coating (like polymer modified cementitious elastic membrane).

Due to problems related to the proper use of the products in job site, also cementitious mortars for concrete repair can show some problems to those of reinforced concrete. For this reason additional protective solutions should be used.

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