IABSE Conference 2018 – *Engineering the Past, to Meet the Needs of the Future*
June 25-27 2018, Copenhagen, Denmark

Dimensioning the flexural strengthening of concrete slabs with textile reinforced mortar – literature data evaluation

Alex-Manuel Muresan, Prof. Dr. Daia Zwicky

Institute of Construction and Environmental Technologies iTEC

School of Engineering & Architecture Fribourg HEIA-FR

Univ. of Applied Sciences of Western Switzerland HES-SO

Contact: alex-manuel.muresan@hefr.ch

Abstract

When strengthening reinforced concrete slabs with textile reinforced mortars (TRM), the "correct" consideration of the global bond behaviour between textile and cementitious matrix is identified as the main challenge in determining the most appropriate global analytical model. The first model evaluated here is based on classical assumptions for structural concrete design. The second model, as another extreme assumption, is completely neglecting textile bond in the cracked zone, thus assuming it as unbonded, end-anchored, external reinforcement. The third model is based on the simplifying assumption of the textile reinforcement being only significantly activated when the internal steel reinforcement is yielding. Analytical results from these approaches are compared to a database containing more than 130 test results reported in literature, and are statistically evaluated.

Keywords: textile reinforced mortar (TRM); flexural strengthening; concrete slabs; analytical model; dimensioning; textile bond; literature data base.

1 Introduction

Numerous experimental studies were conducted lately on flexural strengthening of reinforced concrete elements with textile reinforced mortars (TRM). This promising construction material, being created by embedding one or more layers of uni- or bi-axial glass, carbon or PBO (Poliparafenilenbenzobisoxazolo) textile meshes in a cementitious matrix, presents promising value not only in new construction elements but also in strengthening of existing.

The strengthening of concrete elements with TRM implies a relatively simple procedure. First, the existing concrete is mechanically treated to remove the superficial cement layer and to expose the aggregates inside (roughening). Before applying the first layer of shotcrete, the surface is wetted to help creating good bond between the mortar and the concrete support. Afterwards, the textile reinforcement is applied in one or multiple layers with shotcrete layers in-between. A finishing mortar layer is added to enclose the textile reinforcement in this cementitious matrix.

Because this strengthening technology offers a highly reliable bond between the concrete support and the mortar, the failure at this interface is not prone to appear and the governing failure emerges at the interface between textile and mortar.

Given the small thickness of TRM and its capacity of being applied on large surfaces, the use of this method is very suitable for the strengthening of concrete slabs. As retrofitting nowadays presents significant challenges in order to bring old structures to meet new needs of serviceability and

https://doi.org/10.2749/copenhagen.2018.180