Assessment and Strengthening of a Composite Structure

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Summary

The paper deals with the assessment and rehabilitation of a composite steel-concrete structure. Two types of damages were noticed: a higher deflection of some steel profiles IPE200 due to no proper connection and of fresh concrete action; some important cracks into concrete slab produced by shrinkage. The rehabilitation solutions were: a stiffening steel plate welded on steel profiles for decreasing deflections; infilling the concrete cracks with epoxy-based resin products.

Keywords: assessment; rehabilitation; composite steel-concrete structure; crack injection; counter deflection by welding.

1. Introduction

The design and erection of constructions assume, aside from the common rules and practices, some supplementary technological provisions, which without them the normal service state of the resistance structure could be affected [1]. The present work examines two types of damages and the most suitable measures for decreasing the effect of these degradations. The first analysed defect type concerns the extended deflections that appear in the steel elements of the unconsolidated composite structure as a result of the fresh concrete weight. The second type of degradation consists of the cracks that occur mainly as a result of impeded shrinkage.

The suggested and achieved strengthening solutions pointed out the spectacular effect produced by welding a steel plate on a steel profile flange, with regard to a sensible decrease of the pre-existing deflections. On the other hand, the important effect that the epoxy-based resin products induce over the restoration of the continuity of cracked reinforced concrete elements was reconfirmed.

2. Structure Description [2]

The assessed structure is a rectangular shape building, ground floor hall type. The horizontal dimensions are 23,92 x 51,92 m, the height of the eaves is 7,00 m and the height of the ridge is 8,00 m (Fig. 1).

The steel resistance structure consists of one opening interior transversal frame, respectively four openings of 5,60 m transversal frames at the frontons.

In several areas of the structure an intermediate L shaped floor is erected, consisting of a reinforced concrete plate (90 mm thick according to the project) supported by a steel structure (Fig. 1).

Longitudinally, in the plane of the two edge frames, there were provided X shaped vertical wind struts with stretched diagonals. The area with the intermediate floor is also wind braced with diagonal tubes (compression bars).

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