



Strengthening of existing RC frame in case of construction of additional floor, with account for the construction stages

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Abstract

An additional floor is designed on the top of an existing RC building with frame structure. New transfer columns are supported on the existing beams of the top level. The frame is recalculated and design checks are carried out taking into account the construction stages. The corresponding conclusions about the redistribution of the internal forces depending on the type and the age of the structure are drawn. The necessary strengthening of the existing structure is considered, based on the results obtained by the calculations. Strengthening with FRP and RC jackets of the structural elements is considered as a final solution.

Keywords: construction stages, numerical modelling, strengthening techniques

1 Introduction

The usual practice for calculation and design of structures is assuming that they are completely built and loaded according to the code requirements. The detailed analysis reveals that even in an “ordinary” structure there are elements which are sensitive to the construction sequence and the construction stages shall be taken into account for their design. Taking into account the construction stages in the calculations affects significantly the displacements and the internal forces of some structural elements. There are differences in the displacements and the internal forces in main structural elements that cannot be neglected. A 3-storey RC frame with

additionally constructed transfer columns (TC) is considered in the presented paper. The described example corresponds to a real problem from the practice. In an existing, relatively new building, a new storey is planned to be constructed. According to some architectural restrictions, the new columns are situated in the middle of the beam’s spans of the lower storey. It was necessary to recalculate the existing RC frame taking into account the construction of the new storey and to carry out the necessary analyses. The analysis and the results of the analysis are decisive for of the selection of the most appropriate method for strengthening. The selection of the strengthening technique depends on several factors, such as the amount of strengthening required, the location