



Technical and economic evaluation of various retrofitting methods for concrete columns in buildings

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ABSTRACT

The main weakness of reinforced concrete columns is focused on shear resistance and proper insolubility. So far, various methods have been proposed for the reinforcement of reinforced concrete columns against earthquakes. Several methods are the most common and effective methods for retrofitting reinforced concrete columns against earthquakes using steel jackets, cross sectional reinforcement, FRP fibers, and more. Considering the advantages and disadvantages of each of the methods proposed in this study, a comprehensive study on the technical and economic analysis of these methods has been proposed for recommending the reconstruction of concrete structures of the National Bank of Iran. Analytical hierarchy analysis (AHP) and expert choice software have been used to determine the priority of retrofit methods by statistical method. Based on the final score obtained for the effective measures on the selection of superior retrofit method, the greatest effect on the final dimensions of the column is set at 0.172. The second most influential factor in the final selection of the concrete column retrofit method is the "Execution Limit" criterion with a score of 0.161. The lowest score is related to the "Final Quality of Performance" index with a score of 0.082. Also, based on the final score obtained for various reinforcing concrete columns, it has been observed that ultimately, based on all the effective criteria, the best reinforcement method is determined using FRP fibers. The second method, with a score of 0.33, was related to the reinforcement of the column with a concrete jacket. Finally, the lowest score belonging to the column retrofit method was determined using a 0.317 jumper steel jacket.

Keywords: Retrofitting methods, concrete columns, FRP, Steel jacket, concrete jacket

1. INTRODUCTION

If a structure is damaged under certain conditions (earthquake or debris, etc.), or if we intend to change the use of residential buildings to educational change or increase in the structural classes, then the existing structure of safety and favorable conditions for bearing loads And will need to retrofit or repair and strengthen the structure. Following the erosion of infrastructure and the need to strengthen structures to meet the stringent conditions of design, over the past two decades, much emphasis has been placed on the repair and rehabilitation of structures around the world. Seismic improvement of structures, especially in the earthquake areas, has become very important.

In curtain-mounted frames, the columns are mainly placed under axial loads, with very small shear and flexural loads. Hence, the pillar is known as a pivotal member. However, in structures with a flexural bearing system, the column has a considerable flexural and shear loads, and sometimes the failure and failure of the column is affected by flexural and shear loads, but it should be taken into account that there is still a large amount of axial load on these members.