

ADDITION OF CONCRETE SHEAR WALLS; A TYPICAL RETROFITTING METHOD FOR MASONRY BUILDINGS

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Following the destructive Bam earthquake of 2003, the Iranian Government initiated a vast program of seismic retrofitting for existing important buildings throughout the country. Based on the obtained experiences, Seismic vulnerability and rehabilitation studies for each of thousands of existing buildings throughout the country, needs a long-term period of time and would make the project with limited budget, unachievable in the defined period. For this reason some new and typical methods for retrofitting of common type of buildings that would result in higher performance of structures and save the occupant lives in probable future earthquakes. Unreinforced masonry buildings which are widely constructed in urban areas of Iran and in many other countries are the most common type. An advantageous method for retrofitting of this type of construction is “Perimeter Shotcrete”. In this method some concrete shear walls are added to masonry buildings, along with other retrofitting details for the roof, foundation and masonry walls. This article aims to explain the method along with the scientific base, gained experience, details, governing rules and conditions. This article is the report of this method along with the scientific base and the gained experience.

The results of the studies reveal that the retrofitting process in Iran is a very time consuming and costly one. Covering all the stages in this process for structures with close details and specifications is very rare in the world. Applying the term of “partial rehabilitation” to this new approach does not mean the local rehabilitation. The main reason for choosing this term is that by retrofitting a building according to this new approach, some minor structural deficiencies may remain in the aftermath. In this approach the time-consuming process of study and consultants approval of the technical documents are not considered. Instead, very simple and fast methods are used to evaluate the capacity of the building and upgrading it to a determined level. In development of these techniques, this organization considered 3 goals:

A- Reducing the time of retrofitting projects studies: Since many buildings should have retrofitted according to same methods and because of the close structural details, passing all the steps in retrofitting procedure for each of them is not logical. Moreover, this will require much longer period of time to achieve our goals in retrofitting of all school buildings in 5 years.

B- Increasing the speed and quality of execution: Since implementation of these instructions leads to a unique retrofitting specifications and details, this will result in fast adaptation of the contractors with the executive methods and providing them with the equipment for a repetitive process.

C- Reducing the cost of retrofitting process: The total cost of the project greatly depends on the require tome of the project, the speed of execution and the amount of necessary equipment of the contractors. So repetition with the projects details and equipment will result in considerable cost saving in the retrofitting projects.

In this article, the capacity of the shear walls and the piles are presented. Also specifications have been designed for the connection of the roof and the walls which leads to improvement of the in-plane and out-of-plane wall performance.

The necessary conditions for the buildings chosen to be retrofitted by this method are as follows:

- A. Masonry buildings, preferably constructed by brick walls.
- B. Symmetric.
- C. Roof type must be jack-arch slabs or concrete waffle slabs.

In brief, Iran is one of the most earthquake prone areas in the world and this situation makes it to be at the top of list of the countries with great casualties and financial losses. Vulnerability study and seismic retrofitting of existing buildings throughout the country is an important process for reduction of earthquake danger risk. Seismic vulnerability and rehabilitation studies for each of thousands of existing buildings throughout the country, needs a long-term period of time and would make this process with limited budget, unachievable in short period of time. For this reason some typical methods for retrofitting of common type of buildings, that would result in higher performance of structures in probable future earthquakes, seems to be useful. "Addition of concrete shear walls" described in this article, is a powerful typical retrofitting method for masonry buildings. The investigations done and experiences gained show that this method can improve the performance of structures against earthquakes greatly. It can also reduce the time of retrofitting studies, cost of retrofitting process and increase the speed and quality of execution.

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