Paper Code. 4428

Seismic Evaluation of a Masonry Building Using Simplified Equivalent Static Analysis (Case Study-Blind Institute, Chandigarh INDIA)

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ABSTRACT

Earthquakes have been a major source of destruction in the developed as well as under developed nations, particularly damaging the Un-Reinforced Masonry construction in the 'In-Plane' and 'Out-of-Plane' bending behaviour. The various retrofitting techniques such as the Fibre-Reinforced Polymer Reinforcement, Post tensioning using rubber tyres etc are uneconomical to be put into practice. This paper presents a case study on the seismic evaluation and retrofit design for the Institute of Blind, sector 26, Chandigarh, a building of considerable importance. This building is a lifeline structure and would serve as an added reserve for rehabilitation work during any catastrophe. Seismic evaluation of this masonry building has been carried out using Simplified Equivalent static analysis. In this method, an analogy has been applied to synchronize the pattern of piers to the springs connected in 'series' and 'parallel'. The design seismic forces have been calculated using the provisions of IS: 1893-2002 for seismic zone IV. The stresses evaluated have been checked for permissible value under various load combinations in accordance with Indian Standard Codes. We plan to provide a safeguard scheme without replacing the existing structure using galvanized welded wire mesh and micro concrete. The mesh reinforcement is provided on both faces of the walls. This method has the smallest thickness as compared to the rest of the retrofit schemes. The cost of retrofit has also been calculated in terms of per square meter area of the building. This retrofitting technique does not require heavy machineries, special material and costly equipments, hence is easier in its implementation compared to other techniques available.

Key Words: Seismic Evaluation, Retrofit Design, Masonry Construction

1 INTRODUCTION

Unreinforced masonry (URM) buildings constitute a major part of the buildings existing today worldwide. These buildings are susceptible to lateral loads such as those caused by earthquakes or high speed winds. Much of these buildings were constructed and are being constructed without considering the seismic loading. Hence, these are not capable of dissipating energy through inelastic deformation during earthquakes and are outperformed during such catastrophes. During the past 20 years, a large number of research projects have been conducted on masonry buildings which have brought to light the feasibility of this material for various building constructions. The masonry construction is cost effective over the other materials, masonry is returning to be a reliable construction alternative. Many of the recent researches have laid emphasis on increasing the safety of masonry buildings during the earthquakes. All these researches have focused on improving previous techniques and developing new techniques of retrofitting for already