Seismic Retrofitting of Structures

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ABSTRACT

Many exsisting reinforced concrete structures in present world are inadequate for earthquakes. Recent earthquakes which occered during last decade have indicated that major damage occured was not directly due to action of earthquake but due to poor performence of structures during earthquakes. It is recognized that the most effective method of reducing the risk is seismic retrofitting. In recent years, there is significant improvement of retrofitting techniques. This study highlights the principals of assesing and retrofitting of structures against seismic events. Some of these methods were practically implemented and procedures are illutrated using case study of four storey RC building for moderate earthquake. Finite Element Method was used to investigate the performence of the building during earthquake and to check the behavoir of the structure after applying retrofitting techniques. The methods such as steel and concrete jacketing and application of fibre reinforced polymer (FRP) composites are discussed to improve the load bearing capacity of individual structural elements. Various methods such as shear walls, shear core which can be use to improve overall stability are discussed.

Key Words: Earthquake, Reinforced concrete, Retrofitting, FEM analysis

1. INTRODUCTION

An earthquake is the vibration of the earth surface that follows a sudden release of energy in the earth crust. This huge energy generated during an earthquake can be transmitted from its origin through seismic waves. These seismic waves cause vibration of ground far away from its epicentre. During an earthquake the ground surface moves in all directions. The most critical factor for damaging buildings is horizontal movements which cause lateral inertia force on the structures. Generally most structures are designed and constructed to carry gravity loads. Most buildings do not have good lateral load resisting systems. It is understood that almost all the buildings are not constructed to face this situation.

Concrete has been the most preferred construction material of the twentieth century, and unless a new material with spectacular characteristics is invented, it appears to remain this way for another century.The existing low-rise and medium-rise buildings in the world consist of large number of reinforced concrete (RC) frame buildings designed for gravity loads only [1]. Amoung various methods of retrofitting the most suitable method for a particular building can be identified after performing a structural assessment. The decision about the method of retrofitting is governed by the cost of retrofitting and the required level of performance.