Seismic Performance Assessment of Steel Bar Joints Between Reinforced Masonry Walls and RC Slabs

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ABSTRACT

Reinforced masonry buildings are technically and economically suitable options for earthquake-prone countries, inadequate connections between the components of these structures cause damage and destruction in an earthquake. Percentage and connection type between wall and concrete slab is the most effective parameter in safety of these buildings. In this article a model for the seismic behavior of reinforced masonry(RM) building subjected to push-over analysis has been presented. The modeling of the RM structure with concrete slabs has done in ABAQUS, using explicit finite element model. The proposed finite element model has been verified by comparison with experimental data available in the literature and then five models including one, two and four story buildings in different situations have been modeled. Length of anchors , distance and diameter of joint bars between the walls and concrete slabs have been investigated and some recommendations in this field have been presented.

Key Words: (Reinforced masonry, Concrete slab, Seismic , Joint bars)

1 INTRODUCTION

Masonry is the building of structures from individual units laid in and bound together by mortar. Due to the availability and low cost of masonry materials, these type of structures consist large percentage of existing buildings. Masonry is generally a highly durable form of construction. However, the materials used, the quality of the mortar and workmanship, and the pattern in which the units are assembled can significantly affect the durability of the overall masonry construction. Unreinforced masonry (URM) bearing wall buildings have shown poor performance in past earthquakes.(Fig 1)[1]

The reasons for this poor performance are the inherent brittleness, lack of tensile strength, and lack of ductility; that is, a lack of the properties given to RM by the steel reinforcing. Earthquake forces oscillate, and after a crack occurs in a brittle material, subsequent pulses cause uncontrolled displacement and collapse. Masonry is one of the oldest building materials and has been considered the most durable. However, it depends on a static, unyielding base. Iran happens to be a region of high seismicity. After the 1933 Long Beach earthquake, building codes changed prohibiting unreinforced masonry buildings, and few have been built since then; however, there are URM buildings that remain, which fall into three categories: 1) fully retrofitted; 2) partially retrofitted; and 3) not retrofitted.[2]