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RETROFITTING OF HERITAGE MASONRY BUILDINGS WITH SPLINT BANDAGE TECHNIQUE USING GEOSYNTHETIC

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ABSTRACT

Heritage buildings are the dynamic linkage by each generation in the continuum of society. Once they are lost a part of history will be lost forever. 3D finite element analysis is carried to estimate the in-plane and out-of-plane performance of un-reinforced masonry wallette strengthened with geosynthetic. From the in-plane test it is estimated that the diagonal shear strength increased to 72% as compared to un-strengthened panel, while out of plane test gives increase in flexural strength capacity to 129.23% as compared to un-strengthened panel. Further seismic performance of geotextile as a retrofitting material for heritage masonry buildings using splint and bandage technique is estimated with similar modelling using historical earthquake. The stress contour and deformation results of the retrofitted model shows better control to mitigate earthquake forces.

KEYWORDS: Retrofitting; Geosynthetic; Masonry Structure; Seismic Response

INTRODUCTION

Beyond the obvious need to protect human life, one must also take the responsibility of protecting heritage buildings as these structures are the dynamic linkage of contribution by each generation in the continuum of society. Once they are lost a part of history will be lost forever. Masonry heritage structures (MHS) are an infinite number of buildings dating back to prehistory and in which many "value meanings" – historical, geological, esthetic, symbolic, financial, political, scientific / technological and economic – include making it a real treasure of the civilization of mankind. These structures are protected from seismic earthquake, natural or anthropogenic disasters, and the life expectancy and the protection from collapse. These heritage structures are old and constructed through combination of non-engineered bricks and mortar. Bricks, being good in compression, perform well under gravity loading acting vertically on the structures. However, such unreinforced masonry (URM) structures are usually inadequate in resisting horizontal load due to earthquake and cyclone because of their low tensile strength. The history of past earthquake has shown worst performance, suffered maximum damages and also accounted maximum loss of life and property. The poor seismic performance of URM buildings was demonstrated by past earthquakes in India and many other countries. The engineering community is therefore challenged to improve the shear capacity and stress of masonry structures in order to increase their suitability during earthquakes. URM walls have two failure: in-plane and out-of-plane. In in-plane, masonry walls tend to progress a diagonal crack, whereas the load acts on the walls in the perpendicular direction, causes the out-of-plane flexural bending of the walls (Figure 1) [1]. Lateral loading can produce diagonal cracking failure