

PARAMETRIC STUDY ON DIAGONAL SHEAR AND OUT OF PLANE BEHAVIOR OF MASONRY WALLETTES RETROFITTED BY PP-BAND MESH

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ABSTRACT :

Unreinforced masonry is one of the most popular construction materials in the world. It is also unfortunately, the most vulnerable against earthquakes. Damage to unreinforced masonry buildings has caused huge number of human casualties historically and during recent earthquakes in developing countries. It reveals that development of proper retrofitting technique for masonry buildings, especially existing buildings, is the main challenge to increase seismic safety in those countries. PP-band (Polypropylene band) Technology is a simple, economical and efficient retrofit method developed at International Centre for Urban Safety Engineering (Meguro Lab 2003^[1]), Institute of Industrial Science, The University of Tokyo. This technology has been developed considering economical affordability and social acceptability together with technical feasibility for masonry buildings in earthquake prone regions. PP-bands are commonly utilized for packing and it is available at a very low price even in remote areas of the world. In order to verify the suitability of the proposed retrofitting technique, an experimental program was designed and executed. From test results, it could be seen that PP-band mesh retrofitting could improve the overall stability and ductility of the structure.

KEYWORDS: unreinforced masonry, retrofit, polypropylene band, diagonal shear test, residual strength, PP-band mesh retrofit

1. INTRODUCTION

A real scale model test makes possible to obtain data similar to real structures^[2]. However, it requires large size testing facilities and large amount research funds, so it is difficult to execute parametric tests by using full scaled models. Recently, structural tests of scaled models become well-known as the overall behavior of the system can be also understood from scaled model. In this experimental program, 1/4 scale models was used to investigate the static behavior of masonry walls.

To evaluate the beneficial effects of the proposed PP-band mesh retrofitting method, diagonal shear tests and out-of-plane tests were carried out using masonry wallettes with and without retrofitting. In addition to them, efficiency of different mesh-pitch and effect of looseness in attachment were also examined by diagonal shear tests. The test results are reported in this paper.

2. AXIAL TENSILE TEST OF POLYPROPYLENE BANDS

Preliminary testing of the PP-band was carried out to check its deformational properties and strength. To determine the modulus of elasticity and ultimate strain, 3 bands were tested under uni-axial tensile test as shown in Figure 1 (left). The test was carried out under displacement control method. The results are shown in Figure 2 (right). To