PARAMETRIC STUDY OF DIAGONAL SHEAR TESTS ON MASONRY WALLETTES RETROFITTED BY PP-BAND MESH

Navaratnarajah Sathiparan[1)], Paola Mayorca[2)] and Kimiro Meguro[3)]

1) Post Doctoral Fellow, Institute of Industrial Science, The University of Tokyo
4-6-1 Komaba, Meguro-ku, Tokyo 153-8505, Japan
e-mail: sakthi@risk-mg.iis.u-tokyo.ac.jp
2) Project Research Associate, Institute of Industrial Science, The University of Tokyo
e-mail: paola@iis.u-tokyo.ac.jp
3) Director/ Professor, ICUS, Institute of Industrial Science, University of Tokyo
e-mail: meguro@iis.u-tokyo.ac.jp

Unreinforced masonry is one of the most used construction materials in the world. It is also unfortunately, the most vulnerable during earthquakes and large number of casualties resulted due to the collapse of this type of structures. 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.

Key Words: *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, ¼ 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 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 calculate the stress in the band, its nominal cross section $15.5\times0.6mm^2$ was used. As the matter of fact, the band has a corrugated surface and therefore its thickness is not uniform.

All of the bands exhibited a large deformation capacity, with more than 13% axial strain. The stress-strain curve is fairly bilinear with an initial and residual modulus of elasticity of 3.2 GPa and 1.0 GPa, respectively. Given its large deformation capacity, it is expected that it will contribute to improve the structure ductility.