

STUDY ON SEISMIC PERFORMANCE OF LOW EARTHQUAKE RESISTANT MASONRY BUILDINGS RETROFITTED BY PP-BAND MESH

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ABSTRACT: This paper introduces a technically feasible and economically affordable PP-band (polypropylene bands) retrofitting for low earthquake resistant masonry structures in developing countries. Results of shaking table tests on building models show that the PP-band retrofitting technique can enhance safety of both existing and new masonry buildings even in worst case scenario of earthquake ground motion like JMA7 seismic intensity. Therefore proposed method can be one of the optimum solutions for promoting safer building construction in developing countries and contribute earthquake disaster mitigation in future.

Key Words: Unreinforced masonry, Polypropylene band, PP-band mesh retrofitting, Shaking table test

1. INTRODUCTION

Masonry is the most universally available and economical construction material. The common materials of masonry construction are burned and unburned bricks called adobe, stones and concrete blocks. Adobe masonry made of unburned bricks is the most common type of masonry. Masonry structures are generally self-made because the construction practice is simple and does not require additional energy consumption. In addition to its low cost and simple construction technology, masonry has other advantages, such as excellent thermal and acoustic properties. In spite of this, the technological development of masonry in earthquake engineering has lagged behind compared to the other structural materials like concrete and steel. Therefore, earthquake prone regions in the world have suffered a large number of casualties due to the collapse of this type of structures. This is a serious problem for the societies. Apparently, its solution is straight forward: retrofitting the existing structures.

When we propose the retrofitting method in developing countries, that method should respond to the structural demand on strength and/or deformability as well as to availability of material with low cost including manufacturing and delivery, practicability of construction method and durability in each region. Considering these issues on developing appropriate seismic retrofitting techniques for masonry buildings to reduce the possible number of casualties due to future earthquakes in developing countries, a technically feasible and economically affordable PP-band (polypropylene bands; PP-band is commonly used for packing.) retrofitting technique has been developed and many different aspects have been studied by Meguro Laboratory, Institute of Industrial Science, The University of Tokyo (Mayorca P. and Meguro K., 2004).

A real scaled model test makes possible to obtain data similar to real structures. 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. Therefore, in this study we performed scale model tests to understand the overall behavior of the system. In this research, in order to understand the dynamic