



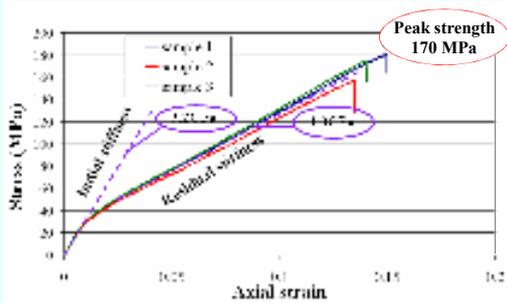
PP-BAND RETROFITTING ASSESSMENT - DIAGONAL COMPRESSION TESTS -



安価な材料を用いた経済的な耐震補強法の研究 - PPバンドメッシュで補強した組積壁の圧縮破壊試 -

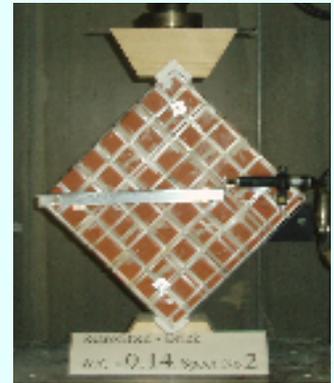
PP-band mechanical properties

To determine the PP-band modulus of elasticity and ultimate strain, three bands were tested in tension. All of them, exhibited large deformation capacity sustaining more than 13% strain. The stress-strain curve is fairly bilinear with an initial and residual stiffness of 3.2GPa and 1.0GPa, respectively.



PP-band retrofitting assessment - Diagonal compression tests -

In order to evaluate the effect of retrofitting masonry walls by PP-band meshes, in-plane diagonal compression tests were carried out using masonry wallettes with and without retrofitting in order to assess their seismic performance. The wallette dimensions were 292.5 × 290 × 50 mm³ and consisted of 7 brick rows of 3.5 bricks each. The mortar joint thickness was 5mm. A mortar mix of cement:lime:sand = 1:7.9:20 and cement/water ratio = 0.14 was used. The direct shear and bond strength of the masonry assembly were 0.03 and 0.05 MPa, respectively.



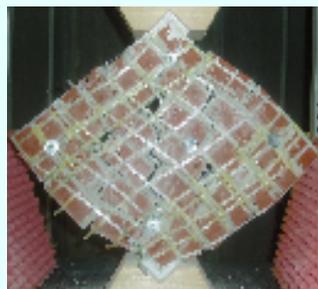
Specimens were tested 28 days after construction under displacement control condition. The loading rate was 0.3mm/min and 2mm/min for the non-retrofitted and retrofitted cases, respectively.

PP-band retrofitting assessment - Performance comparison -

In the non-retrofitted case, the specimens split into two pieces after the first diagonal crack occurred and no residual strength was left. In the retrofitted case, on the other hand, diagonal cracks appear progressively, each new crack followed by a strength drop. Although the PP-band mesh influence was not observed before the first cracking, after it, each strength drop was quickly regained due to the PP-band mesh effect. Although at the end of the tests almost all the mortar joints were cracked, the retrofitted wallettes did not lose stability.

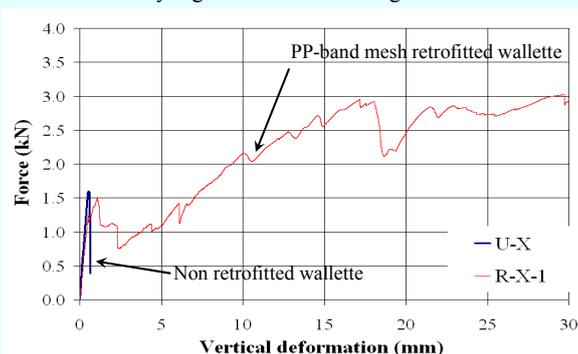


Non-retrofitted masonry



Retrofitted masonry

In the non-retrofitted case, the initial strength was 1.55kN. In the retrofitted case, although the initial cracking was followed by a sharp drop, at least 50% of the peak strength remained. The final strength of the specimen was equal to 3.0kN relatively higher than initial strength of 1.5kN.



* U - Non retrofitted, R - Retrofitted, X - No surface paste

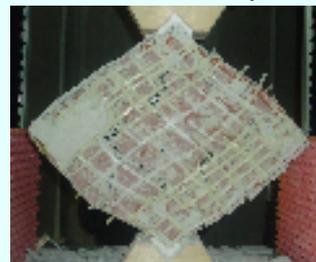
PP-band retrofitting assessment - Mesh orientation efficiency -

To observe the efficiency of different mesh orientations, two types of PP-band mesh arrangement as shown below were used:

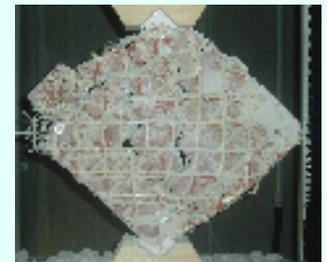
Type-1: PP-band mesh oriented parallel to the masonry joints.

Type-2: PP-band mesh oriented 45° from the masonry joints.

Both had mesh pitch equal to 40mm. A total of 4 wire connectors were used to attach the mesh to the masonry wallette.



Type-1 mesh orientation



Type-2 mesh orientation

Generally the Type-2 mesh arrangement provided higher strength than the Type-1 mesh did. This was expected because the confining effect on the masonry wall is larger in the former case. Cracks become gradually wider as the vertical deformation increased. In this situation, the reinforcement oriented perpendicular to the crack, i.e. Type 2 worked under optimum conditions. Although the Type-1 arrangement did not fully use the mesh capacity, it

improved the wallette behavior to a degree which can be considered enough for the purpose of this study. In addition to this, the mesh Type-1 is easier to manufacture and install and therefore it was selected as the optimum solution for retrofitting.

