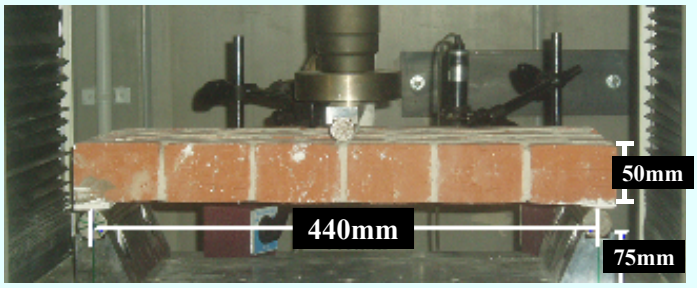
PP-BAND RETROFITTING ASSESSMENT
- OUT-OF-PLANE TEST -
安価な材料を用いた経済的な耐震補強法の研究
ーＰＰバンドメッシュで補強した組積壁の面外水平試験ー

Objective

Out-of-plane tests were carried out in order to investigate the PP-band mesh effectiveness in walls exhibiting arching action.

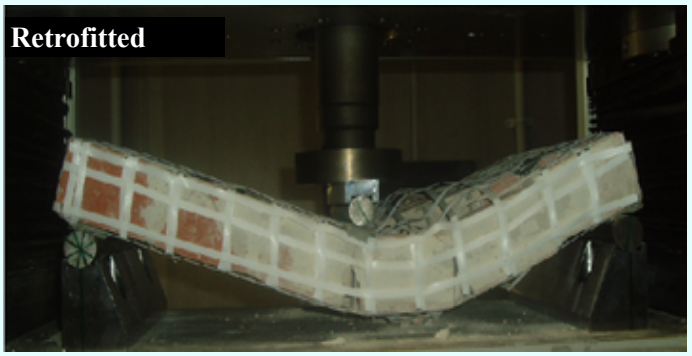
Test setup and loading condition

The nominal dimensions of these wallettes were 475mm length by 235mm width by 50mm thickness. A total of 6 wire connectors were used to attach the meshes with masonry wallettes. No epoxy was used to connect meshes on both sides of the specimen. The mesh band width and pitch were 6mm and 40mm respectively. Considering the stability of the specimens during handling and testing, cement/water ratios equal to 0.25 and 0.45 were used for burned and unburned brick cases, respectively.



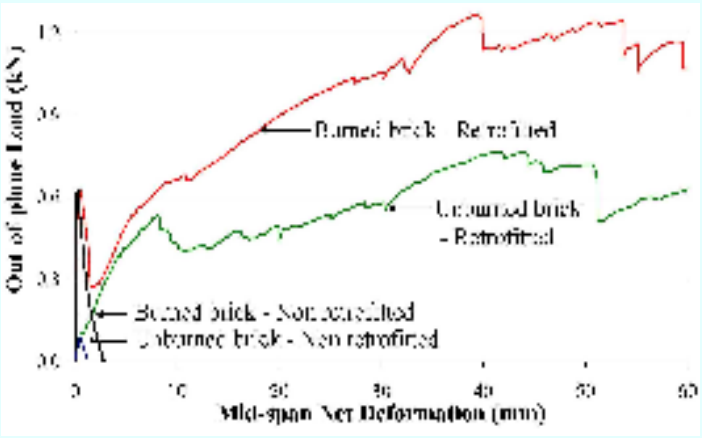
Specimens were tested 28 days after construction under displacement control condition. The wallettes were simply supported with a 440 mm span. Steel rods were used to support the wallettes at the two ends. The masonry wallettes were tested under a line load which was applied by a 20mm diameter steel rod at the wallette mid-span. The loading rate was 0.05mm/min upto 30mm of vertical deflection, after which it was increased to 2mm/min for the remaining of the test. Note that non-retrofitted specimens failed at less than 1mm of vertical deformation.

Failure Patterns



The above pictures show the non-retrofitted and retrofitted masonry wallettes at the end of the test, which corresponded to a mid-span net deformation equal to 2.8mm and 70.0mm, respectively. In the non-retrofitted case, the specimens split into two pieces just after the first crack occurred at mid-span and no residual strength was left. In the retrofitted case, on the other hand, although PP-band mesh influence was not observed before the first cracking, after this occurred, the strength was regained progressively due to the PP-band mesh effects.

Result and discussion



As expected, the initial strength of the burned brick specimen was relatively higher than that of unburned brick. Even a higher cement/water ratio was used for unburned brick, the poor bonding between mortar and unburned brick led to separation along the brick/mortar interface. On the other hand, in the burned brick case, failure occurred within the mortar. This behavior highly influenced the initial strength of the specimens.

The figure on the left shows the out-of-plane load variation in terms of mid-span net vertical deformation for the non-retrofitted and retrofitted wallettes. For the non-retrofitted burned brick, the initial strength was 0.63 kN and there was sharp drop observed after the first crack.. In the retrofitted case, although the initial cracking was followed by a sharp drop same as in case of non-retrofitted specimen, at least 45% of the peak strength remained. After this, the strength was regained by readjusting and packing by PP-band mesh. The final strength of the specimen was equal to over 1.2kN much higher than initial strength of 0.60kN. The retrofitted wallette achieved twice larger strengths and 60 times larger deformations than the non-retrofitted wallettes

In the case of unburned brick, the retrofitted wallette achieved 10 times larger strengths and 60 times larger deformations than the non-retrofitted wallettes.

Both types of retrofitted wallettes showed similar behavior after cracking up to a net vertical deformation equal to 8mm. At this point, brick crushing was observed in the unburned brick case. Due to that, the overall strength of the unburned brick wallettes become smaller than that of burned brick wallettes. There after, if the two types of bricks are compared, the burned brick specimen was stronger than the unburned brick by more than 65%.

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