Abstract

Solid wall without opening is the most effective design in reducing noise pollution. This, however, causes problems of ventilation and heat accumulating in buildings. These problems lead to the use of active ventilation which increases power consumption, whereas passive ventilation alone should be adequate for such buildings. Moreover, current research and development have advanced considerably for using concrete materials in the walling system. This research aimed to improve the noise reduction performance of horizontal hollow concrete blocks produced, with aerated concrete, for wall construction.

A preliminary survey had shown that among the hollow concrete blocks available in the market, those with single slot and with the shell perpendicular to the sound path have better noise reduction properties. The objective of this study was to study the physical properties of hollow concrete blocks for improving noise reduction performance, aiming for the appropriate slot size, shell thickness and cavity within the block according to the Helmholtz resonator principle. The noise reduction performance were compared with those of the available blocks in the market such as solid, single horizontal hollow concrete blocks and double horizontal hollow concrete blocks.

Test results showed that the blocks with the smallest slot size (2.5 cm) yielded higher noise reduction performance than those with larger slot size (5.0 and 7.5 cm). The shell thickness is also related with the noise reduction performance. The double shell type blocks with higher front shell, 5.0 cm in thickness, and the back shell at lower level, 10.0 cm in thickness, provided better noise reduction performance compared to other shapes. The blocks designed with the above configurations and application of cavity within the block achieved the best noise reduction at 430 Hz. When compared with the horizontal hollow blocks without cavity and ordinary hollow blocks, it was found that the newly designed blocks provided the better noise reduction performance in every frequency range. This was comparable to the calculated value based on Helmholtz resonator principle, particularly in the 315 - 500 Hz range. Overall, the noise reduction performance was 18 - 20 dB better than those of the blocks available in the market.