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Effectiveness of existing noise barriers: comparison between vegetation, concrete hollow block, and panel concrete

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Abstract

Noise barrier is used to shield receivers from noise especially road traffic noise. In Malaysia, there is lack of literature regarding noise barriers including the effectiveness of noise barrier that has been erected. This study investigates the effectiveness of existing noise barriers; vegetation, concrete hollow block and panel concrete at three urban residential areas in Klang Valley region. Insertion loss is used to identify the effectiveness of selected noise barriers. The finding indicates that panel concrete provides consistent insertion loss and exceed the minimum value of effective noise barrier followed by concrete hollow block and vegetation.

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Keywords: noise barrier; vegetation; concrete hollow block; panel concret;, insertion loss

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1. Introduction

Some noise reduction measures that are possible on existing roads including erect noise barriers and managing traffic. Noise barriers are solid obstruction built between the highway and residential areas. Noise barrier can be built out of wood, concrete, masonry, metal and transparent materials [1]. Noise barrier perform at its best if long enough and high enough to block the view of the road. However, the function of the noise barrier is only as noise reducer but not completely block the sound annoyance [1].

In order to evaluate the effectiveness of the noise barrier, insertion loss is used. Insertion loss is defined as differences between the measured sound pressure levels behind existing barriers and without barriers [2]. However, there is still a lack of research in noise barrier in Malaysia. Little attention has been carried out to the effectiveness of noise barrier that has been built. Thus this study was conducted to determine the effectiveness of noise barriers in urban residential areas in Klang Valley Malaysia in hoping to bridge the gap in the literature.

2. Material and method

The present study of effectiveness of noise barriers were conducted in urban residential areas in the city of Klang Valley, Malaysia. Three types of noise barriers were selected including vegetation, concrete hollow block, and panel concrete that were located adjacent Sungai Besi Highway, DUKE Highway, and KESAS Highway respectively. Noise level in 'A' weighting network was measured using the Sound Level Meter (SLM) which complies with the International Electrotechnical Commissioning (IEC) 61672 Class 1 standard. The SLM used was Blue Solo 01 model that has been manufactured by 01dB-Metravib.

Procedure for field measurements to determine insertion loss was based on the ISO 10847:1997 [3] and ANSI S12.18-1994 [4]. To determine the insertion loss of the barriers, indirect BEFORE method at an equivalent site were used. The method requires noise measurement at a site with a barrier to determine AFTER noise levels and another sets of measurements at an equivalent site without the presence of the barrier to determine the equivalent BEFORE levels. The BEFORE and AFTER sets of noise measurement for the indirect BEFORE method should be measured simultaneously to ensure the equivalent conditions of traffic and meteorology. However, it is hard to find an ideal equivalent site. Good engineering judgment should be used on whether or not the adjacent site without barrier is equivalent enough for ground surface or potential influencing factors.

The noise measurements were carried out for five days with two hours of monitoring during peak time (0700 to 0900, 1200 to 1400 and 1700 to 1900) as well as off peak time (2300 to 0100). These measurements were conducted for each sampling location with three sets of measurements. The data of number of vehicles and the composition of traffic were recorded for every 15 minutes.

The noise monitoring was carried out from 14 June 2011 until 17 July 2011. The meter was held 1.5 meter above the ground surface on the highway shoulder at a distance of 3 m from the pavement edge for both BEFORE and AFTER sets. All noise monitoring experiments were carried out under ideal meteorological condition with relative humidity, temperature and wind speed of sites varied from 76% to 93%, 26 to 29°C and 0 to 0.7 m/s.

3. Results and discussion

Fig. 1 illustrates insertion loss recorded during weekdays and weekends for different types of noise barriers.