A Field Evaluation of Speed Cushions

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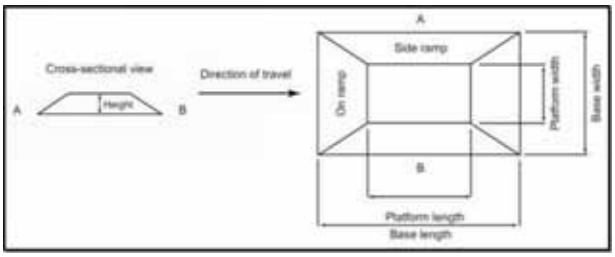
BACKGROUND

What is a Speed Cushion?

Speed cushions are an alternative to speed humps, which are found not to be user friendly to emergency vehicles and buses. Speed cushions were initially introduced in Germany and the theory was that they would cause less interference to wider vehicles such as buses and emergency vehicles, but still reduce the speed of cars. During some early studies, various layouts and dimensions were trialled to determine the optimum configuration. The width, height, length and on/off and side ramp gradients of the raised area vary between sites where speed cushions have been installed . Cushion layout types include single, pair, double-pair, three-abreast and various other combinations of features.



Recommended ranges of dimensions, based on the results of off-road trials at the Transport Research Laboratory and on-road trials in Sheffield and York, are:

- Side ramp gradient not steeper than 1:4;
- On/off gradients not steeper than 1:8 (or average gradient not steeper than 1:5 for a curved on/off ramp);
- Height not greater than 80mm (or 75mm for cushions constructed in situ and 65mm for narrow cushions);
- Maximum length of 3700mm;
- Maximum width of 2000mm (1600mm – 1700mm for bus routes).

RESEARCH OBJECTIVES

The objectives of this research were:

- To investigate road users' behaviours at speed cushions
- To examine different road configurations in relation to traffic behaviour at speed cushions
- To assess the environmental impacts of speed cushion installations, in particular the influence on noise.

RESEARCH METHOD

Fourteen sites in Tauranga were initially selected for this research, but one of them was later removed from the list due to the removal of speed cushions. The research involved:

- speed surveys (using rubber tubes)
- noise measurements (using a Modular Precision Sound Level Meter)
- observing road users' driving behaviours when travelling over the speed cushions (to obtain the rate of straddling the speed cushion to minimise its effects).

At the beginning of the scheme, in order to keep a consistent design and maintain convenience, it was decided to use the same cushion dimensions for all sites (i.e. 1:4 gradients for ramps, with 1.8m platform width, 3.7m platform length, and 75mm platform height and 200mm of base height for the thickness).

After the field survey, raw data were analysed to compare behaviour before-and-after at five sites and compare behaviour at eight sites after of speed cushions.

Additional analyses were also undertaken to identify the variance within and between different features of speed cushion installation. In particular, sites with or without pedestrian crossing facilities, and sites with or without previous speed humps were separated into two groups for comparison purposes.

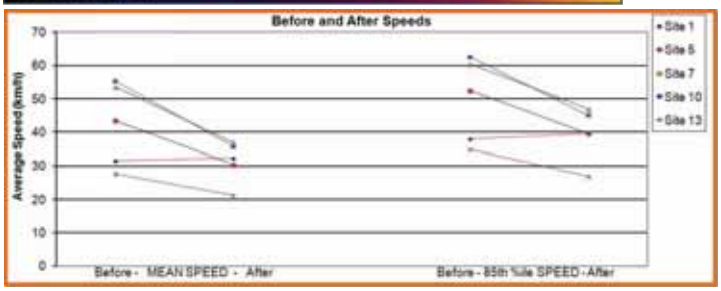
Furthermore, for the purpose of this scheme, physical objects are installed in the centre of the road wherever possible to discourage drivers straddling or crossing the centreline. But it is an interesting factor to examine if there are any differences regarding speed reductions between vehicles straddling speed cushions and vehicles travelling with either wheel in the gap among them. Therefore, this research defines straddling rate as drivers crossing speed cushions with both wheels over the top.

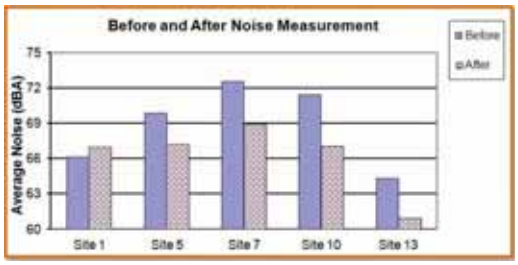
Offset Pair with side strips

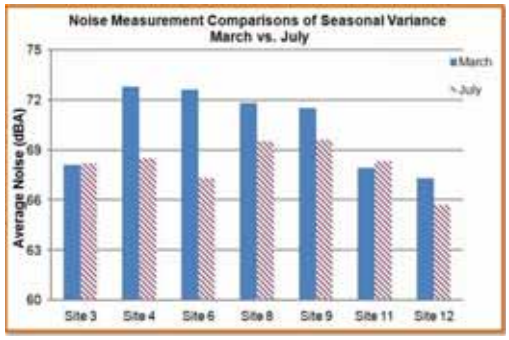
Pair and Offset Pair

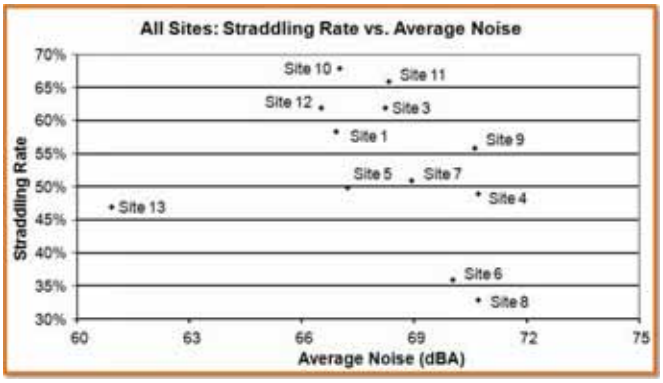
Three Abreast

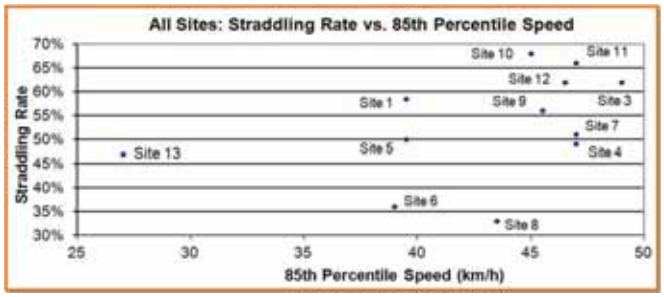
RESULTS











CONCLUSIONS

- There was a statistically significant speed reduction after speed cushion installation at five sites.
- Cross-sectional comparisons presented speed survey results at various configuration characteristics but no substantial differences can be clearly identified.
- Most of survey sites were in line with the expected average noise level at the same road surface and under the limit of the single event noise level thresholds.
- No clear trend of distinctive relationship was found between travelling speed and noise level.
- There is no evidence to claim adverse noise impacts due to the installation of speed cushions.
- Drivers do not appear to behave consistently when crossing over speed cushions. The straddling rate varies from 32% to 68% among all survey sites and there is a reasonable decreasing relationship between straddling rate and noise level.

Research Report for Details:
Huang, L. (2011). A Field Evaluation of Speed Cushions. MET Research Report, Department of Civil & Natural Resources Engineering, University of Canterbury, NZ