Quiet Surfacing Prioritisation Methodology

A report by the Director of Kent Highway Services to the Highways Advisory Board on 8th July 2008

Introduction

1. This paper sets out a methodology for prioritising the County Council's investment in quiet surfacing schemes and puts forward a robust and transparent process for determining the priority of re-surfacing quiet surfacing schemes within Kent. The prioritisation methodology considers both the potential noise benefits associated with re-surfacing a given section of road, the impact that will have on local residents and the cost of undertaking the resurfacing scheme; thus providing an indication of the cost-benefit of each scheme.

2. Road traffic noise is widely considered to be a genuine nuisance to those people who live, work and attend school or college in the vicinity of a culpable road(s). In the most prominent cases, constant or regular exposure to high levels of traffic noise can have a detrimental impact on the quality of life experienced by local people and can potentially result in a significant proportion of the population be bothered by it. Although KHS has no influence over vehicle tyre types or engine manufacturing, it can take steps to reduce vehicle type noise by specifying the type of road surface installed at a particular location and thereby seek to improve people's quality of life.

Road Traffic Noise

3. Noise is measured in units called decibels (dB). As traffic noise fluctuates continually, it is necessary to define it in a manner that can be related to the subjective response of those experiencing it. Attitude surveys have indicated a relationship between the annoyance caused by traffic and the sound level exceeded for 10% of the time during an 18 hour period between 0600 and 0000 (midnight). Road traffic noise is generated as vehicles travel along a road and is a major contributor to environmental noise exposure to premises, including residential properties, located nearby. The main sources of road traffic noise are:

   - Engine and Powertrain Noise; engine and vehicle exhaust noise tends to be the dominant source of noise when traffic is moving slowly, particularly when traffic comprises a large proportion of heave goods vehicles.
   - Tyre Rolling Noise: tyre noise is likely to be experienced when traffic is free flowing, especially at moderate to high speeds.
   - Body Rattle Noise: this noise occurs when a vehicle, particularly a heavy goods vehicle, passed over a traffic hump, pothole or sunken trench in the carriageway; thus causing the vehicle body, and sometimes its goods, to rattle.
   - Other Factors, these include; vehicle speed, volume of traffic, heavy goods vehicle composition, gradient of the road and surface type.

Predicting Noise

4. The proposed methodology for predicting road traffic noise is taken from an existing approach provided by the Department for Transport's (DfT) Calculation of Road Traffic Noise (CRTN). This method is based on acquiring accurate traffic information relating to the traffic composition and vehicle speeds over set period. Additional information is also collected and includes; road gradient and surface type and can be acquired using the JCAM (carriageway condition survey) technology. The CRTN deems that valid noise prediction levels can be made within 300m of a road; therefore this determines that properties within this distance of a targeted road will be included.

5. The proposed methodology also provides an ability to measure the influence of the road surface on noise generation and allows for a comparison of different surfaces and standard measurement conditions. This approach has been incorporated into the noise test provided by the Highways Authorities Product Approval System (HAPAS) and is currently used in the UK for the approval and certification of road surfacing products for use on public roads. Therefore, a comparison can be made for given road surface type against that for a standard Hot Rolled Asphalt (HRA) surface.

Impact of Surface Type on Road Noise

6. Studies have shown that surfaces with a smaller aggregate size are quieter. This is as a result of the different vibrating frequency as the tyres pass over the surface. For example, a surface dressing with a 6mm aggregate has been shown to be approximately 2dB(A) quieter than one with a 10mm aggregate and approximately 2.5dB(A) quieter than one with 14 mm aggregate. It should be noted, however, that in some cases of surface dressing, by reducing the aggregate size, a loss of durability may occur. Modern TSCS (also know as Quiet Surfacing) can be significantly quieter than dense HRA and surface dressed surfacing of the past. The influence of a road surface on noise will also be determined by vehicle speed; generally speaking, the greater the vehicle speed, the greater the level of noise reduction.

Safety

7. TSCS provides a surface that is safe under wet skidding conditions as water on the road can escape from beneath the tyre patch through interstices in the surface as well as the texture depth and type tread. There are no known incidences of higher rates of pedestrian crashes as a result of quieter surfacing being applied.

Proposed Quiet Surfacing Assessment Methodology

8. The proposed methodology also seeks to quantify the proportion of people “bothered” by road noise. The Highways Agency’s Design Manual for Roads and Bridges (DMRB) provides industry standard noise nuisance levels for human response to noise. It provides the percentage of people annoyed by road traffic noise, defined as ‘bothered very much or quite a lot’. The relationship between nuisance and noise is based upon research undertaken by TRL. Using this relationship, the total number of people bothered by road traffic noise in a given scenario can be predicted.

9. Information relating to the existing road surface can be acquired via the JCAM carriageway condition survey and integrated with the noise reduction level at the analysis stage in order to determine the scope of reducing road traffic noise. The key stages of the assessment methodology comprise:

   - Based upon the predicted noise level, noise nuisance levels for each receptor would be calculated using the tables contained within DMRB. For residential properties an average occupancy of 2.36 would be assumed. Where schools are present the approximate number of pupils would be confirmed.
   - The total number of people bothered by noise would be calculated for the two scenarios and compared.
   - The cost of resurfacing the road would be calculated and divided by the reduction in people bothered by road traffic noise for each scheme.
   - All sites proposed for resurfacing are then ranked with those providing greatest noise benefits and lowest cost being preferable to those with least noise benefits and highest costs.
   - The priority list will be presented to the Highways Advisory Board on an annual basis for their recommendation to approve the programme of works.

10. In order to rigorously test and calibrate the proposed methodology and the noise prediction model component, a brief Pilot Study is recommended. The study is planned for the Summer 2008 and will identify two suitable roads and seek to quantify potential noise reduction levels at each site and prioritise where investment should be made based on the reduction in people bothered and the cost-benefit at each scheme. If supported, the results of the survey will be presented to the HAB.

Conclusions

11. The Highways Advisory Board views are requested on the proposed methodology for prioritising quiet surfacing schemes and that it supports a Pilot Study, which will run during the Summer 2008.

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