MEASUREMENTS ON A NOISE BARRIER
CONSTRUCTED OF ONDULINE

By A.R. Whatmore - Consulting Engineer
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Submitted to:

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Noise measurements have been conducted on a barrier material called "Onduline" which is manufactured by O.F.I.C. (GB) Ltd. Its effectiveness as a traffic noise barrier has been assessed by noise data taken at the side of a dual carriageway at Ringwood Hampshire. Measurements were taken before and after the erection of the barrier so that a direct comparison could be made. The results showed that the Onduline barrier reduced the $L_{10}$ noise level from traffic by 7 dB(A) at the measurement position. For concrete barriers, the predicted $L_{10}$ noise reduction using the D.O.E. publication (1) was 8 dB(A). The conclusion is that the "Onduline" noise barrier is as effective as a concrete noise barrier of the same dimensions.
1.0 INTRODUCTION

This report describes a traffic noise survey that was carried out by the Wolfson Unit for Noise and Vibration Control on behalf of O.F.I.C. (GB) Ltd. The object was to test the suitability of their Onduline material as a traffic noise barrier. Noise tests were carried out at Ringwood, Hampshire, in Parsonage Barn Lane which runs parallel to the A31(M). Two visits were made to Ringwood: the first was on Thursday, 10th November 1977 when there was no barrier and the second on 14th June 1978 when the barrier was in position.

The tests were conducted between 10 a.m. and 4 p.m. with $L_{10}$ dB(A) readings being taken hourly for a continuous period of 15 minutes. Traffic flow measurements were also made during the recording periods.

The construction of the barrier and the test site are briefly discussed, together with the instrumentation and test procedure. The performance of a concrete barrier of the same dimensions has been calculated (reference 1) and is compared with the measured performance of the Onduline barrier.

* $L_{10}$ dB(A) is a standard index for measuring traffic noise and relates to the noise level exceeded for 10% of a specified time period.
2.0 DESCRIPTION OF BARRIER AND TEST SITE

2.1 Barrier
Onduline is a lightweight corrugated flexible sheeting material manufactured from bitumen combined with mineral and vegetable fibres, saturated at high temperature. Its surface weight is 4.4 kg/m².

The barrier comprised a sheet of Onduline nailed to each side of a 5cm (2") wooden support framework (8.8 kg/m²). The height was approximately 2 metres. Timber vertical support was at 2½ metre intervals approximately. There were no gaps in the structure and the overlap of the sheets was staggered on opposite sides of the barrier.

2.2 Test Site
The test site was situated at Parsonage Barn Lane, Ringwood. This road is a cul-de-sac which runs parallel to the newly opened A31(M), as shown in Figure 1. The microphone was placed on the roadside furthest from the motorway mid-way between the brickwall, at the eastern end of the Lane, and the public house at the entrance to the Lane. Weather conditions were calm and dry.
3.0 INSTRUMENTATION AND TEST PROCEDURE

Noise readings were taken using calibrated precision grade equipment. For the November tests, a CEL 134 statistical noise level meter was used, and in June a B & K noise analyser (type 4426) was employed. Hourly readings were taken during the period 10.00 a.m. to 4.00 p.m. Each measurement was of 15 minutes duration and data were recorded in terms of $L_{10}$ dB(A).

The number of heavy and light vehicles which passed the measurement position were recorded on hand counters.
4.0 RESULTS

Table I shows the results obtained for both measurement sessions. Without the barrier, the average noise level was $L_{10} = 72.7$ dB(A) for an average of 83 heavy vehicles and 333 total vehicles per 15 minutes. The hourly flow rate is equivalent to 332 and 1332 vehicles, respectively. The heavy vehicle flow is 25% of the total. With the barrier in position the measured average noise level was $L_{10} = 65.4$ dB(A). (Data for the 3.00p.m. and 4.00 p.m. periods were not obtained due to interference from a nearby noise source). The average flow rates were 71 heavy vehicles and 387 total vehicles per 15 minutes. This corresponds to 284 heavy vehicles and 1548 total flow per hour with an 18.5% flow of heavy vehicles.

In order to make a direct comparison with and without the barrier in position, two corrections need to be made to one set of data. These are, firstly, a correction to equalise the total flow rate, and secondly a correction to equalise the percentage of heavy vehicles. These adjustments are given in a government publication entitled "Calculation of Road Traffic Noise" (reference 1) in charts 3 & 4. Table II gives details of this normalising procedure, with respect to the "no barrier" situation. The total hourly flow rate correction is $-0.5$ dB(A) and the percentage of heavy vehicles correction (at 100 kph) is $+0.8$ dB(A). These corrections are made to the "with barrier" noise level. The normalised noise level for the "with barrier" situation is therefore $L_{10} = 65.7$ dB(A) (as shown in Table II).

The overall effect of the barrier has been to reduce the noise from the motorway traffic in terms of $L_{10}$ from 72.7 dB(A) to 65.7 dB(A). This represents an overall barrier attenuation of 7 dB(A).
5.0 INTERPRETATION

In order to judge the overall cost/acoustic effectiveness of the Onduline barrier the attenuation of a similar concrete barrier needs to be considered. Again, use is made of the government publication on traffic noise (reference 1). Figure 2 shows a cross-section of Parsonage Barn Lane and the dual carriageway. A barrier of height 1.8 metres has been drawn on.

Using Chart 9 of reference 1, and referring to figure 2, the direct sight line between microphone and noise source is just broken by the embankment. (For noise prediction purposes, the distributed noise sources across the carriageway are assumed concentrated along a line parallel with the roadway at a distance of 3.5 metres from the edge of the nearside carriageway and at a height of 0.5 metres). Consequently, with the barrier absent, the noise at the microphone position would be reduced by the embankment by about 5 dB(A). This value has been obtained from Chart 9 at the transition point between the illuminated zone and shadow zone. With the barrier present, the predicted attenuation would be 13 dB(A) (based upon path difference). Thus the effect of erecting a concrete barrier would be to reduce the traffic noise by $L_{10} = 8$ dB(A). This figure can be directly compared with the attenuation provided by the Onduline barrier of 7 dB(A).
6.0 CONCLUSIONS

As a result of the noise measurements taken, the following conclusions are given:-

6.1 The measured noise attenuation of the Onduline barrier was \( L_{10} = 7 \text{ dB(A)} \).

6.2 The predicted noise attenuation of a concrete barrier of equivalent dimensions would be \( L_{10} = 8 \text{ dB(A)} \).

6.3 Within experimental error, both types of barrier give essentially the same reduction in traffic noise. The minimum surface weight of 3.8 kg/m\(^2\) for the Onduline barrier must be maintained.
REFERENCE

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WITH OASULINE BARRELS (14 Tus 1977)
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<td>1332</td>
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<td><strong>With Onduline Barrier</strong></td>
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<tr>
<td>$L_{10}$ dBA</td>
<td>-0.5 dBA</td>
<td>+0.8 dBA</td>
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**Normalised "With Barrier" Noise Level ($L_{10}$)**

$$65.4 \text{ dBA} - 0.5 \text{ dBA} + 0.8 \text{ dBA} = 65.7 \text{ dBA}$$

**Effect of Barrier ($L_{10}$)**

$$72.7 \text{ dBA} - 65.7 \text{ dBA} = 7 \text{ dBA}$$

**Table II** Noise Data Normalisation.
Figure 2. Representation of Cross-Section Showing Position of Overlying Barrier.