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Occupational noise exposure at the Guide Dogs for the Blind Association training centre, Forfar

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ABSTRACT

The paper reports on the findings of a series of measurements of occupational noise exposure at the new Guide Dogs for the Blind Association guide dog training centre at Forfar, Angus. Hepworth Acoustics were commissioned to investigate the noise exposure of dog care staff working in close proximity to guide dogs in training, with particular focus on one of the four kennel blocks at the site where noise levels were higher than in the others.

The first phase of the work consisted of a series of noise and reverberation time measurements at a number of locations around the training centre in order to quantify the noise environment in kennel blocks. Following on from these measurements, an assessment of occupational noise exposure in line with the Control of Noise at Work Regulations, 2005¹ was prepared including recommendations to reduce noise levels and improve the acoustic environment in the noisiest kennel block.

Following implementation of the recommended noise control measures, a further assessment of employee noise exposure was carried out, including detailed noise dose measurements of staff working throughout the training centre and follow-up reverberation time measurements.

1. INTRODUCTION

The Guide Dog Training Centre at Forfar, was the first of a new generation of training centres to be opened by the Guide Dogs for the Blind Association. These new training centres provide a large atrium at the centre of the building which is used for dog training, and the dogs are accommodated in four large kennel blocks at the corners of the building. Each kennel block houses up to around 30 dogs at a time with two to three dogs to a pen. The dog accommodation at the new training centres has been designed to be open plan specifically in order to promote dog socialisation.

Dog care staff are responsible for feeding the dogs, and cleaning out and maintenance of the kennel blocks. They spend much of their working day in the kennels and are intermittently exposed to the noise of dogs barking.

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Hepworth Acoustics Ltd was commissioned by GDUK Ltd to carry out an assessment of occupational noise exposure of dog care staff and to provide advice on options to reduce noise levels where necessary/feasible in line with the Control of Noise at Work Regulations, 2005.

2. INITIAL SITE VISIT AND ASSESSMENT

A. Short term noise measurements

Noise levels were measured in terms of short term 'A' weighted 'equivalent continuous noise levels', L_{Aeq} as these directly relate to $L_{EP,d}$ and $L_{EP,w}$. Octave band frequency analysis was also carried out. Measurements of Peak sound pressure levels, L_{Cpeak} , were also made.

The noise climate in the kennels is characterised by long periods of fairly modest noise levels interspersed with comparatively short periods of very high noise levels when the dogs are barking. When staff first enter the kennels in the morning, very high noise levels occur due to most dogs barking. During and after feeding and when some dogs are removed to the outdoor runs, noise levels reduce. The typical range of noise levels experienced by staff working in the kennels are given in Table 1 below.

Table 1: Measured short term noise levels.

Kennel Block Name	Range of Measured Short Term Noise Levels - dB	
	L_{Aeq}	L_{Cpeak}
Glen Esk	73 – 102	94 – 120
Glen Prosen	62 – 100	98 – 119
Glen Clova	58 – 98	87 – 118
Glen Moy	79 – 93*	110 - 116

* Noise measurements did not take place in Glen Moy until after the end of the initial noisy morning period

The highest levels were measured when all of the dogs were barking. However, even with only half of the dogs barking, noise levels were not significantly lower. With only three or four dogs barking in a given kennel, noise levels could still be as high as 95 dB L_{Aeq} . The lower action peak sound pressure level was not exceeded during the noise measurements.



Figure 1: Dog care staff at work in kennels

It was clear from the measurements that the highest noise levels (with all dogs barking) in each of the kennels were very similar, with marginally higher levels experienced in Glen Esk kennel block. Glen Esk kennel block is a double height room with a viewing window for visitors at first floor level and an exposed soffit. The other kennel blocks are single storey with a suspended ceiling.

It was reported that only a short period of exposure without hearing protection to the very high noise levels generated when all or most of the dogs are barking results in daily noise exposure in excess of the lower and upper exposure action levels as defined in the Control of Noise at Work regulations, 2005. This is illustrated in Table 2 below:

Table 2: Duration of exposure required to reach action level

Noise Level L_{Aeq} dB	Duration of Exposure (minutes)	
	Lower Action Value – 80 dB $L_{EP,d}$	Upper Action Level – 85 dB $L_{EP,d}$
102	3	9.5
100	5	15
98	7.5	24

Table 2 shows that exposure to a level of 102 dB L_{Aeq} for a period of just 3 minutes would result a daily personal noise exposure at the lower action value. Only 9.5 minutes exposure is required to reach the upper action value. For noise levels lower than 102 dB L_{Aeq} the corresponding exposure times are longer.

The figures in Table 2 demonstrate that the lower and upper action values can be exceeded with only brief exposure to the level of noise generated when all or most of the

dogs are barking in the kennels. This, together with the relative unpredictability of the occurrence of the dogs barking, means that there is a risk of staff being exposed to noise levels above the lower and upper action values during any shift unless hearing protection is worn at all times when in any of the kennels.

B. Reverberation time measurements

Noise levels in Glen Esk kennel block were found to be generally higher than in the other kennel blocks. Furthermore, the acoustic environment in Glen Esk was subjectively less desirable during periods when dogs were barking. This was clearly the result of the double-height room and absence of the suspended ceiling.

In order to quantify the effect on the acoustic environment of the larger room volume and absence of suspended ceiling, a series of reverberation time measurements were carried out in each of the kennels.

Figure 2 summarises the results of the reverberation time measurements in each of the four kennels:

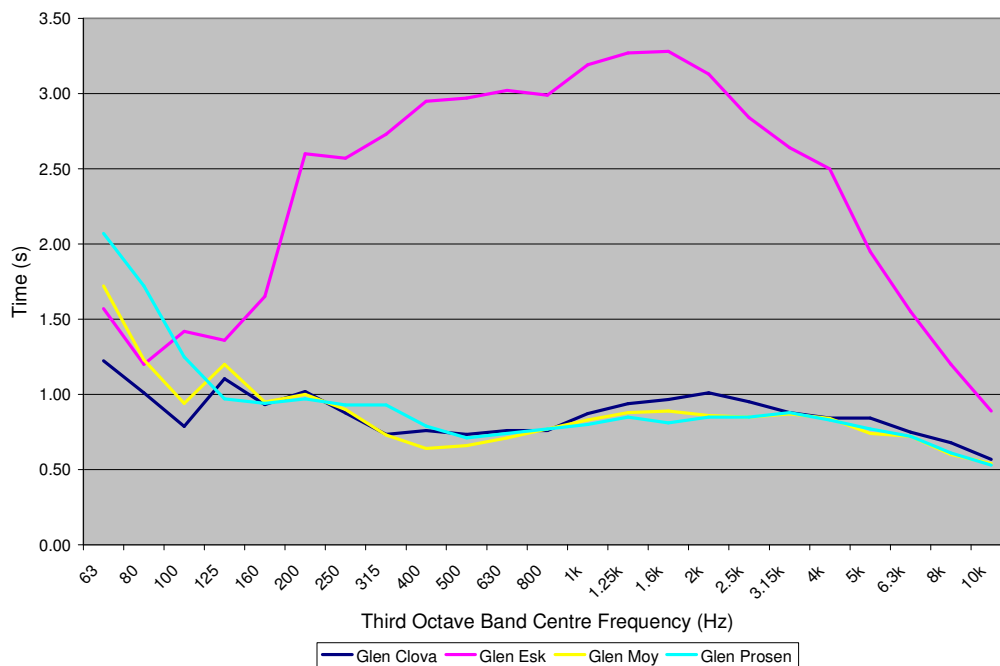


Figure 2: Kennel reverberation times

The reverberation time in Glen Esk was found to be substantially higher than in the other kennels, particularly in the mid to high frequency range. The reverberation times in the other kennels were very similar, as one would expect given the near identical layout and room finishes.

C. Hearing protection zones

In accordance with the current Regulations, there is a requirement to demarcate all kennels as Hearing Protection Zones.

Hearing protection made available in the kennels was in the form of semi-aural banded ear plugs. Using the manufacturer's published data we calculated that these ear plugs were capable of providing the necessary protection to control employee noise exposure. However, due to the potential variability of noise exposure, we recommended that employees are provided with alternative inner aural banded earplugs to provide additional protection.

D. Options to reduce noise exposure

In line with the requirement on employers to reduce noise exposure levels, where reasonably practicable, other than by provision of ear protectors, options to reduce noise were investigated.

The open-plan layout of the kennels at the training centre has been designed in order to provide an accommodation environment for the dogs which encourages socialisation with other dogs and this was a key design feature of the new centre. However, with this layout, dogs in all parts of the kennel block have a view of dogs in adjoining kennels and of dog care staff at all times which results in more dog barking than would otherwise occur if the layout was not open-plan.

Also, in all of the kennels, there is a requirement for the floors and base of the walls to be hard wearing and washable. As such, it was not considered feasible in the kennels with the suspended ceiling to significantly increase the amount of acoustic absorption thereby reducing reverberant noise levels. However, in the more reverberant Glen Esk, where noise levels were demonstrably higher and of a more unpleasant character, the introduction of additional absorption was recommended.

We understood that, due to the viewing window at first floor level in Glen Esk, it was not feasible to install an acoustic suspended ceiling at the same height as in the other kennels. Nevertheless, in order to increase the amount of absorption in Glen Esk, the following measures were recommended:

- Install a highly absorptive acoustic ceiling (i.e. $\geq 0.9 \alpha_w$) below the soffit, leaving as large a gap as possible filled with mineral wool; and
- Fix acoustically absorbent (i.e. $\geq 0.9 \alpha_w$) wall tiles to the walls above the height of the existing ceramic tiles.

Some calculations were undertaken to determine the likely improvement in reverberation time that could be expected with the introduction of additional absorption in Glen Esk. Figure 3 shows the measured reverberation time in Glen Esk and the potential reverberation time with the installation of the additional absorption:

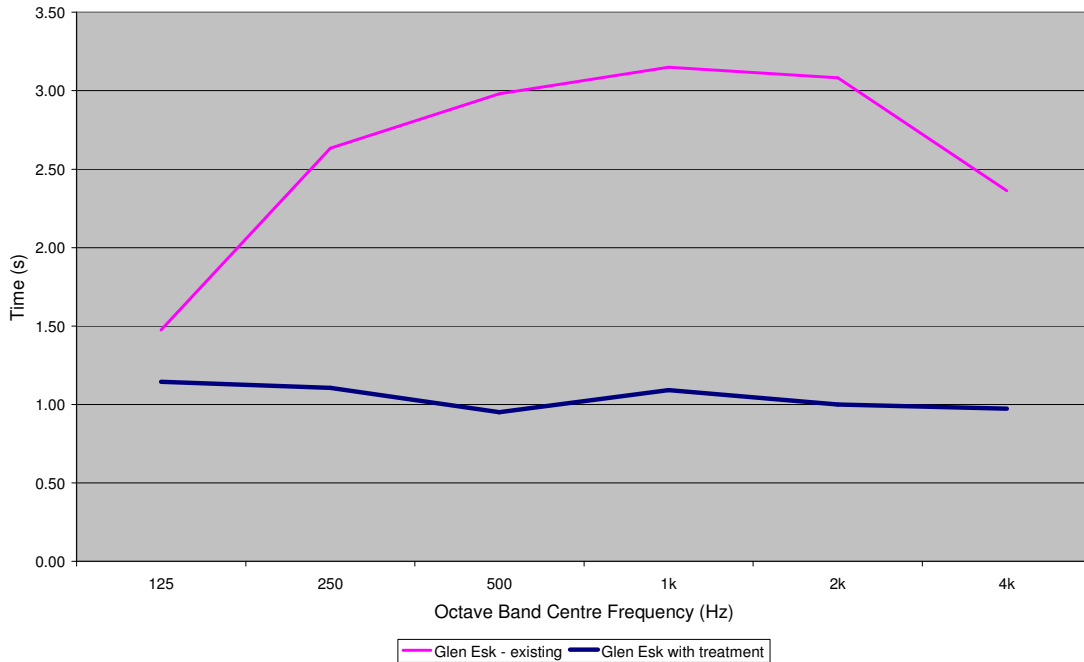


Figure 3: Calculated potential effect of acoustic absorption in Glen Esk

2. FOLLOW-UP SITE VISIT

Following submission of our first report, GDUK installed the additional acoustic absorption recommended in Glen Esk kennel block. Following completion of the works, which comprised the installation of Rockfon Koral and Rockfon Boxer acoustic panels, Hepworth Acoustics were instructed to return to carry out some follow-up noise and reverberation time measurements to determine what improvements had been achieved and to carry out some more detailed noise dose measurements on dog care staff.

A. Noise Dose Measurements

The $L_{EP,d}$ of a total of 10 members of the kennel staff (eight employees working the early or intermediate shift and two employees on the late shift) were undertaken on 4th September 2008. The measurements were carried out on two members of staff working in each of the four kennel blocks during the early/intermediate shifts and for both members of staff working the late shift.

The results of the dosimeter measurements are set out in Tables 3 and 4 below.

Table 3: Results of Dosemeter Measurements – Early/Intermediate Shift

Location	Dog Care Staff Member	Measured/Calculated Noise Levels dB	
		$L_{EP,d}$	L_{Cpeak}
Glen Esk	Staff Member A	85	146*
	Staff Member B	80	125
Glen Prosen	Staff Member C	82	126
	Staff Member D	82	130
Glen Clova	Staff Member E	84	126
	Staff Member F	86	133
Glen Moy	Staff Member G	84	134
Intake	Staff Member H	82	130

*- considered anomalously high

Table 4: Results of Dosemeter Measurements – Late Shift

Location	Dog Care Staff Member	Measured/Calculated Noise Levels dB	
		$L_{EP,d}$	L_{Cpeak}
Glen Moy/Esk	Staff Member I	83	128
Glen Prosen/Clova	Staff Member J	82	129

Tables 3 and 4 show that all staff were exposed to noise at or above the lower action value of 80 dB $L_{EP,d}$. Furthermore, two members of staff were exposed to noise at or above the upper action value of 85 dB $L_{EP,d}$. Figure 4 shows a sample time trace of staff noise exposure in terms of consecutive 10 minute L_{Aeq} values. This indicates that the $L_{EP,d}$ exposure values for staff are the result of intermittent exposure to high noise levels from dog barking.

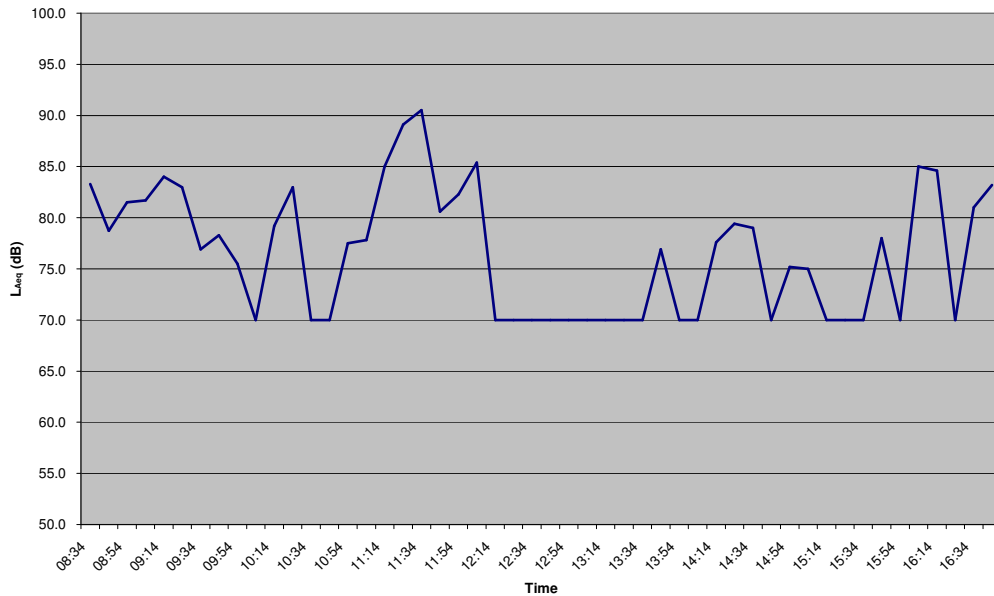


Figure 4: Noise exposure time trace of Staff Member D (intermediate shift)

In general, the highest measured peak noise levels were below the lower action value of 135 dB L_{CPeak} . The dosimeter fitted to one member of staff (Staff member A) indicated peak noise levels of up to 146 dB L_{CPeak} , however this was considered anomalously high and possibly due to the dosimeter microphone impacting on hard surfaces etc.

Some noise measurements carried out in close proximity to barking dogs with a sound level meter indicated that peak noise levels from dogs barking were generally in the range 125 – 130 dB L_{CPeak} which is below the lower action value for peak noise.

It is interesting to note that, in general, staff working in Glen Esk were not exposed to higher noise levels than those working in the other kennels which have a low suspended ceiling.

In addition to dosimeter measurements, a series of short term noise measurements and reverberation time measurements were carried out in Glen Esk kennel to evaluate the improvement in acoustic environment following completion of the remedial works.

As before, noise levels were measured in terms of short term 'A' weighted 'equivalent continuous noise levels', L_{Aeq} during the period immediately following staff entering the kennel in the morning (the noisiest time of the day). The noise levels were measured at the centre of the kennel block for short periods from the first entry to the kennel in line with the measurements carried out in January 2008. A comparison of the pre and post remedial works noise levels in Glen Esk are shown in Table 5:

Table 5: Noise Measurements in Glen Esk – before and after remedial works

Date	Measured Noise Levels upon first entry (dB)
	L_{Aeq}
January 2008 – before remedial works	102
September 2008 – post remedial works	98

Table 5 shows that there has been a 4 dB reduction in average noise levels in Glen Esk as a result of the remedial works to install acoustically absorbent wall and ceiling tiles.

B. Follow-up reverberation time measurements

Figure 5 shows a comparison of the measured reverberation times in Glen Esk pre and post remedial works:

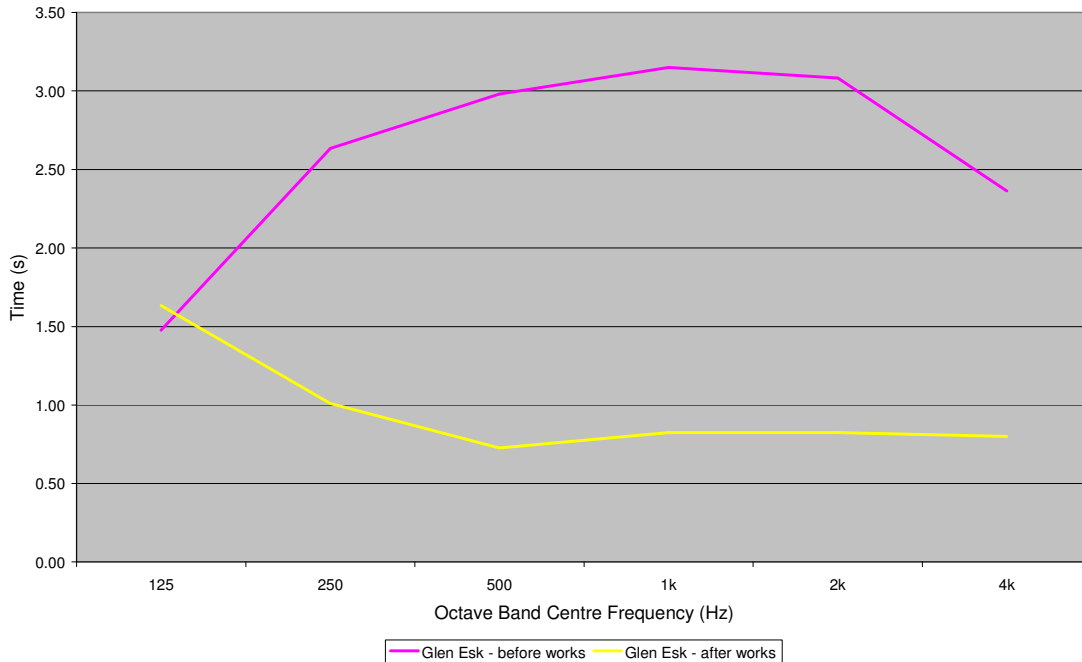


Figure 5: Kennel Reverberation Times

Figure 5 shows that the reverberation time in Glen Esk has been dramatically reduced following completion of the remedial works to install absorbent wall and ceiling tiles, particularly at high frequencies. From 500 Hz upwards, the reverberation time in Glen Esk is now lower than the reverberation time measured in the single-height kennel blocks. This accounts for the significant improvement in the subjective acoustic quality within Glen Esk that had been reported by the staff.

Figure 6 shows Glen Esk with the newly installed absorptive panels on the upper sections of the walls and under the soffit:



Figure 6: Glen Esk kennel block with additional absorption installed

The only remaining option to reduce employee exposure to noise would involve installing additional solid panel partitions between individual pens in the kennels in place of the steel fencing currently in place. Increasing the height of the partitions would also help to prevent dogs being able to see other pens by standing on the hind legs. This would reduce the direct sound from dog barking at any given position within the kennel and may help to reduce the amount of dog barking by limiting the view between pens. However, it is important for the Guide Dogs for the Blind Association to retain the open-plan kennel layout which provides a sociable and stimulating environment for the dogs.

References:

1. Statutory Instrument 2005 No. 1643 *The Control of Noise at Work Regulations 2005*, ISBN 0110729846