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PROPOSED NOISE CRITERIA FOR THE HSE GUIDANCE ON POP CONCERT SAFETY

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1. INTRODUCTION

At the end of October 1991, the draft guide[1] to the health, safety and welfare at pop concerts was published by the Health and Safety Commission and the Home Office. As the title suggests the guidance provides advice on all important aspects of setting up a safe system of work for the organisation of a pop concert. The document is at present in its consultation stage with a view to publication in Spring or early Summer 1992.

Travers Morgan Environment was asked by the Health and Safety Executive (HSE) to give advice at the drafting stage on the section relating to sound and noise. Four areas were addressed:

i. Environmental noise
ii. Audience exposure
iii. Worker exposure
iv. Control procedures

This paper presents the suggested guidelines and gives the methodology behind the recommendations. The impact of these guidelines on pop concerts has been discussed in an earlier paper[2], however a summary of the results has also been included for completeness.

2. ENVIRONMENTAL NOISE GUIDELINES

A fair balance between the rights of people to enjoy themselves against the rights of people not to be unduly disturbed has to be reflected in the choice of criteria. A number of objective and subjective factors need to be considered such as the proximity of housing, the background noise levels, event noise levels, the frequency of the events, the timing of the concert, the use of control procedures and individual sensitivity and preferences.

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Taking account of these objective and subjective factors and on the basis of experience at numerous events the following recommendations were made:

1. At concerts held on only one day per year at a particular venue.

   i) The L_{Aeq} measured for any 15 minute period of the concert or rehearsal, the Event Noise Level (ENL) at a Noise Sensitive Receiver (NSR) should not exceed the Background L_{Aeq} Noise Level (BNL) by more than 20 dB(A) between 0900 hours and 2300 hours. The BNL is measured during a comparable period when no concert or rehearsal is in progress.

   ii) Between the hours of 2300-0900 the ENL at a NSR should not exceed the BNL.

2. Concerts held on more than one day but not exceeding 12 concerts per year at a particular venue.

   i) The ENL at a NSR should not exceed the BNL by more than 10 dB(A) between 0900 hours and 2300 hours.

   ii) Between the hours of 2300-0900 the ENL at a NSR should not exceed the BNL.

3. Concerts held on more than 12 days per year at a particular venue.

   i) The ENL at a NSR should not exceed the BNL between 0900 hours and 2300 hours.

   ii) Sound from the venue should be inaudible within any habitable building between 2300-0900 hours

An increase of the order of 20dB(A) for 'one-off' concerts has been found to be acceptable with minimal report of complaints at places such as Maine Road, Cardiff Arms Park and Crystal Palace Park. The 10dB(A) increase has been successfully adopted at numerous events[3][4].

The recommended guidelines above have been modified in the draft guidance in terms permitted exceedence of background which in itself has been changed to L_{A90} levels to be consistent with BS4142 : 1990[5]. An absolute L_{Aeq} value of 75dB(A) has also been included as a maximum level not to be exceeded.

3. WORKERS EXPOSURE GUIDELINE

All people employed to work at pop concerts are covered by the Noise at Work Regulations 1989. The Regulations place duties on employers where an employee is likely to be exposed to noise at or above three action levels. Duties are also placed on the self-employed. An example of the main employers at concerts include the promoter, the production company, the licensee, the performers and the licensing authority.

The three action levels are given below and the personal noise exposure ($L_{EP,d}$) is defined as the total exposure over the working period.

1st Action Level - A daily personal noise exposure ($L_{EP,d}$) of 85dB(A)
2nd Action Level - A daily personal noise exposure ($L_{EP,d}$) of 90dB(A)
Peak Action Level - A peak sound pressure of 140dB

Where an employee is exposed to levels at or above the action levels, the employer must provide training and instruction on aspects such as: the risk of high sound levels on hearing, remedial measures that can be taken, the use of ear protectors and the employees obligations under the Regulations.

4. AUDIENCE EXPOSURE GUIDELINES

Members of the audience can be exposed to the similar high sound levels that are experienced by some employees working at concerts. The audience are not covered by the Noise at Work Regulations and other factors must be considered when setting an exposure guideline. Such factors include the audience's expectation for high sound levels, the audience attend the event voluntarily and pay an admission fee for the entertainment. On the other hand people should not be exposed to unnecessarily excessive sound levels.

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Given the above factors, the potential risk of hearing damage versus the enjoyment value is not unsimilar to the inherent risks of smoking. Guidelines have therefore been proposed on the basis that there is an accepted potential hazard to hearing but that members of the audience are informed of the risks.

The following guidelines have been proposed:

1. In any public area, the event L_{Aeq} (from the start of the 1st act to the finish of the last act) should not exceed 104dB(A).

2. In any public area, the peak sound pressure should not exceed 140dB.

3. Members of the audience should not be allowed within 3 metres of an operational speaker.

4. If the event L_{Aeq} is likely to exceed 96dB(A), promoters should ensure that information on sound levels and potential hearing damage risks is given to the audience.

The exposure limit of 104dB(A) was derived from an attendance pattern of an individual attending a 2 hour concert every week for 10 years. This exposure time equates to a Noise Immission Level (NIL) equal to a first action level of an L_{Aeq} of 85dB(A) for eight hours over forty years.

The event L_{Aeq} of 96dB(A) given the above attendance pattern would reduce the risk of 30dB hearing loss to less than 5% at the age of 60 years for otologically normal persons[7].

5. IMPACT OF PROPOSED AUDIENCE GUIDELINES

A survey of sound levels recorded at eighteen varied pop concerts was carried out for the Health and Safety Executive and reported in an earlier paper[2] and HSE Research Report. A summary of the results are shown in Tables 1 and 2 which compare the event L_{Aeq} sound levels with the proposed audience exposure criteria and the guidance given in the GLC Code of Practice[8] (L_{Aeq} of 93dB(A) over an eight hour concert).

The results show that 61% of the concerts in the study exceeded the proposed HSE L_{Aeq} guideline of 104dB(A) over the period of the concert. 22% of the events exceeded the unweighted peak sound pressure limit of 140dB. When assessing the survey results against the GLC guidelines only 1 out of the 18 concerts met the recommended limit.

The enforcement of the proposed guidelines would mean that a reduction in sound level would be required for a majority of Rock, Pop, Rap and House type music. The magnitude of the reduction is dependent upon the performer but the proposed guideline was achieved by one or more artistes during the survey for each type of music. A significant reduction in sound levels would be required for nearly all music types for the GLC audience exposure limits to be met.

6. REFERENCES

1. Guide to Health, Safety and Welfare at Pop Concerts and other similar events : draft document, HSE : October 1991.
2. Audience Exposure to Sound at Pop Concerts and the Impact of Proposed Guidelines, J E T Griffiths and J G Staunton, Proc.IOA Vol 13 Part 7 1991.
3. Noise Control Techniques and Environmental Guidelines for Open Air Pop Concerts : J E T Griffiths, Proc.IOA 1985.
4. Revised Environmental Noise Guidelines for Pop Concerts : J E T Griffiths and S S Kamath, Proc.IOA 1987.
5. Method for Rating Industrial Noise affecting Mixed Residential Areas : BS4142 : 1990.
6. Noise at Work Regulations, HSE : 1989.
7. Tables for the estimation of hearing impairment due to noise for otologically normal persons and for a typical unscreened population, as a function of age and duration of exposure : D Robinson, HSE Contract Research Report No 2/1988.
8. Code of Practice for Pop Concerts, GLC, 1985.

7. ACKNOWLEDGEMENTS

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Table 1 - Statistical Analysis of Results at the Barrier

Concert Type	Sample Size	L_{Aeq}				Lp			
		mean	range	SD	% above 104dBA	mean	range	SD	% above 140dB
All Concerts	18	104.7	94.4 - 113.0	4.7	61	135.7	122.9 - 146.0	6.3	22
Rock	7	106.1	102.9 - 109.9	2.6	86	137.8	132.3 - 141.1	3.0	14
Pop	5	105.9	101.6 - 113.0	4.5	60	136.6	131.3 - 146.0	5.6	20
MOR	3	97.2	94.4 - 98.8	2.5	0	124.7	122.9 - 126.6	1.9	0
Rap	2	107.4	102.8 - 112.0	6.5	50	141.8	141.1 - 142.5	1.0	100
House	1	106.0	-		above	137	-	-	below

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TABLE 2 - Comparison of Concert L_{Aeq} with GLC Guidelines

Concert ID	GLC L_{Aeq} Limit*	Concert L_{Aeq}#	Comments	Conclusions
1RI	97.8	104.6	exceeded	17 out of 18 concerts (94%) exceeded the GLC guideline limit
2RO	95.0	99.8	exceeded	
3RI	96.9	105.2	exceeded	
4RO	93.1	102.0	exceeded	
5RO	92.1	94.0	exceeded	
6RI	98.3	109.9	exceeded	
7RI	96.8	104.3	exceeded	
8PO	94.1	97.5	exceeded	
9RI	97.2	105.0	exceeded	
10PI	97.8	113.0	exceeded	
11PI	97.8	102.8	exceeded	
12PI	98.8	101.6	exceeded	
13MI	97.1	98.5	exceeded	
14MI	98.4	98.8	exceeded	
15MI	97.5	94.4	limit met	
16AI	99.0	112.0	exceeded	
17AI	97.3	102.8	exceeded	
18HI	97.0	106.0	exceeded	

* Permissible concert L_{Aeq} for compliance with the GLC limit of an L_{Aeq} of 93dB(A) for an 8 hour concert

\# For outdoor concerts the mixer L_{Aeq} has been used, for indoor events the barrier L_{Aeq} is used for the comparison

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