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AUDIENCE AND EMPLOYEE EXPOSURE TO SOUND AND NOISE AT POP CONCERTS

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1. INTRODUCTION

1. The Health and Safety Commission (HSC) transferred responsibility for inspecting most pop concerts under the Health and Safety at Work Act 1974 (HSW Act) to Local Authorities (LAs) in 1990. This lead to requests for guidance to help LA inspectors aim for consistency of enforcement, and at about the same time the need for new safety guidelines for promoters became clear in debate following an accident resulting in two deaths at a pop festival in 1988 and other incidents highlighting potential safety problems associated with large crowds.

2. In October 1991 the Health and Safety Executive (HSE) announced public consultation on draft guidance produced jointly with the Home Office which is responsible for legislation on licensing of these events [1, 2] after taking advice from experts including LA Inspectors, the police and employers. The draft covered all aspects of health and safety, and around 150 individuals and organisations submitted comments, about 40 of them referring to the sections on sound levels and noise.

3. The advice on neighbourhood noise nuisance in the 1991 draft was produced in agreement with the Department of the Environment which is responsible for the main legislation on noise outside the venues. A separate paper discusses developments in this area [3]. This paper deals with protection of workers and the audience from hearing damage risks.

2. CAN MUSIC DAMAGE HEARING?

4. Over the years there has been a good deal of debate about whether music is likely to damage hearing to the same extent as other kinds of sound. Rational discussion has sometimes been made difficult by sensational reporting in the popular media and the defensive reactions to it which seem to leave some unwilling to agree that a desirable product might have an undesirable side-effect which can be assessed sufficiently well to provide a basis for control.

5. A critical review by Robinson and Whittle [4] in 1979 concluded that "there is as yet no convincing evidence that pop music need be treated in any other way than industrial noise of the kind upon which recent damage risk criteria have evolved.". In 1985 a re-

view of leisure noise hazards [5] discussed the limited evidence and drew attention to possible differences in the nature of the damage typically caused by music and industrial noise, but did not conclude that this justifies a different basis for assessing hazard. In 1990 a panel convened by the US National Institutes of Health to advise on noise and hearing loss recommended ".. it is the acoustic energy of the sound reaching the ear, not its source, which is important. That is, it does not matter if the hazardous sound is generated by a machine in the workplace, by an amplifier/loudspeaker at a rock concert, or by a snowmobile ..... significant amounts of acoustic energy reaching the ear will create damage - at work, at school, at home or during leisure activities." [6]

6. Some authorities, however, continue to question whether general procedures for assessing hazard can be applied to music. Commenting on the HSC's 1988 proposals for workplace noise legislation the Institute of Acoustics doubted the reliability of risk criteria and thought "where research has been undertaken within specialist areas, such as mining and the music industry, the evidence has shown that risks are not so great." [7] A similar view is taken by some major pop concert promoters who consider that "There is no conclusive evidence that noise at concerts damages your ears" [8].

7. The HSC decided for workplace regulations the same criteria should be used for specifying legal duties, and neither the Noise at Work Regulations 1974 nor the HSE's guidance on the legal requirements [9] discriminates between types of sound.

8. In the USA there has been considerable interest in hearing hazards in the music industry and some prominent artists publicly acknowledge their own hearing problems or encourage wider use of ear protectors designed for musicians [10, 11, 12]. The Consumer Electronics Group of the US Electronic Industries Association has promoted a public campaign "We want you listening for a lifetime" designed to educate purchasers of domestic equipment about the hazards of excessive sound levels [13] and several musicians have supported public awareness campaigns [14, 15]. In the British industry interestseems to have been more muted, though concern about the need for action appears to be growing, in particular recognition that those working in the industry can be at risk and should be encouraged to use personal ear protection.

3. EMPLOYEE EXPOSURE

9. Employees at pop concerts are covered by the Noise at Work Regulations 1989 in the same way as anyone else at work. Jobs likely to be affected include sound engineers, security staff, stewards, performers, first-aid staff, stage hands, DJs, and merchandising staff. The draft guide explained that action will be needed to identify who is likely to be exposed above the three "Action Levels" of the regulations and appropriate measures in-

troduced to provide them with information and personal protection, and controls exercised to limit exposure to the extent reasonably practicable.

10. Comments on the draft generally accepted that the 1989 noise regulations should be complied with though there were several requests for the text to be clarified. The balance between, on the one hand, technical and legal precision of language and, on the other, simplicity so that the advice can be understood by lay readers was criticised, though there was no clear consensus on which should predominate. Those with a background of acoustics or enforcement tended to favour the former. Others, thought the staff likely to be controlling sound at pop concerts would have difficulty grasping the ideas involved in assessing and controlling worker-exposure. Some doubted whether, without more guidance, many within the industry would be capable of making worthwhile assessments of likely worker-exposure before an event actually takes place. This view seems to be shared by some in the industry who think it would be difficult or impossible to forecast sound levels before the sound system is installed.

4. AUDIENCE EXPOSURE

Sound level limit and provision of information

11. This issue generated more comment than worker protection. The draft proposed that the equivalent continuous sound level (L_{eq}) at any point in audience areas should not exceed 104 dB(A) over the duration of the event and that attenders should be provided with information on risks if it is likely to exceed 96 dB(A). A limit of 140 dB re 20 μPa was also proposed for the peak sound pressure. The proposed L_{eq} limit is higher than is tolerable for unprotected exposure of workers but comparing risk is difficult.

12. It seems likely that only the most enthusiastic attenders will take part in enough of the louder concerts to receive a substantial exposure from that source alone, although the exposure may be significant. Table 1 shows exposure estimates made by the MRC Institute of Hearing Research [5]. This suggests that a minority of attenders receive from them alone lifetime noise immission levels (NILs) comparable with the exposures expected from a lifetime's work at 85 dB(A) (around 101 dB NIL).

13. However, while there is little statistical evidence on how people who attend pop concerts engage in other "noisy" activities, it seems unsafe to assume that the majority of them will confine their exposure to loud sounds to pop concerts. They might, for example engage in other leisure activities involving high sound levels, such as discotheques or shooting, or work in noisy jobs. Their overall risk will depend on the total exposure, and the louder concerts may contribute materially to this. Concert promoters

cannot be held responsible for exposures outside their control but how they conduct their events may affect the total..

Centile of population	8-hour L_{eq} per session (assuming typical 3-hour sessions)	Noise Immission Level (assuming typical 6 sessions per year for 7 years attendance)
10	107 dB(A)	100 dB
50	99 dB(A)	92 dB
90	91 dB(A)	84 dB

Table 1: Estimated range of Noise Immission Levels for typical attendance patterns at live rock concerts.
(After MRC Institute of Hearing Research [3])

14. Other, sometimes conflicting, factors affect any decision on a limit value. Most people accept that individuals are free to engage in activities carrying some risk if they judge that the benefits outweigh the risk, for example hang gliding or mountain climbing. But society sometimes intervenes to take the judgement out of the hands of the people who bear the risk, for example by requiring the use of seat belts in motor vehicles, and particular concern is likely to be felt about the safety of young people who are less likely to fully understand the risk

15. Before the draft HSE/Home Office guide the major guidance on audience exposure was a code of practice [16] produced by the former Greater London Council (GLC) which recommended that the 8-hour L_{eq} should not exceed 93 dB(A), measured at 50 metres from the loudspeaker supports at outdoor events, or at any point in the audience area of indoor events. This would mean a 96 dB(A) L_{eq} limit for a 4-hour event. This code was widely used by other LAs when licensing events.

16. A survey of 18 representative concerts by Griffiths[17] suggested most concerts would be affected by the proposed new draft's 104 dB(A) limit, particularly Rock, Pop, Rap and House events, and that all but some Middle of the Road (MOR) events would need to provide information on risks (Table 2) if the proposals were confirmed. 22% of events exceeded the proposed 140 dB peak pressure limit. Only one of the events complied with the GLC code's 93 dB(A) limit.

17. Comments on the audience sound level limit showed considerable differences of opinion.

18. Some thought that the proposal left the audience at excessive risk or questioned whether it is right to sanction a level likely to damage hearing. Some wanted the limit reduced to around 100 dB(A).

Type of event	Sample size	Mean L_{eq} (dB(A))	Number exceeding (L_{eq})			
			101 dB(A)	104 dB(A)	107 dB(A)	110 dB(A)
Rock	7	106.1	7	6	2	0
Pop	5	105.9	5	3	1	1
MOR	3	97.2	0	0	0	0
Rap	2	107.4	2	1	1	1
House	1	106.1	1	1	0	0
All types	18	104.7	15	11	4	2

Table 2: Audience area sound level of concerts surveyed in 1991 *(after Griffiths [17])*

19. Others felt the proposals unrealistically stringent and would, if implemented, reduce audience enjoyment and attendance at events which are an important source of income to football grounds, sports facilities etc. Some thought they would be prejudicial to small premises which are often the birthplace of performers. It was pointed out that the purchaser of a ticket has a free choice, just as when deciding to smoke tobacco or to ski, and that it is the nature of pop concerts for music to be played at high volume. Some in the industry thought it wrong action should be taken until it has been more convincingly demonstrated to them that attendance at pop concerts has damaged hearing. Others thought the limit should be higher, around 110 dB(A), or that it is inappropriate to impose any limit at all.

20. Provision of information was generally supported, though there were few detailed suggestions on the practical problem of how it is to be effectively provided to the large audiences often involved. Some think that if promoters gave information on the planned sound levels performers might compete to provide the loudest concert.

Other issues affecting the audience

21. The draft also gave advice on other measures, including use of sound distribution systems which do not create regions of high sound levels in the audience area, ensuring that audience members cannot get too close to powerful loudspeakers, and procedures for monitoring to ensure that limits are not exceeded. Comment in this area drew attention to a variety of particular difficulties a given the wide range of venues used.

22. Although not dealt with in the draft itself, during its preparation HSE received suggestions that very young children should be banned from the louder concerts because their hearing is particularly liable to damage, for example by prohibiting those less than 5 years old attending concerts where L_{eq} is likely to exceed 96 dB(A). HSE's letter inviting comments drew attention to this and asked particularly for information on whether there is sufficient evidence that the young are at particular risk to justify it. This produced a number of comments supporting or opposing the proposition, but little evidence of special susceptibility to damage. There are, of course also other safety reasons for exercising care about the admission of young children to events where large crowds are expected and these are covered separately in the draft.

5. DEVELOPMENT AND ROLE OF THE GUIDE

23. The draft guide is being revised before final submission to the HSC and Home Office for approval to publish. It is hoped this will be early in 1993, in time for the main season of outdoor concerts.

24. When it is published the guide will not have the force of law. However it should provide inspectors enforcing the legal requirements , promoters, and others who need to decide what they should do with guidance which is at the same time clear on essentials and flexible enough to be adjusted to meet local circumstances.

25. As well as the Noise at Work Regulations 1989 which require protection of those at work, the Health and Safety at Work Act 1974 imposes general duties on employers and the self-employed to safeguard the health and safety of those not in their employment, such as the audience at concerts, as well as their employees. Inspection under this legislation at most events will be by the LA. The events normally need to be licensed by LAs under various legislation, principally the Local Government (Misc Provisions) Act 1982, the London Government Act 1963, and the Civic Government (Scotland) Act 1982, and some other legislation. LAs have wide discretion about the conditions and restrictions they attach to licenses. The guide will have an important role as authoritative advice on what measures can reasonably be expected under all of this legislation.

6. REFERENCES

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