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COMMUNICATION FROM THE COMMISSION TO THE COUNCIL

concerning the determination of criteria for Noise

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I GENERAL

1. This communication concerning the determination of criteria for noise is presented within the framework of the "Programme of Action of the European Communities on the Environment" (Part II, Title I)* which requires that an objective evaluation of the risks to human health and to the environment from pollution is carried out.

2. Criteria establish the relationship between a given exposure and an observable effect on human health or the environment; they are an important element in the objective evaluation of the undesirable effects or dangers inherent in any given nuisance.

3. Noise was chosen as one of the pollutants for priority investigation on the grounds of the current state of knowledge of its significance in the health field.

4. In preparing this communication the Commission has been guided by the principles defined in the above mentioned "Action Programme". The following tasks have been undertaken:
   - compilation of as complete a bibliography as possible on the effects and pollution levels of noise;
   - a critical analysis of this information - and, as a result,
   - the determination of criteria.

5. Meetings of national experts have been held to discuss and to critically analyse the available bibliography on the adverse or undesirable effects of the exposure of man to noise. The results of this work are given in "Damage and Annoyance caused by Noise" (document N° 5398e, rapporteurs: H. Bastenier, W. Klosterkötter and J.B. Large, annexed). These meetings also approved the criteria contained in this communication.

6. These criteria have been selected from epidemiological, occupational and experimental studies for man. It has not been possible to consider the long-term effects of sleep disturbance as insufficient data is available, and further research is necessary.

7. The Commission has also taken into account the work performed at national and international level. In particular it has considered the report published the W.H.O. (Geneva) in 1972, entitled "Health Hazards of the Human Environment" as it relates to noise.

* OJ N° C 112 20/12/1973

8. In the determination of some of these criteria (especially annoyance) it was considered that specific noise sources such as aircraft, traffic, musical noise etc. were likely to produce different levels of acceptability. The exposure/effect curves for each type of noise were not identical.

9. It was also considered that because the reactions of individual members of the general population, vary very considerably in relation to noise, so will the perceived effects of noise vary.

10. In the determination of these criteria the population as a whole was considered. In some cases special considerations have been applied to hypersensitive sections of the population, for example, old people, the sick and the very young.

11. This communication concerning the determination of criteria for noise does not cover vibrations, and ultrasonic and infrasonic waves, which will be the subjects of further studies.

12. These criteria will be revised as and when new data becomes available.

II CRITERIA ESTABLISHING THE RELATIONSHIP BETWEEN GIVEN EXPOSURES AND OBSERVABLE EFFECTS FROM NOISE

The following relationships between given exposures and observable effects have been selected for:

1. Sleep interference
2. Speech interference
3. Annoyance
4. Performance of tasks
5. Hearing damage

In Annex I the definitions are given.

1. Sleep Interference

1.1 Reports of sleep disturbance or awakening are made by about 10 % of the subjects tested, irrespective of the cause, when exposed to an indoor equivalent continous sound level of 38dB(A). Steady noise in this respect signifies fluctuations of level of less than 5dB.

1.2 The pattern of sleep (e.g. EEG) is changed for about 20 % of subjects tested when exposed to an indoor equivalent continuous sound level of 40dB(A) and for about 50 % for a level of 50dB(A).

1.3 Changed activation of the central nervous system, which may lead to awakening, is observed if an increase of 10 dB or more occurring in 0,5 sec. or less is superimposed on a continuous background level.

1.4 Reduced sleeping ability of the particularly sensitive population (e.g. old, sick, convalescent) has been demonstrated at values approximately 10 dB below those mentioned above.

2. Speech Interference

2.1 A equivalent continuous sound level of 65dB(A) makes normal conversation just possible at 1 metre.

2.2 A equivalent continuous sound level of 45dB(A) or less provides no problems for relaxed conversation at a distance of 1 metre. At greater distances speech intelligibility requires lower levels.

2,3 In particular situations where the contents of the message must be completely understood, for example teaching in classrooms and medical consultations, the levels of background noise should preferably be 10dB lower than those of paragraphs 2.1 and 2.2.

2.4 For television viewing, listening to the radio, or telephone conversation, in cases where the background noise levels show large variations with time, equivalent continuous sound levels should be about 5dB lower than those of paragraphs 2.1 and 2.2.

3. Annoyance

3.1 Under average town living conditions, outside noise which emanates from transportation and industrial sources of 50dB(A) daytime equivalent continuous noise levels will generally cause about 15 % of the population to be highly annoyed. 65dB(A) will generally cause about 40 % of the population to be highly annoyed.

3.2 In noisier living conditions, city centres and near industrial sites, somewhat higher noise levels will correspond to the above described effects. On the other hand in quieter situations such as rural areas the same effects will occur at correspondingly lower levels. Tones and impulsive noises present in the environment increase the level of annoyance at each value of the equivalent noise level.

3.3 During periods where the sensitivity to noise is greater, such as periods of rest or relaxation, the corresponding noise levels are lower.

4. Performance of tasks

The findings of laboratory work show in general that:

4.1 A steady noise, without special significance, would not appear to interfere with most human activities that require no acoustic information in order to be carried out. This is so even where the steady level is relatively high, possibly as high as 90dB(A).

4.2 Intermittent or impulsive noise has a more marked disturbing effect than steady noise.

4.3 High frequency noise components (above about 2000Hz) usually cause worse interference with performance than do low frequency components.

4.4 Noise does not have a notable effect on overall performance - but high levels of noise can cause variations in the performance of sequential tasks. There can here be a complete breakdown of performance or a total absence of reaction to stimuli, sometimes followed by a compensating improvement.

4.5 Noise affects the quality of work more than the quantity.

4.6 Complicated tasks, demanding considerable concentration, are more easily influenced by noise then are simple tasks

5. Hearing damage

High level noise can cause permanent impairment to hearing, separate from that which can occur due to age and illness, and which can lead to a handicap. Such a handicap can be avoided for the great majority of the population if the noise level to which they are exposed over their whole lifetime is less than a 24-hour daily value of equivalent continuous sound level, Leq, of 80dB(A). This level corresponds to a value over 8 hours daily of 85dB(A); with higher levels of continuous noise the risk of hearing damage is increased unless exposure times are shortened. The damage risk is greater if the ear is exposed to very high absolute sound pressure - the human ear is in danger of being damaged by noise having an instantaneous value greater than 150dB.

ANNEX I

DEFINITION

Criteria The term "criterion" signifies the relationship between the exposure of a target to pollution or nuisance, and the risk and/or the magnitude of the adverse or undesirable effect resulting from the exposure in given circumstances.

Annoyance is a feeling of displeasure experienced by the individual. It is a subjective response to the combined effects of disturbance and factors of a psychological, sociological, physiological, economic nature, etc, which may be unrelated to the primary disturbance.

Background Noise The total of all noise in a system or situation, apart from that of the signal. In popular usage the term "background noise" is also used with the same meaning as "residual noise".

Handicap (Hearing handicap) The occupational and social difficulty experienced by a person who has a hearing loss.

Impulse Noise (Impulsive noise) Noise of short duration (typically, less than one second) especially of high intensity, abrupt onset and rapid decay; and often rapidly changing spectral composition. (Impulse noise is characteristically associated with such sources as explosions, impacts, the discharge of firearms, the passage of supersonic aircraft (sonic boom), and many industrial processes).

Intermittent Noise Noise which lasts more than one second but which is interrupted by intervals during which only background noise can be heard.

Fluctuating noise Noise whose levels show clearly perceptible fluctuations with time.

A-weighted sound level The ear does not respond equally to frequencies, but is less efficient at low and high frequencies than it is at medium or speech range frequencies. Thus, to obtain a single number representing the sound level of a noise containing a wide range of frequencies in a manner representative of the ear's response, it is necessary to reduce, or weight, the effects of the low and high frequencies with respect to the medium frequencies. The resultant sound level in dB is said to be A-weighted. The A-weighted sound level is also called the noise level. Sound level meters have an A-weighting network for measuring A-weighted sound level.