

# **Environmental Health Criteria 12**

## **NOISE**

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**World Health  
Organization**



INTERNATIONAL PROGRAMME ON CHEMICAL SAFETY

## ENVIRONMENTAL HEALTH CRITERIA 12

### NOISE

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## REFERENCES

## NOTE TO READERS OF THE CRITERIA DOCUMENTS

While every effort has been made to present information in the criteria documents as accurately as possible without unduly delaying their publication, mistakes might have occurred and are likely to occur in the future. In the interest of all users of the environmental health criteria documents, readers are kindly requested to communicate any errors found to the Division of Environmental Health, World Health Organization, Geneva, Switzerland, in order that they may be included in corrigenda which will appear in subsequent volumes.

In addition, experts in any particular field dealt with in the criteria documents are kindly requested to make available to the WHO Secretariat any important published information that may have inadvertently been omitted and which may change the evaluation of health risks from exposure to the environmental agent under examination, so that the information may be considered in the event of updating and re-evaluation of the conclusions contained in the criteria documents.

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List of abbreviations and symbols used in this document

AI	articulation index
$c$	speed of sound
CNEL	community noise equivalent level
CNR	composite noise rating
$f$	frequency
$I$	sound intensity
$L_{dn}$	day-night average-sound level
$L_e$	aircraft exposure level
$L_{eq}$	equivalent continuous sound pressure level
$L_p$ or SPL	sound pressure level
$L_p(A)$	A-weighted sound pressure level
$L_{PN}$	mean peak perceived noise level
NEF	noise exposure forecast
NI	noisiness index

NIPTS	noise-induced permanent threshold shift
NITS	noise-induced threshold shift
NITTS	noise-induced temporary threshold shift
NNI	noise and number index
NPL	noise pollution level
p	root mean square pressure
p <sub>2</sub>	mean square sound pressure
P	sound power
PNL	perceived noise level
SIL	speech interference level
SPL or L <sub>p</sub>	sound pressure level
TNEL	total noise exposure level
TNI	traffic noise index
WECPNL	weighted equivalent continuous perceived noise level
lambda	wavelength

#### ENVIRONMENTAL HEALTH CRITERIA FOR NOISE

A WHO Task Group on Environmental Health Criteria for Noise met in Brussels from 31 January to 4 February 1977. Dr. H. W. de Koning, Scientist, Control of Environmental Pollution and Hazards, Division of Environmental Health, WHO, opened the meeting on behalf of the Director General and expressed the appreciation of the Organization to the Government of Belgium for having made available the necessary financial support for the meeting. On behalf of the Government, the Group was welcomed by Professor Lafontaine, Director of the Institute for Hygiene and Epidemiology, Brussels. The Task Group reviewed and revised the second draft criteria document and made an evaluation of the health risks from exposure to noise.

The first draft of the criteria document was prepared by a study group that met in Geneva from 5-9 November 1973. Participants of the Group included: Dr. T. L. Henderson and Professor G. Jansen (Federal Republic of Germany); Dr A. F. Meyer (USA); Professor J. B. Ollerhead (United Kingdom, Rapporteur); Professor P. Rey (Switzerland, Chairman); Professor R. Rylander (Sweden); Professor W. J. Sulkowski (Poland); Dr A. Annoni, Mr E. Hellen, and Mr B. Johansson (Consultant), International Labour Organisation (ILO); Dr A. Alexandre, Organisation for Economic Co-operation and Development (OECD); Dr A. Berlin, Commission of the European Communities (CEC); Professor L. A. Saenz, Scientific Committee on Problems of the Environment (SCOPE); Mr H. J. Gursahaney, International Civil Aviation Organization (ICAO); Dr M. Suess, World Health Organization Regional Office for Europe; and Dr G. Cleary and Dr G. E. Lambert, World Health Organization, Geneva. Certain sections of the first draft were later completed with the assistance of Dr A. Alexandre (OECD), Dr D. E. Broadbent (UK), Professor G. Jansen (FRG), and Professor W. D. Ward (USA).

The second draft was prepared by the Secretariat after comments had been received from the national focal points for the WHO Environmental Health Criteria Programme in Czechoslovakia, Federal Republic of Germany, Finland, Greece, Japan, New Zealand, Poland, Sweden, Thailand, United Kingdom, USSR, and USA, and from the International Labour Organisation, Commission of the European Communities, the Organisation for Economic Co-operation and Development, the International Civil Aviation Organization, and the International Organization for Standardization. Many comments were also received from individual experts and commercial concerns including E. I. Du Pont de Nemours & Company, Wilmington, Delaware, USA, whose contributions are gratefully acknowledged.

The Secretariat particularly wishes to thank Dr D. Hickish, Ford Motor Company Limited, Brentwood, Essex, England, Dr G. E. Lambert,

Professor J. B. Ollerhead, Professor P. Rey, Professor R. Rylander, and Ms A. Suter for their most valued help in the final phases of the preparation of the document.

This document is based primarily on original publications listed in the reference section and every effort has been made to review all pertinent data and information available up to 1978. In addition, reference has often been made to the various publications on noise of the International Organization for Standardization that include the international standards for noise assessment (ISO, 1971; 1973a; 1975a). The following reviews and criteria documents have been referred to: Burns & Robinson (1970), Karagodina et al. (1972), Burns (1973), NIOSH (1973a), US Environmental Protection Agency (1973a), ILO (1976), Thiessen (1976), Rylander et al. (1978), and Health and Welfare, Canada (1979).

Details of the WHO Environmental Health Criteria Programme including some terms frequently used in the document may be found in the general introduction to the Environmental Health Criteria Programme published together with the environmental health criteria document on mercury (Environmental Health Criteria 1, Mercury, World Health Organization, Geneva, 1976) and now available as a reprint.

## 1. SUMMARY AND RECOMMENDATIONS FOR FURTHER STUDIES

### 1.1 Summary

#### 1.1.1 Introduction

Noise can disturb man's work, rest, sleep, and communication; it can damage his hearing and evoke other psychological, physiological, and possibly pathological reactions. However, because of their complexity, their variability, and the interaction of noise with other environmental factors, the adverse health effects of noise do not lend themselves to a straightforward analysis.

Probably the most important issue is the industrial noise problem, and a need for noise control and hearing conservation programmes is widely recognized. Road traffic is the main source of community noise that may disturb large segments of the urban population. Also of worldwide concern is aircraft noise, which can significantly affect the mode of life of people living in the vicinity of airports.

#### 1.1.2 Noise measurement

Sound is produced by the vibration of bodies or air molecules and

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