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ACOUSTIC TERMINOLOGY GUIDE

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Prepared By

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## INTRODUCTION

The development and the acceptance of terminology standards has not kept pace with the increase in environmental-noise nomenclature. As a consequence, not only do the members of the noise control profession witness confusion in the use of terminology, but the public faces a sometimes overwhelming task of extracting substantive information out of noise directives and reports, while wading through ambiguous and confusing terminology. Faced with this problem, the Deputy Assistant Administrator for Noise Control Programs approved the formation of an ad-hoc task group to explore this problem.

The group's intention was to generate a standard EPA list of acoustical descriptors, symbols, and units that would be consistent with current standards and usage. To assure that this condition was met, the group employed standards developed by the American National Standards Institute (ANSI) and the Committee on Hearing, Bioacoustics and Biomechanics (CHABA) as a basis for its work. Mr. Daniel Flynn of the National Bureau of Standards participated as a consultant to the group.

### Descriptor Symbol Usage

The recommended symbols for the commonly used acoustic descriptors based on A-weighting are contained in Table I. As most acoustic criteria and standards used by EPA are derived from the A-weighted sound level, almost all descriptor symbol usage guidance is contained in Table I.

Since acoustic nomenclature includes weighting networks other than "A" and measurements other than pressure, an expansion of Table I was developed (Table II). The group adopted the ANSI descriptor-symbol scheme which is

structured into three stages. The first stage indicates that the descriptor is a level (i.e., based upon the logarithm of a ratio), the second stage indicates the type of quantity (power, pressure, or sound exposure), and the third stage indicates the weighting network (A, B, C, D, E.....). If no weighting network is specified, "A" weighting is understood. Exceptions are the A-weighted sound level and the A-weighted peak sound level which require that the "A" be specified. For convenience in those situations in which an A-weighted descriptor is being compared to that of another weighting, the alternative column in Table II permits the inclusion of the "A" designation for descriptors which customarily do not include the "A". For example, a report on blast noise might wish to contrast the  $L_{Cdn}$  with the  $L_{Adn}$ .

Although not included in the tables, it is also recommended that " $L_{PN}$ " and " $L_{EPN}$ " be used as symbols for perceived noise level and effective perceived noise level, respectively.

It is recommended that in their initial use within a report, such terms be written in full, rather than abbreviated. An example of preferred usage is as follows:

The A-weighted sound level ( $L_A$ ) was measured before and after the installation of acoustical treatment. The measured  $L_A$  values were 85 and 75 dB respectively.

#### Descriptor Nomenclature

With regard to energy averaging over time, the term "average" should be discouraged in favor of the term "equivalent". Hence,  $L_{eq}$  is designated the "equivalent sound level". For  $L_d$ ,  $L_n$ , and  $L_{dn}$ , "equivalent" need not be stated since the concept of day, night, or day-night averaging is by definition

understood. Therefore, the designations are "day sound level", "night sound level", and "day-night sound level", respectively.

The peak sound level is the logarithmic ratio of peak sound pressure to a reference pressure and not the maximum root mean square pressure.

While the latter is the maximum sound pressure level, it is often incorrectly labelled peak. In that sound level meters have "peak" settings, this distinction is most important.

"Background ambient" should be used in lieu of "background", "ambient", "residual", or "indigenous" to describe the level characteristic of the general background noise due to the contribution of many unidentifiable noise sources near and far.

With regard to units, it is recommended that the unit decibel (abbreviated dB) be used without modification. Hence, dBA, PNdB, and EPNdB are not to be used. Examples of this preferred usage are: the Perceived Noise Level ( $L_{PN}$ ) was found to be 75 dB.  $L_{PN} = 75$  dB. This decision was based upon the recommendation of the National Bureau of Standards, and the policies of ANSI and the Acoustical Society of America, all of which disallow any modification of bel except for prefixes indicating its multiples or submultiples (e.g., deci).

#### Noise Impact

In discussing noise impact, it is recommended that "Level Weighted Population" (LWP) replace "Equivalent Noise Impact" (ENI). The term "Relative Change of Impact" (RCI) shall be used for comparing the relative differences in LWP between two alternatives.

Further, when appropriate, "Noise Impact Index" (NII) and "Population Weighted Loss of Hearing" (PHL) shall be used consistent with CHABA Working Group 69 Report "Guidelines for Preparing Environmental Impact Statements (1977)."

TABLE I: A-Weighted Recommended Descriptor List

<u>Term</u>	<u>Symbol</u>
1. A-Weighted Sound Level	$L_A$
2. A-Weighted Sound Power Level	$L_{WA}$
3. Maximum A-Weighted Sound Level	$L_{max}$
4. Peak A-Weighted Sound Level	$L_{Apk}$
5. Level Exceeded x% of the time	$L_x$
6. Equivalent Sound Level	$L_{eq}$
7. Equivalent Sound Level over Time (T) (1)	$L_{eq}(T)$
8. Day Sound Level	$L_d$
9. Night Sound Level	$L_n$
10. Day-Night Sound Level	$L_{dn}$
11. Yearly Day-Night Sound Level	$L_{dn}(y)$
12. Sound Exposure Level	$L_{SE}$

(1) Unless otherwise specified, time is in hours (e.g. the hourly equivalent level is  $L_{eq}(1)$ ). Time may be specified in non-quantitative terms (e.g., could be specified a  $L_{eq}(WASH)$  to mean the washing cycle noise for a washing machine.)

TABLE II: Recommended Descriptor List

TERM	ALTERNATIVE (1)		(2)	
	A-WEIGHTING	A-WEIGHTING	OTHER WEIGHTING	UNWEIGHTED
1. Sound (Pressure) (3) Level	$L_A$	$L_{pA}$	$L_B, L_{pB}$	$L_p$
2. Sound Power Level	$L_{WA}$		$L_{WB}$	$L_W$
3. Max. Sound Level	$L_{max}$	$L_{Amax}$	$L_{Bmax}$	$L_{pmax}$
4. Peak Sound (Pressure) Level	$L_{Apk}$		$L_{Bpk}$	$L_{pk}$
5. Level Exceeded x% of the time	$L_x$	$L_{Ax}$	$L_{Bx}$	$L_{px}$
6. Equivalent Sound Level	$L_{eq}$	$L_{Aeq}$	$L_{Beq}$	$L_{peq}$
7. Equivalent Sound Level Over Time(T) (4)	$L_{eq(T)}$	$L_{Aeq(T)}$	$L_{Beq(T)}$	$L_{peq(T)}$
8. Day Sound Level	$L_d$	$L_{Ad}$	$L_{Bd}$	$L_{pd}$
9. Night Sound Level	$L_n$	$L_{An}$	$L_{Bn}$	$L_{pn}$
10. Day-Night Sound Level	$L_{dn}$	$L_{Adn}$	$L_{Bdn}$	$L_{pdn}$
11. Yearly Day-Night Sound Level	$L_{dn(y)}$	$L_{Adn(Y)}$	$L_{Bdn(Y)}$	$L_{pdn(Y)}$
12. Sound Exposure Level	$L_S$	$L_{SA}$	$L_{SB}$	$L_{Sp}$
13. Energy Average value over (non-time domain) set of observations	$L_{eq(e)}$	$L_{Aeq(e)}$	$L_{Beq(e)}$	$L_{peq(e)}$
14. Level exceeded x% of the total set of (non-time domain) observations	$L_x(e)$	$L_{Ax(e)}$	$L_{Bx(e)}$	$L_{px(e)}$
15. Average $L_x$ value	$L_x$	$L_{Ax}$	$L_{Bx}$	$L_{px}$

(1) "Alternative" symbols may be used to assure clarity or consistency.

(2) Only B-weighting shown. Applies also to C,D,E,..... weighting.

(3) The term "pressure" is used only for the unweighted level.

(4) Unless otherwise specified, time is in hours (e.g., the hourly equivalent level is  $L_{eq(h)}$ ). Time may be specified in non-quantitative terms (e.g., could be specified as  $L_{eq(WASH)}$  to mean the washing cycle noise for a washing machine).