

Corrected values for Annex B of ISO 1999

William W. Clark and Carl D. Bohl
 Central Institute for the Deaf, 818 South Euclid, St. Louis, Missouri 63110

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A recalculation of the values contained in Annex B of the new ISO standard R1999: "Determination of occupational noise exposure and the estimation of noise-induced hearing impairment," utilizing procedures specified in the standard and in its supporting documentation was conducted. Three calculation errors, which occurred in the supporting document and were perseverated into the standard, were identified. These errors are explained and a corrected version of Annex B is presented.

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The International Organization for Standardization (ISO) has recently promulgated an international standard in acoustics, entitled "Determination of occupational noise exposure and the estimation of noise-induced hearing impairment."¹ This standard presents, in statistical terms, a method for calculating the relation between noise exposure and noise-induced permanent threshold shift for groups of individuals of various ages and noise-exposure histories.

In the standard, NIPTS is deduced from the difference in hearing level between groups of individuals exposed to noise and similar groups not exposed with age, years of exposure, and history controlled. Two databases are presented as appendices to the standard for such a calculation. Database A (Annex A in the standard) is made up of "highly screened" individuals and has been standardized as ISO 7029 for male and female populations. Database B is a set of data collected on a controlled population of the country un-

der consideration and not occupationally exposed to noise. An example of a database B is presented in Annex B, and is indicated to be "representative of a population not exposed to occupational noise." In paragraph 5.2.3 of the ISO standard, it is stated that Database B is the more appropriate database to use when otological irregularities and nonoccupational exposure are not considered.

The data for Annex B in the standard are from the U.S. Public Health Service Survey² and are representative of hearing levels of U.S. adults by age and sex. These data were analyzed by Johnson³ and were subjected to statistical smoothing and extrapolation procedures.

In preparation for a review of other U.S. industry databases, a reanalysis of the basic data from the Glorig and Roberts PHS survey, and of Johnson's evaluation procedure was conducted. It was found that by following the procedure described in Johnson's report³ 141 of the 144 hearing levels

TABLE I. Corrected version of ISO Annex B.

Frequency (Hz)	Hearing threshold level (dB)											
	Age years											
	30			40			50			60		
	Fractiles											
	0.9	0.5	0.1	0.9	0.5	0.1	0.9	0.5	0.1	0.9	0.5	0.1
Males												
500	-1	7	15	0	8	19	1	10	21	2	12	26
1000	-5	0	10	-4	3	15	-3	5	16	-2	6	21
2000	-4	2	13	-3	4	19	-2	8	28	0	10	43
3000	-1	9	30	2	13	41	5	19	51	9	30	62
4000	-1	10	38	4	17	50	8	26	54	12	36	68
6000	8	18	48	11	24	62	17	31	62	22	46	80
Females												
500	-1	6	15	0	7	19	1	10	23	4	14	29
1000	-6	1	9	-5	2	13	-4	4	16	-2	7	21
2000	-6	0	10	-4	2	13	-2	6	23	0	8	29
3000	-4	4	13	-2	6	18	0	9	26	6	16	37
4000	-5	4	16	-4	6	18	-1	9	26	4	17	43
6000	3	12	25	5	15	31	8	20	45	15	29	57

in Annex B could be resolved within plus or minus 1 dB for the interpolated values and plus or minus 2 dB for the extrapolated values. The three erroneous values, along with a most possible source of the error as discussed with Johnson, are presented below:

(1) 30-yr-old males, 3 kHz, 10th percentile: "20" should be "30."

Explanation: The "20" figure, which is in Johnson's report, most likely was due to a typographical error.

(2) 30-yr-old males, 6 kHz, 10th percentile: "32" should be "48."

Explanation: The smoothing graph used by Johnson was misplotted for the percentiles below 40. This caused the error in the 10th percentile in Johnson's report.³

(3) 50-yr-old females, 1 kHz, 90th percentile: "+ 4" should be "- 4."

Explanation: The value is "- 4" in Johnson's report. Apparently, the minus sign was dropped some time in the early stage of the standard.

A full, corrected version of Annex B is presented in Ta-

ble I. These corrected values have been submitted to the working group which prepared the standard and to the secretariat of TC 43, and appropriate revisions to Annex B of the standard will be made.

ACKNOWLEDGMENTS

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¹ISO 1999, "Acoustics—Determination of occupational noise exposure and estimation of noise-induced hearing impairment" (International Organization for Standardization, Geneva, 1990).

²A. Glorig and J. Roberts, "Hearing levels of adults by age and sex: United States, 1960-1962," DHEW-PUB-1000-SER-11-11 (National Center of Health Services Research and Development, U.S. Department of Health, Education and Welfare, Washington, DC, 1965).

³D. L. Johnson, "Derivation of presbycusis and noise induced permanent threshold shift (NIPTS) to be used for the basis of a standard on the effects of noise on hearing," AMRL-TR-78-128 (Wright-Patterson Air Force Base, Ohio, 1978).