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Data supplied to NIOSH by manufacturers and distributors of hearing protective devices are presented. The name of the supplier, model, type, weight, head bend force, average attenuation values and standard deviation at test frequencies of 125 to 8000 Hertz, test standard used, and the testing laboratory are noted for 243 devices. Methods for determining the noise reduction factors for the devices are also given. The noise reduction factor is generally defined as the difference between the measured workplace noise level and the effective noise level when wearing the protective device. The performance of a given hearing protective device cannot be predicted exactly because of person and test to test variations. Three computational procedures for calculating noise reduction factors and examples of their use are described. The calculations can be performed on any electronic calculator that has logarithm and anti logarithm function buttons. Criteria for selecting the appropriate method are reviewed. Considerations in the selection and use of hearing protective devices are discussed. Important factors include proper fit, calculated noise reduction factors, durability, and whether the wearer has a need to communicate verbally.

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COMPENDIUM OF HEARING PROTECTION DEVICES

by

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Abstract

Data supplied to NIOSH by manufacturers or distributors of hearing protection devices are presented. These data include: supplier, model, type, weight, headband force, average attenuation values and standard deviations at test frequencies 125 to 8000 Hz, test standard, and test laboratory. Also presented are methods for calculating noise reduction factors for hearing protectors and a discussion of factors to be considered in the selection and use of these devices.

Introduction

A list of hearing protector data and methods for computing noise reduction were published in September 1975 by the National Institute for Occupational Safety and Health (NIOSH)[1] in response to requests for information regarding the types of hearing protectors available for use in hearing conservation programs. Since that time, a modification (ANSI S3.19-1974)[2] of the standard laboratory method (ANSI Z24.22-1957)[3] for testing hearing protection devices has resulted in the retesting of most products. Also, some companies have left the market, and several new companies have asked that their products be incorporated. For these reasons, a new list has been compiled and is presented in this report.

Data supplied to NIOSH by manufacturers or distributors of hearing protection devices for inclusion in this report are presented in Appendix I as received from the suppliers. Included in Appendix I are: supplier, model, type, weight and headband force in ounces (oz.), average attenuation in decibels (dB) for the test frequencies from 125 to 8000 hertz (Hz), and standard deviations in dB of these attenuation data. With few exceptions, the hearing protectors listed were tested by Paul L. Michael and Associates, Inc., State College, Pennsylvania, using the new standard method. In those cases where a different test method or a different laboratory was used, the information is given in the footnotes referenced in the ID number column of Appendix I.

In the earlier NIOSH report[1], the majority of suppliers had their hearing protectors tested according to the American National Standards Institute (ANSI) standard Z24.22-1957, "Method for the Measurement of the Real-Ear Attenuation of Ear Protectors at Threshold."[3] Almost all products reported herein have been tested in accordance with the new standard, ASA STD 1-1975 (ANSI S3.19-1974), "Method for the Measurement of Real-Ear Protection of Hearing Protectors and Physical Attenuation of Earmuffs."[2] The main differences between the ASA 1975 standard and the old standard are that the new standard requires use of third-octave bands of noise instead of discrete tones as the test stimuli and it requires a reverberant test room instead of an anechoic test room. Rigorous comparison of attenuation data obtained re Z24.22 presented in the previous (1975) report[1], with that obtained re S3.19-1974 presented in this report, has not been made. However, in general it appears that data obtained using the new standard show lower mean attenuation values as well as lower standard deviations. Also, attenuation data are presented in this report for "nonlinear" hearing protection devices, whereas such data were not available for inclusion in the previous (1975) report.[1] While standard methods for the real-ear evaluation of nonlinear devices, amplitude sensitive devices, and other hearing protection devices with features designed to operate exclusively against impulse noise are not yet established[2], there is insufficient data to determine the existence of nonlinearity in continuous noise.

The results from tests using the procedures specified in the above mentioned standards are expressed in terms of the means and standard deviations of the attenuation in dB for each test frequency. These data can be used to make calculations of the noise reduction capabilities of the hearing protectors.

Three methods of making such calculations are presented in this report, along with examples. The attenuation values presented in Appendix I were measured under "experimenter (best) fit"[2] conditions in the laboratory. Even under these conditions, there is variation in attenuation from person to person and from test to test. In order to account for this variability, standard deviations can be included in the noise reduction calculations, as has been done in the examples. For each method, the limitations, advantages, and disadvantages are discussed. Except for two changes, these noise reduction computation methods are identical to those presented in the 1975 NIOSH report.[1] The two changes are: 1) the A-weighting* values for octave band sound levels have been reduced by 0.1 dB at 125, 250, and 500 Hz to conform with the weighting values in ANSI S1.4-1971 (R1976) "Specification for Sound Level Meters"[4], and 2) the C-weighted** value for "pink" noise, or noise that has equal sound pressure levels at all octave bands, used in the second method has been reduced by 0.6 dB (see footnotes on page 14). With these two changes, the noise reduction constant designated R_c in the previous NIOSH report[1] has been converted to the Environmental Protection Agency's Noise Reduction Rating (NRR)[5] to minimize possible confusion.

In the following section, the calculations of the reduction factors will be presented, followed by a section on selection and use of hearing protectors.

Determination of Noise Reduction for Hearing Protectors

The attenuation data listed in this report show how the effectiveness of each hearing protector depends upon the frequency (Hz) x sound exposure level (dB) content of the assaulting noise. In industrial situations one usually needs to determine the amount by which the total workplace noise, usually expressed in sound levels on an A-scale, is effectively reduced by the hearing protector. Since industrial noise is usually made up of a mixture of individual sounds of various frequencies and strengths, termed its "spectrum", it is necessary to employ some sort of formula in computing the noise reduction to take account of its spectrum. If information regarding the workplace noise spectrum (typically expressed in octave band noise levels) is not available, then safety factors must be included to adjust for this spectral uncertainty. The performance of a hearing protector cannot be predicted exactly because of person to person and test to test variations, and it is appropriate to adjust for these measurement uncertainties as well. The purpose of this section is to provide the reader with the information needed to estimate the effective noise exposure level expected in a workplace when a hearing protector is worn in optimum fashion.

Through a series of calculations a dBA-reduction factor, "R", is determined. After R has been calculated, it can be subtracted from the measured workplace dBA noise level to predict the effective noise exposure level of the worker.

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*A-weighting is a method of adjusting the noise levels to the response of the human ear.

**C-weighting gives essentially equal weight to noise levels that can be heard by the human ear.

For example, if the measured workplace noise is 102 dBA and the R factor is 17 decibels, then the worker's effective noise exposure level should be no higher than 85 dBA. However, actual field performance may be substantially poorer than the expected performance if the protector is ill-fitted (see <u>Considerations in Selection and Use of Hearing Protectors</u>).

Three methods for calculating reduction factors will be presented with examples to illustrate how they are used. For all three methods, the calculations are similar, using logarithms and antilogarithms which many electronic calculators can compute with the "log x" button for logarithms and with the "10^x" or "y^x" button for antilogarithms. In general, the reduction factor equals the measured workplace noise level minus the effective noise level when wearing the hearing protector. The effective noise level is calculated differently in the three methods, depending upon the workplace noise data available. However, common to the three methods are: (1) the average attenuation at each octave band and a correction for uncertainty in measuring the attenuation; and (2) the dB A-weighting factor for each octave band. When taken together and subtracted from the octave band noise level in dB, these elements reduce the octave band noise level to the effective octave band noise level in dBA. In the equations to follow, these elements have been conveniently combined into a factor, Q, for each octave band.

A scheme for computing Q factors, using the data for the first hearing protector listed in Appendix I as an example, is presented in Table 1. Note that the average attenuation data for 3150 and 4000 Hz in Appendix I are averaged for computing Q factor 6, and similarly the data for 6300 and 8000 Hz have been averaged for computing Q factor 7. Twice the standard deviation has been used as the measurement uncertainty correction except for Q factors 6 and 7 where the standard deviations associated with the two frequencies involved have been added. The Q factors so calculated are listed in line 1 of Appendix II, where the Q factors for all the hearing protectors listed in Appendix I are presented.

Table 1. Scheme for calculating Q factors.

Factor Number	Octave Band Center Frequency Hz	Average Attenuation	A-weighting Factor	Measurement Uncertainty	Q Factor
		A	B	C	A+B−C
1	125	21	16.1	(2)(2.4)	32.3
2	250	22	8.6	(2)(2.0)	26.6
3	500	24	3.2	(2)(2.1)	23.0
4	1000	30	0	(2)(2.4)	25.2
5	2000	36	−1.2	(2)(2.5)	29.8
6	4000	(41+39)/2	−1.0	3.4+4.8	30.8
7	8000	(37+35)/2	1.1	2.5+2.7	31.9

The three methods of calculating noise reduction factors differ in the type of noise data used and the resulting accuracy of the estimate. For method 1, the most accurate method, octave band noise levels, the dBA noise level (which can be computed using the octave band levels), and the Q factors are required. For method 2, the next most accurate method, octave band noise levels are not needed; what is needed is the difference between the dBC and dBA noise levels and the Q factors. For method 3, only Q factors are needed. Method 2 yields a NRR for each hearing protector. The NRR, calculated as shown in the example for Method 2 for each hearing protector, is listed in Appendix II along with the Q factors for each hearing protector. It is required under 40 CFR 211.201 that each hearing protector be labeled with a NRR, however, the values listed in Appendix II may be different from those used by the manufacturer for a number of reasons: 1) an approximate tabular method for combining the effective (or "protected ear") octave band noise levels may be used instead of the more exacting method of using logarithmic calculations as shown in Method 2; 2) mean attenuation values for each product shown in this report are rounded to the nearest integer (values of .5 have been rounded down) and these rounded values were used to compute the NRR value shown in Appendix II; 3) the manufacturer may label the protector at values different than indicated by the test results and by the computation procedure presented in this report; and 4) changes in the manufacturer's product and variability between different laboratory tests of the product.

The three computational methods usually yield different R factors for a given hearing protector/noise combination. The less precise methods are principally based on assumptions concerning <u>possible</u> noise spectra encountered in industry. These less precise methods include adjustments to guard against overestimating the R factor or underestimating the expected noise exposure when the hearing protector is used. As a general rule: the greater the accuracy of a method, the greater the computed value of R. Another consideration which affects the value of R in all methods is the adjustment factor to account for statistical variations from person to person. The adjustment procedure which has been used throughout this report is to reduce the listed attenuation values by subtracting twice the standard deviation values (or the equivalent when combining data; see Table 1) obtained in the laboratory measurements. This procedure should assure that most wearers will obtain the expected benefits from the hearing protector most of the time, when it is worn under the test conditions of best fit. If the standard deviations for a particular hearing protector are not available, then it may be suitable to use the worst-case data listed in Appendix I for other protectors of similar design. Alternatively, the reader may choose some adjustment for measurement uncertainty other than twice the listed standard deviation. (See <u>Considerations in Selection and Use of Hearing Protectors</u>.)

A guide for choosing a method for calculating noise reduction factors is presented in Table 2, and the detailed presentations and discussion of each method follow.

Table 2. Guide to choosing a method for computing noise reduction.

Method 1 (MOST ACCURATE METHOD; RECOMMENDED)

Data required:	Octave band noise levels at 125, 250, 500, 1000, 2000, 4000 and 8000 Hz, denoted by L_1, L_2, L_3, L_4, L_5, L_6, and L_7, respectively. The dBA noise level (which can be computed using the octave band noise levels). Q factors.
Comments:	Most precise of the three methods. Does not require an adjustment for spectral uncertainty. Computed R factor is appropriate only for a given noise spectrum, but the same R can be used for different dBA levels if only the intensity of the given noise changes. R factor is subtracted from the workplace dBA level to give the effective dBA level when the hearing protector is worn.

Method 2

Data required:	The difference (δ) between the dBC and dBA levels is needed to compute R, but not for the modified R described below. δ (delta) = $L_C - L_A$ Q factors.
Comments:	Second-most precise of the three methods. Incorporates an adjustment of minus 3 dB to account for spectral uncertainty. The effective dBA level can be computed by using R or a modified R factor called "NRR". NRR is subtracted from the workplace dBC level, whereas R is subtracted from the dBA level. NRR is a constant, however, R will change for each situation in which the δ is not the same.

Method 3 (LEAST ACCURATE)

Data required:	Q factors.
Comments:	Least precise of the three methods. Incorporates an adjustment of minus 8.5 dB to account for spectral uncertainty. (A less constraining procedure may be used if a certain assumption can be made - see "Discussion" for method 3.). R factor can be computed without noise level data. R factor is subtracted from workplace dBA level to give the effective dBA level.

METHOD 1: Detailed presentation and discussion

Formula

$$R = L_A - 10 \log S$$

where R = dBA-reduction factor

L_A = workplace dBA noise level

$$\begin{aligned} S = {} & \text{antilog}\,[(0.1)(L_1-Q_1)] + \text{antilog}\,[(0.1)(L_2-Q_2)] \\ & + \text{antilog}\,[(0.1)(L_3-Q_3)] + \text{antilog}\,[(0.1)(L_4-Q_4)] \\ & + \text{antilog}\,[(0.1)(L_5-Q_5)] + \text{antilog}\,[(0.1)(L_6-Q_6)] \\ & + \text{antilog}\,[(0.1)(L_7-Q_7)] \end{aligned}$$

L_1, L_2, L_3, L_4, L_5, L_6, and L_7, denote octave band sound levels at 125, 250, 500, 1000, 2000, 4000, and 8000 Hz, respectively

Q_1, Q_2, Q_3, Q_4, Q_5, Q_6, and Q_7 account for the attenuation of a given hearing protector (method for computation shown on page 6)

Notes: 1. Q FACTORS FOR HEARING PROTECTORS IN APPENDIX I ARE IN APPENDIX II.

2. antilog $[x] = 10^x$.

Example

Suppose a hearing protector is needed in an area with a noise level of 95 dBA and octave band noise levels of

125	250	500	1000	2000	4000	8000 Hz
88	89	85	89	89	89	80 dB

and a fictitious hearing protector with the following attenuation characteristics is used:

	125	250	500	1000	2000	3150	4000	6300	8000 Hz
Mean Attenuation	21	22	23	29	41	47	43	40	37 dB
Standard Deviation	3.7	3.3	3.8	4.7	3.3	4.0	2.7	6.0	6.6

The "Q" (see page 6 and Appendix II) and "L-Q" values in S are:

$Q_1 = 21$	$+ 16.1 - (2)(3.7) = 29.7$	$(L_1-Q_1) = 88 - 29.7 = 58.3$
$Q_2 = 22$	$+ 8.6 - (2)(3.3) = 24.0$	$(L_2-Q_2) = 89 - 24.0 = 65.0$
$Q_3 = 23$	$+ 3.2 - (2)(3.8) = 18.6$	$(L_3-Q_3) = 85 - 18.6 = 66.4$
$Q_4 = 29$	$- (2)(4.7) = 19.6$	$(L_4-Q_4) = 89 - 19.6 = 69.4$
$Q_5 = 41$	$- 1.2 - (2)(3.3) = 33.2$	$(L_5-Q_5) = 89 - 33.2 = 55.8$
$Q_6 = (47 + 43)/2$	$- 1.0 - 4.0 - 2.7 = 37.3$	$(L_6-Q_6) = 89 - 37.3 = 51.7$
$Q_7 = (40 + 37)/2$	$+ 1.1 - 6.0 - 6.6 = 27.0$	$(L_7-Q_7) = 80 - 27.0 = 53.0$

Applying the formula for the dBA reduction factor,

$$R = L_A - 10 \log S$$

where $L_A = 95$

$$\begin{aligned} \text{and } S &= \text{antilog } [(0.1)(58.3)] + \text{antilog } [(0.1)(65.0)] \\ &+ \text{antilog } [(0.1)(66.4)] + \text{antilog } [(0.1)(69.4)] \\ &+ \text{antilog } [(0.1)(55.8)] + \text{antilog } [(0.1)(51.7)] \\ &+ \text{antilog } [(0.1)(53.0)] \\ &= 676{,}083 + 3{,}162{,}278 + 4{,}365{,}158 + 8{,}709{,}636 \\ &+ 380{,}189 + 147{,}911 + 199{,}526 \\ &= 17{,}640{,}781 \end{aligned}$$

$$R = 95 - 10 \log (17{,}640{,}781) = 95 - 72.5 = \underline{22.5 \text{ dB}}$$

The effective dBA level is

$$L_A - R = 95 - 22.5 = 72.5 \text{ dBA},$$

which, incidently, is equal to the value of the term "10 log S."

Alternatively, the effective dBA level can be estimated using the "L-Q" values and Table 3, as shown in Table 4. Use of Table 3 to determine the effective dBA level can result in an overestimate of the R factor of 0.3 dB.

Discussion

The R factor calculated by this method only has an adjustment to account for measurement uncertainty which is accomplished by subtracting twice the standard deviation values from the corresponding attenuation values. No adjustment for spectral uncertainty is needed because the attenuation data are subtracted directly from the octave band levels of the noise. This is the most precise method and may be used an an ideal reference against which other methods can be compared.

This method has the drawback that a different R has to be calculated for each noise spectrum, but the same R can be used for different dBA levels if only the intensity of the given noise changes.

The use of this method is strongly recommended when speech communication or the ability to hear other environmental information is an important concern.

Table 3. Values used for summing two decibel (dB) levels.

HIGHER MINUS LOWER LEVEL	ADD TO HIGHER LEVEL
0.0 TO 0.1	3.0
0.2 TO 0.3	2.9
0.4 TO 0.5	2.8
0.6 TO 0.7	2.7
0.8 TO 0.9	2.6
1.0 TO 1.2	2.5
1.3 TO 1.4	2.4
1.5 TO 1.6	2.3
1.7 TO 1.9	2.2
2.0 TO 2.1	2.1
2.2 TO 2.4	2.0
2.5 TO 2.7	1.9
2.8 TO 3.0	1.8
3.1 TO 3.3	1.7
3.4 TO 3.6	1.6
3.7 TO 4.0	1.5
4.1 TO 4.3	1.4
4.4 TO 4.7	1.3
4.8 TO 5.1	1.2
5.2 TO 5.6	1.1
5.7 TO 6.1	1.0
6.2 TO 6.6	0.9
6.7 TO 7.2	0.8
7.3 TO 7.9	0.7
8.0 TO 8.6	0.6
8.7 TO 9.6	0.5
9.7 TO 10.7	0.4
10.8 TO 12.2	0.3
12.3 TO 14.5	0.2
14.6 TO 19.3	0.1
= OR > 19.4	0.0

Table 4. Example for using Table 3 to sum seven octave band levels in method 1 example (seven octave band levels shown are seven "L-Q" values).

Octave Band Level	Previous Result	Higher Minus Lower Level	Add to Higher Level		Higher Level		Result
58.3	-	-	-		-		58.3
65.0	58.3	6.7	0.8	+	65.0	=	65.8
66.4	65.8	0.6	2.7	+	66.4	=	69.1
69.4	69.1	0.3	2.9	+	69.4	=	72.3
55.8	72.3	16.5	0.1	+	72.3	=	72.4
51.7	72.4	20.7	0.0	+	72.4	=	72.4
53.0	72.4	19.4	0.0	+	72.4	=	72.4

METHOD 2: Detailed presentation and discussion.

Formula

$$R = NRR - \delta$$

$$= (4.9 - 10 \log T) - \delta$$

where R = dBA-reduction factor

NRR = 4.9 - 10 log T (see discussion of NRR on page 14)

$$T = \text{antilog}\,[(-0.1)(Q_1)] + \text{antilog}\,[(-0.1)(Q_2)] + \text{antilog}\,[(-0.1)(Q_3)] + \text{antilog}\,[(-0.1)(Q_4)] + \text{antilog}\,[(-0.1)(Q_5)] + \text{antilog}\,[(-0.1)(Q_6)] + \text{antilog}\,[(-0.1)(Q_7)]$$

Q_1, Q_2, Q_3, Q_4, Q_5, Q_6, and Q_7 account for attenuation of a given hearing protector (method for computation shown on page 6)

$$\delta = L_C - L_A$$

L_C = workplace dBC noise level

L_A = workplace dBA noise level

Notes: 1. NRR values are given in Appendix II for hearing protectors in this list.

2. The expression antilog $[(-0.1)(Q)]$ is equivalent to antilog $[(0.1)(L-Q)]$, where $L=0$.

3. antilog $(x) = 10^x$.

Example

Suppose a fictitious hearing protector with the following attenuation characteristics is used:

	125	250	500	1000	2000	3150	4000	6300	8000 Hz
Mean Attenuation	21	22	23	29	41	47	43	40	37 dB
Standard Deviation	3.7	3.3	3.8	4.7	3.3	4.0	2.7	6.0	6.6

If this hearing protector were actually in the list, NRR could be found by using the protector's I.D. No. to locate the value in Appendix II. In this case, however, the "10 log T" value must be computed as shown on page 13 and is equal to -14.9.

Workplace noise levels are: $L_C = 96$, $L_A = 95$

Applying the formula,

$$R = NRR - \delta$$

$$\begin{aligned} \text{where } NRR &= 4.9 - 10 \log T \\ &= 4.9 - (-14.9) \\ &= 19.8 \text{ dB} \end{aligned}$$

$$\text{and } \delta = 96 - 95 = 1$$

$$\begin{aligned} R &= 19.8 - 1 \\ &= 18.8 \text{ dB} \end{aligned}$$

The effective dBA level is

$$L_A - R = 95 - 18.8 = 76.2 \text{ dBA}$$

or, using NRR and the dBC noise level, the effective dBA level is

$$L_C - NRR = 96 - 19.8 = 76.2 \text{ dBA}$$

Computation of 10 log T

The "Q" values are:

$$\begin{aligned}
Q_1 &= 21 + 16.1 - (2)(3.7) = 29.7 \\
Q_2 &= 22 + 8.6 - (2)(3.3) = 24.0 \\
Q_3 &= 23 + 3.2 - (2)(3.8) = 18.6 \\
Q_4 &= 29 - (2)(4.7) = 19.6 \\
Q_5 &= 41 - 1.2 - (2)(3.3) = 33.2 \\
Q_6 &= (47 + 43)/2 - 1.0 - 4.0 - 2.7 = 37.3 \\
Q_7 &= (40 + 37)/2 + 1.1 - 6.0 - 6.6 = 27.0
\end{aligned}$$

$$\begin{aligned}
\text{and } T &= \text{antilog } [(-0.1)(29.7)] + \text{antilog } [(-0.1)(24.0)] \\
&+ \text{antilog } [(-0.1)(18.6)] + \text{antilog } [(-0.1)(19.6)] \\
&+ \text{antilog } [(-0.1)(33.2)] + \text{antilog } [(-0.1)(37.3)] \\
&+ \text{antilog } [(-0.1)(27.0)] \\
&= 0.00107 + 0.00398 + 0.01380 + .01096 \\
&+ 0.00048 + 0.00019 + 0.00200 \\
&= .03248
\end{aligned}$$

$$\begin{aligned}
10 \log T &= 10 \log (0.03248) \\
&= (10)(-1.49) \\
&= -14.9
\end{aligned}$$

Discussion

This method is based upon a simplifying assumption which is applied to a procedure developed by J. Botsford[6]. A "sound level conversion" value, or a modified R factor (denoted herein as NRR), is computed by using the attenuation data of a hearing protector and a single noise spectrum which is composed of equal sound pressure levels for all octave bands ("pink" noise). (This noise spectrum represents the median "shape," with δ equal to approximately 1.5, of the sample of 100 noise spectra shown in Figure 1 of the previous (1975) report[1], which were chosen to correspond to the distribution of noise exposures found in major industries in the U.S.). The computation of NRR involves subtracting the effective dBA level from the dBC level of the assumed pink noise. The result of this subtraction can be shown to equal "7.9 - 10 log T", where T is derived from the hearing protector attenuation data including adjustments for measurement uncertainty.* However, an additional adjustment** of 3 dB is then required to protect against overestimation because of the possible variations in the spectra of actual workplace noises. The dBA-reduction factor, R, is then just NRR minus δ. Thus, the expression for R is :

$$\begin{aligned} R &= 7.9 - 10 \log T - \delta - 3 \\ &= 4.9 - 10 \log T - \delta \\ &= NRR - \delta \end{aligned}$$

As shown in the example for this method, the effective dBA level can be computed using NRR as well as R. The only difference is that NRR is subtracted from the dBC level whereas R is subtracted from the dBA level. Being a constant for a given hearing protector, NRR is convenient to use if the workplace dBC noise level is known; furthermore, it makes determination of δ unnecessary. R, however, is dependent on the value of δ (i.e. $L_C - L_A$) for the workplace noise and is not necessarily constant for a given hearing protector.

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*The value 7.9 dB corresponds to the dBC level for pink noise used in the EPA Noise Reduction Rating (NRR) which was computed over the octave bands 125 to 8000 Hz. In the previous NIOSH (1975) report[1], dBC levels were computed over the 63 to 8000 Hz octave bands (for all noise spectra used in the determination of correction factors for spectral uncertainty; see footnote below) and the pink noise value was 8.5 dB.

**This adjustment factor is the 98th percentile point in the error distribution of values of R computed using δ as an index of the noise spectrum versus values of R computed using octave band sound pressure levels. This factor was determined using the attenuation data and the 100 noise spectra presented in the previous (1975) report[1] and a pink noise dBC level of 8.5 dB. If the pink noise value of 7.9 dB had been included in the determination of the 98th percentile adjustment factor, then this factor would have been 2.4 dB instead of 3 dB. Thus, an additional adjustment factor of .6 dB has been included.

Since a variable R factor could cause some difficulty in its use, a conservative procedure can be used to calculate a constant value of R if one has sufficient knowledge of the δ values of noise in the workplace. The procedure is to determine the highest value of δ at the workers' positions of concern and use that value in the equation for R. The resulting R factor can be subtracted from dBA levels throughout the workplace to determine the effective dBA noise levels. As an example, if one were sure that the value of δ were no greater than 5.0 at all locations in his factory, then a single R factor of 14.8 dB could be used for the hearing protector of the above example ($R = NRR - \delta = 19.8 - 5.0$).

METHOD 3: Detailed presentation and discussion.

Formula

$$R = -1.5 - 10 \log T$$

$$R \cong NRR - 7$$

where R = dBA-reduction factor

$NRR = 4.9 - 10 \log T$ (see discussion of NRR on page 14)

$$T = \text{antilog } [(-0.1)(Q_1)] + \text{antilog } [(-0.1)(Q_2)] + \text{antilog } [(-0.1)(Q_3)] + \text{antilog } [(-0.1)(Q_4)] + \text{antilog } [(-0.1)(Q_5)] + \text{antilog } [(-0.1)(Q_6)] + \text{antilog } [(-0.1)(Q_7)]$$

Q_1, Q_2, Q_3, Q_4, Q_5, Q_6, and Q_7 account for attenuation of a given hearing protector (method for computation shown on page 6)

Note that antilog $(x) = 10^x$.

Example

As an example, the fictitious hearing protector used in the example of method 2, with a "10 log T" value of -14.9, is used below.

Applying the formula,

$$\begin{aligned} R &= -1.5 - 10 \log T \\ &= -1.5 - (-14.9) \\ &= \underline{13.4 \text{ dB}} \end{aligned}$$

For a workplace dBA level of 95, the effective dBA level is

$$L_A - R = 95 - 13.4 = 81.6 \text{ dBA}$$

Discussion

This method requires no noise measurements to compute R. The formula has been derived by assuming a noise spectrum which is composed of equal sound pressure levels for all octave bands ("pink" noise). (This noise spectrum represents the median "shape" of the sample of 100 noise spectra shown in Figure 1 of the previous (1975) report[1], which were chosen to correspond to the distribution of noise exposures found in major industries in the U.S.). The computation of R involves subtracting the effective dBA level from the dBA level of the assumed pink noise. The result of this subtraction can be shown to equal "7.0 - 10 log T", where T is derived from the hearing protector attenuation data including adjustments for measurement uncertainty. However, an additional adjustment* of 8.5 dB is then required to protect against overestimation of R because of variation in the noise spectra of actual industrial noises. The resulting expression for R is:

$$R = 7.0 - 10 \log T - 8.5$$
$$= -1.5 - 10 \log T$$

Once the value of "10 log T" is determined, R is computed by a single subtraction. A possible disadvantage with this method is that too low of a value of R might result because of the necessity for having a large adjustment factor (8.5 dB). To demonstrate differences that can occur between the methods, the R factors in the examples for methods 1, 2, and 3 were computed using the same hearing protector and the same noise data. The results are: method 1 (22.5 dB), method 2 (18.8 dB), and method 3 (13.4 dB). If an unsatisfactory R is computed using method 3, several alternatives are available to the user. Possibly a different hearing protector with a larger R factor could be selected, or additional noise data (octave band sound levels or dBC levels) can be obtained in order to use method 1 or method 2, which will usually yield greater values of R. However, given the likelihood that the true noise reduction factor is typically at least 6 dB higher (possibly as much as 12 dB higher depending on the actual noise spectrum), use of dBC levels or octave band levels is strongly recommended when speech communication or other enivronmental information is an important concern.

Even if the noise data needed to compute R by method 2 is not directly available, the method may still be used if a certain assumption can be made about the term δ (delta), which is the difference between the dBC (L_C) and dBA (L_A) levels of the workplace noise ($\delta = L_C - L_A$). The procedure is to assume the highest value of δ expected for actual noises within a given workplace and use that value in the formula for R presented in method 2 (i.e. $R = 4.9 - 10 \log T - \delta$). The assumed value of δ should be based on actual noise measurements, noise data from a similar operation, or some other well-founded reason.

---

* This adjustment factor is the 98th percentile point in the error distribution of values of R computed by the method 3 procedure versus values of R computed using octave band sound pressure levels. This factor was determined using the attenuation data and the 100 noise spectra presented in the previous (1975) report.[1]

The formula for R in method 3 can be rearranged to illustrate how it is similar to the method 2 formula:

$$
\begin{aligned}
R &= -1.5 - 10 \log T \\
&= 4.9 - 10 \log T - 6.4 \\
&= NRR - 7
\end{aligned}
$$

In this form, the method 3 formula is shown to be equal to the method 2 formula for a δ value of approximately 7.** This point is important because a certain amount of caution should be exercised in using method 3 in workplaces where dBC(L_C) - dBA(L_A) differences might be greater than 7. This situation is relatively easy to recognize because it implies dominant low frequency noise, with a hearty rumble or deep roar. This slight restriction in the application of the formula emerged out of the development of the method. Method 3 was designed to meet the requirements of (1) having a simple, short procedure for calculating R without knowing any noise levels; (2) obtaining a constant R factor (for a given hearing protector) which can be subtracted from measured dBA levels to give the effective dBA level; and (3) having a value of R which is not unreasonably small for most protectors. Without the indicated restriction, an adjustment factor larger than 8.5 dB would be needed which could result in values of R being almost too low to be useful. Therefore, use caution in applying a method 3 R factor if low frequency noises are present, and when in doubt, use method 1 or 2, if possible.

This completes the presentation of methods 1, 2, and 3. The following section provides additional information concerning the evaluation of hearing protectors.

** Although the formula R = NRR - 6.4 is consistent with the correction factor of 8.5 dB for spectral uncertainty, the "approximate" formula R = NRR - 7 is presented to avoid undue confusion with applications of method 3 as presented in the previous (1975) report.[1]

Considerations in Selection and Use of Hearing Protectors

Calculated noise reduction factors are based on experimenter (best) fit data. To investigate the attenuation achieved in actual use, a field test method was developed by NIOSH and research studies were conducted, using this method.[7,8,9] The results of these *in-situ* attenuation tests of workers using preformed, acoustic wool, custom-molded, and acoustic foam earplugs, when compared to manufacturer's best-fit laboratory test results, indicated that 50% of the workers tested were receiving less than half the potential attenuation in dBA of the earplugs (determined using experimenter (best) fit mean attenuation values). Approximately 10% of the workers tested received less than 3 dB of protection, regardless of the type of earplug used.

In the area of muff-type protectors, the Mine Safety and Health Administration has conducted a study where the noise was recorded simultaneously through microphones placed inside and outside the protective cup as the worker performed his normal work tasks.[10] The results, when compared to manufacturers' best-fit laboratory test results, were similar to those of the NIOSH studies.

In order to appropriately estimate the actual noise reduction that will be achieved in actual use, there are several options. Some type of "user-informed fit" could be employed in the standard laboratory method; however, at present there is no concensus as to how to achieve consistency using such a procedure. Field data as those mentioned above could be used to calculate noise reduction factors; however, substantially more data would need to be collected and, if two standard deviations were subtracted from the mean attenuation values in order to estimate the minimum noise reduction that would be achieved by 98% of the population, then the amount of noise reduction would be zero dB in most cases. Lastly, "derating" factors could be used in conjunction with the noise reduction factors presented in methods 1, 2, and 3; however, more work must be done to arrive at a consistent and meaningful scheme for determining such factors.

Thus, in selecting a hearing protector, calculated noise reduction factors are an important consideration, but several other aspects must be considered which can effect the actual reduction achieved and the acceptance of the device by a worker. The possibility of wearer adjustment should be evaluated in terms of reliability of performance. Additional considerations are durability (shelf life or use life), sanitation-hygienic characteristics, the need of the worker to communicate verbally and to hear warning signals, environmental conditions such as heat, the time needed to install the device, and the amount of time(s) during the day that the device will be worn. If muff type hearing protection devices are used in a position other than "over-the-head" and a retaining strap is available, then it is important to utilize this option which should improve the reliability of the performance of the device. If custom-molded hearing protectors are to be used, the expertise of those persons who will prepare the impression materials and form the final mold should be considered; the performance of these devices can be outstanding when they are properly made.[9]

In use, factors which usually degrade the noise reduction are improper fitting at the time of distribution, interference by hair or eyeglasses, and improper wearing by the worker. Proper fit of a hearing protector is most important in realizing the expected attenuation because it is on this basis that the attenuation data presented in Appendix 1 were derived. Improper fit is often a result of attempts to improve comfort and reduce the time needed to install the device. Many companies have found that the practices of personally fitting each worker, offering a variety of types to the workers, and providing regular and frequent monitoring of the proper use and fit of the protectors, have greatly improved acceptance of wearing hearing protectors.

References

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Appendix I. List of Hearing Protection Devices and Attenuation Data as Supplied by the Manufacturers and Distributors

Legend of Design Codes 1, 2, and 3

DESIGN CODE 1 (TYPE)

CODE	DESCRIPTION
PN	PLUGS PRE-MOLDED, NO FLANGES
PI	PLUGS PRE-MOLDED, ONE FLANGE
P2	PLUGS PRE-MOLDED, TWO FLANGES
P3	PLUGS PRE-MOLDED, THREE FLANGES
P5	PLUGS PRE-MOLDED, FIVE FLANGES
PC	PLUGS PRE-MOLDED, CONICAL
PU	PLUGS USER-MOLDED
PS	PLUGS SPECIAL (CUSTOM)-MOLDED
PE	PLUGS SELF-MOLDING (EXPANDABLE)
CS	PLUGS PRE-MOLDED, CONCHA SEATED
MO	MUFFS OVER-THE-HEAD
MB	MUFFS BEHIND-THE-HEAD
MU	MUFFS UNDER-THE-CHIN
MH	MUFFS MOUNTED ON HELMET

DESIGN CODE 2 (MATERIALS)

CODE	DESCRIPTION
AC	ACRYLIC PLUG
FO	FOAM PLUG
GF	GLASS FIBER PLUG
SI	SILICONE PLUG
VI	VINYL PLUG
WC	WAX-COTTON PLUG
LM	LIQUID-FILLED MUFF CUSHION WITH METAL HEADBAND
LP	LIQUID-FILLED MUFF CUSHION WITH PLASTIC HEADBAND
FM	FOAM-FILLED MUFF CUSHION WITH METAL HEADBAND
FP	FOAM-FILLED MUFF CUSHION WITH PLASTIC HEADBAND
FH	FOAM-FILLED MUFF CUSHION MOUNTED ON HELMET

DESIGN CODE 3 (IF APPLICABLE)

CODE	DESCRIPTION
B	PLUGS WITH HEADBAND
C	SAFETY CORD (OPTION)
D	DISPOSABLE PLUG TYPE
R	MUFFS WITH RETAINING STRAP
A	ACTIVE HEADSET (OPTION)

"I.D. No." FOOTNOTES

a Tested re ANSI Z24.22-1957
b Tested re ANSI-1969 at the Audiology Center of Redlands, Redlands, California.
c Tested by Industrial Acoustics Company, Bronx, New York.
d Tested by Audiology Centers of Los Angeles, Los Angeles, California.

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	Design Code 2	Design Code 3	Weight (Force) oz.	Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	800
1	ADCO HEARING CONSERVATION 1558 CALIFORNIA STREET DENVER CO 80202 (303)893-0624	ADCOSIL CUSTOM	PS	SI	C		21 (2.4)	22 (2.0)	24 (2.1)	30 (2.4)	36 (2.5)	41 (3.4)	39 (4.8)	37 (2.5)	35 (2.7
2	AIRCO INC/JACKSON PRODUCTS 5801 SAFETY DRIVE N.E. BELMONT MI 49306	EP-1,2,3 EP-1C,2C,3C	P3	SI	D C		22 (2.6)	24 (2.0)	29 (3.1)	33 (2.3)	36 (2.3)	38 (2.4)	41 (1.4)	40 (2.8)	39 (3.0
3	(616)784-6200	SA-30	MO	FM	R	9 (17)	15 (3.2)	21 (3.0)	26 (3.8)	33 (3.1)	33 (3.2)	32 (3.8)	31 (3.5)	35 (5.0)	37 (4.0
4		SA-30MB	MH	FP		9	14 (2.3)	18 (2.4)	27 (2.8)	32 (2.1)	36 (2.4)	39 (2.1)	41 (2.6)	40 (3.1)	37 (3.0
5		SA-20	MB	FM	R	6 (21)	8 (2.4)	14 (2.2)	19 (2.4)	26 (1.7)	34 (1.8)	38 (3.4)	37 (3.8)	33 (3.6)	31 (3.0
6		SA-10	P1	AC	B		10 (2.0)	15 (2.0)	17 (1.8)	20 (1.9)	31 (2.8)	34 (2.1)	31 (2.0)	31 (1.9)	31 (3.4
7	AMERICAN ALLSAFE CO. 99 WALES AVENUE TONAWANDA NY 14151	HS-2326	MO	FM		9 (30)	20 (3.1)	23 (2.7)	29 (2.6)	39 (2.1)	38 (2.5)	38 (3.4)	39 (2.6)	43 (2.5)	42 (2.8
8	(716)695-8300	HS-2326	MB	FM		9 (30)	20 (5.7)	22 (4.1)	29 (3.6)	39 (3.7)	39 (3.1)	38 (3.2)	39 (3.5)	41 (3.1)	40 (4.6
9		HS-2326	MU	FM		9 (30)	18 (3.8)	22 (3.4)	29 (3.7)	36 (3.3)	40 (2.4)	38 (2.8)	39 (3.4)	40 (2.8)	41 (3.7
10		HS-260 ON CAM-HI HELMET W/CAPMATE	MH	FH		8	20 (2.9)	24 (2.1)	29 (3.5)	35 (1.7)	37 (2.2)	40 (1.8)	42 (2.0)	41 (2.7)	41 (2.3
11		HS-2023	MO	FM		6 (27)	13 (2.1)	20 (2.0)	23 (2.0)	33 (3.0)	37 (3.2)	42 (3.0)	40 (2.0)	40 (3.0)	37 (4.0
12		HS-2023	MB	FM		6 (27)	13 (3.6)	18 (2.7)	21 (2.4)	31 (3.6)	33 (3.2)	41 (1.7)	39 (2.5)	38 (3.5)	35 (4.1)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	Design Code 2	Design Code 3	Weight (Force) oz.	125	250	500	1000	2000	3150	4000	6300	8000
							Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB)								
13		HS-2023	MU	FM		6 (27)	14 (2.9)	19 (2.3)	22 (2.2)	34 (2.1)	34 (3.3)	41 (2.4)	40 (3.0)	38 (3.3)	35 (3.5)
14		HS-220 ON BULLARD HELMET W/CAPMATE	MH	FH		7	15 (2.0)	18 (2.5)	23 (2.0)	32 (2.0)	35 (2.3)	42 (1.5)	42 (2.2)	42 (3.3)	40 (3.6)
15		HS-1820	MO	FP		5 (30)	13 (2.1)	15 (2.7)	20 (1.7)	32 (2.0)	34 (2.2)	40 (2.6)	40 (2.1)	40 (3.0)	39 (3.3)
16		HS-1820	MB	FP		5 (30)	12 (2.6)	15 (2.1)	20 (1.9)	31 (2.0)	33 (2.9)	41 (2.8)	41 (1.9)	40 (3.5)	38 (3.4)
17		HS-1820	MU	FP		5 (30)	11 (2.7)	15 (3.2)	19 (1.9)	30 (3.4)	31 (3.0)	38 (2.9)	38 (2.4)	37 (3.0)	36 (3.4)
18		HS-216 ON CAM-HI HELMET W/CAPMATE	MH	FH		7	18 (2.8)	18 (2.0)	22 (2.1)	31 (3.0)	32 (2.4)	40 (3.2)	42 (2.3)	42 (2.3)	41 (3.0)
19		A-220	CS		B		10 (2.0)	15 (2.0)	17 (1.8)	20 (1.9)	31 (2.8)	34 (2.1)	31 (2.0)	31 (1.9)	31 (3.4)
20		A-FM 24 & 26	P3	SI	C		25 (6.1)	26 (5.7)	24 (5.2)	26 (2.8)	32 (3.9)	38 (6.7)	42 (7.1)	43 (8.5)	46 (8.6)
21	AMERICAN OPTICAL CORP. 14 MECHANIC STREET SOUTHBRIDGE MA 01550 (617)765-9711	1720	MO	FM		8	15 (1.8)	20 (1.7)	27 (2.1)	33 (2.4)	35 (1.6)	37 (2.0)	39 (2.0)	40 (1.8)	38 (2.3)
22		1720	MB	FM		8	7 (1.9)	15 (2.2)	22 (3.5)	28 (3.0)	35 (2.0)	35 (1.9)	36 (2.2)	36 (2.1)	35 (1.9)
23		1720	MB	FM	R	8	10 (2.8)	15 (1.8)	24 (2.7)	32 (2.3)	35 (1.9)	37 (1.7)	37 (1.9)	37 (2.5)	35 (2.2)
24		1720	MU	FM		8	6 (1.8)	13 (2.3)	21 (3.7)	27 (3.0)	32 (2.2)	32 (2.5)	35 (2.1)	35 (1.7)	34 (1.6)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	Design Code 2	Design Code 3	Weight (Force) oz.	125	250	500	1000	2000	3150	4000	6300	8000
							Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB)								
25		1776K	MH	FM		7	14 (3.0)	17 (3.5)	27 (3.2)	35 (2.3)	39 (2.0)	38 (2.1)	36 (2.5)	35 (1.8)	34 (2.5)
26		AO SOUND OUT OVER-THE-HEAD	CS		B	2	16 (2.4)	17 (2.8)	20 (3.2)	26 (3.2)	31 (2.7)	34 (1.6)	32 (1.9)	29 (2.7)	30 (3.7)
27		AO SOUND OUT UNDER-THE-CHIN	CS		B	2	21 (3.1)	19 (2.8)	18 (2.8)	23 (1.9)	29 (2.3)	32 (2.3)	29 (1.9)	27 (1.9)	27 (2.9)
28		AO SOUND OUT BEHIND-THE-HEAD	CS		B	2	20 (2.7)	19 (2.1)	18 (2.6)	23 (2.0)	29 (2.9)	33 (2.5)	31 (3.2)	29 (2.5)	27 (3.5)
29		AO QUIET TIP	PC	VI			27 (3.4)	27 (3.4)	28 (4.4)	32 (3.4)	37 (2.8)	42 (3.4)	38 (4.6)	36 (3.4)	34 (3.6)
30		V51R	PI	VI	C		20 (2.2)	23 (2.2)	25 (2.3)	29 (1.8)	35 (2.0)	38 (2.5)	39 (2.3)	38 (3.3)	39 (2.8)
31b	AURAL RESEARCH 190 WEST SANTA FE STREET POMONA CA 91767 (714)596-6112	AR-200-P	MO	FM	R	11 (32)			11 (5.4)	4 (4.2)	8 (6.5)	8 (4.9)	8 (6.2)	17 (9.7)	
32	AURAL TECHNOLOGY INC. 12722 RIVERSIDE DRIVE NORTH HOLLYWOOD CA 91607	PROTECTEAR (VENTED POSITION)	PS	VI	C		7 (3.8)	8 (3.9)	13 (2.2)	20 (2.6)	29 (3.0)	36 (2.6)	36 (2.6)	31 (3.0)	27 (3.5)
33	(213)760-2020	PROTECTEAR (OCCLUDED)	PS	VI	C A		29 (5.0)	29 (4.9)	31 (4.2)	35 (5.3)	37 (2.4)	43 (2.6)	41 (3.7)	39 (4.8)	39 (4.2)
34	BILSOM INTERNATIONAL INC. 11800 SUNRISE VALLEY DRIVE RESTON VA 22091	PROPP-O-PLAST 5521&5026	PE	GF	D		23 (3.6)	24 (2.8)	26 (2.5)	26 (3.0)	34 (3.0)	39 (2.2)	40 (2.8)	41 (3.2)	38 (3.6)
35	(703)620-3950	SOFT 5031	PE	GF	D		27 (3.3)	28 (3.2)	29 (3.1)	32 (2.4)	37 (2.8)	44 (2.1)	43 (2.3)	43 (3.9)	43 (2.7)
36		EARDOWN 2000&3001	PU	GF	D		10 (2.4)	13 (1.6)	16 (1.9)	20 (1.9)	31 (1.9)	36 (1.6)	37 (2.4)	38 (2.1)	34 (1.4)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	2	3	Weight (Force) oz.	Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000
37		PER-FIT 5601, 5602,5603,5604	PC	SI	C		29 (3.7)	29 (3.8)	30 (3.2)	32 (2.1)	37 (2.5)	43 (3.0)	40 (5.1)	39 (4.6)	35 (3.1)
38		UNIVERSAL MUFF 2308(UF-1)	MO	FP		6 (24)	17 (1.9)	20 (1.3)	26 (2.4)	33 (1.7)	40 (1.5)	45 (1.9)	47 (1.4)	45 (1.9)	44 (2.8)
39		UNIVERSAL MUFF 2308(UF-1)	MU	FP		6 (24)	13 (1.9)	17 (1.1)	24 (1.7)	32 (2.2)	39 (1.5)	42 (1.7)	43 (1.5)	41 (1.9)	38 (1.9)
40		UNIVERSAL MUFF 2308(UF-1)	MB	FP		6 (24)	14 (2.0)	19 (1.8)	26 (2.4)	33 (2.1)	40 (1.2)	44 (1.1)	46 (2.0)	43 (2.2)	41 (2.8)
41		VIKING MUFF 2318 SDF-1	MO	FP	R	9 (52)	23 (2.2)	25 (2.0)	31 (1.9)	36 (2.2)	40 (2.0)	42 (2.3)	41 (3.2)	39 (3.2)	37 (3.0)
42		VIKING MUFF 2318 SDF-1	MB	FP	R	9 (46)	21 (1.8)	24 (1.8)	31 (2.6)	36 (1.7)	39 (2.6)	41 (3.6)	42 (2.7)	39 (2.5)	36 (1.9)
43		VIKING MUFF 2318 SDF-1	MU	FP	R	9 (46)	21 (3.1)	24 (1.9)	31 (1.7)	35 (1.4)	37 (2.0)	40 (2.1)	41 (2.3)	39 (2.5)	35 (2.3)
44		BILSOM COMFORT 2315 MDF1	MO	FP	R	8 (46)	17 (2.1)	21 (1.9)	24 (2.0)	36 (1.8)	38 (1.8)	41 (2.4)	42 (1.6)	39 (2.5)	36 (1.9)
45		BILSOM COMFORT 2315 MDF1	MB	FP	R	8 (38)	16 (2.1)	19 (2.4)	24 (1.9)	33 (1.7)	38 (1.9)	41 (2.6)	42 (2.4)	40 (2.9)	37 (2.6)
46		BILSOM COMFORT 2315 MDF1	MU	FP	R	8 (38)	14 (1.9)	17 (1.7)	24 (1.9)	34 (1.8)	37 (1.7)	40 (2.8)	40 (2.6)	37 (2.8)	35 (1.7)
47		BILSOM COMFORT 2315 MHF-20	MH	FP		9 (25)	14 (2.8)	18 (2.0)	25 (2.5)	34 (2.5)	35 (3.0)	40 (2.5)	41 (2.2)	41 (2.7)	38 (2.8)
48		VIKING 2314 SHF-30	MH	FP		10 (34)	15 (1.8)	21 (2.0)	27 (2.5)	37 (2.8)	36 (1.5)	38 (2.3)	42 (3.0)	42 (3.7)	39 (3.6)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	2	3	Weight (Force) oz.	125	250	500	1000	2000	3150	4000	6300	8000
							Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB)								
49		HELMET MUFF 2312 HF-5	MH	FP		7	15 (1.9)	16 (2.0)	21 (1.9)	29 (2.4)	37 (2.4)	43 (2.3)	43 (1.8)	40 (2.3)	37 (2.8)
50		NECKBAND MUFF 2309 NF-1	MB	FP	R	7 (35)	10 (1.2)	10 (1.4)	19 (2.3)	32 (2.3)	35 (1.9)	40 (2.1)	41 (2.0)	41 (2.2)	41 (1.9)
51		UNIVERSAL LIQUID MUFF 2301 UL-1	MO	LP		9 (45)	15 (2.2)	19 (2.9)	23 (3.0)	33 (2.2)	39 (2.3)	40 (1.5)	39 (3.3)	36 (2.7)	34 (1.4)
52		UNIVERSAL LIQUID MUFF 2301 UL-1	MB	LP		9 (37)	14 (2.2)	17 (1.7)	22 (2.7)	31 (2.4)	38 (2.3)	40 (1.8)	39 (2.3)	37 (2.1)	34 (2.0)
53		UNIVERSAL LIQUID MUFF 2301 UL-1	MU	LP		9 (37)	14 (2.0)	18 (2.0)	23 (1.5)	31 (2.5)	37 (2.8)	42 (2.4)	40 (2.6)	37 (1.8)	36 (2.6)
54a	CURTIS SAFETY PRODUCTS CO. 91 STAFFORD STREET WORCESTER MA 01603	NOISE-CHECKS (V-51R)	P1	VI	C		20 (2.2)	23 (2.2)	25 (2.3)	29 (1.8)	35 (2.0)	38 (2.5)	39 (2.3)	38 (3.3)	39 (2.8)
55a	(617)754-3906	TRI-CHECKS (TRIPLE FLANGE)	P3	SI	C		23 (2.6)	25 (2.0)	30 (3.1)	34 (2.3)	37 (2.3)	39 (2.4)	42 (1.4)	41 (2.8)	40 (3.0)
56	DAVID CLARK COMPANY INC. 360 FRANKLIN STREET WORCESTER MA 01604	27	MO	FM		16	23 (3.8)	26 (3.5)	26 (3.7)	31 (3.7)	31 (3.3)	34 (4.2)	35 (4.7)	36 (4.9)	36 (4.3)
57	(617)756-6216	10A	MO	FM		14	11 (1.4)	21 (2.6)	29 (3.6)	33 (2.6)	36 (1.4)	37 (2.3)	38 (1.6)	37 (2.1)	37 (2.7)
58		805V	MB	FM	R	12	15 (4.6)	21 (3.1)	30 (4.2)	41 (4.3)	39 (3.2)	40 (3.4)	38 (3.8)	38 (3.1)	37 (3.5)
59		730/731/732	MH	FH		11	17 (3.0)	20 (2.9)	27 (4.6)	34 (5.1)	35 (3.9)	34 (4.0)	34 (3.5)	36 (5.1)	35 (3.7)
60a		705	MH	FH		11	12 (2.5)	17 (3.0)	30 (4.6)	35 (5.6)	35 (4.5)	36 (4.3)	37 (4.2)	32 (4.1)	30 (2.9)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	2	3	Weight (Force) oz.	Average Attenuation In dB vs. Frequency In Hz (Standard Deviation In dB) 125	250	500	1000	2000	3150	4000	6300	8000
61		310 TRI-FIT	MO	FM		12	14	20	26	34	39	41	41	38	35
							(2.7)	(1.7)	(2.1)	(1.3)	(1.6)	(1.9)	(1.0)	(1.5)	(1.2)
62		310 TRI-FIT	MB	FM		12	8	15	24	31	36	39	40	39	35
							(2.1)	(2.3)	(2.8)	(1.7)	(1.6)	(2.0)	(1.7)	(1.7)	(1.4)
63		310 TRI-FIT	MU	FM		12	9	15	24	32	37	39	39	38	35
							(2.3)	(2.2)	(2.1)	(1.6)	(1.9)	(1.8)	(1.5)	(2.3)	(1.5)
64a		320 TRI-FIT	MO	FM		13	12	17	25	36	37	41	40	38	35
							(2.2)	(1.8)	(2.4)	(5.0)	(3.8)	(5.3)	(5.7)	(4.8)	(5.1)
65a		320 TRI-FIT	MB	FM		13	11	18	24	37	35	41	42	37	35
							(2.1)	(1.7)	(2.5)	(5.4)	(3.4)	(4.6)	(5.9)	(4.1)	(4.3)
66a		320 TRI-FIT	MU	FM		13	10	17	25	35	33	41	38	33	32
							(2.3)	(2.6)	(3.8)	(6.4)	(4.1)	(5.6)	(5.0)	(5.5)	(4.3)
67	E-A-R DIVISION	E-A-R PLUG	PE	FO	C		35	36	41	41	38	43	44	44	42
	7911 ZIONSVILLE ROAD	(PL-101)					(2.2)	(2.4)	(2.8)	(2.9)	(3.1)	(2.9)	(4.5)	(5.5)	(4.3)
	INDIANAPOLIS IN 46268														
68	(317)872-1111	CABOFLEX MODEL 600	PC		B	1	22	22	23	28	32	37	89	41	41
		(UNDER-THE-CHIN)				(5)	(3.1)	(2.7)	(2.3)	(2.4)	(2.8)	(3.3)	(3.6)	(4.8)	(4.9)
69		CABOFLEX MODEL 600	PC		B	1	21	22	23	27	32	37	39	40	41
		(BEHIND-THE-NECK)				(5)	(3.1)	(3.0)	(2.3)	(2.2)	(2.6)	(3.4)	(2.9)	(4.8)	(5.1)
70	EARMARK, INC.	TYPE "H" COMMUNI-	MO	FM	R	11	17	21	27	33	33	35	36	37	37
	1125 DIXWELL AVENUE	CATION EARMUFFS			A	(56)	(1.4)	(1.3)	(1.8)	(1.4)	(1.0)	(1.4)	(1.8)	(1.8)	(2.2)
	HAMDEN CT 06514														
	(203)777-2130														
71	EASTERN SAFETY EQUIPMENT	EHP-1 510	MO	FM		9	12	20	28	39	40	36	36	39	39
	45-17 PEARSON STREET					(45)	(2.7)	(2.2)	(2.8)	(1.9)	(1.8)	(1.9)	(1.9)	(2.7)	(3.1)
	LONG ISLAND C. NY 11101														
72	(212)392-4100	510-2	MO	FP			19	19	30	40	38	36	34	37	38
							(3.0)	(2.0)	(2.1)	(2.8)	(2.9)	(2.6)	(2.3)	(3.3)	(3.7)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	Design Code 2	Design Code 3	Weight (Force) oz.	125	250	500	1000	2000	3150	4000	6300	8000
							Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB)								
73		986	PE	FO	D		36 (3.9)	38 (3.0)	41 (2.3)	39 (2.7)	37 (2.8)	45 (3.2)	44 (4.1)	44 (4.2)	45 (4.8)
74		512	P1	VI			20 (2.0)	22 (2.0)	24 (2.0)	28 (2.0)	34 (2.0)	36 (3.0)	37 (3.0)	37 (3.0)	37 (3.0)
75		509	CS	VI	B		10 (2.0)	15 (2.0)	17 (1.8)	20 (1.9)	31 (2.8)	34 (2.1)	31 (2.0)	31 (1.9)	31 (3.4)
76	ERB SAFETY, INC. 529 GA. HWY. 5 NORTH WOODSTOCK GA 30188	211	MO	FP		5 (42)	19 (3.0)	19 (2.0)	29 (2.1)	40 (2.8)	38 (2.9)	36 (2.6)	34 (2.3)	37 (3.3)	38 (3.7)
77	(404)926-7944	213	MH	FH		6 (24)	13 (2.3)	14 (2.4)	22 (2.5)	32 (3.3)	37 (3.6)	35 (2.1)	34 (1.9)	32 (3.4)	33 (4.0)
78	FLENIS PRODUCTS CO. INC. 14 ORCHARD STREET NORWALK CT 06850	ANTI-NOISE EAR STOPPLES	PU	WC	D		25 (2.6)	27 (2.9)	27 (3.1)	32 (3.1)	37 (3.2)	40 (2.9)	45 (5.3)	41 (4.9)	37 (4.8)
79	(203)866-2581	QUIET-DOWN	PU	GF	D		10 (2.4)	13 (1.6)	16 (1.9)	20 (1.9)	31 (1.9)	36 (1.6)	37 (2.4)	38 (2.1)	34 (1.4)
80		SILAFLEX	PU	SI	D		23 (2.1)	26 (2.2)	28 (2.3)	30 (1.9)	36 (2.0)	45 (2.8)	44 (3.1)	36 (2.7)	34 (2.5)
81		FLEXIPLUG	P5	SI	C		22 (2.2)	25 (2.8)	27 (2.6)	31 (1.8)	37 (3.3)	39 (2.6)	36 (2.7)	34 (2.6)	33 (2.9)
82		V51R	P1	VI	C		20 (2.2)	23 (2.2)	25 (2.3)	29 (1.8)	35 (2.0)	39 (2.5)	39 (2.3)	38 (3.3)	39 (2.8)
83		SILAPLUG	P3	SI	C		23 (2.6)	25 (2.0)	30 (3.1)	34 (2.3)	37 (2.3)	39 (2.4)	42 (1.4)	41 (2.8)	40 (3.0)
84		PEACE AND QUIET HEADBAND	CS	VI	B		10 (2.0)	15 (2.0)	17 (1.8)	20 (1.9)	31 (2.8)	34 (2.1)	31 (2.0)	31 (1.9)	31 (3.4)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	2	3	Weight (Force) oz.	Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000
85		SILA-BAND HEADBAND OVER-THE-HEAD	CS	VI	B		16 (2.4)	17 (2.8)	20 (3.2)	26 (3.2)	31 (2.7)	34 (1.6)	32 (1.9)	29 (2.7)	30 (3.7
86		SILA-BAND HEADBAND BEHIND-THE HEAD	CS	VI	B		20 (2.7)	19 (2.1)	18 (2.6)	23 (2.0)	29 (2.9)	33 (2.5)	31 (3.2)	29 (2.5)	27 (2.5
87		SILA-BAND HEADBAND UNDER-THE-CHIN	CS	VI	B		21 (3.1)	19 (2.8)	18 (2.8)	23 (1.9)	29 (2.3)	32 (2.3)	29 (1.9)	27 (1.9)	27 (2.9
88		SILENTA UNIVERSAL OVER-THE-HEAD	MO	FM		7 (37)	15 (1.3)	20 (1.4)	26 (1.4)	38 (2.0)	37 (1.8)	41 (2.0)	42 (2.8)	39 (2.2)	36 (2.5
89		SILENTA UNIVERSAL BEHIND-THE-HEAD	MB	FM		7 (42)	14 (1.4)	19 (1.7)	24 (1.4)	35 (2.5)	36 (2.3)	42 (2.2)	43 (2.3)	37 (3.0)	34 (2.4
90		SILENTA UNIVERSAL UNDER-THE-CHIN	MU	FM		7 (42)	14 (2.3)	19 (1.6)	24 (1.7)	35 (2.0)	36 (2.5)	42 (2.1)	42 (3.7)	37 (3.5)	35 (2.5
91		SILENTA UNICAP HELMET MUFF	MH	FH		6 (34)	15 (3.0)	17 (2.0)	21 (1.8)	32 (3.0)	34 (2.0)	41 (2.6)	42 (3.1)	38 (3.5)	35 (2.3
92		DIELECTRIC MUFF OVER-THE-HEAD	MO	FP		5 (42)	19 (3.0)	19 (2.0)	29 (2.1)	40 (2.8)	38 (2.9)	36 (2.6)	34 (2.3)	37 (3.3)	38 (3.7
93		DIELECTRIC MUFF BEHIND-THE-HEAD	MB	FP		5 (45)	12 (3.5)	14 (2.6)	21 (4.7)	34 (6.2)	34 (4.6)	35 (2.6)	34 (2.2)	37 (2.7)	37 (2.2
94		DIELECTRIC MUFF UNDER-THE-CHIN	MU	FP		5 (45)	12 (3.9)	14 (2.7)	22 (4.9)	33 (6.2)	34 (4.4)	33 (3.4)	32 (3.3)	35 (2.4)	38 (2.0
95	GLENDALE OPTICAL CO. INC. 130 CROSSWAYS PARK DRIVE WOODBURY NY 11797	GN900, GN901	MO	FP		10 (46)	13 (1.2)	16 (1.4)	23 (1.4)	33 (1.0)	37 (1.4)	40 (1.8)	42 (2.1)	39 (2.1)	35 (1.5
96	(516)921-5800	GN900, GN901	MB	FP		10 (54)	12 (1.3)	16 (1.9)	23 (2.1)	31 (1.2)	34 (1.3)	37 (1.9)	39 (2.5)	36 (1.5)	34 (1.3

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	2	3	Weight (Force) oz.	Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000
97		GN900, GN901	MU	FP		10 (72)	13 (1.2)	17 (1.8)	22 (1.9)	31 (1.9)	35 (0.9)	40 (1.8)	41 (1.4)	38 (2.0)	34 (1.8)
98		GN920	MO	FP		8 (61)	12 (4.1)	14 (2.9)	23 (2.0)	33 (1.8)	36 (2.5)	42 (2.7)	39 (2.9)	39 (3.3)	40 (3.2)
99		GN920	MB	FB		8 (62)	11 (2.8)	14 (2.4)	23 (2.0)	32 (2.3)	37 (2.9)	41 (3.4)	38 (2.1)	40 (2.7)	39 (3.7)
100		GN920	MU	FP		8 (62)	11 (2.7)	14 (1.8)	23 (1.5)	33 (1.8)	35 (2.8)	41 (3.5)	38 (2.7)	39 (3.5)	39 (4.0)
101		GN930H	MH	FP		8 (18)	8 (3.3)	10 (2.6)	19 (3.2)	27 (3.0)	31 (3.5)	32 (5.7)	31 (5.4)	30 (4.1)	28 (3.3)
102	HEARING CONTROL INC. P.O. BOX 1427 CLARKSVILLE TX 75426 (214)427-5685	RC 31.3	PS	VI	C		32 (3.3)	33 (2.4)	35 (2.4)	36 (2.4)	39 (2.5)	44 (3.5)	45 (3.0)	45 (2.7)	43 (4.4)
103	H.E.DOUGLASS ENG.SALES CO. 10861 SHERMAN WAY SUN VALLEY CA 91352	SOUND SENTRY CANAL CAP 7500B-1	CS		B		23 (3.8)	21 (3.9)	19 (3.4)	23 (2.8)	32 (3.1)	35 (2.6)	33 (3.7)	31 (5.5)	29 (4.4)
104	(213)875-3144	SOUND SENTRY CANAL CAP 7500B	CS		B		18 (7.6)	17 (7.8)	16 (5.5)	19 (4.2)	30 (4.2)	33 (4.5)	30 (5.7)	27 (8.0)	25 (7.3)
105d	H.S. LEIGHT & ASSOCIATES 1705 EAST 20TH STREET LOS ANGELES CA 90058	AIR SOFT, AS-1, AS-30R	P3	VI	C		23 (1.6)	25 (1.7)	29 (2.0)	32 (2.0)	35 (2.7)	40 (2.1)	43 (2.9)	40 (3.1)	38 (3.0)
106d	(213)746-2234	QUIET, QD-1, QD-30	PN	VI	C		31 (3.6)	32 (4.3)	32 (2.7)	33 (3.1)	34 (4.3)	40 (4.9)	43 (4.0)	46 (5.1)	45 (5.6)
107d		QUIET BAND, QB2 (UNDER-THE-CHIN)	PC	VI	B		22 (3.0)	23 (2.9)	25 (2.1)	31 (2.2)	39 (2.8)	43 (3.4)	45 (3.4)	45 (4.6)	46 (4.8)
108d		QUIET BAND, QB2 (BEHIND-THE-HEAD)	PC	VI	B		22 (3.1)	22 (3.0)	24 (2.2)	30 (2.1)	38 (2.6)	40 (3.5)	42 (3.6)	42 (4.7)	43 (5.0)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	2	3	Weight (Force) oz.	Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000
109	HOCKS LABORATORIES 935 N.E. COUCH PORTLAND OR 97214	NOISE BRAKER FILTERED	PS	SI	C		10 (1.8)	13 (1.7)	23 (2.7)	30 (2.1)	34 (1.8)	43 (2.1)	41 (2.4)	33 (3.1)	33 (2.5)
110	(800)547-3669	NOISE BRAKER SOLID	PS	SI	C		29 (2.8)	31 (3.0)	36 (2.4)	38 (2.1)	38 (2.3)	44 (2.9)	45 (2.1)	39 (3.3)	37 (3.0)
111c	INSTA-MOLD PROSTHETICS P.O. BOX 2146 BOULDER CO 80306 (303)447-2619	INST-MOLD NOISE GUARD	PS	SI			22 (4.0)	26 (4.3)	27 (5.5)	25 (4.4)	41 (3.0)	48 (8.0)	48 (6.2)	52 (6.5)	37 (5.5)
112	MEDIPRINT INC. P.O. BOX 904 WALLINGFORD CT 06492	V51R SINGLE FLANGE	P1	VI	C		20 (2.2)	23 (2.2)	25 (2.3)	29 (1.8)	35 (2.0)	38 (2.5)	39 (2.3)	38 (3.3)	39 (2.8)
113	(203)265-2110	TRIPLE FLANGE	P3	SI	C		23 (2.6)	25 (2.0)	30 (3.1)	34 (2.3)	37 (2.3)	39 (2.4)	42 (1.4)	41 (2.8)	40 (3.0)
114		FOAM	PE	FO			35 (3.0)	37 (3.1)	40 (3.3)	38 (2.2)	37 (1.5)	42 (2.3)	42 (2.9)	44 (3.7)	45 (4.0)
115	MIDLAND OPTICAL INC. 412 N. EAST STREET COUDERSPORT PA 16915	960	MO	FP		7 (37)	17 (1.8)	20 (2.1)	25 (2.3)	33 (1.9)	37 (2.1)	38 (2.2)	36 (2.4)	34 (2.1)	32 (2.0)
116	(814)274-8581	960	MB	FP		7 (37)	15 (3.9)	17 (4.0)	24 (2.2)	33 (3.2)	34 (2.5)	36 (2.7)	34 (2.8)	31 (3.3)	29 (3.5)
117		960	MU	FP		7 (37)	13 (3.7)	17 (4.3)	23 (3.2)	33 (3.1)	34 (2.5)	35 (2.5)	33 (2.6)	30 (3.3)	29 (4.0)
118	MINE SAFETY APPLIANCES CO. 600 PENN CENTER BLVD. PITTSBURGH PA 15235	EAR DEFENDERS	P1	VI			26 (3.6)	26 (3.4)	25 (3.8)	30 (2.9)	34 (3.1)	40 (3.3)	38 (4.8)	34 (4.8)	32 (4.5)
119	(412)273-5170	ACCU-FIT	P3	SI			29 (3.5)	28 (2.7)	29 (2.2)	33 (1.9)	36 (3.0)	40 (3.6)	37 (4.0)	36 (2.6)	35 (3.3)
120		EAR DEFENDERS II	P2	VI			30 (3.3)	30 (3.2)	29 (2.8)	34 (2.9)	39 (3.4)	42 (2.9)	42 (4.8)	40 (5.7)	38 (4.1)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	2	3	Weight (Force) oz.	Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000
121		COMFO 500	MO	FP		6 (48)	11 (2.4)	17 (2.3)	21 (2.1)	25 (1.8)	32 (2.6)	36 (2.6)	37 (2.5)	35 (3.5)	34 (4.3)
122		COMFO 500	MB	FP		6 (48)	10 (1.6)	15 (2.7)	20 (1.8)	25 (2.7)	31 (2.5)	35 (3.2)	35 (3.2)	35 (4.4)	32 (4.6)
123		COMFO 500	MU	FP		6 (48)	9 (1.6)	16 (3.1)	21 (2.0)	24 (2.4)	31 (2.6)	36 (3.0)	37 (2.6)	36 (4.2)	32 (3.9)
124		NOISEFOE MARK II	MO	FM		11 (59)	15 (2.2)	21 (1.8)	29 (2.0)	35 (1.6)	37 (2.1)	37 (1.9)	37 (2.4)	37 (3.1)	36 (2.2)
125		NOISEFOE MARK IV	MO	FM		11 (29)	14 (2.2)	19 (1.4)	28 (1.9)	34 (1.7)	36 (2.2)	40 (3.0)	40 (3.0)	40 (2.6)	40 (3.9)
126		NOISEFOE MARK IV	MB	FM		11 (39)	14 (1.7)	21 (1.5)	27 (3.3)	32 (2.7)	37 (2.2)	42 (2.2)	44 (1.8)	40 (2.1)	38 (2.8)
127		NOISEFOE MARK IV	MU	FM		11 (39)	14 (1.5)	20 (2.1)	26 (3.2)	31 (1.7)	35 (2.3)	41 (2.3)	43 (1.9)	39 (2.5)	37 (2.5)
128		NOISEFOE MARK IVMC	MO	FM		11 (59)	14 (1.8)	21 (1.6)	28 (1.9)	37 (1.8)	41 (2.0)	41 (2.8)	41 (2.2)	41 (1.4)	40 (2.6)
129		NOISEFOE MARK IVMC	MB	FM		11 (60)	11 (2.8)	15 (2.0)	26 (2.8)	35 (3.1)	38 (3.0)	39 (3.0)	40 (2.9)	40 (2.4)	39 (2.8)
130		NOISEFOE MARK IVMC	MU	FM		11 (60)	10 (3.8)	15 (2.3)	26 (2.6)	34 (2.2)	37 (2.2)	39 (2.3)	38 (1.7)	39 (2.9)	37 (2.9)
131		MARK IV KIT ON SKULL GARD CAP	MH	FM		10 (42)	14 (2.2)	19 (2.1)	28 (2.3)	38 (1.5)	40 (1.7)	42 (1.8)	41 (1.4)	40 (1.8)	39 (2.0)
132		MARK V KIT ON TOPGARD CAP	MH	FM		9 (30)	15 (2.6)	20 (1.5)	28 (1.9)	35 (2.5)	33 (2.1)	35 (2.8)	33 (2.6)	33 (2.7)	32 (3.0)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	Design Code 2	Design Code 3	Weight (Force) oz.	125	250	500	1000	2000	3150	4000	6300	8000
							Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB)								
133		NOISEFOE MARK V	MO	FP		9 (48)	15 (1.7)	23 (1.5)	30 (1.8)	38 (2.1)	36 (1.8)	38 (2.5)	38 (1.5)	37 (2.4)	35 (2.9)
134		NOISEFOE MARK V	MB	FP	R	9 (52)	15 (1.5)	22 (2.6)	29 (1.8)	37 (2.0)	38 (2.8)	40 (3.1)	39 (2.7)	36 (2.6)	36 (3.2)
135		NOISEFOE MARK V	MU	FP	R	9 (52)	15 (1.4)	23 (2.6)	31 (2.1)	37 (2.6)	38 (2.2)	40 (2.7)	38 (3.1)	37 (2.5)	36 (3.1)
136		NOISEFOE MARK V	MB	FP		9 (49)	12 (1.9)	21 (1.4)	29 (2.5)	38 (3.1)	36 (1.6)	42 (3.5)	39 (2.4)	36 (2.8)	35 (2.4)
137		NOISEFOE MARK V	MU	FP		9 (49)	12 (1.4)	22 (1.4)	30 (2.1)	39 (2.7)	36 (1.6)	42 (3.2)	39 (2.2)	36 (2.4)	36 (3.1)
138		MARK V KIT ON SKULLGARD CAP	MH	FP		9 (42)	18 (2.9)	22 (1.5)	30 (2.3)	38 (2.9)	37 (2.7)	41 (3.5)	39 (3.1)	39 (3.5)	37 (3.6)
139		MARK V KIT ON V-GARD CAP	MH	FP		9 (37)	14 (2.6)	21 (1.5)	28 (1.8)	34 (2.2)	33 (2.3)	36 (2.6)	34 (2.6)	32 (4.0)	32 (3.8)
140		MARK V ON V-GARD CAP W/FACESHIELD	MH	FP		14 (40)	17 (3.1)	20 (2.1)	29 (2.9)	37 (2.6)	37 (3.6)	41 (2.8)	40 (3.2)	39 (2.3)	37 (3.2)
141		MARK V ON TOPGARD CAP W/FACESHIELD	MH	FP		14 (40)	14 (3.0)	18 (2.7)	26 (3.2)	34 (3.0)	36 (2.9)	39 (3.8)	39 (3.3)	36 (4.9)	35 (4.6)
142	MOLDEX-METRIC INC. 4671 LEAHY STREET CULVER CITY CA 90230 (213)870-9121	PURA-FOAM #6600	PE	FO	D		36 (3.9)	38 (3.0)	41 (2.3)	39 (2.7)	37 (2.8)	45 (3.2)	44 (4.1)	44 (4.2)	41 (4.8)
143	PELTOR INC. 871 WATERMAN AVENUE E. PROVIDENCE RI 02914 (401)438-4800	PELTOR H7P3E, ON MSA V-GARD CAP	MH	LM		9 (37)	14 (2.1)	19 (2.0)	28 (3.0)	36 (2.1)	36 (2.2)	38 (2.3)	35 (2.1)	35 (2.1)	36 (2.4)
144		PELTOR H7B	MB	LM		7 (38)	14 (3.5)	20 (3.4)	27 (2.8)	38 (3.3)	38 (3.0)	39 (2.2)	35 (3.5)	34 (3.7)	35 (4.0)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	2	3	Weight (Force) oz.	125	250	500	1000	2000	3150	4000	6300	8000
							Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB)								
145		PELTOR H9P3E, ON MSA V-GARD CAP	MH	FM		6 (26)	10 (2.3)	15 (2.4)	23 (2.7)	33 (2.7)	36 (3.2)	39 (3.2)	36 (2.9)	33 (3.6)	37 (3.3)
146		PELTOR H3A	MO	LM		7 (30)	14 (3.3)	21 (3.6)	28 (3.6)	38 (3.1)	37 (3.0)	38 (2.9)	34 (2.8)	32 (3.1)	33 (3.7)
147		PELTOR H3P3E, ON MSA V-GARD CAP	MH	LM		3 (29)	14 (2.7)	20 (2.8)	27 (3.7)	37 (3.2)	37 (3.1)	39 (2.4)	34 (2.3)	32 (2.6)	37 (3.7)
148		PELTOR H6A	MO	FM		6 (50)	12 (1.9)	13 (2.2)	23 (1.6)	32 (2.5)	35 (3.2)	44 (3.6)	39 (2.6)	39 (2.4)	37 (2.8)
149		PELTOR H6F	MO	FM		6 (50)	13 (2.1)	13 (1.4)	23 (1.4)	32 (2.2)	35 (2.3)	44 (3.1)	40 (1.4)	40 (3.2)	38 (3.8)
150		PELTOR H6P3E, ON MSA V-GARD CAP	MH	FM		5 (54)	11 (2.1)	14 (1.9)	24 (1.9)	32 (2.9)	34 (2.3)	42 (3.4)	40 (2.5)	38 (2.7)	36 (3.8)
151		PELTOR H6-B	MB	FM		6	11 (3.1)	14 (2.0)	23 (2.9)	32 (3.6)	34 (3.0)	43 (2.3)	40 (2.5)	37 (2.5)	36 (4.0)
152		PELTOR H7-A	MO	LM		8	17 (2.8)	24 (1.8)	30 (1.9)	38 (2.2)	40 (2.1)	45 (3.7)	40 (2.6)	39 (3.9)	38 (3.8)
153		PELTOR H9A	MO	FM		5 (34)	13 (1.4)	16 (2.7)	25 (2.2)	32 (2.0)	37 (2.3)	39 (1.9)	38 (1.3)	35 (2.0)	34 (2.6)
154		PELTOR BULLSEYE"9"	MO	FM		5 (34)	13 (1.4)	16 (2.7)	25 (2.2)	32 (2.0)	37 (2.3)	39 (1.9)	38 (1.3)	35 (2.0)	34 (2.6)
155		PELTOR BULLSEYE"6"	MO	LM		6	13 (2.1)	13 (1.4)	23 (1.4)	32 (2.2)	35 (2.3)	44 (3.1)	40 (1.4)	40 (3.2)	38 (3.8)
156		PELTOR BULLSEYE"7"	MO	LM		8	17 (2.8)	24 (1.8)	30 (1.9)	38 (2.2)	40 (2.1)	45 (3.7)	40 (2.6)	39 (3.9)	38 (3.8)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	2	3	Weight (Force) oz.	125	250	500	1000	2000	3150	4000	6300	8000
							Average Attenuation In dB vs. Frequency In Hz (Standard Deviation In dB)								
157	PLASMED INC. 145 N. PLAINS IND. PK. RD. WALLINGFORD CT 06492	V51R SINGLE FLANGE	P1	VI	C		20 (2.2)	23 (2.2)	25 (2.3)	29 (1.8)	35 (2.0)	38 (2.5)	39 (2.3)	38 (3.3)	39 (2.8)
158	(203)265-6761	TRIPLE FLANGE	P3	SI	C		23 (2.6)	25 (2.0)	30 (3.1)	34 (2.3)	37 (2.3)	39 (2.4)	42 (1.4)	41 (2.8)	40 (3.0)
159		FOAM	PE	FO			35 (3.0)	37 (3.1)	40 (3.3)	38 (2.2)	37 (1.5)	42 (2.3)	42 (2.9)	44 (3.7)	45 (4.0)
160	PULMOSAN SAFETY EQUIPMENT 30-48 LINDEN PLACE FLUSHING NY 11354	80336	MO	FM		14 (34)	11 (1.4)	21 (2.6)	29 (3.6)	33 (2.6)	36 (1.4)	37 (2.3)	38 (1.6)	37 (2.1)	37 (2.7)
161a	(212)939-3200	80339	MH	FM		11	12 (2.5)	17 (3.0)	30 (4.6)	35 (5.6)	35 (4.5)	36 (4.3)	37 (4.2)	32 (4.1)	30 (2.9)
162		80342	MB	FM		12 (59)	15 (4.6)	21 (3.1)	30 (4.2)	41 (4.3)	39 (3.2)	40 (3.4)	38 (3.8)	38 (3.1)	37 (3.5)
163		80720	PU	SI	D		23 (2.1)	26 (2.2)	28 (2.3)	30 (1.9)	36 (2.0)	45 (2.8)	44 (3.1)	36 (2.7)	34 (2.5)
164		80786	PN	VI	B		10 (2.0)	15 (2.0)	17 (1.8)	23 (1.9)	31 (2.8)	34 (2.1)	38 (2.0)	38 (1.9)	31 (3.4)
165		80792	MO	FM		9 (45)	12 (2.7)	20 (2.2)	28 (2.8)	39 (1.9)	40 (1.8)	36 (1.9)	36 (1.9)	39 (2.7)	39 (3.1)
166		80792	MB	FM		9 (40)	12 (2.6)	19 (2.3)	26 (2.5)	35 (1.8)	37 (1.7)	36 (1.5)	36 (1.5)	36 (1.8)	35 (1.9)
167		80792	MU	FM		9 (40)	12 (2.9)	19 (2.4)	26 (1.6)	35 (1.5)	38 (1.4)	37 (1.8)	37 (2.3)	36 (2.7)	35 (2.3)
168		80795,80798,80801 80804,80807,80810	P3	SI	C		23 (2.6)	25 (2.0)	30 (3.1)	34 (2.3)	37 (2.3)	39 (2.4)	42 (1.4)	41 (2.8)	40 (3.0)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	2	3	Weight (Force) oz.	125	250	500	1000	2000	3150	4000	6300	8000
							Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB)								
169	SAFECO MANUFACTURING LTD.	CAP MOUNTED	MH	FP	R	7	11	14	21	29	33	38	36	33	32
	947 WARDEN AVENUE	MODEL 970 .				(24)	(2.2)	(2.8)	(3.7)	(3.2)	(3.1)	(4.1)	(3.9)	(3.6)	(5.6)
	SCARBOROUGH ONT M1L 4E3														
170	(416)752-6740	OVER HEAD	MO	FP	R	6	11	19	25	33	37	41	40	35	33
		MODEL 204				(24)	(2.4)	(3.5)	(3.1)	(2.6)	(2.6)	(3.2)	(3.8)	(3.7)	(3.7)
171		OVERHEAD	MO	FM	R	9	16	19	27	36	38	42	41	37	35
		MODEL 290				(37)	(1.8)	(2.1)	(3.4)	(3.9)	(2.6)	(3.1)	(3.5)	(3.0)	(3.4)
172		OVERHEAD	MO	LP	R	9	17	19	24	36	38	38	37	35	33
		MODEL 304				(26)	(4.2)	(3.4)	(3.0)	(2.3)	(2.0)	(2.0)	(3.0)	(2.9)	(4.0)
173		OVERHEAD	MO	LM	R	11	18	22	26	34	36	39	39	37	35
		MODEL 258				(37)	(3.6)	(3.5)	(3.5)	(3.0)	(3.1)	(4.3)	(5.0)	(4.2)	(4.8)
174	SAFETY DIRECT INC.	SILENCIO MACH II	MO	LM		12	21	26	32	41	42	43	39	35	36
	23 SNIDER WAY	PT NO CD8-80				(68)	(2.4)	(1.7)	(1.4)	(2.0)	(2.4)	(2.6)	(2.7)	(2.9)	(2.7)
	SPARKS NV 89431														
175	(702)359-4451	SILENCIO MACH I	MO	FM		10	14	19	27	35	33	42	34	32	33
		PT NO CD8-81				(68)	(3.0)	(1.9)	(1.7)	(2.3)	(2.0)	(1.6)	(2.0)	(1.9)	(1.7)
176		SILENCIO	MO	FM		9	17	22	27	37	39	41	38	36	36
		PT NO RBW-71				(53)	(2.3)	(2.0)	(2.7)	(2.8)	(2.9)	(2.0)	(2.1)	(2.2)	(2.1)
177		SILENCIO	MU	FM		9	17	19	28	36	39	42	37	36	35
		PT NO RBW-71				(67)	(2.1)	(1.8)	(3.1)	(2.3)	(2.2)	(2.0)	(2.1)	(2.5)	(1.7)
178		SILENCIO	MB	FM		9	14	19	27	36	38	41	37	36	35
		PT NO RBW-71				(67)	(2.9)	(2.4)	(2.8)	(2.9)	(2.6)	(3.2)	(2.3)	(2.5)	(2.7)
179		SILENCIO LIQUID	MO	LM		11	20	25	31	38	41	41	37	36	36
		PT NO LIQ-71				(53)	(2.3)	(2.0)	(2.3)	(2.2)	(2.4)	(2.8)	(1.8)	(1.6)	(2.8)
180		SILENCIO LIQUID	MU	LM		11	13	19	25	31	34	36	34	35	34
		PT NO LIQ-71				(67)	(2.3)	(3.5)	(3.0)	(3.2)	(2.5)	(2.5)	(2.2)	(1.9)	(1.8)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	2	3	Weight (Force) oz.	125	250	500	1000	2000	3150	4000	6300	8000
							Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB)								
181		SILENCIO LIQUID PT NO LIQ-71	MO	LM		11 (67)	17 (2.6)	20 (3.3)	27 (2.3)	33 (2.6)	36 (2.0)	39 (2.1)	37 (2.6)	35 (2.3)	35 (1.9)
182		SDI 100, 101	P2	VI	C		27 (3.9)	19 (2.9)	31 (3.0)	33 (3.0)	37 (4.0)	43 (3.4)	45 (3.6)	40 (4.2)	36 (4.3)
183	SELLSTROM MFG. COMPANY 220 SOUTH HICKS ROAD PALATINE IL 60067 (312)358-2000	404 TONEDOWN II HEARING PROTECTOR	MO	FP	R	13 (62)	11 (2.0)	15 (1.9)	24 (1.5)	32 (1.6)	35 (3.0)	43 (1.9)	39 (2.0)	36 (2.2)	35 (1.7)
184	SIEBE NORTON 2000 PLAINFIELD PIKE CRANSTON RI 02920	COM-FIT	P3	SI			30 (3.0)	28 (3.3)	30 (3.5)	32 (2.2)	34 (2.0)	40 (2.5)	42 (4.1)	46 (4.5)	46 (4.6)
185	(401)943-4400	SILENT PARTNER	PN	SI			18 (2.8)	24 (2.5)	27 (1.9)	30 (1.6)	37 (2.5)	42 (1.4)	42 (1.7)	42 (1.7)	42 (2.2)
186		PEACEKEEPER	PS	SI			9 (1.8)	13 (1.3)	14 (1.3)	19 (1.4)	28 (1.9)	33 (2.2)	35 (2.6)	29 (2.8)	27 (2.1)
187		SONIC EAR VALV 'FOR IMPACT NOISE'	P3	SI			7 (2.5)	6 (3.0)	5 (2.4)	13 (2.3)	23 (2.8)	23 (2.2)	21 (2.8)	28 (3.4)	24 (3.2)
188		SILENT BAND-IT OVER-THE-HEAD	PN	SI	B		18 (3.4)	23 (2.1)	27 (1.5)	30 (1.8)	36 (1.7)	42 (2.0)	42 (1.5)	42 (2.2)	42 (2.7)
189		SILENT BAND-IT BEHIND-THE-HEAD	PN	SI	B		18 (2.1)	24 (2.8)	27 (2.3)	30 (1.6)	36 (1.3)	41 (1.8)	42 (1.9)	41 (2.7)	38 (2.4)
190		SILENT BAND-IT UNDER-THE-CHIN	PN	SI	B		17 (1.9)	22 (1.7)	25 (1.7)	29 (1.5)	36 (1.5)	40 (1.5)	41 (1.4)	41 (2.2)	38 (1.7)
191		#4540	MO	FM		11	14 (3.1)	23 (2.7)	32 (2.5)	41 (2.9)	36 (2.5)	34 (2.3)	34 (2.7)	36 (2.2)	38 (2.3)
192		#4540	MB	FM		11	15 (3.5)	22 (3.2)	31 (2.4)	40 (3.9)	34 (2.9)	34 (2.6)	33 (2.7)	34 (4.5)	34 (4.8)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	Design Code 2	Design Code 3	Weight (Force) oz.	125	250	500	1000	2000	3150	4000	6300	8000
							Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB)								
193		#4540	MU	FM		11	18 (3.8)	23 (2.5)	30 (3.0)	39 (3.5)	34 (2.9)	33 (3.1)	32 (2.5)	38 (4.1)	37 (3.6)
194		#4530	MO	FM		12	15 (2.1)	21 (2.4)	29 (2.3)	40 (2.5)	42 (2.5)	42 (2.9)	43 (3.5)	41 (4.0)	40 (4.0)
195		#4530	MB	FM		12	14 (2.7)	20 (3.1)	27 (3.5)	37 (2.5)	39 (2.3)	42 (3.9)	43 (3.9)	42 (2.5)	40 (3.9)
196		#4530	MU	FM		12	14 (3.0)	20 (3.1)	28 (2.9)	36 (2.7)	38 (2.7)	41 (3.9)	42 (3.6)	42 (3.9)	40 (4.4)
197		#4520	MO	FM		11	13 (3.3)	19 (3.3)	25 (2.6)	35 (2.6)	38 (2.5)	40 (2.6)	40 (2.9)	40 (3.3)	40 (4.3)
198		#4520	MB	FM		11	12 (3.0)	17 (1.7)	25 (2.2)	35 (2.0)	36 (1.7)	38 (2.6)	39 (3.0)	38 (3.6)	37 (4.2)
199		#4520	MU	FM		11	12 (2.6)	18 (2.8)	24 (2.7)	34 (2.1)	36 (1.7)	38 (3.1)	37 (2.9)	38 (3.6)	37 (3.0)
200	TASCO CORPORATION 37 TRIPPS LANE EAST PROVIDENCE RI 02915	T-250, T-250S	MO	FM		9 (45)	12 (2.7)	20 (2.2)	28 (2.8)	39 (1.9)	40 (1.8)	36 (1.9)	36 (1.9)	39 (1.7)	39 (3.1)
201	(401)438-9200	T-250, T-250S (T-250A-RET.STRAP)	MB	FM		9 (40)	12 (2.6)	19 (2.3)	26 (2.5)	35 (1.8)	37 (1.7)	36 (1.5)	36 (1.5)	36 (1.8)	35 (1.9)
202		T-250, T-250S	MU	FM		9 (40)	12 (2.9)	19 (2.4)	26 (1.6)	35 (1.5)	38 (1.4)	37 (1.8)	37 (2.3)	36 (2.7)	35 (2.3)
203		T-100, T-100S	CS	VI	B		10 (2.0)	15 (2.0)	17 (1.8)	20 (1.9)	31 (2.8)	34 (2.1)	31 (2.0)	31 (1.9)	31 (3.4)
204		SWIVEL BAND,-DEFENSE, O-T-II	CS	VI	B		16 (2.4)	17 (2.8)	20 (3.2)	26 (3.2)	31 (2.7)	34 (1.6)	32 (1.9)	29 (2.7)	30 (3.7)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	Design Code 2	Design Code 3	Weight (Force) oz.	Average Attenuation In dB vs. Frequency In Hz (Standard Deviation In dB) 125	250	500	1000	2000	3150	4000	6300	8000
205		SWIVEL BAND,- DEFENSE, B-I-H	CS	VI	B		20 (2.7)	19 (2.1)	18 (2.6)	23 (2.0)	29 (2.9)	33 (2.5)	31 (3.2)	29 (2.5)	27 (3.5)
206		SWIVEL BAND,- DEFENSE, U-I-C	CS	VI	B		21 (3.1)	19 (2.8)	18 (2.8)	23 (1.9)	29 (2.3)	32 (2.3)	29 (1.9)	27 (1.9)	27 (2.9)
207		T-300, T-300S	MB	FP		6 (53)	8 (2.4)	14 (2.2)	19 (2.4)	26 (1.7)	34 (1.8)	38 (3.4)	37 (3.8)	33 (3.6)	31 (3.0)
208		T-300, T-300S	MU	FP		6 (53)	7 (1.9)	13 (1.9)	17 (2.6)	24 (3.0)	29 (3.9)	33 (5.1)	32 (5.6)	28 (4.1)	26 (4.5)
209		RD-1 SAFETY CONE	PC	VI	D C		27 (3.4)	27 (3.4)	38 (4.4)	32 (3.4)	37 (2.8)	42 (3.4)	38 (4.6)	36 (3.4)	34 (3.6)
210		H-1 EAR PLUG (XS,S,M,L,XL)	PI	VI	C		20 (2.0)	22 (2.0)	24 (2.0)	28 (2.0)	34 (2.0)	36 (3.0)	37 (3.0)	37 (3.0)	37 (3.0)
211		T-520, ON JACKSON PROD. SC-6 S.-CAP	MH	FH		9	10 (2.9)	18 (2.7)	25 (2.8)	34 (2.5)	36 (2.4)	35 (2.5)	36 (3.1)	37 (3.2)	35 (3.2)
212		TRI-GARD EARPLUG (S,M,L)	P3	SI	C		22 (2.6)	24 (2.0)	29 (3.1)	33 (2.3)	36 (2.3)	38 (2.4)	41 (1.4)	40 (2.8)	39 (3.0)
213	TELEX COMMUNICATIONS, INC. 9600 ALDRICH AVENUE SOUTH MINNEAPOLIS MN 55420 (612)884-4051	HD-3 63700-002; HD-4 63700-007	MO	FM	A	19 (52)	12 (3.2)	19 (2.2)	21 (1.8)	33 (2.1)	33 (2.8)	36 (2.7)	36 (2.7)	37 (3.5)	37 (3.9)
214	WILLSON SAFETY PRODUCTS 2ND&WASHINGTON STS BOX 622 READING PA 19603	459A/459AL SOUND BARRIER	MO	LM	A	15/13 (30)	19 (3.8)	23 (3.3)	24 (2.7)	33 (2.2)	33 (3.0)	32 (3.4)	33 (3.3)	34 (2.6)	35 (3.6)
215	(215)376-6161	460A SOUND BARRIER	MO	LM	A	22 (35)	20 (3.3)	23 (2.5)	25 (3.6)	34 (2.4)	34 (2.3)	34 (2.5)	35 (3.3)	36 (3.7)	37 (2.9)
216		460CU-2 SOUND BARRIER	MO	LM	A	23 (35)	18 (3.4)	19 (2.8)	22 (2.5)	33 (2.2)	34 (2.6)	37 (7.3)	36 (4.2)	33 (3.5)	33 (4.3)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	2	3	Weight (Force) oz.	Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000
217		462A SOUND BARRIER	MO	LM	A	18 (35)	21 (3.4)	23 (2.5)	23 (3.3)	34 (2.5)	34 (1.8)	34 (2.2)	35 (3.3)	37 (4.1)	37 (3.2)
218		390 SOUND BARRIER	MH			9 (29)	12 (2.9)	18 (2.2)	25 (2.0)	35 (2.2)	35 (2.3)	34 (3.0)	37 (2.8)	37 (3.4)	34 (2.8)
219		390A/390AL SOUND BARRIER	MH		A	10/12 (29)	15 (2.0)	19 (2.5)	26 (2.2)	36 (2.4)	38 (2.0)	34 (2.3)	37 (3.0)	38 (3.7)	35 (2.6)
220		381A SOUND BARRIER	MO	LM		11 (43)	13 (2.2)	17 (2.6)	27 (2.4)	34 (1.5)	37 (1.6)	38 (1.9)	38 (1.8)	40 (2.0)	41 (1.9)
221		381A SOUND BARRIER	MB	LM	R	11 (49)	12 (2.0)	16 (2.0)	23 (1.4)	30 (1.9)	36 (1.7)	37 (1.7)	37 (1.9)	39 (2.3)	40 (2.2)
222		381A SOUND BARRIER	MU	LM	R	11 (49)	11 (1.8)	15 (1.9)	22 (2.2)	30 (1.9)	35 (1.6)	36 (2.1)	37 (2.2)	37 (2.0)	35 (2.1)
223		381 SOUND BARRIER	MO	FM		9 (46)	10 (1.9)	14 (2.3)	21 (2.5)	31 (2.3)	34 (2.4)	37 (1.7)	37 (2.4)	40 (1.7)	40 (2.0
224		381 SOUND BARRIER	MB	FM	R	9 (53)	9 (1.7)	14 (1.8)	21 (2.2)	29 (2.2)	34 (1.9)	36 (1.7)	37 (1.7)	39 (2.6)	3[illegible] (2.[illegible]
225		381 SOUND BARRIER	MU	FM	R	9 (53)	9 (2.1)	13 (2.0)	20 (1.8)	29 (2.0)	34 (1.6)	35 (1.8)	36 (1.7)	36 (1.9)	3[illegible] (1.7
226		365A SOUND BARRIER	MO	LP		11 (56)	21 (1.5)	21 (2.2)	29 (2.9)	38 (2.8)	39 (2.0)	38 (1.9)	38 (1.4)	39 (1.5)	4[illegible] (2.[illegible]
227		365A SOUND BARRIER	MB	LP		11 (54)	18 (3.5)	23 (1.8)	29 (2.3)	37 (2.7)	37 (1.9)	36 (1.5)	38 (1.9)	38 (1.7)	3[illegible] (2.[illegible]
228		365A SOUND BARRIER	MU	LP		11 (54)	18 (2.5)	22 (3.1)	29 (1.8)	35 (3.3)	36 (1.7)	37 (2.1)	37 (2.7)	39 (2.3)	3[illegible] (2.[illegible]

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I.D. No.	Manufacturer or Supplier	Model	Design Code 1	Design Code 2	Design Code 3	Weight (Force) oz.	Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000
229		365 SOUND BARRIER	MO	FP		9 (61)	17 (1.9)	20 (2.5)	30 (3.6)	38 (2.9)	39 (2.0)	37 (1.9)	38 (1.4)	40 (2.3)	40 (3.1)
230		365 SOUND BARRIER	MB	FP		9 (61)	14 (2.7)	19 (2.8)	29 (3.1)	36 (3.6)	37 (2.1)	36 (1.8)	37 (2.2)	39 (1.9)	38 (2.2)
231		365 SOUND BARRIER	MU	FP		9 (61)	13 (2.4)	18 (2.9)	27 (4.0)	34 (3.3)	36 (1.9)	36 (2.0)	37 (2.2)	39 (1.7)	38 (2.7)
232		358A SOUND BARRIER	MO	LM		11 (46)	14 (1.9)	17 (2.0)	24 (2.5)	34 (1.6)	32 (1.8)	30 (1.4)	33 (1.4)	31 (1.6)	27 (1.7)
233		351A SOUND BARRIER	MO	LM		12 (46)	15 (2.1)	20 (1.8)	25 (2.1)	34 (2.6)	34 (1.5)	31 (1.4)	32 (1.4)	30 (2.0)	28 (2.7)
234		351 SOUND BARRIER	MO	FM		10 (53)	11 (2.2)	16 (2.7)	23 (2.4)	32 (2.5)	33 (2.0)	33 (1.8)	34 (1.7)	28 (3.5)	25 (3.5)
235		155 SOUND BARRIER	MB	FM	R	7	11 (2.6)	15 (1.6)	21 (2.1)	31 (2.1)	35 (2.4)	41 (2.5)	35 (1.9)	31 (2.6)	32 (2.3)
236		155A SOUND BARRIER	MB	LM	R	9 (35)	17 (3.3)	20 (2.8)	25 (2.1)	33 (2.1)	37 (2.7)	41 (3.0)	36 (2.9)	34 (2.9)	34 (3.4)
237		EP100, 100B SOUND SILENCER	P2	VI	C		27 (3.9)	29 (2.9)	31 (3.0)	33 (3.0)	37 (4.0)	43 (3.4)	45 (3.6)	40 (4.2)	36 (4.3)
238		EP200, 201 SOUND LESS	PE	FO	C		24 (2.7)	30 (4.7)	37 (4.8)	40 (3.0)	40 (3.6)	46 (3.7)	46 (5.2)	44 (6.0)	41 (4.0)
239		20 SOUND BAN BEHIND-THE-HEAD	CS	VI	B	1 (11)	28 (3.5)	25 (3.2)	21 (2.8)	22 (2.6)	35 (2.5)	46 (2.6)	48 (4.2)	47 (4.1)	45 (3.7)
240		20 SOUND BAN UNDER-THE-CHIN	CS	VI	B	1 (10)	25 (2.6)	24 (2.1)	22 (2.0)	24 (1.8)	36 (2.4)	46 (2.5)	47 (3.5)	48 (4.7)	46 (3.9)

I.D. No.	Manufacturer or Supplier	Model	Design Code 1	2	3	Weight (Force) oz.	Average Attenuation in dB vs. Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000
241		10 SOUND BAN OVER-THE-HEAD	CS	VI	B	2 (9)	24 (3.7)	21 (2.4)	19 (3.1)	22 (2.5)	40 (4.9)	50 (3.0)	49 (3.7)	44 (5.9)	42 (6.0)
242		10 SOUND BAN BEHIND-THE-HEAD	CS	VI	B	2 (10)	26 (4.2)	22 (3.1)	19 (2.3)	22 (2.8)	40 (4.2)	49 (3.2)	48 (4.3)	43 (5.3)	42 (6.0)
243		10 SOUND BAN UNDER-THE-CHIN	CS	VI	B	2 (10)	27 (4.5)	22 (4.2)	17 (2.5)	21 (1.7)	39 (3.0)	48 (3.0)	45 (3.4)	43 (7.1)	42 (5.0)

Appendix II. Values of "Q" and "NRR" for Hearing Protection Devices in Appendix I.

I.D. No.	Type	Q1	Q2	Q3	Q4	Q5	Q6	Q7	NRR
1	PLUG	32.3	26.6	23.0	25.2	29.8	30.8	31.9	24
2	PLUG	32.9	28.6	26.0	28.4	30.2	34.7	34.8	26
3	MUFF	24.7	23.6	21.6	26.8	25.4	23.2	28.1	21
4	MUFF	25.5	21.8	24.6	27.8	30.0	34.3	33.5	23
5	MUFF	19.3	18.2	17.4	22.6	29.2	29.3	26.5	17
6	PLUG	22.1	19.6	16.6	16.2	24.2	27.4	26.8	16
7	MUFF	29.9	26.2	27.0	34.8	31.8	31.5	38.3	26
8	MUFF	24.7	22.4	25.0	31.6	31.6	30.8	33.9	23
9	MUFF	26.5	23.8	24.8	29.4	34.0	31.3	35.1	24
10	MUFF	30.3	28.4	25.2	31.6	31.4	36.2	37.1	26
11	MUFF	24.9	24.6	22.2	27.0	29.4	35.0	32.6	23
12	MUFF	21.9	21.2	19.4	23.8	25.4	34.8	30.0	20
13	MUFF	24.3	23.0	20.8	29.8	26.2	34.1	30.8	22
14	MUFF	27.1	21.6	22.2	28.0	29.2	37.3	35.2	22
15	MUFF	24.9	18.2	19.8	28.0	28.4	34.3	34.3	20
16	MUFF	22.9	19.4	19.4	27.0	26.0	35.3	33.2	20
17	MUFF	21.7	17.2	18.4	23.2	23.8	31.7	31.2	18
18	MUFF	28.5	22.6	21.0	25.0	26.0	34.5	37.3	22
19	PLUG	22.1	19.6	16.6	16.2	24.2	27.4	26.8	16
20	PLUG	28.9	23.2	16.8	20.4	23.0	25.2	28.5	18
21	MUFF	27.5	25.2	26.0	28.2	30.6	33.0	36.0	25
22	MUFF	19.3	19.2	18.2	22.0	29.8	30.4	32.6	18
23	MUFF	20.5	20.0	21.8	27.4	30.0	32.4	32.4	20
24	MUFF	18.5	17.0	16.8	21.0	26.4	27.9	32.3	17
25	MUFF	24.1	18.6	23.8	30.4	33.8	31.4	31.3	21
26	PLUG	27.3	20.0	16.8	19.6	24.4	28.5	24.2	18
27	PLUG	30.9	22.0	15.6	19.2	23.2	25.3	23.3	17
28	PLUG	30.7	23.4	16.0	19.0	22.0	25.3	23.1	17
29	PLUG	36.3	28.8	22.4	25.2	30.2	31.0	29.1	24
30	PLUG	31.7	27.2	23.6	25.4	29.8	32.7	33.5	24
31	MUFF								
32	PLUG	15.5	8.8	11.8	14.8	21.8	29.8	23.6	11
33	PLUG	35.1	27.8	25.8	24.4	31.0	34.7	31.1	25
34	PLUG	31.9	27.0	24.2	20.0	26.8	33.5	33.8	22
35	PLUG	36.5	30.2	26.0	27.2	30.2	38.1	37.5	27
36	PLUG	21.3	18.4	15.4	16.2	26.0	31.5	33.6	16
37	PLUG	37.7	30.0	26.8	27.8	30.8	32.4	30.4	26
38	MUFF	29.3	26.0	24.4	29.6	35.8	41.7	40.9	25
39	MUFF	25.3	23.4	23.8	27.6	34.8	38.3	36.8	23
40	MUFF	26.1	24.0	24.4	28.8	36.4	40.9	38.1	24
41	MUFF	34.7	29.6	30.4	31.6	34.8	35.0	32.9	29
42	MUFF	33.5	29.0	29.0	32.6	32.6	34.2	34.2	28
43	MUFF	30.9	28.8	30.8	32.2	31.8	35.1	33.3	28
44	MUFF	28.9	25.8	23.2	32.4	33.2	36.5	34.2	25
45	MUFF	27.9	22.8	23.4	29.6	33.0	35.5	34.1	24
46	MUFF	26.3	22.2	23.4	30.4	32.4	33.6	32.6	23
47	MUFF	24.5	22.6	23.2	29.0	27.8	34.8	35.1	22
48	MUFF	27.5	25.6	25.2	31.4	31.8	33.7	34.3	25
49	MUFF	27.3	20.6	20.4	24.2	31.0	37.9	34.5	21
50	MUFF	23.7	15.8	17.6	27.4	30.0	35.4	38.0	18

I.D. No.	Type	Q1	Q2	Q3	Q4	Q5	Q6	Q7	NRR
51	MUFF	26.7	21.8	20.2	28.6	33.2	33.7	32.0	22
52	MUFF	25.7	22.2	19.8	26.2	32.2	34.4	32.5	21
53	MUFF	26.1	22.6	23.2	26.0	30.2	35.0	33.2	23
54	PLUG	31.7	27.2	23.6	25.4	29.8	32.7	33.5	24
55	PLUG	33.9	29.6	27.0	29.4	31.2	35.7	35.8	27
56	MUFF	31.5	27.6	21.8	23.6	23.2	24.6	27.9	21
57	MUFF	24.3	24.4	25.0	27.8	32.0	32.6	33.3	23
58	MUFF	21.9	23.4	24.8	32.4	31.4	30.8	32.0	23
59	MUFF	27.1	22.8	21.0	23.8	26.0	25.5	27.8	21
60	MUFF	23.1	19.6	24.0	23.8	24.8	27.0	25.1	20
61	MUFF	24.7	25.2	25.0	31.4	34.6	37.1	34.9	24
62	MUFF	19.9	19.0	21.6	27.6	31.6	34.8	35.0	20
63	MUFF	20.5	19.2	23.0	28.8	32.0	34.7	33.8	20
64	MUFF	23.7	22.0	23.4	26.0	28.2	28.5	27.7	21
65	MUFF	22.9	23.2	22.2	26.2	27.0	30.0	28.7	21
66	MUFF	21.5	20.4	20.6	22.2	23.6	27.9	23.8	19
67	PLUG	46.7	39.8	38.6	35.2	30.6	35.1	34.3	32
68	PLUG	31.9	25.2	21.6	23.2	25.2	55.1	32.4	22
69	PLUG	30.9	24.6	21.6	22.6	25.6	30.7	31.7	22
70	MUFF	30.3	27.0	26.6	30.2	29.8	31.3	34.1	26
71	MUFF	22.7	24.2	25.6	35.2	35.2	31.2	34.3	24
72	MUFF	29.1	23.6	29.0	34.4	31.0	29.1	31.6	25
73	PLUG	44.3	40.6	39.6	33.6	30.2	36.2	36.6	32
74	PLUG	32.1	26.6	23.2	24.0	28.8	29.5	32.1	23
75	PLUG	22.1	19.6	16.6	16.2	24.2	27.4	26.8	16
76	MUFF	29.1	23.6	28.0	34.4	31.0	29.1	31.6	25
77	MUFF	24.5	17.8	20.2	25.4	28.6	29.5	26.2	19
78	PLUG	35.9	29.8	24.0	25.8	29.4	33.3	30.4	25
79	PLUG	21.3	18.4	15.4	16.2	26.0	31.5	33.6	16
80	PLUG	34.9	30.2	26.6	26.2	30.8	37.6	30.9	26
81	PLUG	33.7	28.0	25.0	27.4	29.2	31.2	29.1	25
82	PLUG	31.7	27.2	23.6	25.4	29.8	33.2	33.5	24
83	PLUG	33.9	29.6	27.0	29.4	31.2	35.7	35.8	27
84	PLUG	22.1	19.6	16.6	16.2	24.2	27.4	26.8	16
85	PLUG	27.3	20.0	16.8	19.6	24.4	28.5	24.2	18
86	PLUG	30.7	23.4	16.0	19.0	22.0	25.3	24.1	17
87	PLUG	30.9	22.0	15.6	19.2	23.2	25.3	23.3	17
88	MUFF	28.5	25.8	26.4	34.0	32.2	35.7	33.9	26
89	MUFF	27.3	24.2	24.4	30.0	30.2	37.0	31.2	24
90	MUFF	25.5	24.4	23.8	31.0	29.8	35.2	31.1	24
91	MUFF	25.1	21.6	20.6	26.0	28.8	34.8	31.8	21
92	MUFF	29.1	23.6	28.0	34.4	31.0	29.1	31.6	25
93	MUFF	21.1	17.4	14.8	21.6	23.6	28.7	33.2	16
94	MUFF	20.3	17.2	15.4	20.6	24.0	24.8	33.2	16
95	MUFF	26.7	21.8	23.4	31.0	33.0	36.1	34.5	23
96	MUFF	25.5	20.8	22.0	28.6	30.2	32.6	33.3	22
97	MUFF	26.7	22.0	21.4	27.2	32.0	36.3	33.3	22
98	MUFF	19.9	16.8	22.2	29.4	29.8	33.9	34.1	19
99	MUFF	21.5	17.8	22.2	27.4	30.0	33.0	34.2	20
100	MUFF	21.7	19.0	23.2	29.4	28.2	32.3	32.6	20

I.D. No.	Type	Q1	Q2	Q3	Q4	Q5	Q6	Q7	NRR
101	MUFF	17.5	13.4	15.8	21.0	22.8	19.4	22.7	14
102	PLUG	41.5	36.8	33.4	31.2	32.8	37.0	38.0	31
103	PLUG	31.5	21.8	15.4	17.4	24.6	26.7	21.2	17
104	PLUG	18.9	10.0	8.2	10.6	20.4	20.3	11.8	9
105	PLUG	35.9	30.2	28.2	28.0	28.4	35.5	34.0	27
106	PLUG	39.9	32.0	29.8	26.8	24.2	31.6	35.9	26
107	PLUG	32.1	25.8	24.0	26.6	32.2	36.2	37.2	25
108	PLUG	31.9	24.6	22.8	25.8	31.6	32.9	33.9	24
109	PLUG	22.5	18.2	20.8	25.8	29.2	36.5	28.5	20
110	PLUG	39.5	33.6	34.4	33.8	32.2	38.5	32.8	31
111	PLUG	30.1	26.0	19.2	16.2	33.8	32.8	33.6	19
112	PLUG	31.7	27.2	23.6	25.4	29.8	32.7	33.5	24
113	PLUG	33.9	29.6	27.0	29.4	31.2	35.7	35.8	27
114	PLUG	45.1	39.4	36.6	33.6	32.8	35.8	37.9	32
115	MUFF	29.5	24.4	23.6	29.2	31.6	31.4	30.0	24
116	MUFF	23.3	17.6	22.8	26.6	27.8	28.5	24.3	19
117	MUFF	21.7	17.0	19.8	26.8	27.8	27.9	23.3	18
118	PLUG	34.9	27.8	20.6	24.2	26.6	29.9	24.8	22
119	PLUG	38.1	31.2	27.8	29.2	28.8	29.9	30.7	26
120	PLUG	39.5	32.2	26.6	28.2	31.0	33.3	30.3	27
121	MUFF	22.3	21.0	20.0	21.4	25.6	30.4	27.8	19
122	MUFF	22.9	18.2	19.6	19.6	24.8	27.6	25.6	18
123	MUFF	21.9	18.4	20.2	19.2	24.6	29.9	27.0	18
124	MUFF	26.7	26.0	28.2	31.8	31.6	31.7	32.3	25
125	MUFF	25.7	24.8	27.4	30.6	30.4	33.0	34.6	25
126	MUFF	26.7	26.6	23.6	26.6	31.4	38.0	35.2	24
127	MUFF	27.1	24.4	22.8	27.6	29.2	36.8	34.1	23
128	MUFF	26.5	26.4	27.4	33.4	35.8	35.0	37.6	26
129	MUFF	21.5	19.6	23.6	28.8	30.8	32.6	35.4	21
130	MUFF	18.5	19.0	24.0	29.6	31.4	33.5	33.3	20
131	MUFF	25.7	23.4	26.6	35.0	35.4	37.3	36.8	25
132	MUFF	25.9	25.6	27.4	30.0	27.6	27.6	27.9	24
133	MUFF	27.7	28.6	29.6	33.8	31.2	33.0	31.8	27
134	MUFF	28.1	25.4	28.6	33.0	31.2	32.7	31.3	26
135	MUFF	28.3	26.4	30.0	31.8	32.4	32.2	32.0	26
136	MUFF	24.3	26.8	27.2	31.8	31.6	33.6	31.4	25
137	MUFF	25.3	27.8	29.0	33.6	31.6	34.1	31.6	26
138	MUFF	28.3	27.6	28.6	32.2	30.4	32.4	32.0	26
139	MUFF	24.9	26.6	27.6	29.6	27.2	28.8	25.3	23
140	MUFF	26.9	24.4	26.4	31.8	28.6	33.5	33.6	25
141	MUFF	24.1	21.2	22.8	28.0	29.0	30.9	27.1	21
142	PLUG	44.3	40.6	39.6	33.6	30.2	36.2	34.6	31
143	MUFF	25.9	23.6	25.2	31.8	30.4	31.1	32.1	24
144	MUFF	23.1	21.8	24.6	31.4	30.8	30.3	27.9	22
145	MUFF	21.5	18.8	20.8	27.6	28.4	30.4	26.7	19
146	MUFF	23.5	22.4	24.0	31.8	29.8	29.3	26.8	22
147	MUFF	24.7	23.0	22.8	30.6	29.6	30.8	26.8	22
148	MUFF	24.3	17.2	23.0	27.0	27.4	34.3	33.9	20
149	MUFF	24.9	18.8	23.4	27.6	29.2	36.5	33.1	21
150	MUFF	22.9	18.8	23.4	26.2	28.2	34.1	31.6	20

I.D. No.	Type	Q1	Q2	Q3	Q4	Q5	Q6	Q7	NRR
151	MUFF	20.9	18.6	20.4	24.8	26.8	35.7	31.1	19
152	MUFF	27.5	29.0	29.4	33.6	34.6	35.2	31.9	27
153	MUFF	26.3	19.2	23.8	28.0	31.2	34.3	31.0	21
154	MUFF	26.3	19.2	23.8	28.0	31.2	34.3	31.0	21
155	MUFF	24.9	18.8	23.4	27.6	29.2	36.5	33.1	21
156	MUFF	27.5	29.0	29.4	33.6	34.6	35.2	31.9	27
157	PLUG	31.7	27.2	23.6	25.4	29.8	32.7	33.5	24
158	PLUG	33.9	29.6	27.0	29.4	31.2	35.7	35.8	27
159	PLUG	45.1	39.4	36.6	33.6	32.8	35.8	37.9	32
160	MUFF	24.3	24.4	25.0	27.8	32.0	32.6	33.3	23
161	MUFF	23.1	19.6	24.0	23.8	24.8	27.0	25.1	20
162	MUFF	21.9	23.4	24.8	32.4	31.4	30.8	32.0	23
163	PLUG	34.9	30.2	26.6	26.2	30.8	37.6	30.9	26
164	PLUG	22.1	19.6	16.6	19.2	24.2	30.9	30.3	17
165	MUFF	22.7	24.2	25.6	35.2	35.2	31.2	34.3	24
166	MUFF	22.9	23.0	24.2	31.4	32.4	32.0	32.9	23
167	MUFF	22.3	22.8	26.0	32.0	34.0	31.9	31.6	23
168	PLUG	33.9	29.6	27.0	29.4	31.2	35.7	35.8	27
169	MUFF	22.7	17.0	16.8	22.6	25.6	28.0	24.4	17
170	MUFF	22.3	20.6	22.0	27.8	30.6	32.5	27.7	21
171	MUFF	28.5	23.4	23.4	28.2	31.6	33.9	30.7	23
172	MUFF	24.7	20.8	21.2	31.4	32.8	31.5	28.2	21
173	MUFF	26.9	23.6	22.2	28.0	28.6	28.7	28.1	22
174	MUFF	32.3	31.2	32.4	37.0	36.0	34.7	31.0	29
175	MUFF	24.1	23.8	26.8	30.4	27.8	33.4	30.0	23
176	MUFF	28.5	26.6	24.8	31.4	32.0	34.4	32.8	25
177	MUFF	28.9	24.0	25.0	31.4	33.4	34.4	32.4	25
178	MUFF	24.3	22.8	24.6	30.2	31.6	32.5	31.4	23
179	MUFF	31.5	29.6	29.6	33.6	35.0	33.4	32.7	28
180	MUFF	24.5	20.6	22.2	24.6	27.8	29.3	31.9	21
181	MUFF	27.9	22.0	25.6	27.8	30.8	32.3	31.9	23
182	PLUG	35.3	21.8	28.2	27.0	27.8	36.0	30.6	24
183	MUFF	23.1	19.8	24.2	28.8	27.8	36.1	32.7	21
184	PLUG	40.1	30.0	26.2	27.6	28.8	33.4	38.0	26
185	PLUG	28.5	27.6	26.4	26.8	30.8	37.9	39.2	26
186	PLUG	21.5	19.0	14.6	16.2	23.0	28.2	24.2	15
187	PLUG	18.1	8.6	3.4	8.4	16.2	16.0	20.5	6
188	PLUG	27.3	27.4	27.2	26.4	31.4	37.5	38.2	25
189	PLUG	29.9	27.0	25.6	26.8	32.2	36.8	35.5	25
190	PLUG	29.3	27.2	24.8	26.0	31.8	36.6	36.7	25
191	MUFF	23.9	26.2	30.2	35.2	29.8	28.0	33.6	25
192	MUFF	24.1	24.2	29.4	32.2	27.0	27.2	25.8	23
193	MUFF	26.5	26.6	27.2	32.0	27.0	25.9	30.9	24
194	MUFF	26.9	24.8	27.6	35.0	35.8	35.1	33.6	26
195	MUFF	24.7	22.4	23.2	32.0	33.2	33.7	35.7	23
196	MUFF	24.1	22.4	25.4	30.6	31.4	33.0	33.8	23
197	MUFF	22.5	21.0	23.0	29.8	31.8	33.5	33.5	22
198	MUFF	22.1	22.2	23.8	31.0	31.4	31.9	30.8	22
199	MUFF	22.9	21.0	21.8	29.8	31.4	30.5	32.0	21
200	MUFF	22.7	24.2	25.6	35.2	35.2	31.2	35.3	24

I.D. No.	Type	Q1	Q2	Q3	Q4	Q5	Q6	Q7	NRR
201	MUFF	22.9	23.0	24.2	31.4	32.4	32.0	32.9	23
202	MUFF	22.3	22.8	26.0	32.0	34.0	31.9	31.6	23
203	PLUG	22.1	19.6	16.6	16.2	24.2	27.4	26.8	16
204	PLUG	27.3	20.0	16.8	19.6	24.4	28.5	24.2	18
205	PLUG	30.7	23.4	16.0	19.0	22.0	25.3	23.1	17
206	PLUG	30.9	22.0	15.6	19.2	23.2	25.3	23.3	17
207	MUFF	19.3	18.2	17.4	22.6	29.2	29.3	26.5	17
208	MUFF	19.3	17.8	15.0	18.0	20.0	20.8	19.5	15
209	PLUG	36.3	28.8	32.4	25.2	30.2	31.0	29.1	26
210	PLUG	32.1	26.6	23.2	24.0	28.8	29.5	32.1	23
211	MUFF	20.3	21.2	22.6	29.0	30.0	28.9	30.7	21
212	PLUG	32.9	28.6	26.0	28.4	30.2	34.7	34.8	26
213	MUFF	21.7	23.2	20.6	28.8	26.2	29.6	30.7	21
214	MUFF	27.5	25.0	21.8	28.6	25.8	24.8	29.4	22
215	MUFF	29.5	26.6	21.0	29.2	28.2	27.7	31.0	23
216	MUFF	27.3	22.0	20.2	28.6	27.6	24.0	26.3	21
217	MUFF	30.3	26.6	19.6	29.0	29.2	28.0	30.8	22
218	MUFF	22.3	22.2	24.2	30.6	29.2	28.7	30.4	22
219	MUFF	27.1	22.6	24.8	31.2	32.8	29.2	31.3	23
220	MUFF	24.7	20.4	25.4	31.0	32.6	33.3	37.7	23
221	MUFF	24.1	20.6	23.4	26.2	31.4	32.4	36.1	22
222	MUFF	23.5	19.8	20.8	26.2	30.6	31.2	33.0	20
223	MUFF	22.3	18.0	19.2	26.4	28.0	31.9	37.4	19
224	MUFF	21.7	19.0	19.8	24.6	29.0	32.1	34.9	19
225	MUFF	20.9	17.6	19.6	25.0	29.6	31.0	33.0	19
226	MUFF	34.1	25.2	26.4	32.4	33.8	33.7	36.9	26
227	MUFF	27.1	28.0	27.6	31.6	32.0	32.6	35.8	26
228	MUFF	29.1	24.4	28.6	28.4	31.4	31.2	35.4	25
229	MUFF	29.3	23.6	26.0	32.2	33.8	33.2	35.7	25
230	MUFF	24.7	22.0	26.0	28.8	31.6	31.5	35.5	23
231	MUFF	24.3	20.8	22.2	27.4	31.0	31.3	35.2	22
232	MUFF	26.3	21.6	22.2	30.8	27.2	27.7	26.8	22
233	MUFF	26.9	25.0	24.0	28.8	29.8	27.7	25.4	23
234	MUFF	22.7	19.2	21.4	27.0	27.8	29.0	20.6	19
235	MUFF	21.9	20.4	20.0	26.8	29.0	32.6	27.7	20
236	MUFF	26.5	23.0	24.0	28.8	30.4	31.6	28.8	23
237	PLUG	35.3	31.8	28.2	27.0	27.8	36.0	30.6	26
238	PLUG	34.7	29.2	30.6	34.0	31.6	36.1	33.6	29
239	PLUG	37.1	27.2	18.6	16.8	28.8	39.2	39.3	19
240	PLUG	35.9	28.4	21.2	20.4	30.0	39.5	39.5	22
241	PLUG	32.7	24.8	16.0	17.0	29.0	41.8	32.2	18
242	PLUG	33.7	24.4	17.6	16.4	30.4	40.0	32.3	18
243	PLUG	34.1	22.2	15.2	17.6	31.8	39.1	31.5	17