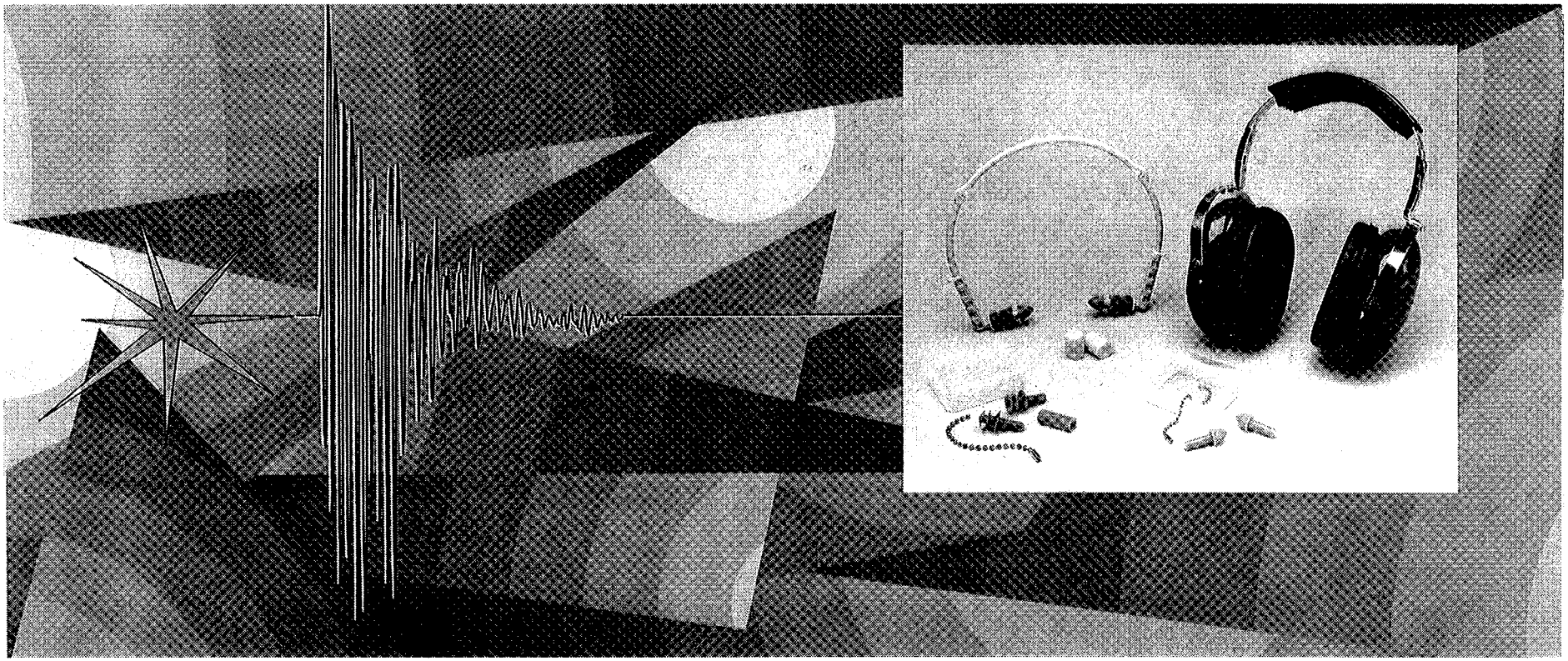
the niosh compendium of hearing protection devices



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

THE NIOSH COMPENDIUM OF HEARING PROTECTION DEVICES

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October 1994

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PREFACE

In 1992, NIOSH researchers initiated an effort to collect data published by the manufacturers of hearing protectors sold in the United States. The data included the mean attenuations and standard deviations reported by the manufacturers on the labeling required by the Environmental Protection Agency. It was intended that the outcome of this data collection effort would allow assessment of the types and styles of hearing protectors available in the United States from domestic and foreign sources. The data shown in this compendium are current as of July 1994.

The data sheets collected were published by 53 manufacturers for 241 different hearing protectors. Of these, 108 were earmuffs, 30 were hard-hat mounted earmuffs, 86 were earplugs, and 17 were semi-aural devices also referred to as ear-canal caps. Many devices are distributed under various brand names, so that the total number of entries in the compendium is for 360 devices.

An informal focus group of audiologists, industrial hygienists, and occupational hearing conversationalists working in both private and public settings made suggestions about how the compendium could be formatted to make it informative and easy to use. As a result of their input, the tables have been formatted to show listings for protector type, composition, features, and compatibility. The test laboratories that performed the attenuation testing and manufacturer-provided comments about special features of the hearing protectors are also listed. Full data sets on each protector are included in an appendix, rather than in the body of the compendium, also following a suggestion of the focus group.

The authors hope that this compendium allows those who must select hearing protectors to prevent noise-induced hearing loss to do so in a more informed manner.

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COMPENDIUM OF HEARING PROTECTIVE DEVICES

INTRODUCTION

This is the third compendium of hearing protection devices developed at the National Institute for Occupational Safety and Health (NIOSH). The first compendium was published in 1975 as a NIOSH technical report (Kroes et al., 1975). It listed mean attenuations and standard deviations for various hearing protectors along with methods for determining the effective protection provided at each of the test frequencies. The second compendium, which was published in 1984, listed similar information and was updated to reflect the newer test data available (Lempert, 1984). The 1984 compendium also provided the Noise Reduction Rating (NRR) for each protector. The NRR was calculated according to the method described in the Environmental Protection Agency Hearing Protective Devices Labeling Regulation (EPA, 1979). An additional compendium of hearing protection devices was published independently in 1988 (Gasaway, 1988). The Gasaway compendium published the NRR for each hearing protector and also listed features that were considered helpful to the person selecting hearing protectors.

This third NIOSH compendium serves as an update to the prior compendia, but greatly expands the information available for each device. The average attenuations and standard deviations are again included along with listings of features for each device. These features are divided into categories such as style, composition materials, and compatibility with other safety equipment and with various work environments. These manufacturer-reported data have not been verified by the authors, but have been merely collected and reprinted as a resource.

In addition to the NRR, other rating values are reported as calculated in accordance with ISO 4869-2 (1992). Compendium users outside of the United States will find rating systems that may be in use in their respective countries. Compendium users in the United States may use the descriptions and results of other rating systems to gain an understanding of what the ratings mean and how a given rating value may be translated to protection from harmful noise.

NOISE CONTROL AND HEARING PROTECTION

The purpose of an occupational hearing conservation program is to prevent hearing loss due to exposure to occupational noise. The most effective method of preventing noise-induced hearing loss is to remove the noise from the workplace. The NIOSH Noise Criteria Document (1972) established control of workplace noise as a first priority and recommended that hearing protectors be used until the noise was controlled. Suter and Franks (1990) reiterated the premise that noise control is of primary importance, stating, "When noise control is not feasible, or until controls can be installed, other aspects of the hearing conservation program must be emphasized."

Hearing protectors are one of the "other aspects" of the hearing conservation program. The use of hearing protection along with annual audiometry, noise monitoring, employee education and motivation, and analysis of hearing conservation database records can be an effective interim solution, but should never be viewed as the primary means for preventing occupational noise-induced hearing loss. This is because there are many human factors that influence the effectiveness of hearing protection in preventing noise-induced hearing loss; and thus the effectiveness must be monitored individually for each worker. However, noise controls are an objective way of preventing noise from reaching the ear in the first place; therefore, all that needs to be monitored is the effectiveness of the control. Noise controls are thus more protective of hearing and more easily monitored than hearing protection devices.

INFORMATION IN THE COMPENDIUM

Information was provided to NIOSH by 53 manufacturers and/or distributors of hearing protection devices sold in the United States as of December 31, 1993. This represents 100% of total manufacturers and/or distributors with hearing protection devices on the market at that time. The data on each device provided by these suppliers included company name, make, model, type, material, special features, average attenuation values and standard deviations for test frequency octave and one-third-octave bands from 125 Hz to 8000 Hz, and the laboratory that performed the attenuation study as specified in ANSI S3.19-1974.

Data were provided for 241 different devices. Of these, 108 are earmuffs; 30 are hard-hat-mounted earmuffs; 86 are earplugs; and 17 are semi-aural devices (sometimes referred to as ear canal caps). In those instances when a device is distributed by more than one supplier, it is listed separately for each supplier. Also, when a protector can be worn in more than one position on the head and when test results were provided for each position, the device is listed with corresponding attenuation values and standard deviations for each position. Therefore, although there are 241 devices reported, a total of 360 entries appear in the various tables and Appendix D of this compendium.

HEARING PROTECTOR TEST METHODS

The method specified by the EPA for determining the amount of noise attenuation that a hearing protector provides is based on subjective tests of protectors as worn by listeners rather than objective tests from an electromechanical device. The actual test method is called real-ear-attenuation-at-threshold (REAT), and the techniques for measuring REAT are specified in ANSI S3.19-1974, "Measurement of Real-Ear Protection of Hearing Protectors and Physical Attenuation of Ear Muffs." ANSI S3.19 requires that auditory thresholds be

obtained from a panel of 10 normal-hearing listeners sitting in a diffuse random-incidence sound field. The test signals are pulsed one-third-octave bands of noise with center frequencies of 125, 250, 500, 1000, 2000, 3150, 4000, 6300, and 8000 Hz. Thresholds are determined with the listeners' ears open and with their ears occluded by the hearing protector under test. The difference between the open-ear threshold and the occluded-ear threshold at each frequency is the REAT for that frequency. Each listener is tested three times with ears open and three times with ears occluded. The REATs for all 10 listeners are arithmetically summed and the mean attenuation is calculated for each test frequency. Since there are three REATs at each test frequency for 10 listeners, the average is calculated by dividing the grand total by 30 to get the grand mean. The standard deviation is also calculated for each test frequency using the number 29 (n-1 from the formula for the standard deviation of a sample, where n is the number of samples) as the denominator, as if 30 separate subjects had provided one REAT each for each test frequency.

When REAT is being determined for the purpose of labeling hearing protectors according to EPA labeling requirements, the protector is fitted into the ear or placed on the head by the experimenter to obtain maximum protector performance. Technically, the "experimenter-fit" described in ANSI S3.19 and adopted by the EPA does in fact permit the test subject to fit the protector himself (using a fitting noise to adjust the device for maximum attenuation) provided that the experimenter personally checks each installation for good fit and acoustic seal and reinserts or readjusts the protectors as he deems necessary. In practice, however, the EPA has determined that "experimenter-fit" shall mean that the experimenter always personally fits the device under the test. All of the attenuations and standard deviations reported in this compendium were determined from REATs in accordance with ANSI S3.19.

At this time, newer American and European standards (which are discussed below) may not be used for hearing protector labeling purposes in the United States. Whether the newer methods may be more relevant to actual hearing protector performance in real-life use situations has not been tested. However, there are no restrictions that prohibit the display of the results of other test methods and the resultant ratings. At this writing, the three largest U.S. hearing protector manufacturers were preparing to publish the results of at least two other test/rating methods along with the NRR.

The current American National Standards Institute's method for determining REATs for hearing protectors is ANSI S12.6-1984, "Measurement of the Real-Ear Attenuation of Hearing Protectors." This standard, which replaced ANSI S3.19, allows more freedom in setting up a diffuse sound field, defines sound-field noise-burst audiometry with greater precision, and is more explicit in its details about how audiograms are to be read and analyzed (particularly in the areas of pairing open and occluded thresholds.) ANSI S12.6 requires an experimenter-supervised fit in which the listener fits the hearing protector while listening to a fitting noise and while gaining insight from the experimenter on optimum fitting techniques. The experimenter does not physically touch the protector or the listener after the final fitting. Calculations of mean REAT and standard deviations are identical to the earlier standard. Because ANSI 12.6 - 1984 was adopted after the EPA hearing protector labeling laws were written, and because the EPA regulations made no provision for adopting newer standards, the older ANSI S3.19 method must be used when testing hearing protectors for EPA labeling purposes even though ANSI S12.6 is the most current methodology.

The European community also relies upon the REAT for determining hearing protector attenuation (ISO 4869-1, 1990). However, there are differences in methods. The number of subjects required is 16 rather than 10 and each subject is tested only once with ears open and once with ears occluded to produce one REAT at each test frequency. In addition, 4869-1 relies upon a subject-fit in which the listeners fit the hearing protectors using a fitting noise to adjust the protectors for best perceived attenuation, but without feedback from the experimenter. Because of the lack of coaching by the experimenter, when hearing protectors are tested for European markets, the reported REATs are usually lower than when they are tested for distribution in the United States.

RATING SYSTEMS

The mean attenuations and standard deviations as reported by hearing protector suppliers were used to calculate all ratings of protector performance according to the various methods. In earlier compendia, the Q values were calculated. Q values were essentially the linear average pure-tone attenuation at each frequency (determined according to ASA z24.22 - 1957, the REAT standard which preceded ANSI S3.19) plus the A-weighting for that frequency, minus 2 standard deviations to allow for variability in the measured data. However, they were difficult to apply and have not been commonly used since the NRR became codified by the EPA Hearing Protective Devices Labeling Regulation (EPA, 1979) and the Hearing Conservation Amendment to the Occupational Noise Standard (OSHA, 1983). Therefore, Q values are not reported in this compendium.

The NRR is a single-number rating method which attempts to describe a hearing protector based on how much the overall noise level is reduced by the hearing protector. The NRR is described in 40 CFR Part 211 EPA Product Noise Labeling Law, Subpart B Hearing Protective Devices, and was adapted by the EPA from Method 2 in the first NIOSH Compendium (Kroes et al., 1975). The formula for calculating the NRR is

$$NRR = 107.9\ dBC - 10 \log \sum_{f=125}^{8000} 10^{0.1(L_{Af} - APV_{f98})} - 3\ dB.$$

where L_{Af} is the A-weighted octave band level at frequency f of a pink noise spectrum with an overall level of 107.9 dBC, and APV_{f98} is the mean attenuation value minus 2 standard deviations at frequency f (2 standard deviations accounts for 98% of the variance in a normal distribution).

The equation can be broken down into the steps shown in Table A.1.of Appendix A-1. The NRR assumes a background of pink noise with octave-band levels of 100 dB. The corrections for the C-weighting scale are then subtracted to compute unprotected C-weighted octave-band levels at the ear. These octave-band levels are logarithmically summed to obtain the overall sound level in dBC at the unprotected ear; this value is the first term of the equation and is always 107.9. The corrections for the A-weighting scale are then subtracted from the pink-noise octave-band levels to compute the A-weighted octave-band levels at the ear. The average attenuations minus twice the standard deviations are subtracted from the A-weighted octave-band levels to compute the protected A-weighted octave-band level at the ear. The adjustment of 2 standard deviations theoretically provides an NRR that 98% of the subjects will meet or exceed, provided that the wearers use the hearing protection device the way laboratory subjects did and that the subjects were a reasonable anatomical sample of the user population. The protected A-weighted octave-band levels at the ear are then logarithmically summed to calculate the overall protected A level. The NRR is computed by subtracting 3 dB from the difference between the unprotected C-weighted and the protected A-weighted levels at the ear. The 3 dB factor is a correction for spectral uncertainty to account for whether the pink noise used in the computation really matches the noise in which the hearing protection device is worn.

The NRR is intended to be used to calculate the exposure under the hearing protector by subtracting it from the C-weighted environmental noise exposure level (see Appendix A-1). Thus, if a protector has an NRR of 17 dB and it is used in an environmental noise level of 95 dBC, the noise level entering the ear could be expected to be 78 dBA or lower in 98% of the cases. An alternative use of the NRR is with dBA data. Although not intended for use with dBA measurements, the NRR can be applied if 7 dB is subtracted from its value.

In Europe, new rating systems (ISO, 1992) have been adopted which may have as wide a use there as the NRR has in the United States. The systems are the Single-Number Rating (SNR), the High-Middle-Low (HML) rating, and the Assumed Protection Value (APV). These methods are based on REATs measured according to ISO 4869-1 (discussed above) for one-third octave bands in octave steps from 63 to 8000 Hz (when data for 63 Hz are not present, the summation occurs from 125 to 8000 Hz.) All of these methods provide the user the option of selecting a protection performance value which is an indication of the percentage of test subjects that achieved the specified level of noise reduction. The protection performance is computed by subtracting a multiple of the standard deviation from the mean attenuation values. The most commonly utilized protection performance value in Europe is 80%, which is computed by using a multiplier of 0.84 with the standard deviation values. However, in this document, a protection performance value of 98% (computed by multiplying 2.0 times the standard deviation) is utilized for all SNR, HML, and APV calculations in order to make them more directly comparable to the NRR values. It should be stressed, though, that these methods allow the user to select a protection performance level other than 98%, and the ratings can be recalculated from the data provided.

The SNR is calculated much like the NRR, except that the values used may vary with the selected protection performance value and there is no 3 dB spectral correction factor. The method for calculating the SNR is presented in Appendix A-2. The SNR differs from the NRR further in that the base spectrum for calculation is made of octave-band noise levels that sum to 100 dBC, rather than octave-band noise levels of 100 dB that sum to 107.9 dBC. The SNR considers attenuation only at the octave center frequencies and does not include the third-octave center frequencies of 3150 and 6300 Hz. The octave-band levels are also adjusted by the A-weighting correction factors and summed to a value of 98.5 dBA. The mean attenuation value for each octave-band minus the standard deviation for that octave band times a multiplier for the protection-performance level is subtracted from the A-weighted corrected octave-band levels to calculate the APV for each band. The sum of the APVs is subtracted from 100 dBC to calculate the SNR. The SNR may be subtracted from the environmental noise level in dBC to predict the effective A-weighted sound pressure level under the hearing protector. Thus, if a hearing protector had an SNR of 16 dB and was used in a noise level of 95 dBC, the effective A-weighted sound pressure level under the hearing protector would be assumed to be 79 dBA.

The HML method is a different rating system altogether, in that it provides three numbers to describe hearing protector attenuation. Which number will be used for a given instance depends upon the noise from which protection is sought. The HML method has a number to describe the low-frequency attenuation (L value), the mid-frequency attenuation (M value), and the high-frequency attenuation (H value) of a protector. These numbers are calculated by taking into account typical industrial noise spectra. In the early 1970s, NIOSH collected noise spectra from a variety of industrial locations and developed the NIOSH 100 noises (Johnson and Nixon, 1974). The noise-spectra array was reduced to 8 spectra for calculation of the HML based on the difference between the calculated dBC and dBA level for each noise.

As with the NRR and SNR values, the mean attenuations and standard deviations for calculation of the H, M and L values are provided by the manufacturer. To use the values, the environmental noise level in dBA is subtracted from the environmental noise level in dBC to see which rating is appropriate. If the difference between the dBC and dBA levels is equal to or greater than 2 dB, the mean of the M and L values is used according to the equation:

$$M - \frac{(M - L)}{8} \cdot (dBC - dBA - 2\ dB)$$

If the difference is between 2 dB and -2 dB, the mean of the M and H values is used according to the equation

$$M - \frac{(H - M)}{4} \cdot (dBC - dBA - 2\ dB)$$

The HML method allows selection of a hearing protector so that it can be effective for the frequency range where it is needed most. For example, suppose an earplug had an H rating of 25 dB, and an M rating of 18 dB, and an L rating of 13 dB. If the environmental noise level was 95 dBC and 92 dBA, the dBC - dBA value would be 3 dB. The average attenuation would be calculated from the M and L values, 18 - (18-13)/8 * (95-92-2) = 11.25. So the exposure level at the ear from the protector would be 95.0 - 11.25 = 80.75, which rounds to 81 dBA. The method for calculating the HML is presented in Appendix A-3.

The Assumed Protection Values (APV) are calculated for each test frequency by subtracting a coefficient multiplied by the standard deviation from the averaged attenuation. The coefficient varies depending upon the protection performance desired. For a protection performance of 84%, the coefficient is 1.0; for 80%, the coefficient is 0.84; and for 98% the coefficient is 2.0. The APVs are used in the calculation of the SNR and HML, and they may also be used frequency-by-frequency for a direct calculation of octave-band noise reduction. In a typical application, one would examine the noise spectrum to find the frequency regions with the most energy and then find a hearing protector with adequate APVs for those frequency regions so that the resultant overall dBA level at the ear would be safe. The method for calculating the APV is presented in Appendix A-4.

STRUCTURE OF THE COMPENDIUM - TABLES

The data for this compendium are presented in three tables and four appendices. Tables 1-3 present each device type listed alphabetically by supplier. Included are the make and model, type, material, compatibility features, special features, the test laboratory used by the supplier, and the noise reduction rating (NRR) as calculated by NIOSH using the EPA formula and the manufacturer's supplied data. In the feature columns, a bullet (■) is shown if a device has that feature and a space is left if it does not have the feature. All of the feature information was provided by suppliers and no independent check for accuracy was performed.

Table 1 contains the listing for earplugs. The first feature set indicates style: premolded (number of flanges or conical), user-formed, custom-molded, and expandable. The next feature set indicates the composition of the device: silicon, vinyl, foam vinyl, foam urethane, mineral wool, thermoplastic elastomer, waxed cotton, or hard acrylic. Other distinguishing features are then listed: color coding, availability of safety cord, disposability, level dependency, provision of insertion device or protective case, and provision of instructions for care. Compatibility of wear with other safety devices is listed as well such as hardhat compatibility, respirator compatibility, welder's hood compatibility, usability in confined spaces, protective clothing hood compatibility, and compatibility with safety eye wear. Unique features are listed as comments, including metal detectability, presence of a metal or non-metal acoustic filter, specialized uses (such as musician or HI-FI), and particular devices with which it is designed for use. The remaining entries on the table include the laboratory that performed the testing for the NRR and the NRR itself.

Table 2 shows the listing for ear canal caps. When different positions for wear or use exist for a device, two or more entries appear. The position column indicates whether the headband was over the head, behind the neck, or under the chin. The first feature set indicates style: no flange or conical. The second set indicates composition of the canal piece: silicon, vinyl, foam vinyl or foam urethane. The only features presented are padded headband and instructions for care. Compatibility of wear with other safety devices is listed, including hardhat compatibility, respirator compatibility, welder's hood compatibility, and usability in confined spaces. The remaining entries on the table include the laboratory that performed the testing for the NRR, a comment field, and the NRR.

Table 3 shows the listing for earmuffs. When different positions for wear or use exist for a device, two or more entries appear. The position column indicates whether the headband was over the head, behind the neck, under the chin, or designed for attachment to a helmet. The first feature set indicates composition of the headband and muff cushions: foam-filled cushions/metal headband, foam-filled cushions/plastic headband, liquid-filled cushions/metal headband, liquid-filled cushions/plastic headband, foam-filled cushions combination plastic and metal headband, or foam cushions on the hard hat. The second set indicates special features including color coding, active noise reduction, communication headset, level dependency, foldable headband, earmuff with a strap, and provision of instructions for care. The third set indicates compatibility of wear: hardhat compatibility, respirator compatibility, welder's hood compatibility, usability in confined spaces, protective clothing hood compatibility, compatibility with safety eye wear, and visor compatibility. Additionally, the comment column in Table 3 indicates which earmuffs are designed for backband wear only, have an acoustic filter, are battery operated, are wireless, have a 2-way radio, or are noise- or voice-activated. If indications are made that the earmuff is part of a communication headset, comments include microphone types, volume control features, and compatibility with aircraft communication systems. Comments are also made if the earmuff is for use in combination with another hearing protective device. The remaining entries on the table include the laboratory that tested the earmuff and the NRR itself.

STRUCTURE OF THE COMPENDIUM - APPENDICES

Appendix A. The complete formulae and methods for calculating the NRR, the SNR, the HML, and the APV ratings are presented in Appendix A. The formulae and methods are taken directly from the appropriate standard or regulation. The information in Appendix A will be useful to those who must consider new protectors not listed in this edition of the compendium. Appendix A will also be useful to those developing new attenuation and standard deviation values for new hearing protection devices or using different test protocols for testing hearing protectors.

Appendix B. A variety of laboratories were used by the suppliers to provide the test data. A directory of test laboratories is provided in Appendix B. The E•A•R-CAL Laboratory of Cabot Safety Corp and the Auditory Systems Laboratory at Virginia polytechnic Institute and State University have NVLAP (National Voluntary Laboratory Accreditation Program) accreditation from the National Institute of Standards and Technology (formerly the National Bureau of Standards).

Appendix C. A comparison of "real-world", published laboratory, and newly acquired laboratory data for four different hearing protectors is presented in Appendix C. Present laboratory methods were developed to produce a measurement of attenuation for an "optimum fit" condition. Since the 1970's, researchers in various settings around the world (Abel, S. M., Alberti, P.W., and Rick, K., 1982; Behar, A., 1985; Berger, E. H. and Kieper, R. W., 1991; Casali, J. G. and Parks, M. Y., 1991; Chung, D. Y., Hardie, R., and Gannon. R. P., 1983; Crawford, D. R. and Nozza, R. J., 1981; Edwards, R. G., Broderson, A. B., Green, W. W., and Lempert, B., 1983; Edwards, R. G., and Green, W. W., 1987; Edwards, R. G., Hauser, W. P., Moiseev, N.A., Broderson, A. B., and Green, W. W., 1978; Fleming, R. M., 1980; Franks, J. R., 1993; Goff, R. J. and Blank, W. J., 1984; Hachey, G. A. and Roberts, J. T., 1983; Hempstock, T. I., and Hill, E., 1990; Mendez, A., Salazer, E., and Bontti, H., 1986; Merry, C. J., Sizemore, C. W., and Franks, J. R., 1992; Padilla, M., 1976; Pekkarinen, J., 1987; Pfeiffer, B. H., Kuhn, H. D., Specht, U., and Knipefer, C., 1989; Regan, D. E., 1975; and Smoorenburg, G. F., ten Raa, B. H., and Mimpen, A. M., 1986) have been investigating the amount of attenuation workers typically receive. They found workers generally received much less attenuation than the optimum-fit laboratory methods predict. The magnitude of the difference was from 22 to 84% less attenuation for the real-world setting than for the laboratory setting. Researchers at NIOSH have worked with researchers from other laboratories as part of an ANSI working group to develop and test laboratory methods that give measurements of hearing protector attenuation that are more reflective of real-world performance and are still consistent from laboratory to laboratory. The new method, called the NIOSH/ANSI method for the purposes of this document, provides very consistent interlaboratory results, much more consistent than possible using the methods of ANSI S3.19. The method also provides mean attenuations which are much lower than the optimum-fit attenuations and more in accord with real-world results, while maintaining reasonable standard deviations.

The data in Appendix C are taken from a presentation by Franks and Casali (1993) which compared the results of real-world studies with the manufacturer-published optimum-fit data and those obtained by the new NIOSH/ANSI laboratory method. Appendix C may be used to determine what the various ratings would be for field situations and for the new NIOSH/ANSI laboratory method. At this writing, the NIOSH/ANSI method is being prepared as an alternate procedure in a revision of ANSI S12.6.

Appendix D. Each device is listed alphabetically by supplier, make, and mode in Appendix D. Also presented are the average attenuation values, standard deviations, and various noise reduction ratings: Noise Reduction Rating (NRR), High-Medium-Low Values (HML_H, HML_M, HML_L), Single Number Rating (SNR), and Assumed Protection Values (APV). The HML, SNR, and APV values were calculated in accordance with ISO 4869-2 (1992) using REAT values obtained according to ANSI S3.19-1974 and a protection performance of 98%. The NRR values were calculated in accordance with the EPA 1974 Hearing Protective Devices Labeling Regulation, 40 CFR Part 211, Subpart B.

CONSIDERATIONS IN THE SELECTION AND USE OF HEARING PROTECTORS

Although calculated noise-reduction capabilities are important factors to consider in the selection of hearing protection devices, several other points should also be considered. Studies by Casali (1992) and Riko and Alberti (1982) on the effectiveness of hearing protectors suggest that workers are most likely to demonstrate consistent wear of devices that are comfortable and quick to insert regardless of the amount of attenuation they provide. Additional thought must be given to the worker's physical limitations including concurrent use of safety glasses or eyeglasses, the need of the worker to hear warning signals, and the need to communicate verbally. The environmental conditions of the workplace such as temperature, confined working spaces, or the wearing of additional protective devices also warrant consideration. The durability (shelf life or useful life) and sanitary-hygienic characteristics of each device as well as the length of time it will be worn are also factors that should not be overlooked. If custom-molded hearing protectors are to be used, it is important to ensure the expertise of those who will both prepare the impression and form the final earplug.

In order to assure that a worker receives effective attenuation from a device and consistently uses the device properly, instruction in the fit and care of the devices should be provided by trained personnel at least annually. Each worker should be individually fitted and offered a choice of devices to use. Thereafter, monitoring

annually (as a minimum) of the proper use and fit of the protectors will reinforce their importance and alert the worker as to the need to replace worn or ill-fitting devices.

One of the lessons learned since the EPA 1974 Hearing Protective Devices Labeling Regulation became effective has been that ANSI S3.19 test methods yield REATs that are much greater than workers typically realize. An OSHA directive calls for dividing the NRR on the label by 2 before determining its potential effectiveness against a particular noise. However, examination of the data in Appendix C for the four protectors shows that a universal derating factor may derate earmuffs too much and derate some earplugs too little. NIOSH has recently recommended that NRRs be derated by 25% for earmuffs, by 50% for formable earplugs, and by 70% for all other earplugs.

The best approach for getting the most protection from a hearing protector is to first find a hearing protector for each worker that he or she will wear willingly all of the time, and then instruct each worker thoroughly and repeatedly in the correct use and care of that hearing protector.

ACKNOWLEDGMENTS

The NIOSH Compendium of Hearing Protection Devices was compiled under the direction of John R. Franks, Chief, Bioacoustics and Occupational Vibration Section, Physical Agents Effects Branch, Division of Biomedical and Behavioral Science, NIOSH. Ms. Christa L. Themann oversaw the writing of the text and LtCol (sel) Cari Sherris, United States Air Force, designed the style based on responses to her queries of many potential users. Mr. Douglas Rohrer and Mr. Dale Koesters collected the final data sets and confirmed the accuracy of the data as collected with the hearing protector manufacturers and distributors.

FUNDING

The NIOSH Compendium of Hearing Protection Devices was published with funding from an Interagency Agreement with the U.S. Environmental Protection Agency (EPA IAG DW75936447-01-0, NIOSH IA 94-20)

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3M	Dispos. Earplug	1100								•				•						•	•		•										3		29
	Dispos. Earplug	1110								•				•						•	•		•										3		29
ADCO Hearing Conservation, Inc	ADCO	ADCOSIL								•		•													•	•	•		•	•			2		23
All American Mold Lab, Inc	Comfort Ear									•			•							•					•					•			7		24
American Allsafe Co.	HEARSAFE	A-FM-24			•					•		•													•					•			7		27
	HEARSAFE	A-FM-26			•					•		•								•					•					•			7		27
	HEARSAFE	A-P-1	•							•		•													•					•			7		24
	HEARSAFE	A-PC-1	•							•		•													•					•			7		24
American Research & Design Group	Comfort Ear									•		•													•					•			7		24
Argus Corporation	ARGUS	Foam									•	•													•					•			7		25
Aural Technology, Inc.	PROTECTEAR	III			•					•		•	•												•					•			7	2	27
	PROTECTEAR	MtlRing								•		•	•												•					•			7	1 7	27
	PROTECTEAR	SOLID								•			•												•					•			7	2	25
	PROTECTEAR	VENTED								•			•												•					•			7	2	11
Bilsom International, Inc.	1 - Fit	5680			•					•		•								•					•					•			7		23
	ALL FIT	5830								•										•					•					•			7		28
	Bilsom	Whisper			•							•								•					•					•			7		27
	Down Fit	5148								•										•					•					•			7		26
	EARDOWN	2000								•										•					•					•			7		16
	Per Fit	5603/04								•		•								•					•					•			7		26
	Propp-O-Plast	5026								•										•					•					•			7		22
	QUIETZONE	5640	•									•								•					•					•			7		24
	SOFT	5048								•										•					•					•			7		26
Cabot Safety Corporation	E-A-R Plugs									•		•	•	•						•	•				•					•			3		29
	E-A-R Taperfit2	Insert								•				•						•					•					•			3		33
	E-A-R Tracer	3404007			•											•				•					•					•			3	26	21
	E-A-R Ultrafit	3404003			•											•				•					•					•			3		21
	E-Z-Fit Plugs									•				•						•					•					•			3		28
	HEARGUARD	HV-51R		•								•								•					•					•			3		15
	QUIET TIP	85103								•		•								•					•					•			3		18

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Cabot Safety Corporation,Auditory Systems Div	E-A-R	HI-FI		•			•					•													•	•	•	•	•	•		3	4	12
Curtis Safety Products,Inc.	Curtis	SF		•								•													•	•	•	•	•	•		3		24
EMTECH Laboratories, Inc.	HEARSAVER	SOLID							•		•										•		•		•	•	•	•	•	•		7		29
Earmold & Research Lab, Inc.	Comfort Ear	Plug							•		•														•	•	•	•	•	•		7		24
Earmold Design, Inc.	Sentinel Noise	Plug							•		•														•	•	•	•	•	•		7		29
Eastern Safety Equipment Company, Inc.	EarPlugs	512		•							•										•			•	•	•	•	•	•	•		7		24
	Earplug	339				•					•										•			•	•	•	•	•	•	•		7		24
	Earplug	513				•					•										•			•	•	•	•	•	•	•		7		24
	Earplug	986					•				•										•			•	•	•	•	•	•	•		7		31
	Earplug	987					•				•										•			•	•	•	•	•	•	•		7		31
Elvex Corporation	ELVEX BLUE	EP-201						•			•														•	•	•	•	•	•		3		29
Environmental & Acoustical Research, Inc.	Insta-Mold	Plug							•		•														•	•	•	•	•	•		3		27
Etymotic Research	Musicians Plug	ER-15							•		•														•	•	•	•	•	•		3	25	7
	Musicians Plug	ER-25							•		•														•	•	•	•	•	•		3	235	16
Fibre Metal Products Company	PuraFit	6800							•		•														•	•	•	•	•	•		7		31
	PuraFit	6900							•		•														•	•	•	•	•	•		7		31
Flents Products Co., Inc.	Ear Stopples	020,030					•				•					•									•	•	•	•	•	•		7		25
	Flexiplug	072,073				•					•										•			•	•	•	•	•	•	•		7		25
	Peace & Quiet	001,002	•								•		•								•			•	•	•	•	•	•	•		7		24
	Quiet Down	060					•				•						•								•	•	•	•	•	•		7		16
	Quiet! please	167-70				•					•		•	•							•				•	•	•	•	•	•		7		25
	Silaplug	040,041				•					•		•								•				•	•	•	•	•	•		7		27
	V-51R	075,076		•							•		•								•				•	•	•	•	•	•		7		24
Great Lakes Earmold Lab.	Comfort Ear	Plug							•		•														•	•	•	•	•	•		7		24
Hear Saver, Inc.	Reversible	Plug				•					•		•												•	•	•	•	•	•		7		19
	Stopples	Plug									•						•								•	•	•	•	•	•		7		24
Hearing Conservation Products, Inc.	Oto-Pro	Plug							•		•		•								•				•	•	•	•	•	•		7	6	31

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Hocks Laboratories	NoiseBrakers	VENTED								•	•									•													7	27	20
	Sound Seal	SOLID								•	•									•				•									7		31
Howard Leight Industries	Howard Leight	AS1/30			•							•		•						•				•									5		27
	Howard Leight	LPF1/30				•								•						•				•									5		30
	Howard Leight	MAX1/30				•								•						•				•									5		34
	Howard Leight	QD1/30								•				•						•				•									5		26
Insta-Mold Products, Inc.	InstaMold	III								•	•			•						•				•									3		27
McKeon Products, Inc.	Mack's Earplugs									•	•									•													7		22
Mid-States Laboratories, Inc.	NoiseBraker	SOLID								•	•			•						•				•									7		31
	NoiseBraker	VENTED								•	•									•				•									7		20
Mine Safety Appliance Company	ACCU-FIT										•			•						•				•									7		26
	Ear Defenders			•							•			•						•				•									7		22
	Ear Defenders	III			•							•								•				•									7		27
Moldex-Metric, Inc.	PureFit	6800								•				•						•				•									7		31
North Consumer Products	COM-FIT										•			•				•						•									4		26
	Noise Husher									•				•						•				•									4		29
	Sonic II	HrgPrtr									•			•						•				•									4		6
North Health Care	COM-FIT				•						•			•				•		•				•									7		26
	DECIDAMP									•	•	•								•				•									3		29
	Silent Partner					•					•			•						•				•									7		25
	Sonic Ear Valve				•						•									•				•									7		6
Pacific Coast Laboratories, Inc.	Rockstars !	Solid								•	•			•						•				•									7		28
	Sound Waves									•	•									•				•									7		28
Peltor Inc.	Bull's Eye									•				•						•				•									7		31
PolyPlug Corporation	PolyPlug	PT01								•		•	•							•				•									7		25

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Precision Earmold Lab	Etymotic	ER-15							•				•											•	•	•	•	•	•	•	•	•	3	25	7
	Etymotic	ER-25							•				•											•	•	•	•	•	•	•	•	•	3	25	16
	HI-FI	ER-20			•				•				•											•	•	•	•	•	•	•	•	•	3	4	12
	Comfort Ear	Catamor							•		•		•											•	•	•	•	•	•	•	•	•	7		24
Precision Hearing Instruments, Inc.	Etymotic	ER-20				•							•											•	•	•	•	•	•	•	•	•	3	4	12
Protect Ear International	Convertible w/c	497A							•				•								•			•	•	•	•	•	•	•	•	•	7		24
	Solid	499A							•				•								•			•	•	•	•	•	•	•	•	•	7		26
	VENTED G	495A							•				•								•			•	•	•	•	•	•	•	•	•	7		23
Santa Barbara Medco, Inc.	EAR PUTTY					•					•													•	•	•	•	•	•	•	•	•	1		17
	MEDCO MOLD								•		•													•	•	•	•	•	•	•	•	•	1		18
	Sound Master								•		•													•	•	•	•	•	•	•	•	•	1		15
Sellstrom Manufacturing Co.	Sellstrom	23461				•			•		•													•	•	•	•	•	•	•	•	•	7		24
Silencio	Silencio	FUN-85				•							•											•	•	•	•	•	•	•	•	•	7		7
	Silencio	SDI-100				•							•											•	•	•	•	•	•	•	•	•	7		27
Starkey Labs, Inc.	Sharpshooter								•				•	•										•	•	•	•	•	•	•	•	•	3		29
Supply One	EMTECH Hearsavr	AC							•			•												•	•	•	•	•	•	•	•	•	7		15
	EMTECH Hearsavr	HP					•					•												•	•	•	•	•	•	•	•	•	7		29
Tasco Corp	Tasco	H-1		•									•								•			•	•	•	•	•	•	•	•	•	7		23
	Tasco	RD 1	•										•								•			•	•	•	•	•	•	•	•	•	7		24
	Tasco	Tri-Fit				•						•									•			•	•	•	•	•	•	•	•	•	7		25
	Tasco	Tri-Grd				•						•									•			•	•	•	•	•	•	•	•	•	7		26
Westone Laboratories, Inc.	Etymotic	ER-15							•				•											•	•	•	•	•	•	•	•	•	3	25	7
	Etymotic	ER-25							•				•											•	•	•	•	•	•	•	•	•	3	25	16
	HI-FI	ER-20			•				•				•											•	•	•	•	•	•	•	•	•	3	4	12
	Westone	#40							•				•											•	•	•	•	•	•	•	•	•	7		25
	Westone	#40							•									•						•	•	•	•	•	•	•	•	•	7		24
	Westone	#42							•				•											•	•	•	•	•	•	•	•	•	7		9
	Westone	#44							•				•											•	•	•	•	•	•	•	•	•	7		25
	Westone	#47							•				•											•	•	•	•	•	•	•	•	•	7		18
Willson Safety Products	Sound Silencer	EP 300							•					•										•	•	•	•	•	•	•	•	•	7		27
	Sound Silencer	100/1EP			•								•								•			•	•	•	•	•	•	•	•	•	7		26
Wisconsin Ear Mold Co.	Wisconsin	Custom							•				•											•	•	•	•	•	•	•	•	•	6		18

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American Allsafe Co.	HEARSAFE	A-200-B	B	•		•				•			•			7		17
	HEARSAFE	A-200-O	U	•		•				•			•			7		18
	HEARSAFE	A-200-U	U	•		•				•			•			7		17
	HEARSAFE	A-220-U	U	•		•				•			•			7		16
Bilsom International, Inc.	PERFLEX	5701/02	O		•	•				•			•			7		22
Cabot Safety Corporation	CABOFLEX	600	U	•		•				•			•			3		20
	E-A-R Caps 200	3212101	U	•				•		•			•			3		17
Eastern Safety Equipment Company, Inc.	Band-TypeHearng	509-U	U	•						•			•			7		17
Flents Products Co., Inc.	Peace & Quiet	055-U	U	•						•			•			7		17
	Silo-Band	051-B	B	•						•			•			7		17
	Silo-Band	051-B	U	•						•			•			7		17
	Silo-Band	051-B	O	•						•			•			7		18
Howard Leight Industries	Howard Leight	QB2-U	U	•				•		•			•			5		25
Jackson Products	Noise-Ban	SA-10-U	U	•						•			•			7		17
Moldex-Metric, Inc.	Pura-Band	6500-U	U	•		•				•			•			7		20
	Pura-Band	6500-B	B	•		•				•			•			7		20
North Health Care	Silent Band-It	BH	B	•		•				•			•			7		25
	Silent Band-It	OH	O		•	•				•			•			7		26
	Silent Band-It	UC	U	•		•				•			•			7		25
Tasco Corp	Tasco	Swivel B	B	•						•			•			7		17
	Tasco	Swivel O	O	•						•			•			7		18
	Tasco	Swivel U	U	•		•				•			•			7		17
	Tasco	T-100-U	U	•						•			•			7		17
Willson Safety Products	Sound Ban	10-B	B	•		•				•		•	•			7		18
	Sound Ban	10-O	O	•		•				•		•	•			7		18
	Sound Ban	10-U	U	•		•				•		•	•			7		18
	Sound Ban	20-B	B	•		•				•		•	•			7		19
	Sound Ban	20-U	U	•		•				•		•	•			7		22

Test Laboratory Codes: 1) Cal State Los Angeles; 2) DL Teeter PhD & Assoc.; 3) E-A-R CAL; 4) HEAREX, Inc.; 5) Los Angeles Audiometry Center; 6) Ohio University; 7) Paul Michael & Assoc.; 8) Auditory Systems Laboratory.

Position Code: B - Behind neck; O - Over top of head; U - Under chin.

Table 2 - Feature Listing for Ear Canal Caps by Supplier, Make, and Model

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Company	Make	Model	Position	FoamCushion/MetalHeadband	FoamCushion/PlasticHeadband	LiquidCushion/PlasticHeadband	LiquidCushion/MetalHeadband	FoamCushion/PlasticHeadband	FoamCushion/Metal&PlasticHB	Foam on Helmet	ColorCoding	Active Headset	Communication Headset	Level Dependent	Foldable Headband	Muff with Strap	Instructions for Care	Hard Hat Compatible	Respirator Compatible	Welder Hood Compatible	Confined Space Compatible	Protective Clothing Hood Comp	Safety Eyewear Compatible	Visor Compatible	Test Laboratory	Comments	NRR
American Allsafe Co.	HEARSAFE	HS13-B	B	•															•						7		19
	HEARSAFE	HS22-O	O	•														•							7		21
	HEARSAFE	HS22-U	U	•														•							7		20
	HEARSAFE	HS22-B	B	•														•							7		20
	HEARSAFE	HS24-U	U	•																					7		23
	HEARSAFE	HS24-B	B	•																					7		23
	HEARSAFE	HS24-O	O	•																					7		24
Bilsom International, Inc.	1707-Impact	10707-O	O					•			•	•	•		•	•		•	•						7	COHKL	23
	Bilsom	DownVik	O	•											•	•	•	•	•						7	P	33
	Blue	12308-BH	B	•											•	•		•	•						7		24
	Blue	12308-OH	O	•											•	•		•	•						7		25
	Blue	12308-UC	U	•											•	•		•	•						7		23
	Comfort	12313-H	H					•							•	•	•	•	•						7		23
	Comfort	12315-BN	B	•											•	•		•	•						7		24
	Comfort	12315-OH	O	•											•	•		•	•						7		25
	Comfort	12315-UC	U	•											•	•		•	•						7		23
	Compact	12470-B	B	•											•	•		•	•						7		17
	Economy	12450-BH	B	•											•	•		•	•						7		21
	Economy	12450-OH	O	•											•	•		•	•						7		22
	Economy	12450-UC	U	•											•	•		•	•						7		20
	Economy	12454-H	H	•											•	•		•	•						7		21
	Hobby/Loton	12401-BH	B	•											•	•		•	•						7		20
	Hobby/Loton	12401-OH	O	•											•	•		•	•						7		23
	Hobby/Loton	12401-UC	U	•											•	•		•	•						7		20
	Nova 27	10727-O	O					•							•	•		•	•						7		27
	Pocket	12428-O	O	•											•	•		•	•						7		23
	Special	12453-OH	O				•								•	•		•	•						7		21
	Viking	12314-H	H	•											•	•	•	•	•						7		23
	Viking 29	12318-BH	B	•											•	•		•	•						7		28
	Viking 29	12318-OH	O	•											•	•		•	•						7		29
	Viking 29	12318-UC	U	•											•	•		•	•						7		28
	Warrior	12424-BH	B	•											•	•		•	•						7		22
	Warrior	12424-OH	O	•											•	•		•	•						7		23
	Warrior	12424-UC	U	•											•	•		•	•						7		22

COMPOSITION

FEATURES

COMPATIBILITY

Test Laboratory Codes: 1) Cal State Los Angeles; 2) DL Teeter PhD & Assoc.; 3) E-A-R CAL; 4) HEAREX, Inc.; 5) Los Angeles Audiometry Center; 6) Ohio University; 7) Paul Michael & Assoc.; 8) Auditory Systems Laboratory.

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Table 3 - Feature Listing for Earmuffs by Supplier, Make, and Model

Company	Make	Model	Position	FoamCushion/MetalHeadband	FoamCushion/PlasticHeadband	LiquidCushion/PlasticHeadband	LiquidCushion/MetalHeadband	FoamCushion/PlasticHeadband	Foam on Helmet	FoamCushion/Metal&PlasticHB	ColorCoding	Active Headset	Communication	Level Dependent	Foldable Headband	Muff with Strap	Instructions for Care	Hard Hat Compatible	Respirator Compatible	Welder Hood Compatible	Confined Space Compatible	Protective Clothing Hood Comp	Safety Eyewear Compatible	Visor Compatible	Test Laboratory	Comments	NRR
Cabot Safety Corporation	Cabot	1000-B	B	•										•		•									3		22
	Cabot	1000-U	U	•										•		•									3		22
	Cabot	1000-O	O	•										•											3		20
	Cabot	1720-O	O	•																					3		21
	Cabot	2000H	H						•							•									3		21
	Cabot	3000-B	B											•											3		26
	Cabot	3000-O	O											•											3		25
	Cabot	3000-U	U											•		•									3		26
	Cabot	1820-BH	B											•			•								3		24
	Cabot	1820-OH	O											•			•								3		22
	Cabot	1820-UC	U											•			•								3		24
	ULTRA	9000-O	O								•			•											3	L	16
	ULTRA	9000-U	U								•			•		•									3	L	17
	ULTRA	9000-B	B								•			•		•									3	L	16
David Clark Company, Inc.	David Clark	10A-O	O	•																					7		23
	David Clark	27A-O	O	•																					7		22
	David Clark	310-O	O	•																					7		24
	David Clark	310-B	B	•																					7		20
	David Clark	310-U	U	•																					7		20
	David Clark	805V-B	B	•										•		•									7	A	23
ERB	Ear Muff	211-U	U																						7		16
	Ear Muff	211-O	O																						7		25
	Ear Muff	211-B	B																						7		16
Earmark, Inc.	Earmark	Series4	O	•										•											7	FM	23
	Earmark	Voxxi	O	•										•											7	FM	26
Eastern Safety Equipment Company, Inc.	Deluxe	510-O	O	•																					7		24
	Economy	510-2-01	O		•																				7		19
	Protector	511-H	H		•											•									7		21

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Elvex Corporation	BRUSHGUARD	HB7000	O	•											•		•						•	7		22
	Cap Mount	HM-20	H	•													•							7		24
	Cap Mount	HM-60	H		•												•							7		28
	ELVEX	COM-50	O	•							•	•												7	JL	22
	ELVEX	COM-60	H	•							•	•					•							7	JL	19
	ELVEX	HB-49-01	O	•																				7		25
	EQUALIZER	HB2000	O																					7		25
	ROYAL LIQUID	HB-51-01	O					•																7		27
	Royal Pre-Muff	HB-50-01	O	•																				7		25
	ULTRALITE	HB-45-01	O																					7		23
Fibre Metal Products Company	Earmuff	2011-0	O																					7		24
	Earmuff	2021-H	H														•							7		24
	Earmuff	2029-H	H														•							7		24
	Earmuff	2030-B	B																					7	A	19
Flents Products Co., Inc.	BEL II	2003-B	B														•	•		•				7		17
	BEL II	2003-U	U														•	•		•				7		18
	BEL II	2003-O	O														•	•		•				7		19
	Deluxe	747-U	U	•														•						7		23
	Deluxe	747-O	O	•														•						7		24
	Deluxe	747-B	B	•														•						7		23
	Dielectric	767-U	U	•																				7		21
	Dielectric	767-O	O	•																				7		23
	Dielectric	767-B	B	•																				7		21
	ERGO II	2001-O	O	•																				7		24
	Low Profile	757-B	B														•	•		•				7		19
	Silenta Lite	B083-O	O	•																				7		22
	Silenta Lite	B083-B	B	•																				7		21
	Silenta Lite	B083-U	U	•																				7		20
	Silenta MIL	007-O	O	•													•	•						7		20

COMPOSITION FEATURES COMPATIBILITY

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Table 3 - Feature Listing for Earmuffs by Supplier, Make, and Model

Company	Make	Model	Position	FoamCushion/MetalHeadband	FoamCushion/PlasticHeadband	LiquidCushion/MetalHeadband	LiquidCushion/PlasticHeadband	FoamCushion/Metal&PlasticHB	Foam on Helmet	ColorCoding	Active Headset	Communication Headset	Level Dependent	Foldable Headband	Muff with Strap	Instructions for Care	Hard Hat Compatible	Respirator Compatible	Welder Hood Compatible	Confined Space Compatible	Protective Clothing Hood Comp	Safety Eyewear Compatible	Visor Compatible	Test Laboratory	Comments	NRR
Flents Products Co., Inc.	Silenta Super	2014-U	UI	•																				7		24
	Silenta Super	2014-O	OI	•																				7		27
	Silenta Super	2014-B	BI	•																				7		23
	Silenta Unicap	087-H	HI	•																				7		22
	SilentaUniversal	B080-B	BI	•																				7		24
	SilentaUniversal	B080-U	UI	•																				7		24
	SilentaUniversal	B080-O	OI	•																				7		26
Gentex Electro Acoustics	Gentex	1020A-OI	OI	•							•													7	CK	28
	Gentex	1030A-OI	OI	•							•													7	CK	22
Howard Leight Industries	Howard Leight	QM23-O	OI																					5		24
	Howard Leight	QM24-O	OI												•									5		24
	Howard Leight	QM25-O	OI	•																				5		25
	Howard Leight	QM27-O	OI																					5		27
	Howard Leight	QM27H	HI						•							•								5		28
	Quiet Talk	QT1000	OI								•													5	F	29
	Quiet Talk	QT1000HI	HI								•					•								5	F	28
	Quiet Talk	QT800	OI								•													5	FN	29
	Quiet Talk	QT800H	HI								•					•								5	GN	28
Jackson Products	Cap-Mounted	SA301MBI	HI													•								7		20
	Low Profile	SA-50W	BI		•											•		•						7		19
	Noise-Muff	SA-301BI	BI		•																			7		21
	Noise-Muff	SA-301OI	OI		•																			7		23
	Noise-Muff	SA-301UI	UI		•																			7		21
Mine Safety Appliance Company	Noise Foe	MrkIV-UI	UI	•												•		•	•					7		23
	Noise Foe	MrkIV-OI	OI	•												•		•	•					7		24
	Noise Foe	MrkIV-BI	BI	•												•		•	•					7		22
	Noise Foe	MrkV-B	BI		•											•		•	•					7		23
	Noise Foe	MrkV-O	OI		•											•		•	•					7		25
	Noise Foe	MrkV-U	UI		•											•		•	•					7		24

COMPOSITION FEATURES COMPATIBILITY

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Company	Make	Model	Position	FoamCushion/MetalHeadband	FoamCushion/PlasticHeadband	LiquidCushion/MetalHeadband	LiquidCushion/PlasticHeadband	FoamCushion/Metal&PlasticHB	Foam on Helmet	ColorCoding	Active Headset	Communication Headset	Level Dependent	Foldable Headband	Muff with Strap	Instructions for Care	Hard Hat Compatible	Respirator Compatible	Welder Hood Compatible	Confined Space Compatible	Protective Clothing Hood Comp	Safety Eyewear Compatible	Visor Compatible	Test Laboratory	Comments	NRR
North Consumer Products	Gun Muffler	U	U	•																				4		24
	Gun Muffler	B	B	•																				4		23
	Gun Muffler	O	O	•																				4		25
North Health Care	ATTENUATOR HP	O	O																					7		29
	Dielectric HP	BH	B		•																			7		21
	Dielectric HP	OH	O		•																			7		23
	Dielectric HP	UC	U		•																			7		22
	Industrial HP	BH	B	•																				7		23
	Industrial HP	OH	O	•																				7		25
	Industrial HP	UC	U	•																				7		24
	Sound-Off CMHP	H	H		•									•										7		22
	Sound-Off HP	BH	B	•																				7		23
	Sound-Off HP	OH	O	•																				7		25
	Sound-Off HP	UC	U	•																				7		25
	Sound-Off LFHP	BH	B																					7		23
	Sound-Off LFHP	OH	O																					7		28
	Sound-Off LFHP	UC	U																					7		21
Peltor Inc.	Bull's Eye	7-O	O					•																7		27
	Bull's Eye	9-O	O	•																				7		22
	Bull's Eye	H6B/V	B					•																7		19
	Bull's Eye	Presdnt	O					•																7		24
	Bull's Eye	Shotgnr	O					•																7		21
	Bull'sEyeLitCom	MT7H7A	O					•				•												7	DIN	27
	PELTOR	H10A-O	O	•											•		•							8		30
	PELTOR	H3A-O	O					•																7		22

COMPOSITION

FEATURES

COMPATIBILITY

Test Laboratory Codes: 1) Cal State Los Angeles; 2) DL Teeter PhD & Assoc.; 3) E-A-R CAL; 4) HEAREX, Inc.; 5) Los Angeles Audiometry Center; 6) Ohio University; 7) Paul Michael & Assoc.; 8) Auditory Systems Laboratory.

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Peltor Inc.	PELTOR	H3P3e-HI	HI				•								•								7		22
	PELTOR	H6A/v-OI	OI				•								•								7		20
	PELTOR	H6B/v-BI	BI				•								•								7	A	19
	PELTOR	H6F/v-OI	OI				•				•				•								7		21
	PELTOR	H6P3e/v	HI				•								•								7		20
	PELTOR	H7A-O	OI				•								•								7	L	27
	PELTOR	H7B-B	BI				•						•		•								7	AL	22
	PELTOR	H7F-O	OI				•				•				•								7	L	24
	PELTOR	H7P3e-HI	HI				•								•								7	L	24
	PELTOR	H9A-O	OI	•											•								7		22
	PELTOR	H9P3e-HI	HI	•											•								7		20
	PELTOR LITE-COM	HTM7A-OI	OI	•																			7	E	27
	PELTOR LITE-COM	MT7H7A0I	OI	•																			7	I	27
	PELTOR LITE-COM	MT7H7P3I	HI	•											•								7	DF	24
	PELTOR LITE-COM	MT7H76BI	BI	•											•								7	AF	22
	PELTOR LITE-COM	MT9H6b0I	OI	•											•			•					7	F	19
	PELTOR LITE-COM	MT9H7A0I	OI	•																			7	DG	27
	PELTOR LITE-COM	MT9H7P3I	HI	•											•								7	DG	24
	PELTOR Lumberjk	G413b/c	HI				•								•						•		7		21
Racal Health & Safety, Inc.	Classic	1-0	OI	•						•			•										7		20
	Classic	2-0	OI							•			•										7		22
	Classic	3-0	OI							•			•										7		26
Sellstrom Manufacturing Co.	Sellstrom	404-0	OI	•																			7		21
Silencio	Silencio	CDS-800	OI			•																	7		29
	Silencio	HHA-H	HI	•											•								7		22
	Silencio	KPA-840	OI	•																			7		17
	Silencio	LIQ-71B	BI			•																	7		22
	Silencio	LIQ-71U	UI			•																	7		21
	Silencio	LIQ-710	OI			•																	7		28

COMPOSITION FEATURES COMPATIBILITY

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Silencio	Silencio	IRBW-71BI	BI	•																				7		23
	Silencio	IRBW-71UI	UI	•																				7		25
	Silencio	IRBW-71MI	OI	•																				7		25
Tasco Corp	Tasco	IT-1000HI	HI		•											•								7		20
	Tasco	IT-2-B	BI		•									•		•								7	A	19
	Tasco	IT-2000HI	HI		•											•								7		20
	Tasco	IT-250-UI	UI	•																				7		23
	Tasco	IT-250-OI	OI	•																				7		24
	Tasco	IT-250-BI	BI	•																				7		23
	Tasco	IT-275-OI	OI											•										7		23
	Tasco	IT-275-UI	UI											•										7		21
	Tasco	IT-275-BI	BI											•										7		21
	Tasco ULTIMUFF	2592-H	HI													•								7		25
	Tasco ULTIMUFF	2792-O	OI																					7		27
Willson Safety Products	Sound Barrier	155-B	BI											•										7		20
	Sound Barrier	155A-B	BI			•								•										7		23
	Sound Barrier	351-O	OI	•																				7		19
	Sound Barrier	351A-O	OI																					7		23
	Sound Barrier	358A-O	OI																					7		21
	Sound Barrier	365-B	BI																					7		23
	Sound Barrier	365-O	OI																					7		25
	Sound Barrier	365-U	UI																					7		22
	Sound Barrier	365A-B	BI			•																		7		26
	Sound Barrier	365A-O	OI			•																		7		26
	Sound Barrier	365A-U	UI			•																		7		25
	Sound Barrier	381-B	BI	•																				7		19
	Sound Barrier	381-O	OI	•																				7		19
	Sound Barrier	381-U	UI	•																				7		19
	Sound Barrier	381A-B	BI			•																		7		22
	Sound Barrier	381A-O	OI			•																		7		23
	Sound Barrier	381A-U	UI			•																		7		21
	Sound Barrier	390-H	HI		•											•								7		22
	Sound Barrier	390A-H	HI			•										•								7		24
	Sound Barrier	390AL-HI	HI			•										•								7	F	24

Test Laboratory Codes: 1) Cal State Los Angeles; 2) DL Teeter PhD & Assoc.; 3) E-A-R CAL; 4) HEAREX, Inc.; 5) Los Angeles Audiometry Center; 6) Ohio University; 7) Paul Michael & Assoc.; 8) Auditory Systems Laboratory.

Position Code: B - Behind neck; H - Helmet-mounted; O - Over top of head; U - Under chin.

Codes for Comments: A) Backband wear only; B) Passive acoustic filter; C) Battery-operated; D) Wireless; E) No microphone; F) Boom microphone; G) Throat microphone; H) Talk-through microphone; I) Noise-canceling microphone; J) Volume-controlled microphone; K) Volume-controlled switch; L) Noise-activated; M) Voice-activated; N) 2-way radio; O) Compatible with aircraft communication system; P) Combination earmuff and insert plug.

Table 3 - Feature Listing for Earmuffs by Supplier, Make, and Model

Company	Make	Model	Position	FoamCushion/MetalHeadband	FoamCushion/PlasticHeadband	LiquidCushion/MetalHeadband	LiquidCushion/PlasticHeadband	FoamCushion/Metal&PlasticHB	Foam on Helmet	ColorCoding	Active Headset	Communication Headset	Level Dependent	Foldable Headband	Muff with Strap	Instructions for Care	Hard Hat Compatible	Respirator Compatible	Welder Hood Compatible	Confined Space Compatible	Protective Clothing Hood Comp	Safety Eyewear Compatible	Visor Compatible	Test Laboratory	Comments	NRR
Willson Safety Products	Sound Barrier	459AL-O	O		•							•												7	E	22
	Sound Barrier	460A-O	O		•							•												7	FO	23
	Sound Barrier	462A-O	O		•							•												7	IO	22
	Sound Barrier	665-B	B	•																				8		22
	Sound Barrier	665-O	O	•																				8		21
	Sound Barrier	665-U	U	•																				8		22
	Sound Barrier	665A-B	B		•																			8		22
	Sound Barrier	665A-O	O		•																			8		23
	Sound Barrier	665A-U	U		•																			8		22
	Sound Barrier	690-H	H													•								8		19

COMPOSITION — FEATURES — COMPATIBILITY

Test Laboratory Codes: 1) Cal State Los Angeles; 2) DL Teeter PhD & Assoc.; 3) E-A-R CAL; 4) HEAREX, Inc.; 5) Los Angeles Audiometry Center; 6) Ohio University; 7) Paul Michael & Assoc.; 8) Auditory Systems Laboratory.

Position Code: B - Behind neck; H - Helmet-mounted; O - Over top of head; U - Under chin.

Codes for Comments: A) Backband wear only; B) Passive acoustic filter; C) Battery-operated; D) Wireless; E) No microphone; F) Boom microphone; G) Throat microphone; H) Talk-through microphone; I) Noise-canceling microphone; J) Volume-controlled microphone; K) Volume-controlled switch; L) Noise-activated; M) Voice-activated; N) 2-way radio; O) Compatible with aircraft communication system; P) Combination earmuff and insert plug.

Table 3 - Feature Listing for Earmuffs by Supplier, Make, and Model

Appendix A1
Method for Calculating and Using the Noise Reduction Rating (NRR)

The NRR is a single-number rating which is required by law to be shown on the label of each hearing protector sold in the United States. The NRR is specified by 40 CFR Code of Federal Regulations) Part 211, Product Noise Labeling, Subpart B - Hearing Protective Devices. It is independent of the noise spectrum in which it is applied. The following description of the method of measurement and calculation of the NRR is taken from Method 2 of the NIOSH Compendia (Kroes, et al., 1975) and a similar table can be found in 44 FR (Federal Register) page 56142 (1979).

The values of sound attenuation used for calculation of the NRR are determined in accordance with ANSI S3.19-1974, "American National Standard for the Measurement of Real-Ear Hearing Protector Attenuation and Physical Attenuation of Earmuffs." The experimenter-fit method must be used; that is, the experimenter (not the test subject) must fit the hearing protector onto the head or into the ear of each test subject for each occluded test. Mean attenuations and standard deviations are calculated in accordance with the standard. The NRR is then computed from the mean attenuations and standard deviations according to the following equation:

$$NRR = 107.9\ dBC - 10 \log \sum_{f=125}^{8000} 10^{0.1(L_{Af}-APV_{f98})} - 3\ dB.$$

where L_{Af} is the A-weighted octave band level at frequency f of a pink noise spectrum with an overall level of 107.9 dBC, and

APV_{f98} is the mean attenuation value minus 2 standard deviations at frequency f (2 standard deviations accounts for 98% of the variance in a normal distribution).

The equation can be broken down into the steps shown in Table A.1.1 on page 24. The NRR assumes a pink noise with octave-band levels of 100 dB (line 1). The corrections for the C-weighting scale (line 2) are then subtracted to compute unprotected C-weighted octave-band levels at the ear (line 3). These octave-band levels are logarithmically summed to obtain the overall sound level in dBC at the unprotected ear; this value is the first term of the equation (i.e., 107.9 dBC). The corrections for the A-weighting scale (line 4) are then subtracted from the pink-noise octave-band levels to compute the A-weighted octave-band levels at the ear (line 5). The average attenuations (line 6) minus twice the standard deviations (line 7) are subtracted from the A-weighted octave-band levels to compute the protected A-weighted octave-band level at the ear. Note that the attenuation data for 3000 and 4000 Hz and for 6000 and 8000 Hz are averaged to derive the attenuations at 4000 Hz and 8000 Hz. Note also that the standard deviations for 3000 and 4000 Hz and 6000 and 8000 Hz are summed (in lieu of multiplying by 2) to calculate the total standard deviation for 4000 Hz and 8000 Hz.

The protected A-weighted octave-band levels at the ear are then logarithmically summed to calculate the overall protected A level. This is the second term of the equation. The NRR is computed by subtracting 3 dB from the difference between the unprotected C-weighted and the protected A-weighted levels at the ear.

The Hearing Conservation Amendment to the Occupational Noise Standard (OSHA, 1983) describes six methods for using the NRR to determine a worker's protected A-weighted noise exposure. These methods vary according to the instrumentation and parameters used to determine the unprotected noise levels. However, they can be summarized into two basic formulas, depending on whether unprotected exposure levels were measured on a C-weighted or an A-weighted scale.

For C-weighted measurements:

protected dB(A) = unprotected dB(C) - NRR

where the protected dB(A) and the unprotected dB(C) are 8-hour time-weighted averages determined according to the Occupational Noise Standard. This method is how the NRR was designed to be used. For example, if a protector has an NRR of 17 dB and it is used in an environmental noise level of 95 dB(C), the noise level entering the ear could be expected to be 78 dB(A) [95 - 17 = 78] or lower in 98% of the cases.

For A-weighted measurements:

protected dB(A) = unprotected dB(A) - [NRR - 7]

where, again, the protected and unprotected dB(A) are 8-hour time-weighted averages determined according to the Occupational Noise Standard. This method is an adaptation for those whose instrumentation does not have C-weighting capabilities. The 7 dB correction factor is used to account for the de-emphasis of low-frequency energy inherent to the A-weighting scale. So, for example, if a protector has an NRR of 17 dB and it is used in an environmental noise level of 95 dB(A), the noise level entering the ear could be expected to be 85 dB(A) [95 - (17 - 7) = 85] or less in 98% of the cases.

Table A.1.1
Computation of the Noise Reduction Rating

	Octave Band Center Frequency (Hz)									
	125	250	500	1000	2000	3000	4000	6000	8000	Log Sum
1. Assumed pink noise (dB)	100	100	100	100	100		100		100	
2. C weighting corrections (dB)	-.2	0	0	0	-.2		-.8		-3	
3. unprotected ear C-weighted level	99.8	100	100	100	99.8		99.2		97	**107.9**
4. A weighting corrections (dB)	-16.1	-8.6	-3.2	0	1.2		1.0		-1.1	
5. unprotected ear A-weighted level	83.9	91.4	96.8	100	101.2		101		98.9	
6. average attenuation in dB at each frequency	21	22	23	29	41	43	47	41	36	
	21	22	23	29	41		45*		38.5*	
7. standard deviation in dB at each frequency	3.7	3.3	3.8	4.7	3.3	3.3	3.4	6.1	6.5	
	x2	x2	x2	x2	x2					
	7.4	6.6	7.6	9.4	6.6		6.7**		12.6**	
8. compute APV_{98} in dB at each frequency (line 6 - line 7) 13.6	15.4	15.4	19.6	34.4		38.3		25.9		
9. protected ear A-weighted level (average attenuation minus two standard deviations develops the ear A-weighted levels (line 5 - line 8)	70.3	76.0	81.4	80.4	66.8		62.7		73.0	**85.1**
10. NRR is unprotected ear "C" level (line 3) minus protected ear "A" level (line 9) minus 3 dB										**19.8**

* average attenuation at 3000 and 4000 Hz and at 6000 and 8000 Hz.
** summed standard deviation for 3000 and 4000 Hz and for 6000 and 8000 Hz.

Appendix A2
Method for Calculating and Using the Single Number Rating (SNR)

The SNR is a single-number rating which is calculated in accordance with ISO 4869 2.2 (1992), "Estimation of Effective A-weighted Sound Pressure Levels When Hearing Protectors Are Worn." It is very much like the NRR in terms of its calculation method with a couple of notable exceptions. First, the SNR can be calculated for various levels of protection performance - that is, percentage of the population which can be considered to receive no less than the calculated attenuation - while the NRR is fixed at 98%. Second, there is not an additional 3 dB subtraction as in the NRR. Various protection performances levels (%) are shown in Table A.2.1 along with the appropriate multiplier (α) which is applied to the standard deviation.

Table A.2.1. Values of α for various protection performances, x

Protection Performance x in %	Value of α
75	0.67
80	0.84
84	1.00
85	1.04
90	1.28
95	1.64
98	2.00

When a protection performance level is selected, the SNR is so designated by a subscript. Thus for a protection performance of 80%, the designation would be SNR_{80}. For the SNR to be similar to the NRR, its designation would be SNR_{98} - 3 dB. When the protection performance is yet to be selected, the designation is SNR_x. In the Compendium, a protection performance of 98% (α = 2.00, for 2 standard deviations) was used for all calculations.

The calculation of the SNR_x is based on an assumed background of pink noise with an overall level of 100 dB(C) and Assumed Protection Values, APV_x, of the hearing protector (see Appendix A4). The SNR_x is independent of the actual noise spectrum to which it is applied and is calculated using the equation:

$$SNR_x = 100 \text{ dBC} - 10 \log \sum_{f=63}^{8000} 10^{0.1(L_{Af} - APV_{fx})}$$

where: L_{Af} is the A-weighted octave-band level at frequency f as shown in Table A.2.2, and
APV_{fx} is the Assumed Protection Value for each frequency. If data are not available for 63 Hz, the summation begins at 125 Hz.

Note 1: The term $10 \log \sum_{f=63}^{8000} 10^{0.1(L_{Af} - APV_{fx})}$ equals L_{Ax}.

Note 2: 100 dB represents the total C-weighted sound pressure level of the reference pink noise in Table A.2.2.

The values of L_{Af} are derived in Table A.2.2. They are simply the octave band levels of a 100 dB pink noise corrected to reflect the A-weighting scale.

Table A.2.2. A-weighted octave-band sound pressures levels, L_{Af}, of a pink noise which has a C-weighted sound pressure level of 100 dB

Octave-band center freq. f in Hz	63	125	250	500	1000	2000	4000	8000	Log Sum
Assumed pink noise band level	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	**100.0 dBC**
A-weighting correction factors	-26.2	-16.1	-8.6	-3.2	0	+1.2	+1.0	-1.1	
L_{Af}	65.3	75.4	82.9	88.3	91.5	92.7	92.5	90.4	
L_A (total A-weighted sound level)									**98.5 dBA**

An example SNR calculation is shown in Table A.2.3. The APV values used are taken as derived in Appendix A4.

Table A.2.3. Calculation difference between APV_{f98} and L_{Af}. All values are in decibels.

Octave-band center freq. f in Hz	63	125	250	500	1000	2000	4000	8000	Log Sum
L_{Af}, from Table A.2.2	65.3	75.4	82.9	88.3	91.5	92.7	92.5	90.4	
Example APV_{f98}	0.8	2.8	7.2	10.4	14.8	16.2	24.0	23.7	
L_{Af} - APV_{98}	64.5	7.26	75.7	77.9	76.7	76.5	68.5	66.7	**83.5 dBA**

SNR_x = 100 dBC - 83.5 = 16.5 dB

The SNR_x is used to estimate the noise level under the hearing protector for a specific protection performance level (L'_{Ax}) given a specific C-weighted noise level (L_C). The effective A-weighted sound pressure level, L'_{Ax}, under a hearing protector is calculated by subtracting the SNR_x from the C-weighted sound pressure level of a specific noise. For example, if L_C = 103 dB, and the SNR_{98} = 16.5 dB, L_{A98} is calculated using the equation:

$$L'_{Ax} = L_C - SNR_x,$$

so that

$$L'_{A98} = 103 \text{ dB} - 16.5 \text{ dB} = 86.5 \text{ dB}.$$

It can be stated that the effective A-weighted sound pressure level, L'_{A98}, will be less than or equal to 86.5 dB in 98% of the situations when the hearing protector is properly worn by various users in this noise environment.

Appendix A3

Method for Calculating and Using the High, Middle, Low (HML)

The HML is a rating which is calculated in accordance with ISO 4869-2 (1992), "Estimation of Effective A-weighted Sound Pressure Levels When Hearing Protectors Are Worn". Using the H, M, and L ratings requires both C-weighted (L_C) and A-weighted (L_A) sound pressure levels of the noise. The H and M values are used in the calculation of the protected exposure level for noises which have primary energy in the middle and high frequencies and for which the L_C and L_A levels differ by 2 dB or less. The M and L values are used in the calculation of the protected exposure level for noises which have appreciable low-frequency components and for which the L_C and L_A levels differ by more than 2 dB.

The calculation of the H, M, and L values is based on eight reference noise spectra with different (L_C - L_A) values as shown in Table A.3.1 below and the Assumed Protection Values (APV_{fx} - see Appendix A4) of the hearing protector. The eight reference noise spectra were derived from the NIOSH 100 noises (Johnson and Nixon, 1974). The index, i, is used to refer to a particular noise spectrum. The HML values are independent of the actual noise situation to which they are applied.

Table A.3.1. A-weighted octave-band sound pressure levels, L_{Afi}, of eight reference noises normalized to an A-weighted sound pressure level of 100 dB, L_C - L_A values and constants d_i. All values are in decibels.

Index	Octave-band Center Frequency								Difference	Constant
I	63	125	250	500	1000	2000	4000	8000	(L_C-L_A)	d_i
1	51.4	62.6	70.8	81.0	90.4	96.2	94.7	92.3	-1.2	-1.20
2	59.5	68.9	78.3	84.3	92.8	96.3	94.0	90.0	-0.5	-0.49
3	59.8	71.1	80.8	88.0	95.0	94.4	94.1	89.0	0.1	0.14
4	65.4	77.2	84.5	89.8	95.5	94.3	92.5	88.8	1.6	1.56
5	65.3	77.4	86.5	92.5	96.4	93.0	90.4	83.7	2.3	-2.98
6	70.7	82.0	89.3	93.3	95.6	93.0	90.1	83.0	4.3	-1.01
7	75.6	84.2	90.1	93.6	96.2	91.3	87.9	81.9	6.1	0.85
8	77.6	88.0	93.4	93.8	94.2	91.4	87.9	79.9	8.4	3.14

Note: d_i is an empirically determined constant.

The HML values are calculated using the following equations:

$$H_x = 0.25 \sum_{i=1}^{4} PNR_{xi} - 0.48 \sum_{i=1}^{4} (d_i \cdot PNR_{xi})$$

$$M_x = 0.25 \sum_{I=5}^{8} PNR_{xi} - 0.16 \sum_{I=5}^{8} (d_i \cdot PNR_{xi})$$

$$L_x = 0.25 \sum_{I=5}^{8} PNR_{xi} + 0.23 \sum_{i=5}^{8} (d_i \cdot PNR_{xi})$$

where:

$$PNR_{xi} = 100 \text{ dBA} - 10 \log \sum_{f=63}^{8000} 10^{0.1(L_{Afi} - APV_{fx})}$$

PNR_{xi} refers to the predicted noise reduction for a protection performance level x and a reference noise spectrum i. L_{Afi} and d_i are given in Table A.3.1. If data are not available for 63 Hz, then summation begins at 125 Hz. The value 100 dB represents the total A-weighted sound pressure level of each of the noises in Table A.3.1. The resulting H_x, M_x, and L_x values are to be rounded to the nearest integer.

To calculate the H, M, and L values for a particular protector, it is necessary to obtain the Assumed Protection Value for the desired protector performance for each frequency (see Appendix A4). For example, if the sample protector from Appendix A4 were used, the APV_{f98} would be as in Table A.3.2.

Table A.3.2. Example APV_{f98} for the hearing protector in Appendix A4.

Octave-band center freq. (f) in Hz	63	125	250	500	1000	2000	4000	8000
Example APV_{f98}	0.8	2.8	7.2	10.4	14.8	16.2	24.0	23.7

After the APV_{fx} are obtained, the A-weighted octave-band noise levels under the protector are calculated for each of the reference noises (L_{Afi} - APV_{f98}). For the protector in this example, these levels would be as shown in Table A.3.3.

Table A.3.3. Calculated difference spectrum for L_{Afi} - APV_{f98}

Octave-band center freq. f in Hz	63	125	250	500	1000	2000	4000	8000
L_{Af1} - APV_{f98}	50.6	59.8	63.6	70.6	75.6	80.0	70.7	68.6
L_{Af2} - APV_{f98}	58.7	66.1	71.1	73.9	78.0	80.1	70.0	66.3
L_{Af3} - APV_{f98}	59.0	68.3	73.6	77.6	80.2	78.2	70.1	65.3
L_{Af4} - APV_{f98}	64.6	74.4	77.3	79.4	80.7	78.1	68.5	65.1
L_{Af5} - APV_{f98}	64.5	74.6	79.3	82.1	81.6	76.8	66.4	60.0
L_{Af6} - APV_{f98}	69.9	79.2	82.1	82.9	80.8	76.8	66.1	59.3
L_{Af7} - APV_{f98}	74.8	81.4	82.9	83.2	81.4	75.1	63.9	58.2
L_{Af8} - APV_{f98}	76.8	85.2	86.2	83.4	79.4	75.2	63.9	56.2

The eight $PNR_{i,98}$ values are then calculated by substituting the differences from Table A.3.3 into its equation as follows in Table A.3.4.

Table A.3.4. $PNR_{i,98}$ values for the sample hearing protector.

$$PNR_{1,98} = 100 \text{ dBA} - 10 \log (10^{0.1 \cdot 50.6} + \ldots + 10^{0.1 \cdot 68.6}) = 17.7 \text{ dB}$$
$$PNR_{2,98} = 100 \text{ dBA} - 10 \log (10^{0.1 \cdot 58.7} + \ldots + 10^{0.1 \cdot 66.3}) = 16.5 \text{ dB}$$
$$PNR_{3,98} = 100 \text{ dBA} - 10 \log (10^{0.1 \cdot 59.0} + \ldots + 10^{0.1 \cdot 65.3}) = 15.6 \text{ dB}$$
$$PNR_{4,98} = 100 \text{ dBA} - 10 \log (10^{0.1 \cdot 64.6} + \ldots + 10^{0.1 \cdot 65.1}) = 14.4 \text{ dB}$$
$$PNR_{5,98} = 100 \text{ dBA} - 10 \log (10^{0.1 \cdot 64.5} + \ldots + 10^{0.1 \cdot 60.0}) = 13.2 \text{ dB}$$
$$PNR_{6,98} = 100 \text{ dBA} - 10 \log (10^{0.1 \cdot 69.9} + \ldots + 10^{0.1 \cdot 59.3}) = 12.1 \text{ dB}$$
$$PNR_{7,98} = 100 \text{ dBA} - 10 \log (10^{0.1 \cdot 74.8} + \ldots + 10^{0.1 \cdot 58.2}) = 11.3 \text{ dB}$$
$$PNR_{8,98} = 100 \text{ dBA} - 10 \log (10^{0.1 \cdot 76.8} + \ldots + 10^{0.1 \cdot 56.2}) = 9.4 \text{ dB}$$

The H_{98}, M_{98}, and L_{98} values are calculated using the appropriate equations, the $PNR_{i,98}$ values from Table A.3.4, and the constants d_i from Table A.3.1. The calculations are shown in Table A.3.5. below, and the values are rounded to the nearest integer.

Table A.3.5. Calculated H_{98}, M_{98}, and L_{98} values

$H_{98} = 0.25 \cdot (17.7 + ... + 14.4) - 0.48 \cdot (-1.20 \cdot 17.7 + ... + 1.56 \cdot 14.4) = 18.3$ dB.

$M_{98} = 0.25 \cdot (13.2 + ... + 9.4) - 0.16 \cdot (-2.98 \cdot 13.2 + ... + 3.14 \cdot 9.4) = 13.5$ dB.

$L_{98} = 0.25 \cdot (13.2 + ... + 9.4) + 0.23 \cdot (-2.98 \cdot 13.2 + ... + 3.14 \cdot 9.4) = 8.6$ dB.

The values H_{98}, M_{98}, and L_{98} may be used to estimate L'_{98} (total A-weighted noise level at the ear) for a particular protector in a specific noise situation. Using the calculated values from Table A.3.5, an example is shown below.

1. **Calculate $L_C - L_A$.**

1. The difference $(L_C - L_A)$ is calculated.

2. **Calculate PNR_X.**

2. If this difference is ≤ 2 dB, the predicted noise reduction level, PNR_x, is calculated using the equation:

$$PNR_X = M_X - \frac{H_X - M_X}{4} \cdot (L_C - L_A - 2\text{ dB}).$$

If this difference is ≥ 2 dB, the PNR_x is calculated using the equation:

$$PNR_X = M_X \frac{M_X - L_X}{8} \cdot (L_C - L_A - 2\text{ dB}),$$

For example, if $(L_C - L_A) = -1$, then $PNR_x = 13.5 - (18.3\text{-}13.5)/4 \cdot (-1\text{-}2) = 17.1$, using the HML values from Table A.3.5.

3. **Subtract PNR_X from the A-weighted noise level.**

3. The PNR_X is then subtracted from the total A-weighted noise level to give the effective A-weighted level at the ear under the protector (L_{Ax}):

$L_{Ax} = L_A - PNR_x$.

For example if $L_A = 104$ dB, then, $L_{A98} = 104$ dB - 17.1 dB = 86.9 dB.

It can be stated that the effective A-weighted sound pressure level will be less than or equal to 86.9 dB in 98% of the situations when the hearing protector is properly worn by various people in this noise environment.

Appendix A4
Method for Calculating and Using the Assumed Protection Values (APV_{fx})

The APV_{fx} is calculated by subtracting a multiple of the standard deviation (selected according to Table A.4.1 based on the desired selection performance level) from the average attenuation at each frequency. The APV_{fx} may be used as a direct estimate of the noise reduction at a particular frequency band if the octave-band levels of the noise are known. Thus, if the octave-band level for a noise is 92 dB at 500-Hz, and the $APV_{500(98\%)}$ is 13 dB, the protected level would be equal to the difference value of 79 dB. The APV may be applied by subtracting it from its corresponding octave-band level of the noise for which protection is being sought. The summation of the differences will provide a prediction of the overall effective noise level at the ear under the protector.

Table A.4.1. Values of α for various protection performances, x

Protection Performance	
x in %	Value of α
75	0.67
80	0.84
84	1.00
85	1.04
90	1.28
95	1.64
98	2.00

In the example in Table A.4.2, the APV_{f98} values for a hearing protector are calculated; that is, the protection performance, α, of 98% (2 standard deviations) is selected. These APV_{f98} values then can be used alone (as described above) or utilized in calculations for the SNR (see Appendix A2) and HML (see Appendix A3).

Table A.4.2 - Calculations of APV_{f98}. All values are in decibels

Octave-band center freq. (f) in Hz	63	125	250	500	1000	2000	4000	8000
Mean attenuation in dB, m_f	7.4	10.0	14.4	19.6	22.8	28.6	38.8	34.1
Standard deviation in dB, s_f	3.3	3.6	3.6	4.6	4.0	6.2	7.4	5.2
αs_f, $\alpha = 2.00$	6.6	7.2	7.2	9.2	8.0	12.4	14.8	10.4
$APV_{f98} = m_f - \alpha s_f$, in dB	0.8	2.8	7.2	10.4	14.8	16.2	24.0	23.7

Appendix B. Laboratory Information

1. Cal State Los Angeles
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2. DL Teeter, Ph.D., and Associates
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   P.O. Box 18425
   Tampa, FL 33679

5. Los Angeles Audiometry Center
   Lynda Gluck, M.A. CCC-A
   1728 Laurel Canyon Blvd.
   Los Angeles, CA 90046
   (213) 851-6556

6. Ohio University
   Jon K. Shallop, Ph. D.
   Ohio University
   School of Hearing and Speech Sciences
   Athens, OH 45701
   No longer providing testing services

7. Michael and Associates/Penn State
   Kevin Michael, Ph D.
   Michael and Associates, Inc.
   246 Woodland Dr.
   State College, PA 16803
   (814) 234-7042 **NVLAP accredited testing facility**

8. Retliff Labs
   Retliff Testing Laboratories
   402 Kelly Ave.
   Manchester, NH 03103
   (603) 644-2600

9. Auditory Systems Laboratory
   John G. Casali Ph. D.
   Virginia Polytechnic and State University
   Dept. Industrial & Systems Engineering
   Blacksburg, VA 24061
   (703) 231-5073 **NVLAP accredited testing facility**

Appendix C. Real World Data

Product / Study	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	4000	8000	Estimation of Effective Noise Reduction When Hearing Protectors are Worn EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Assumed Protection Value 125	250	500	1000	2000	4000	8000
Bilsom International UF-1 Muff																			
Hachey & Roberts 1983	7.8 (4.1)	8.8 (5.0)	16.8 (6.2)	27.6 (4.4)	30.5 (6.3)	29.6 (9.2)	24.0 (8.6)	7	7	14	21	17	3	3	10	23	24	20	15
Casali & Parks 1991a	8.3 (4.2)	12.2 (4.4)	19.3 (5.2)	26.5 (6.6)	26.2 (5.5)	36.0 (6.6)	35.3 (7.0)	11	10	17	23	20	4	7	14	19	20	29	28
Casali & Parks 1991b	9.4 (2.5)	13.9 (2.8)	21.0 (2.8)	27.3 (3.7)	28.6 (3.8)	38.4 (5.2)	36.0 (5.6)	17	13	20	27	23	6	11	18	23	24	33	30
NIOSH/ANSI Interlab. Study	7.4 (3.6)	14.0 (3.4)	20.7 (3.3)	29.2 (3.8)	31.7 (4.1)	35.6 (4.0)	34.8 (4.9)	16	11	20	29	23	3	10	17	25	27	31	29
Bilsom International, Inc.	17.1 (1.9)	19.9 (1.3)	25.6 (2.4)	32.8 (1.7)	40.3 (1.5)	46.7 (1.4)	43.9 (2.8)	25	21	27	37	31	15	18	23	31	38	45	41

Product / Study	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	4000	8000	Estimation of Effective Noise Reduction When Hearing Protectors are Worn EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Assumed Protection Value 125	250	500	1000	2000	4000	8000
Willson Safety Products EP100																			
Crawford & Nozza 1981	8.0	8.0	10.0	12.0	22.0	20.0	14.0	-12	-1	0	5	4	-4	-4	-1	-1	7	9	2
	(12.0)	(12.0)	(11.0)	(13.0)	(15.0)	(11.0)	(12.0)												
Edwards, Hauser et al 1978	5.0	4.0	5.0	6.0	13.0	18.0	9.0	-13	-2	0	0	1	-3	-4	-3	-2	0	8	-3
	(8.0)	(8.0)	(8.0)	(8.0)	(13.0)	(10.0)	(12.0)												
Abel et al 1982	16.5	17.4	18.7	20.9	23.2	28.8		0	9	10	7	9	5	7	9	11	13	19	0
	(10.8)	(9.9)	(9.3)	(9.8)	(9.3)	(9.6)	()												
Smoorenewberg et al 1986		6.8	7.7	9.0	19.4	24.2	15.2	-15	-2	-2	3	1	0	-2	-4	-3	4	10	0
	()	(9.7)	(12.5)	(12.9)	(14.9)	(14.1)	(15.0)												
NIOSH/ANSI Interlab Study	14.7	14.5	15.4	17.5	24.4	30.1	27.0	-4	4	7	13	10	3	2	2	6	14	19	13
	(11.7)	(11.6)	(12.5)	(11.1)	(10.2)	(11.1)	(14.0)												
Willson Safety Products	27.0	29.0	31.0	33.0	37.0	45.0	36.0	26	28	30	34	33	23	26	28	30	33	41	31
	(3.9)	(2.9)	(3.0)	(3.0)	(4.0)	(3.6)	(4.3)												

Product / Study	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	4000	8000	Estimation of Effective Noise Reduction When Hearing Protectors are Worn EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Assumed Protection Value 125	250	500	1000	2000	4000	8000
Cabot Safety Corp. E.A.R. Plug																			
Crawford & Nozza 1981	24.0 (11.0)	24.0 (11.0)	26.0 (10.0)	28.8 (11.5)	36.0 (9.0)	39.0 (6.0)	35.0 (10.0)	8	15	18	25	22	13	13	16	17	27	33	25
Hachey & Roberts 1983	10.2 (6.8)	11.2 (5.5)	11.8 (5.5)	14.7 (6.5)	23.4 (7.2)	28.3 (8.4)	22.4 (7.6)	3	7	9	15	13	3	5	6	8	16	19	14
Edwards, Broderson et al 1983a	15.0 (9.1)	15.0 (7.7)	16.1 (7.2)	18.2 (7.6)	28.3 (10.2)	33.2 (8.8)	26.5 (9.4)	3	9	11	17	15	5	7	8	10	18	24	17
Edwards & Green 1987a	22.6 (7.5)	23.6 (8.6)	23.9 (8.0)	24.7 (7.6)	33.7 (7.7)	41.5 (7.6)	37.1 (7.8)	11	17	18	25	22	15	15	15	17	26	33	29
Edwards & Green 1987b	17.7 (8.8)	17.5 (8.0)	23.9 (8.0)	20.2 (8.7)	28.9 (8.8)	38.7 (8.5)	30.8 (9.1)	6	12	14	19	18	8	9	15	11	20	30	21
Edwards, Broderson et al 1983b	9.5 (9.8)	9.6 (8.8)	11.5 (9.2)	13.3 (9.1)	24.9 (12.0)	26.2 (9.5)	23.5 (9.7)	-3	3	5	11	9	-0	0	2	4	12	16	13
Abel et al 1982a	12.8 (9.3)	9.6 (8.8)	14.2 (10.0)	18.0 (7.7)	24.5 (7.5)	25.2 (9.5)	()	-1	4	8	8	8	3	0	4	10	17	15	0
Abel et al 1982b	13.1 (7.8)	14.0 (9.3)	14.6 (8.7)	17.5 (8.5)	32.8 (7.5)	26.4 (10.0)	()	0	7	9	8	8	5	4	5	9	25	16	0
Pfeiffer et al 1989	15.0 (11.0)	11.0 (9.0)	17.0 (10.0)	23.0 (10.0)	27.0 (8.0)	33.0 (9.0)	30.0 (8.0)	1	6	11	19	14	4	2	7	13	19	24	22
Behar 1985b	()	16.9 (6.0)	20.0 (9.1)	22.5 (6.4)	30.2 (5.2)	38.8 (6.8)	33.3 (9.9)	8	9	15	23	18	0	10	10	16	25	32	23
Behar 1985a	()	16.2 (6.5)	19.5 (8.6)	19.8 (6.8)	32.8 (7.5)	37.3 (6.5)	32.8 (10.7)	7	8	14	21	17	0	9	10	13	25	30	22
Casali & Parks 1991a	13.7 (10.1)	14.4 (12.0)	16.5 (13.3)	16.7 (13.1)	26.6 (13.1)	30.0 (11.5)	27.6 (10.6)	-6	4	5	12	9	3	2	3	3	13	18	17
Casali & Parks 1991b	25.0 (8.7)	27.3 (8.5)	31.1 (9.6)	30.8 (7.9)	33.5 (5.2)	36.8 (4.4)	36.3 (6.6)	15	21	24	28	27	16	18	21	22	28	32	29

Product / Study	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	4000	8000	Estimation of Effective Noise Reduction When Hearing Protectors are Worn EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Assumed Protection Value 125	250	500	1000	2000	4000	8000
Cabot Safety Corp. E.A.R. Plug (Continued)																			
Hempstock & Hill 1990	15.4 (9.0)	16.2 (8.7)	18.1 (8.8)	21.1 (7.8)	28.1 (7.3)	33.4 (8.6)	32.1 (10.2)	5	10	13	20	17	6	7	9	13	20	24	21
Berger & Kieper 1991	23.9 (9.5)	35.0 (10.7)	28.8 (11.3)	30.1 (10.3)	32.4 (6.4)	40.1 (4.4)	37.5 (8.1)	11	20	21	26	25	14	24	17	19	26	35	29
NIOSH/ANSI Interlab. Study	21.4 (7.8)	22.0 (7.3)	24.2 (7.8)	25.2 (6.9)	31.0 (4.7)	38.4 (5.8)	38.3 (7.0)	12	17	19	26	23	13	14	16	18	26	32	31
Cabot Safety Corporation	37.4 (5.7)	40.8 (5.0)	44.8 (3.3)	43.8 (3.6)	36.3 (4.8)	42.6 (3.1)	47.3 (2.7)	29	32	33	34	36	28	31	34	31	32	41	44
V-51R Single-Flange Earplug																			
Abel et al 1982	10.8 (10.2)	13.3 (10.1)	12.3 (9.5)	10.5 (9.3)	13.9 (8.6)	15.6 (9.4)	()	-6	3	3	4	5	0	3	2	1	5	6	0
Fleming 1980	8.6 (5.4)	9.4 (7.1)	11.4 (8.7)	15.9 (6.3)	21.9 (9.9)	21.3 (8.4)	18.4 (12.6)	-3	4	7	10	10	3	2	2	9	12	12	5
Edwards, Hauser et al 1978	9.0 (11.0)	9.0 (10.0)	9.0 (11.0)	13.0 (11.0)	20.5 (14.0)	20.0 (11.0)	14.0 (12.0)	-10	0	2	5	5	-2	-1	-2	2	6	9	2
Royser et al 1991	()	()	12.3 (9.5)	14.8 (11.5)	18.8 (8.7)	22.0 (10.3)	()	-5	2	4	6	6	0	0	2	3	10	11	0
Padilla 1976	()	()	5.5 (9.1)	()	()	()	()	-5	0	0	0	1	0	0	-3	0	0	0	0
NIOSH/ANSI Interlab. Study	11.5 (10.4)	10.9 (9.7)	11.6 (10.4)	14.1 (10.2)	21.3 (9.9)	22.8 (7.9)	18.6 (11.2)	-5	3	4	10	8	1	1	1	3	11	14	7
Cabot Safety Corporation Hear Guard	26.3 (7.9)	25.5 (7.5)	25.9 (6.6)	26.2 (6.0)	29.1 (4.3)	33.8 (6.0)	42.0 (6.1)	15	20	21	25	25	18	18	19	20	24	27	35
Bilsom Quiet Zone	31.0 (3.0)	31.0 (3.0)	30.0 (2.4)	31.0 (2.3)	37.0 (3.0)	35.0 (4.4)	40.1 (8.0)	24	28	28	32	32	28	28	27	28	34	30	32

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Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
3M 3M Center, Building 275-6W-01 St. Paul, MN 55144-1000 612-733-0957 612-736-2555 (fax)																					
Dispos. Earplug 1100	26.7 (4.4)	33.3 (3.5)	40.3 (4.1)	37.4 (4.0)	37.1 (3.1)	43.2 (2.1)	44.3 (2.9)	45.6 (3.5)	46.6 (4.5)	29	30	34	36	37	22	29	36	33	34	41	42
Dispos. Earplug 1110	26.4 (5.6)	34.1 (5.6)	39.3 (5.2)	37.6 (3.1)	37.7 (3.1)	41.6 (3.4)	42.7 (3.8)	44.0 (3.8)	44.1 (5.0)	29	29	34	36	36	20	28	34	34	34	38	39
ADCO Hearing Conservation, Inc 7310 S. Alton Way Ste A Englewood, CO 80112 303-290-8339 303-290-0405 (fax)																					
ADCO ADCOSIL	20.7 (2.4)	22.0 (2.0)	23.8 (2.1)	30.4 (2.4)	35.6 (2.5)	41.0 (3.4)	39.2 (4.8)	37.4 (2.5)	35.0 (2.7)	23	22	26	32	30	18	20	21	28	33	34	32
All American Mold Lab, Inc 226 SW Sixth PO Box 25751 Oklahoma City, OK 73125 405-232-8144 800-654-3245 405-232-0672 (fax)																					
Comfort Ear	29.2 (5.0)	29.8 (5.0)	28.3 (4.5)	30.5 (3.5)	37.0 (3.0)	42.4 (3.5)	45.3 (4.5)	44.3 (4.5)	44.1 (6.0)	24	26	27	34	31	24	24	23	27	34	40	38
American Allsafe Co. 99 Wales Ave. Tanawanda, NY 14151-5104 716-695-8300 800-231-1332 716-695-6905 (fax)																					
HEARSAFE A-200-B	20.0 (2.7)	18.9 (2.1)	18.1 (2.6)	23.1 (2.0)	29.2 (2.9)	33.1 (2.5)	31.4 (3.2)	28.6 (2.5)	27.2 (3.5)	17	18	20	25	23	17	16	15	21	26	28	23

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB)									Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn												
	125	250	500	1000	2000	3150	4000	6300	8000	EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
American Allsafe Co. **99 Wales Ave.** **Tanawanda, NY 14151-5104** **716-695-8300 800-231-1332 716-695-6905 (fax)**																						
HEARSAFE	15.7	17.0	19.6	26.2	31.1	33.8	32.2	29.0	29.9	18	17	21	27	24	13	14	16	23	28	30	26
A-200-O	(2.4)	(2.8)	(3.2)	(3.2)	(2.7)	(1.6)	(1.9)	(2.7)	(3.7)												
HEARSAFE	21.1	19.5	17.8	22.2	29.3	32.0	29.5	27.3	27.5	17	18	19	25	23	18	16	15	20	27	27	24
A-200-U	(3.1)	(2.8)	(2.8)	(1.9)	(2.3)	(2.3)	(1.9)	(1.9)	(2.9)												
HEARSAFE	10.3	15.4	17.0	20.3	31.5	33.9	30.8	30.8	31.2	16	14	18	26	22	7	13	15	18	28	28	27
A-220-U	(3.0)	(2.0)	(1.8)	(1.9)	(2.8)	(2.1)	(2.0)	(1.9)	(3.4)												
HEARSAFE	22.0	24.0	29.0	33.0	36.0	38.0	41.0	40.0	41.0	27	24	29	35	33	19	22	26	31	34	39	38
A-FM-24	(3.0)	(2.0)	(3.0)	(2.0)	(2.0)	(2.0)	(2.0)	(3.0)	(3.0)												
HEARSAFE	22.0	24.0	29.0	33.0	36.0	38.0	41.0	40.0	41.0	27	24	29	35	33	19	22	26	31	34	39	38
A-FM-26	(3.0)	(2.0)	(3.0)	(2.0)	(2.0)	(2.0)	(2.0)	(3.0)	(3.0)												
HEARSAFE	27.2	27.2	28.3	32.2	37.4	41.9	38.5	36.4	34.3	24	25	28	33	31	23	23	23	28	34	33	30
A-P-1	(3.4)	(3.4)	(4.4)	(3.4)	(2.8)	(3.4)	(4.6)	(3.4)	(3.6)												
HEARSAFE	27.2	27.2	28.3	32.2	37.4	41.9	38.5	36.4	34.3	24	25	28	33	31	23	23	23	28	34	33	30
A-PC-1	(3.4)	(3.4)	(4.4)	(3.4)	(2.8)	(3.4)	(4.6)	(3.4)	(3.6)												
HEARSAFE	12.3	14.0	23.3	28.8	27.3	30.8	34.1	35.3	34.1	19	15	22	27	25	9	12	20	26	25	31	30
HS19-B	(2.7)	(1.6)	(2.6)	(2.4)	(2.3)	(2.9)	(3.0)	(3.1)	(3.2)												
HEARSAFE	15.0	18.4	29.0	34.8	34.5	34.8	35.8	36.7	34.8	21	18	26	31	29	11	15	25	31	30	31	30
HS22-O	(3.3)	(2.5)	(3.8)	(3.5)	(3.8)	(3.8)	(4.8)	(3.6)	(4.3)												
HEARSAFE	12.7	14.9	23.5	32.0	29.7	31.1	32.6	34.0	35.2	20	16	23	29	26	10	13	21	29	27	29	31
HS22-U	(2.0)	(1.9)	(2.4)	(2.9)	(2.1)	(3.1)	(3.0)	(3.0)	(3.5)												
HEARSAFE	12.6	14.2	23.1	31.7	30.0	30.8	32.2	32.8	35.0	20	16	23	29	26	10	12	20	28	27	29	32
HS22-B	(2.0)	(2.0)	(2.5)	(3.3)	(2.1)	(2.3)	(2.9)	(3.1)	(2.4)												
HEARSAFE	12.4	19.2	26.4	35.2	37.8	37.4	37.2	36.3	34.8	23	17	26	35	29	9	16	24	33	36	34	32
HS24-U	(2.9)	(2.4)	(1.6)	(1.5)	(1.4)	(1.8)	(2.3)	(2.7)	(2.3)												
HEARSAFE	11.8	19.1	25.6	35.2	37.4	36.4	35.8	35.7	34.8	23	17	26	35	29	9	16	23	33	35	34	32
HS24-B	(2.6)	(2.3)	(2.5)	(1.8)	(1.7)	(1.5)	(1.5)	(1.8)	(1.9)												

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
American Allsafe Co. 99 Wales Ave. Tanawanda, NY 14151-5104 716-695-8300 800-231-1332 716-695-6905 (fax)																					
HEARSAFE	12.2	19.8	28.3	38.9	40.2	35.8	36.3	39.2	38.8	24	18	27	37	30	9	17	25	37	38	34	35
HS24-O	(2.7)	(2.2)	(2.8)	(1.9)	(1.8)	(1.9)	(1.9)	(2.7)	(3.1)												
American Research & Design Group 10701 W. Kellogg Wichita, KS 67209 316-722-6343																					
Comfort Ear	29.2	29.8	28.3	30.5	37.0	42.4	45.3	44.3	44.1	24	26	27	34	31	24	24	23	27	34	40	38
	(5.0)	(5.0)	(4.5)	(3.5)	(3.)	(3.5)	(4.5)	(4.5)	(6.0)												
Argus Corporation 19 Shea Way,Delaware Indus Prk Ste 307 Newark, DE 19711 302-737-3511 302-737-6369 (fax)																					
ARGUS	24.8	27.7	30.2	31.3	34.9	40.9	42.2	44.5	45.3	25	25	29	33	32	20	23	26	28	31	38	41
Foam	(4.6)	(3.8)	(3.6)	(3.1)	(3.5)	(3.3)	(4.1)	(4.4)	(3.9)												
Aural Technology, Inc. 12722 Riverside Dr. North Hollywood, CA 9160 818-760-2020																					
PROTECTEAR	28.2	27.4	32.6	33.6	36.9	35.4	36.6	36.1	36.9	27	28	31	34	34	25	24	29	31	34	33	34
II	(2.7)	(2.9)	(3.2)	(2.2)	(2.2)	(2.7)	(2.7)	(1.6)	(2.7)												

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Aural Technology, Inc. 12722 Riverside Drive North Hollywood, CA 9160 818-760-2020																					
PROTECTEAR	28.2	27.4	32.6	33.6	36.9	38.4	36.6	36.1	36.9	27	28	31	34	34	25	24	29	31	34	33	34
MtlRing	(2.7)	(2.9)	(3.2)	(2.3)	(2.2)	(2.7)	(2.8)	(1.6)	(2.8)												
PROTECTEAR	28.7	29.1	30.9	34.8	36.8	42.9	41.5	39.5	39.2	25	27	30	34	33	23	24	26	29	34	37	34
SOLID	(5.0)	(4.9)	(4.2)	(5.3)	(2.4)	(2.6)	(3.7)	(4.8)	(4.7)												
PROTECTEAR	7.4	8.3	13.3	19.9	29.9	35.6	36.1	31.4	27.4	11	8	14	24	18	3	4	11	17	26	33	23
VENTED	(3.8)	(3.9)	(2.2)	(2.6)	(3.0)	(2.6)	(2.6)	(3.0)	(3.5)												
Bilsom International, Inc. 5300 Region Court Lakeland, FL 22170 813-683-9164 800-733-1177 813-683-9582 (fax)																					
1 - Fit	32.7	31.8	32.9	27.9	33.7	42.0	44.6	46.5	45.4	23	27	26	30	31	28	27	28	24	29	39	40
5680	(3.8)	(4.0)	(4.3)	(3.8)	(4.1)	(5.3)	(5.0)	(3.3)	(4.5)												
707-Impact	13.2	19.5	28.3	32.4	31.1	33.2	35.8	36.4	35.1	23	18	26	31	29	10	17	26	30	28	33	32
0707-O	(2.5)	(2.1)	(2.3)	(2.3)	(2.3)	(2.7)	(2.5)	(3.2)	(2.3)												
ALL FIT	33.6	35.5	37.5	35.6	35.2	41.0	42.1	44.8	45.3	28	32	32	34	35	29	31	32	31	32	37	40
5830	(3.9)	(4.1)	(4.9)	(4.0)	(2.8)	(2.7)	(4.5)	(4.6)	(4.5)												
Bilsom	25.5	34.0	44.8	44.7	41.1	50.9	51.3	49.4	46.3	33	30	38	40	40	21	31	41	41	37	45	42
DownVik	(4.2)	(2.7)	(3.1)	(3.0)	(3.4)	(4.5)	(5.4)	(4.8)	(4.1)												
Bilsom	22.8	24.8	30.0	33.6	37.1	39.2	41.7	41.4	39.8	27	25	30	36	33	20	22	26	31	34	40	36
Whisper	(2.6)	(2.0)	(3.1)	(2.3)	(2.3)	(2.4)	(1.4)	(2.8)	(3.0)												
Blue	14.2	19.0	25.7	33.3	40.0	43.8	45.9	43.5	40.6	24	19	26	37	30	12	17	23	31	38	43	37
2308-BH	(2.0)	(1.8)	(2.4)	(2.1)	(1.2)	(1.1)	(2.0)	(2.2)	(2.8)												
Blue	17.1	19.9	25.6	32.8	40.3	44.7	46.7	45.1	43.9	25	21	27	37	31	15	18	23	31	38	45	41
2308-OH	(1.9)	(1.3)	(2.4)	(1.7)	(1.5)	(1.9)	(1.4)	(1.9)	(2.8)												

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB)									Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn												
	125	250	500	1000	2000	3150	4000	6300	8000	EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Bilsom International, Inc. 5300 Region Court Lackland, FL 33801 813-683-9165 800-733-1177 800-683-9164(fax)																					
Blue	13.0	17.4	23.7	32.1	38.7	41.9	43.5	41.1	38.3	23	18	25	36	29	11	16	22	29	37	42	36
2308-UC	(1.9)	(1.1)	(1.7)	(2.2)	(1.5)	(1.7)	(1.5)	(1.9)	(1.9)												
Comfort	13.8	17.7	25.5	34.4	35.4	40.5	41.2	40.6	38.0	23	18	26	34	29	11	15	23	31	32	39	35
2313-H	(2.8)	(2.0)	(2.5)	(2.5)	(3.0)	(2.5)	(2.2)	(2.7)	(2.8)												
Comfort	15.8	19.5	23.9	33.0	37.6	41.1	41.9	39.8	37.5	24	19	26	35	29	13	17	22	31	35	39	34
2315-BN	(2.1)	(2.)	(1.9)	(1.7)	(1.9)	(2.6)	(2.4)	(2.9)	(2.6)												
Comfort	16.6	20.7	24.4	36.3	37.9	41.1	42.4	39.3	36.3	25	21	27	36	31	14	18	22	34	36	40	34
2315-OH	(2.1)	(1.9)	(2.0)	(1.8)	(1.8)	(2.4)	(1.6)	(2.5)	(1.9)												
Comfort	14.2	17.5	23.6	34.0	36.8	39.8	40.0	37.4	34.7	23	18	25	35	29	12	15	21	32	35	37	33
2315-UC	(1.9)	(1.7)	(1.9)	(1.8)	(1.7)	(2.8)	(2.6)	(2.8)	(1.7)												
Compact	10.4	11.7	18.9	23.7	33.2	35.3	38.9	40.4	38.1	17	13	19	28	23	7	10	15	21	29	35	33
2470-B	(2.8)	(1.6)	(3.0)	(2.2)	(3.5)	(3.5)	(3.7)	(4.7)	(4.9)												
Down Fit	25.4	26.6	29.5	31.9	35.3	37.9	37.8	39.1	41.8	26	26	29	33	32	21	23	27	29	31	35	37
5148	(3.9)	(3.6)	(2.0)	(2.2)	(3.5)	(4.0)	(2.8)	(4.2)	(4.3)												
EARDOWN	10.3	12.6	16.2	19.7	30.9	36.2	36.9	38.0	34.0	16	13	18	26	22	7	11	14	17	29	34	32
2000	(2.4)	(1.6)	(1.9)	(1.9)	(1.9)	(1.6)	(2.4)	(2.1)	(1.4)												
Economy	11.3	14.1	22.3	32.5	35.6	36.4	36.1	35.1	34.3	21	15	23	33	26	8	12	20	30	33	34	31
2450-BH	(2.8)	(1.4)	(1.4)	(2.3)	(1.7)	(1.7)	(2.0)	(2.2)	(3.2)												
Economy	11.8	15.5	24.8	34.8	37.3	38.7	37.4	37.2	33.7	22	16	25	35	28	9	14	23	32	35	35	32
2450-OH	(2.1)	(1.4)	(1.6)	(2.2)	(1.9)	(2.3)	(1.8)	(2.3)	(1.6)												
Economy	10.8	14.2	22.7	32.6	35.5	35.6	35.7	34.9	33.6	20	15	23	33	26	8	12	20	30	33	33	30
2450-UC	(2.1)	(2.0)	(2.0)	(2.2)	(2.1)	(1.8)	(2.0)	(2.0)	(3.0)												
Economy	14.7	16.1	21.5	28.9	37.3	43.3	43.3	39.7	37.3	21	17	23	33	27	12	14	19	26	34	41	34
2454-H	(1.9)	(2.0)	(1.9)	(2.4)	(2.4)	(2.3)	(1.8)	(2.3)	(2.8)												
Hobby/Loton	11.7	15.0	23.4	30.6	33.2	35.5	34.5	30.6	29.6	20	16	23	31	26	9	13	21	28	31	32	27
2401-BH	(2.7)	(1.7)	(2.1)	(2.2)	(1.9)	(3.4)	(2.0)	(2.1)	(1.7)												

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Bilsom International, Inc. 5300 Region Court Lackland, FL 33801 813-683-9165 800-733-1177 800-683-9164(fax)																					
Hobby/Loton	15.3	18.4	25.1	34.2	33.6	36.6	37.2	32.2	31.7	23	19	26	33	29	13	16	22	33	31	35	29
2401-OH	(1.6)	(2.2)	(2.2)	(1.2)	(1.8)	(3.0)	(2.2)	(1.7)	(1.9)												
Hobby/Loton	12.4	15.5	24.7	31.5	33.9	36.3	36.0	33.8	31.7	20	16	24	31	27	9	13	22	29	31	32	29
2401-UC	(2.7)	(2.2)	(2.6)	(2.4)	(2.2)	(2.8)	(3.5)	(2.6)	(2.6)												
Nova 27	16.9	22.3	32.6	35.5	37.5	41.5	38.6	38.4	39.1	27	22	30	36	33	14	20	29	33	35	35	36
0727-O	(2.1)	(2.1)	(2.8)	(2.5)	(2.1)	(3.0)	(2.9)	(3.0)	(2.7)												
PERFLEX	30.8	29.3	31.8	30.0	34.7	36.2	38.1	40.3	40.9	22	26	27	30	30	26	24	26	25	30	32	36
5701/02	(4.8)	(4.6)	(5.5)	(4.6)	(4.7)	(5.7)	(5.8)	(3.6)	(4.4)												
Per Fit	32.0	32.0	32.0	30.0	38.0	43.0	41.3	41.4	41.1	26	29	29	34	33	30	29	28	27	35	37	37
5603/04	(2.0)	(3.0)	(4.0)	(3.0)	(2.2)	(2.0)	(4.0)	(4.3)	(4.0)												
Pocket	12.9	16.4	25.1	31.8	37.3	39.7	41.7	43.9	42.8	23	17	25	35	28	10	14	23	29	34	38	39
2428-O	(2.3)	(1.9)	(1.5)	(2.2)	(2.8)	(3.0)	(2.9)	(1.8)	(3.8)												
Propp-O-Plast	22.6	24.5	26.2	26.2	34.0	39.2	40.5	41.3	38.3	22	23	25	30	29	19	21	23	23	31	37	34
5026	(3.6)	(2.8)	(2.5)	(3.0)	(3.0)	(2.2)	(2.8)	(3.2)	(3.6)												
QUIETZONE	31.0	31.0	30.0	31.0	37.0	36.1	35.0	39.0	40.1	24	29	29	32	32	28	28	27	28	34	30	32
5640	(3.0)	(3.0)	(2.4)	(2.3)	(3.0)	(3.4)	(4.4)	(7.0)	(8.0)												
SOFT	27.3	27.7	28.7	31.7	36.9	43.8	43.1	43.1	43.5	26	26	29	35	33	24	24	25	29	34	40	40
5048	(3.3)	(3.2)	(3.1)	(2.4)	(2.8)	(2.1)	(2.3)	(3.9)	(2.7)												
Special	13.8	15.2	20.8	29.7	35.0	38.5	40.5	37.7	37.3	21	16	23	32	26	11	13	19	27	31	36	32
2453-OH	(2.5)	(1.6)	(1.6)	(2.5)	(3.4)	(2.8)	(3.9)	(3.8)	(4.7)												
Viking	14.5	20.2	26.7	35.6	36.1	38.5	39.1	40.0	38.9	23	19	27	35	30	11	17	24	33	32	36	36
2314-H	(3.5)	(2.5)	(2.6)	(2.1)	(3.3)	(2.9)	(2.8)	(2.7)	(2.7)												
Viking 29	21.0	24.2	31.4	36.3	39.4	41.1	41.6	39.1	36.5	28	25	31	37	34	19	22	28	34	36	38	34
2318-BH	(1.8)	(1.8)	(2.6)	(1.7)	(2.6)	(3.6)	(2.7)	(2.5)	(1.9)												
Viking 29	22.9	24.8	31.4	35.9	39.6	41.6	41.5	39.2	37.0	29	26	32	37	34	20	22	29	33	37	38	34
2318-OH	(2.2)	(2.0)	(1.9)	(2.2)	(2.0)	(2.3)	(3.2)	(3.2)	(3.0)												

Appendix D. Hearing Protector List by Supplier Alphabetically

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with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Bilsom International, Inc. 5300 Region Court Lackland, FL 33801 813-683-9165 800-733-1177 800-683-9164(fax)																					
Viking 29	20.9	24.5	30.6	34.9	37.5	40.2	40.8	39.1	35.5	28	25	31	36	34	17	22	28	33	35	38	33
2318-UC	(3.1)	(1.9)	(1.7)	(1.4)	(2.0)	(2.1)	(2.3)	(2.5)	(2.3)												
Warrior	12.4	15.9	25.9	30.6	35.1	38.6	41.0	39.8	40.1	22	17	24	33	28	10	14	23	28	32	37	35
2424-BH	(2.4)	(1.8)	(2.2)	(2.3)	(3.1)	(3.6)	(3.5)	(3.5)	(4.2)												
Warrior	12.6	17.1	25.9	33.0	36.9	38.2	40.4	42.7	41.7	23	17	25	35	29	10	15	23	30	34	36	37
2424-OH	(1.9)	(2.0)	(2.4)	(2.4)	(2.8)	(3.1)	(3.7)	(3.0)	(4.1)												
Warrior	11.9	15.5	25.8	31.3	35.3	37.7	40.5	40.0	39.8	22	16	25	34	28	10	14	23	29	33	37	35
2424-UC	(1.9)	(1.5)	(2.4)	(1.6)	(2.)	(3.2)	(2.9)	(3.3)	(4.2)												
Cabot Safety Corporation 5457 West 79th Street Indianapolis, IN 46268 317-692-6666 800-225-9038 317-692-6775 (fax)																					
CABOFLEX	28.7	28.3	28.0	28.6	32.2	42.1	44.3	47.2	44.6	20	23	25	30	29	21	22	22	23	28	40	38
600	(6.8)	(6.3)	(5.8)	(4.9)	(3.7)	(3.2)	(3.8)	(3.9)	(5.7)												
Cabot	14.8	17.1	27.7	35.2	34.0	36.8	39.1	44.0	43.3	22	17	25	33	28	11	14	25	31	31	35	40
1000-B	(3.2)	(3.1)	(2.3)	(3.5)	(3.0)	(3.2)	(3.3)	(3.0)	(3.1)												
Cabot	14.4	18.4	28.0	34.8	34.3	36.5	38.8	43.7	43.2	22	17	26	33	29	10	15	25	32	30	35	40
1000-U	(3.7)	(3.4)	(2.5)	(2.8)	(3.4)	(2.6)	(2.9)	(2.9)	(3.0)												
Cabot	11.7	16.2	26.5	31.6	32.5	35.0	38.1	41.8	41.8	20	15	24	32	27	8	13	23	29	29	35	38
1000-O	(3.3)	(2.7)	(2.7)	(2.6)	(3.0)	(2.8)	(2.5)	(4.7)	(3.8)												
Cabot	11.7	18.4	27.7	36.1	35.4	35.3	37.4	38.5	36.0	21	16	25	33	28	8	15	25	33	32	34	31
1720-O	(2.9)	(3.4)	(2.3)	(2.8)	(3.1)	(2.4)	(2.6)	(3.2)	(4.7)												
	Comments: over-the-head only																				

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Cabot Safety Corporation 5457 West 79th Street Indianapolis, IN 46268 317-692-6666 800-225-9038 317-692-6775 (fax)																					
Cabot 2000H	13.0	17.7	25.6	30.1	32.8	35.9	33.5	36.4	37.2	21	17	24	31	27	9	15	23	27	29	31	33
	(3.6)	(2.7)	(2.4)	(2.5)	(3.4)	(2.4)	(2.0)	(3.3)	(3.7)												
Cabot 3000-B	21.2	22.3	33.1	41.2	34.7	36.1	38.3	37.9	38.7	26	23	30	34	33	18	19	30	38	31	36	34
	(2.4)	(2.9)	(2.3)	(2.7)	(3.2)	(2.7)	(1.9)	(2.7)	(4.2)												
Cabot 3000-O	16.5	21.8	33.8	40.4	35.1	36.2	38.4	38.3	39.7	25	21	30	34	32	14	19	30	36	31	35	36
	(2.5)	(2.7)	(3.0)	(3.9)	(3.4)	(3.4)	(3.2)	(2.2)	(2.8)												
Cabot 3000-U	20.5	22.7	32.6	41.2	34.6	37.3	38.9	37.3	39.5	26	23	30	34	33	16	20	30	38	31	36	35
	(4.3)	(2.6)	(2.6)	(2.9)	(3.5)	(2.5)	(2.9)	(2.1)	(4.0)												
Cabot 820-BH	15.0	20.6	30.4	39.6	35.4	36.2	36.6	35.2	35.5	24	19	28	33	30	11	18	28	36	32	33	30
	(3.2)	(2.3)	(2.3)	(3.6)	(3.4)	(3.5)	(3.1)	(4.8)	(4.9)												
Cabot 820-OH	12.2	19.5	28.7	37.7	35.0	37.0	36.3	34.7	33.8	22	17	26	33	29	9	16	25	35	31	33	29
	(2.8)	(3.1)	(2.8)	(2.5)	(3.5)	(3.1)	(3.1)	(5.0)	(4.4)												
Cabot 820-UC	14.7	20.9	30.4	38.5	35.4	36.8	37.3	35.4	36.0	24	19	28	34	31	11	18	27	35	32	34	32
	(3.0)	(2.7)	(2.6)	(2.9)	(2.5)	(2.6)	(2.6)	(3.9)	(4.0)												
E-A-R Caps 200 3212101	22.7	21.1	19.4	21.1	31.1	37.7	38.1	40.1	39.2	17	18	19	26	24	18	17	16	18	28	35	35
	(4.4)	(4.1)	(3.3)	(2.5)	(3.1)	(2.4)	(2.5)	(3.8)	(4.2)												
E-A-R Plugs	37.4	40.9	44.8	43.8	36.3	41.9	42.6	46.1	47.3	29	36	36	34	37	31	35	41	40	31	39	44
	(5.7)	(5.0)	(3.3)	(3.6)	(4.9)	(3.0)	(3.1)	(3.5)	(2.7)												
E-A-R Taperfit2 Insert	36.4	39.1	41.7	40.7	38.1	44.5	45.9	48.4	48.1	33	37	37	38	40	32	36	38	37	35	43	44
	(3.6)	(2.9)	(3.4)	(3.5)	(2.8)	(2.0)	(2.3)	(3.2)	(3.7)												
E-A-R Tracer 3404007	33.6	33.0	34.4	31.2	33.3	37.4	37.6	41.4	45.3	21	27	27	29	30	27	27	28	25	28	30	41
	(5.9)	(6.0)	(5.6)	(5.8)	(5.0)	(5.5)	(7.4)	(7.7)	(3.6)												
E-A-R Ultrafit 3404003	33.6	33.0	34.4	31.2	33.3	37.4	37.6	41.4	45.3	21	27	27	29	30	27	27	28	25	28	30	41
	(5.9)	(6.0)	(5.6)	(5.8)	(5.0)	(5.5)	(7.4)	(7.7)	(3.6)												
E-Z-Fit Plugs	35.6	36.9	39.0	37.5	35.1	42.3	44.9	47.7	48.7	28	32	33	34	36	29	31	34	31	32	41	44
	(5.8)	(5.0)	(4.6)	(5.9)	(3.0)	(2.6)	(3.3)	(3.4)	(4.5)												

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Cabot Safety Corporation 5457 West 79th Street Indianapolis, IN 46268 317-692-6666 800-225-9038 317-692-6775 (fax)																					
HEARGUARD	26.3	25.5	25.9	26.2	29.1	34.7	33.8	39.2	42.0	15	20	21	25	25	18	18	19	20	24	27	35
V-51R	(7.9)	(7.5)	(6.6)	(6.0)	(4.3)	(6.2)	(6.0)	(6.4)	(6.1)												
	Comments: EarGage fitting device available to facilitate sizing																				
QUIET TIP	24.2	23.9	24.5	25.3	31.9	37.1	36.1	29.8	25.3	18	21	23	26	26	20	20	20	22	29	32	21
85103	(3.6)	(3.9)	(4.5)	(3.3)	(2.7)	(3.6)	(3.6)	(3.7)	(3.6)												
ULTRA	12.3	17.0	24.4	22.9	23.8	27.4	25.0	23.0	25.6	16	16	21	22	23	9	14	22	20	21	21	23
9000-O	(2.9)	(2.4)	(2.4)	(2.3)	(2.2)	(3.0)	(3.1)	(1.9)	(2.6)												
ULTRA	13.8	18.2	24.6	23.5	24.7	27.5	26.8	24.2	25.0	17	18	21	23	23	11	15	22	20	22	23	22
9000-U	(2.8)	(2.3)	(2.3)	(3.0)	(2.2)	(3.4)	(2.9)	(3.3)	(2.8)												
ULTRA	14.2	15.9	24.7	23.8	23.2	29.4	26.5	23.1	25.3	16	16	21	22	23	11	12	22	21	21	23	21
9000-B	(2.9)	(3.3)	(2.2)	(2.7)	(1.8)	(2.7)	(2.9)	(2.7)	(3.4)												
Cabot Safety Corporation,Auditory Systems Div 5407 West 79th Street Indianapolis, IN 46268 317-692-6555 800-624-5995 317-692-6770 (fax)																					
E-A-R	14.5	15.3	16.9	18.9	22.5	23.0	19.8	22.3	24.6	12	14	16	18	19	10	12	14	15	19	17	22
HI-FI	(3.8)	(2.8)	(2.5)	(3.0)	(3.4)	(3.0)	(2.8)	(2.9)	(2.6)												
	Comments: for use in moderate noise																				
Curtis Safety Products,Inc. 91 Stafford Street Worcester, MA 01603 508-754-3906																					
Curtis	31.0	31.0	30.0	31.0	37.0	36.1	35.0	39.0	40.1	24	29	29	32	32	28	28	27	28	34	30	32
SF	(3.0)	(3.0)	(2.4)	(2.3)	(3.0)	(3.4)	(4.4)	(7.0)	(8.0)												

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
David Clark Company, Inc. 360 Franklin Street Box 15054 Worcester, MA 01615-0054 508-756-6216 508-753-5827 (fax)																					
David Clark 10A-O	10.9	20.9	28.8	32.8	35.9	37.4	38.3	37.5	37.1	23	18	27	35	30	9	18	25	30	34	36	34
	(1.4)	(2.6)	(3.6)	(2.6)	(1.4)	(2.3)	(1.6)	(2.1)	(2.7)												
David Clark 27A-O	22.9	26.4	26.1	31.0	31.5	33.6	35.5	35.8	35.8	22	24	26	29	29	19	22	22	27	28	30	31
	(3.8)	(3.5)	(3.7)	(3.7)	(3.3)	(4.2)	(4.7)	(4.9)	(4.3)												
David Clark 310-O	13.8	20.0	25.9	34.0	38.9	41.1	40.6	38.1	35.0	24	19	27	36	30	11	18	23	32	37	39	33
	(2.7)	(1.7)	(2.1)	(1.3)	(1.6)	(1.9)	(1.0)	(1.5)	(1.2)												
David Clark 310-B	8.0	14.7	24.0	30.9	36.3	39.5	39.8	38.7	35.5	20	13	22	34	26	5	12	21	29	34	38	34
	(2.1)	(2.3)	(2.8)	(1.7)	(1.6)	(2.0)	(1.7)	(1.7)	(1.4)												
David Clark 310-U	8.6	15.5	23.9	32.4	36.9	38.7	38.9	37.8	34.8	20	14	23	34	26	6	13	21	30	35	37	33
	(2.3)	(2.2)	(2.1)	(1.6)	(1.9)	(1.8)	(1.5)	(2.3)	(1.5)												
David Clark 805V-B	15.5	21.1	29.7	41.1	38.6	40.0	37.8	37.8	36.9	23	19	28	35	30	10	18	25	36	35	34	33
	(4.6)	(3.1)	(4.2)	(4.3)	(3.2)	(3.4)	(3.8)	(3.1)	(3.5)												
	Comments: behind-the-head only																				
EMTECH Laboratories, Inc. PO Box 12900 Roanoke, VA 24022 703-890-5411 800-336-5719 703-890-5441 (fax)																					
HEARSAVER SOLID	27.7	30.2	32.9	33.2	34.8	40.6	40.0	40.8	40.0	29	30	32	34	35	25	28	31	31	32	37	36
	(1.8)	(2.0)	(1.7)	(2.0)	(2.0)	(2.0)	(2.4)	(3.2)	(3.3)												
ERB #1 Safety Way PO Box 1237 Woodstock, GA 30188-1237 404-926-7944 800-800-6522																					
Ear Muff 211-U	12.0	14.0	22.0	33.0	34.0	33.0	32.0	35.0	34.0	16	14	21	29	24	8	11	17	26	29	28	32
	(3.9)	(2.7)	(4.9)	(6.2)	(4.4)	(3.4)	(3.3)	(2.4)	(2.0)												

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn (ISO 4896-2.2) EPA NRR	HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
ERB #1 Safety Way PO Box 1237 Woodstock, GA 30188-1237 404-926-7944 800-800-6522																					
Ear Muff 211-O	19.0 (3.0)	19.0 (2.0)	29.0 (2.1)	40.0 (2.8)	38.0 (2.9)	36.0 (2.6)	34.0 (2.3)	37.0 (3.3)	38.0 (3.7)	25	21	28	34	31	16	17	26	37	35	31	34
Ear Muff 211-B	12.0 (3.5)	14.0 (2.6)	21.0 (4.7)	34.0 (6.2)	34.0 (4.6)	35.0 (2.6)	34.0 (2.2)	37.0 (2.7)	37.0 (2.2)	16	14	21	30	24	8	11	16	27	29	31	34
Earmark, Inc. 1125 Dixwell Ave. Hamden, CT 06514 203-777-2130 203-777-2886 (fax)																					
Earmark Series4	16.9 (3.2)	28.8 (3.5)	29.0 (1.9)	32.2 (2.6)	28.1 (2.1)	30.7 (3.1)	34.3 (2.2)	34.4 (3.4)	34.5 (3.8)	23	23	28	28	29	13	25	27	29	26	32	30
Earmark Voxset	17.5 (2.1)	23.0 (1.6)	27.2 (1.9)	32.7 (1.3)	34.6 (1.4)	36.1 (1.2)	38.4 (1.3)	36.3 (1.0)	35.5 (1.7)	26	23	29	34	32	15	21	25	31	33	37	33
Earmold & Research Lab, Inc. PO Box 12368 Wichita, KS 67277 617-682-9587 800-321-3898																					
Comfort Ear Plug	29.2 (5.0)	29.8 (5.0)	28.3 (4.5)	30.5 (3.5)	37.0 (3.0)	42.4 (3.5)	45.3 (4.5)	44.3 (4.5)	44.1 (6.0)	24	26	27	34	31	24	24	23	27	34	40	38
Earmold Design, Inc. 3424 East Lake Street Minneapolis, MN 55406 612-721-5711 800-334-6466																					
Sentinel Noise Plug	28.5 (3.2)	30.5 (2.5)	32.9 (2.6)	35.6 (2.6)	36.8 (1.9)	44.8 (4.6)	44.7 (5.0)	43.0 (3.8)	40.3 (3.7)	29	30	33	36	36	25	28	30	33	34	39	36

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Eastern Safety Equipment Company, Inc. 59-20 56th Avenue Maspeth, NY 11378 718-894-7900 718-326-4048 (fax)																					
Band-TypeHearng	10.3	15.4	17.0	20.3	31.5	33.9	30.8	30.8	31.2	17	14	18	26	22	8	13	15	18	28	28	27
509-U	(2.0)	(2.0)	(1.8)	(1.9)	(2.8)	(2.1)	(2.0)	(1.9)	(3.4)												
Deluxe	12.2	19.8	28.3	38.9	40.2	35.8	36.3	39.2	38.8	24	18	27	37	30	9	17	25	37	38	34	35
510-O	(2.7)	(2.2)	(2.8)	(1.9)	(1.8)	(1.9)	(1.9)	(2.7)	(3.1)												
EarPlugs	27.2	27.2	28.3	32.2	37.4	41.9	38.5	36.4	34.3	24	25	28	33	31	23	23	23	28	34	33	30
512	(3.4)	(3.4)	(4.4)	(3.4)	(2.8)	(3.4)	(4.6)	(3.4)	(3.6)												
Earplug	27.2	27.2	28.3	32.2	37.4	41.9	38.5	36.4	34.3	24	25	28	33	31	23	23	23	28	34	33	30
339	(3.4)	(3.4)	(4.4)	(3.4)	(2.8)	(3.4)	(4.6)	(3.4)	(3.6)												
Earplug	27.2	27.2	28.3	32.2	37.4	41.9	38.5	36.4	34.3	24	25	28	33	31	23	23	23	28	34	33	30
513	(3.4)	(3.4)	(4.4)	(3.4)	(2.8)	(3.4)	(4.6)	(3.4)	(3.6)												
Earplug	35.8	37.9	40.8	39.3	36.9	44.7	44.1	44.1	41.1	31	36	36	36	38	31	34	38	36	34	40	36
986	(3.9)	(3.0)	(2.3)	(2.7)	(2.8)	(3.2)	(4.1)	(4.2)	(4.8)												
Earplug	35.8	37.9	40.8	39.3	36.9	44.7	44.1	44.1	41.1	31	36	36	36	38	31	34	38	36	34	40	36
987	(3.9)	(3.0)	(2.3)	(2.7)	(2.8)	(3.2)	(4.1)	(4.2)	(4.8)												
Economy	9.2	15.7	29.1	35.6	31.2	26.0	27.3	32.0	34.0	19	15	24	28	26	7	13	25	33	28	24	30
510-2-O	(1.9)	(2.4)	(4.0)	(2.4)	(2.5)	(2.2)	(3.0)	(3.9)	(3.3)												
Protector	10.4	17.9	25.3	34.0	35.8	35.5	36.3	36.6	35.3	21	15	24	33	27	7	15	22	31	33	33	32
511-H	(2.9)	(2.7)	(2.8)	(2.5)	(2.4)	(2.5)	(3.1)	(3.2)	(3.2)												
Elvex Corporation 7 Trowbridge Drive PO Box 850 Bethel, CT 06801-0850 203-743-2488 203-791-2278 (fax)																					
BRUSHGUARD	16.2	15.7	24.7	37.1	37.6	40.5	39.1	38.9	37.5	22	17	25	35	28	13	13	22	34	34	37	33
HB7000	(2.9)	(2.0)	(2.6)	(3.1)	(3.1)	(2.5)	(2.1)	(3.4)	(3.6)												
	Comments: nylon brush guard																				

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Elvex Corporation 7 Trowbridge Drive PO Box 850 Bethel, CT 06801-0850 203-743-2488 203-791-2278 (fax)																					
Cap Mount	16.2	19.9	25.2	34.1	36.0	39.2	39.0	40.3	38.1	24	20	27	35	30	13	18	23	32	33	37	34
HM-20	(2.5)	(1.8)	(2.0)	(1.7)	(2.2)	(3.1)	(2.0)	(4.0)	(4.1)												
Cap Mount	19.2	20.9	31.6	36.8	38.1	40.0	42.8	43.1	40.6	28	23	30	37	33	17	19	29	35	35	39	37
HM-60	(1.5)	(1.6)	(2.4)	(1.6)	(2.3)	(2.2)	(2.9)	(4.0)	(3.3)												
ELVEX	14.2	18.6	27.8	33.6	31.4	35.8	39.3	40.4	39.9	22	18	26	31	28	10	15	24	31	28	36	37
COM-50	(3.4)	(2.9)	(3.4)	(2.5)	(3.0)	(3.2)	(2.7)	(2.6)	(2.7)												
ELVEX	11.0	13.7	24.2	28.3	29.1	35.4	36.8	40.8	40.8	19	14	22	29	25	8	11	21	25	26	33	36
COM-60	(2.5)	(2.3)	(2.6)	(3.1)	(2.5)	(2.7)	(3.3)	(4.2)	(4.3)												
ELVEX	17.2	19.5	27.3	36.8	37.1	36.7	35.8	38.2	37.8	25	21	28	35	31	15	17	24	34	34	33	34
HB-49-O	(1.5)	(1.9)	(2.9)	(2.1)	(2.7)	(2.5)	(2.2)	(3.0)	(3.1)												
	Comments: lightweight, 5.8 oz.																				
ELVEX BLUE	38.5	41.2	43.2	39.6	35.6	41.1	42.2	45.3	46.7	29	36	35	34	37	33	35	38	35	31	39	43
EP-201	(5.4)	(5.3)	(4.3)	(3.8)	(4.0)	(2.2)	(3.0)	(3.0)	(3.3)												
EQUALIZER	17.7	18.1	27.0	37.2	38.7	40.4	41.7	42.7	42.6	25	20	27	37	31	15	16	24	34	35	39	39
HB2000	(2.2)	(1.8)	(2.3)	(2.4)	(3.4)	(1.9)	(1.8)	(2.5)	(3.1)												
ROYAL LIQUID	19.2	23.6	29.5	33.7	40.7	41.1	39.8	38.5	37.6	27	23	30	37	33	17	21	27	31	38	38	35
HB-51-O	(2.2)	(2.5)	(2.1)	(1.8)	(2.1)	(1.8)	(1.1)	(2.2)	(2.1)												
Royal Pro-Muff	13.2	21.2	29.7	36.1	37.3	37.1	36.4	36.7	36.2	25	19	28	35	31	11	19	26	33	35	33	33
HB-50-O	(2.0)	(2.1)	(2.9)	(3.0)	(2.3)	(3.3)	(2.5)	(3.5)	(3.1)												
ULTRALITE	16.4	17.5	25.6	32.5	37.6	39.0	35.6	34.7	35.3	23	19	26	34	29	14	15	23	30	35	33	32
HB-45-O	(1.6)	(1.7)	(2.4)	(2.3)	(2.1)	(2.4)	(2.3)	(2.1)	(2.8)												
Environmental & Acoustical Research, Inc. PO Box 2146 Boulder, CO 80306 303-447-2619 303-938-9625 (fax)																					
Insta-Mold	34.1	33.9	35.4	32.8	36.4	44.6	45.1	46.4	46.9	27	30	31	34	35	28	28	30	30	32	41	42
Plug	(5.9)	(5.4)	(4.7)	(2.8)	(3.9)	(3.5)	(3.7)	(4.1)	(4.7)												

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Etymotic Research 61 Martin Lane ElkGroveVillage, IL 6000 708-228-0006 708-228-6836 (fax)																					
Musicians Plug	14.8	14.5	14.4	13.8	13.4	14.3	13.8	13.9	19.1	7	12	11	11	13	11	11	12	11	10	11	15
ER-15	(3.7)	(2.6)	(2.3)	(2.3)	(3.2)	(2.2)	(2.1)	(2.7)	(3.9)												
Musicians Plug	20.5	22.4	24.9	25.0	25.6	25.5	22.3	23.1	35.1	16	20	22	22	23	15	18	21	22	21	19	31
ER-25	(5.4)	(4.4)	(3.3)	(2.7)	(3.9)	(1.9)	(2.4)	(4.3)	(4.1)												
Fibre Metal Products Company PO Box 248 Concordville, PA 19331 215-459-5300																					
Earmuff	16.0	18.0	26.0	33.0	38.0	39.0	36.0	35.0	35.0	24	19	26	34	29	14	16	23	30	35	33	32
2011-O	(1.6)	(1.7)	(2.4)	(2.3)	(2.1)	(2.4)	(2.3)	(2.1)	(2.8)												
Earmuff	16.0	20.0	25.0	34.0	36.0	39.0	39.0	40.0	38.0	24	20	27	35	30	13	18	23	32	33	37	33
2021-H	(2.5)	(1.8)	(2.0)	(1.7)	(2.2)	(3.1)	(2.0)	(4.0)	(4.2)												
Earmuff	16.0	20.0	25.0	34.0	35.0	39.0	39.0	40.0	39.0	24	20	27	34	30	13	18	23	32	32	37	34
2029-H	(2.5)	(1.8)	(2.0)	(1.7)	(2.2)	(3.5)	(2.0)	(4.0)	(4.1)												
Earmuff	12.3	14.0	28.3	25.6	27.3	30.8	34.1	35.3	34.1	19	15	22	27	25	9	12	25	23	25	31	30
2030-B	(2.7)	(1.8)	(2.6)	(2.4)	(2.3)	(2.9)	(3.0)	(3.1)	(3.2)												
	Comments: backband hearing protection																				
PuraFit	32.3	34.5	38.1	38.3	38.4	42.8	44.5	45.2	45.6	31	32	35	37	38	27	30	34	35	35	40	40
6800	(5.0)	(4.3)	(3.5)	(3.1)	(2.7)	(3.8)	(4.3)	(4.5)	(4.8)												
PuraFit	32.3	34.5	38.1	38.3	38.4	42.8	44.5	45.2	45.6	31	32	35	37	38	27	30	34	35	35	40	40
6900	(5.0)	(4.3)	(3.5)	(2.6)	(2.7)	(3.8)	(4.3)	(4.5)	(4.8)												
Flents Products Co., Inc. PO Box 2109 Norwalk, CT 06852-2109 203-866-2581 203-854-9322 (fax)																					
BEL II	9.0	11.8	21.4	29.5	32.8	36.0	34.8	31.8	31.5	17	12	20	30	23	6	9	18	26	30	31	27
2003-B	(2.7)	(2.2)	(3.0)	(2.8)	(2.5)	(2.1)	(3.5)	(3.9)	(3.9)												

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Flents Products Co., Inc.																					
PO Box 2109																					
Norwalk, CT 06852-2109																					
203-866-2581 203-854-9322 (fax)																					
BEL II	9.5	12.4	21.8	29.4	32.9	36.9	36.5	34.4	33.4	18	13	21	30	24	7	10	19	26	30	33	29
2003-U	(2.5)	(1.9)	(2.3)	(2.7)	(2.8)	(2.1)	(3.4)	(3.7)	(3.8)												
BEL II	11.1	15.2	23.4	28.2	30.5	34.4	34.0	33.0	33.3	19	15	23	29	26	8	13	21	25	27	30	29
2003-O	(2.4)	(2.0)	(2.3)	(2.5)	(2.6)	(2.6)	(3.1)	(2.8)	(3.5)												
Deluxe	12.4	19.2	26.4	35.2	37.8	37.4	37.2	36.3	34.8	23	17	26	35	29	9	16	24	33	36	34	32
747-U	(2.9)	(2.4)	(1.6)	(1.5)	(1.4)	(1.8)	(2.3)	(2.7)	(2.3)												
Deluxe	12.2	19.8	28.3	38.9	40.2	35.8	36.3	39.2	38.8	24	18	27	37	30	9	17	25	37	38	34	35
747-O	(2.7)	(2.2)	(2.8)	(1.9)	(1.8)	(1.9)	(1.9)	(2.7)	(3.1)												
Deluxe	11.8	19.1	25.6	35.2	37.4	36.4	35.8	35.7	34.8	23	17	26	35	29	9	16	23	33	35	34	32
747-B	(2.6)	(2.3)	(2.5)	(1.8)	(1.7)	(1.5)	(1.5)	(1.8)	(1.9)												
Dielectric	10.1	17.7	27.8	36.4	35.3	31.4	30.9	32.4	32.0	21	16	25	31	27	8	15	24	34	33	28	27
767-U	(1.5)	(2.6)	(3.1)	(2.1)	(2.3)	(2.8)	(2.2)	(3.1)	(4.7)												
Dielectric	10.1	19.6	29.7	36.4	37.6	34.0	33.4	34.8	35.9	23	17	27	33	29	8	17	26	33	35	30	32
767-O	(1.7)	(2.1)	(3.0)	(3.2)	(2.4)	(3.5)	(2.8)	(2.2)	(3.8)												
Dielectric	9.8	18.1	28.5	35.6	36.5	31.7	31.6	34.3	34.4	21	16	25	32	27	8	15	24	32	33	29	30
767-B	(1.7)	(3.1)	(4.4)	(3.4)	(2.6)	(2.5)	(2.2)	(2.1)	(4.2)												
ERGO II	15.5	22.2	33.1	37.4	36.2	38.6	34.7	35.0	35.0	24	20	29	33	31	12	19	30	33	33	32	31
2001-O	(2.8)	(2.9)	(3.1)	(3.7)	(2.7)	(2.7)	(2.7)	(2.3)	(3.1)												
Ear Stopples	25.0	27.0	27.0	32.0	38.0	47.0	45.0	41.0	37.0	25	25	28	34	32	22	24	23	28	34	39	32
020,030	(2.6)	(2.9)	(3.1)	(3.1)	(3.2)	(2.9)	(5.3)	(4.9)	(4.8)												
Flexiplug	22.0	25.0	27.0	31.0	37.0	39.0	36.0	34.0	33.0	25	24	28	32	31	19	22	24	29	33	33	30
072,073	(2.2)	(2.8)	(2.6)	(1.8)	(3.3)	(2.6)	(2.7)	(2.6)	(2.9)												
Low Profile	12.3	14.0	23.3	28.8	27.3	30.8	34.1	35.3	34.1	19	15	22	27	25	9	12	20	26	25	31	30
757-B	(2.7)	(1.6)	(2.6)	(2.4)	(2.3)	(2.9)	(3.0)	(3.1)	(3.2)												
Peace & Quiet	27.2	27.2	28.3	32.2	37.4	41.9	38.5	36.4	34.3	24	25	28	33	31	23	23	23	28	34	33	30
001,002	(3.4)	(3.4)	(4.4)	(3.4)	(2.8)	(3.4)	(4.6)	(3.4)	(3.6)												

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB)									Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn												
	125	250	500	1000	2000	3150	4000	6300	8000	EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Flents Products Co., Inc. PO Box 2109 Norwalk, CT 06852-2109 203-866-2581 203-854-9322 (fax)																						
Peace & Quiet	10.3	15.4	17.0	20.3	31.5	33.9	30.8	30.8	31.2	17	14	18	26	22	8	13	15	18	28	28	27
055-U	(2.0)	(2.0)	(1.8)	(1.9)	(2.8)	(2.1)	(2.0)	(1.9)	(3.4)												
Quiet Down	10.0	13.0	16.0	20.0	31.0	36.0	37.0	38.0	34.0	16	13	18	26	22	7	11	14	18	29	34	32
060	(2.4)	(1.6)	(1.9)	(1.9)	(1.9)	(1.6)	(2.4)	(2.1)	(1.4)												
Quiet! please	24.8	27.7	30.2	31.3	34.9	40.9	42.2	44.5	45.3	25	25	29	33	32	20	23	26	28	31	38	41
167-70	(4.6)	(3.8)	(3.6)	(3.1)	(3.5)	(3.3)	(4.1)	(4.4)	(3.9)												
Sila-Band	20.0	19.0	18.0	23.0	29.0	33.0	31.0	29.0	27.0	17	18	20	25	23	17	16	15	21	26	27	23
051-B	(2.7)	(2.1)	(2.6)	(2.0)	(2.9)	(2.5)	(3.2)	(2.5)	(3.5)												
Sila-Band	21.0	19.0	18.0	23.0	29.0	32.0	29.0	27.0	27.0	17	18	20	25	23	17	16	15	21	26	27	24
051-B	(3.1)	(2.8)	(2.8)	(1.9)	(2.3)	(2.3)	(1.9)	(1.9)	(2.9)												
Sila-Band	16.0	17.0	20.0	26.0	31.0	34.0	32.0	29.0	30.0	18	17	21	27	24	13	14	16	22	28	30	26
051-B	(2.4)	(2.8)	(3.2)	(3.2)	(2.7)	(1.6)	(1.9)	(2.7)	(3.7)												
Silaplug	23.0	25.0	30.0	34.0	37.0	39.0	42.0	41.0	40.0	27	25	30	36	33	20	23	26	31	34	40	37
040,041	(2.6)	(2.0)	(3.1)	(2.3)	(2.3)	(2.4)	(1.4)	(2.8)	(3.0)												
Silenta Lite	15.4	17.3	23.5	33.6	33.9	38.2	38.3	36.6	36.6	22	17	25	33	28	11	14	21	31	32	36	34
B083-O	(3.6)	(2.5)	(2.3)	(2.5)	(1.6)	(2.8)	(2.2)	(1.8)	(1.9)												
Silenta Lite	15.4	17.1	22.7	31.7	32.2	38.3	38.5	34.9	33.7	21	18	24	31	27	12	14	20	29	29	35	29
B083-B	(3.0)	(2.3)	(2.0)	(2.3)	(2.8)	(2.5)	(2.9)	(3.5)	(3.9)												
Silenta Lite	15.7	17.2	21.9	31.3	31.7	38.6	37.0	32.2	31.1	20	17	24	30	26	11	15	19	28	28	33	27
B083-U	(4.3)	(2.1)	(2.2)	(2.5)	(3.3)	(4.0)	(3.2)	(2.7)	(4.1)												
Silenta MIL	12.7	14.2	19.7	28.9	30.8	37.8	38.3	34.7	31.6	20	16	22	30	25	10	12	18	26	28	36	27
007-O	(1.8)	(1.3)	(1.6)	(2.1)	(2.0)	(2.4)	(1.7)	(3.5)	(4.4)												
Silenta Super	18.0	22.0	29.0	36.0	40.0	38.0	39.0	41.0	41.0	24	21	28	36	31	14	18	25	32	37	35	37
2014-U	(3.8)	(3.4)	(3.7)	(3.3)	(2.4)	(2.8)	(3.4)	(2.8)	(3.7)												
Silenta Super	20.0	23.0	29.0	39.0	39.0	38.0	39.0	43.0	43.0	27	23	30	37	33	16	20	26	36	36	36	40
2014-O	(3.1)	(2.7)	(2.6)	(2.1)	(2.5)	(3.4)	(2.6)	(2.5)	(2.8)												

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Flents Products Co., Inc.																					
PO Box 2109																					
Norwalk, CT 06852-2109																					
203-866-2581 203-854-9322 (fax)																					
Silenta Super	21.0	22.0	29.0	40.0	39.0	38.0	39.0	42.0	40.0	23	21	28	36	31	15	17	25	36	35	35	35
2014-B	(5.7)	(4.1)	(3.6)	(3.7)	(3.1)	(3.2)	(3.5)	(3.1)	(4.6)												
Silenta Unicap	15.0	17.0	22.0	32.0	34.0	41.0	42.0	38.0	35.0	22	18	24	33	27	12	15	20	29	32	38	32
087-H	(3.0)	(2.0)	(1.8)	(3.0)	(2.0)	(2.6)	(3.1)	(3.5)	(2.3)												
SilentaUniversa	14.0	19.0	24.0	35.0	36.0	42.0	43.0	37.0	34.0	24	19	26	34	29	12	17	22	32	33	40	31
B080-B	(1.4)	(1.7)	(1.4)	(2.5)	(2.3)	(2.2)	(2.3)	(3.0)	(2.4)												
SilentaUniversa	14.0	19.0	24.0	35.0	36.0	42.0	42.0	37.0	35.0	24	19	26	34	29	11	17	22	33	33	38	32
B080-U	(2.3)	(1.6)	(1.7)	(2.0)	(2.5)	(2.1)	(3.7)	(3.5)	(2.5)												
SilentaUniversa	15.0	20.0	26.0	38.0	37.0	41.0	42.0	39.0	36.0	26	20	28	36	31	13	18	24	36	35	39	33
B080-O	(1.3)	(1.4)	(1.4)	(2.0)	(1.8)	(2.0)	(2.8)	(2.2)	(2.5)												
V-51R	20.0	23.0	25.0	29.0	35.0	38.0	39.0	38.0	39.0	24	23	26	33	30	17	20	22	27	33	36	36
075,076	(2.2)	(2.2)	(2.3)	(1.8)	(2.0)	(2.5)	(2.3)	(3.3)	(2.8)												
Gentex Electro Acoustics																					
5 Tinkham Avenue																					
Derry, NH 03038																					
603-434-0311 800-258-3554 603-434-3002 (fax)																					
Gentex	21.0	26.0	34.0	35.0	37.0	40.0	42.0	41.0	40.0	28	25	31	37	34	18	23	30	32	35	40	37
1020A-O	(2.4)	(2.6)	(3.6)	(2.6)	(1.4)	(2.3)	(1.6)	(2.1)	(2.7)												
Gentex	22.9	26.4	26.1	31.0	31.5	33.6	35.5	35.8	35.8	22	24	26	29	29	19	22	22	27	28	30	31
1030A-O	(3.8)	(3.5)	(3.7)	(3.7)	(3.3)	(4.2)	(4.7)	(4.9)	(4.3)												
Great Lakes Earmold Lab.																					
5897 State Rd. PO Box 348006																					
Cleveland, OH 44134																					
216-842-8131																					
Comfort Ear	29.2	29.8	28.3	30.5	37.0	42.4	45.3	44.3	44.1	24	26	27	34	31	24	24	23	27	34	40	38
Plug	(5.0)	(5.0)	(4.5)	(3.5)	(3.0)	(3.5)	(4.5)	(4.5)	(6.0)												

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Hear Saver, Inc. 1555 Third Avenue PO Box 213 LPO Niagara Falls, NY 14304- 416-945-2242 416-945-3386 (fax)																					
Reversible	17.7	22.5	24.8	25.7	32.0	36.8	36.1	35.1	34.2	19	20	23	28	27	15	19	20	22	28	31	30
Plug	(2.7)	(3.5)	(4.2)	(3.3)	(3.6)	(4.6)	(5.1)	(4.4)	(4.0)												
Stopples	23.0	24.5	25.6	30.1	35.6	40.8	40.0	39.0	40.0	24	23	27	33	31	19	21	22	28	33	37	36
Plug	(3.2)	(3.0)	(3.0)	(1.8)	(2.4)	(1.7)	(2.6)	(3.3)	(4.0)												
Hearing Conservation Products, Inc. 107 West Broadway Clarksville, TX 75426 903-427-5621 903-427-5376 (fax)																					
Oto-Pro	32.2	33.3	34.6	36.3	39.2	44.2	44.9	44.9	42.7	31	32	34	38	37	28	30	32	33	36	41	38
Plug	(3.3)	(2.4)	(2.4)	(2.4)	(2.5)	(3.5)	(3.0)	(2.7)	(4.4)												
Hocks Laboratories PO Box 14400 Portland, OR 97214 503-234-4366																					
NoiseBrakers VENTED	9.7	13.1	22.9	30.0	34.2	43.4	41.1	32.8	32.7	20	14	22	32	25	7	11	20	27	32	38	30
	(1.8)	(1.7)	(2.7)	(2.1)	(1.8)	(2.1)	(2.4)	(3.1)	(2.5)												
Sound Seal SOLID	29.3	31.4	36.0	38.1	38.2	44.2	44.6	39.4	37.5	31	31	35	37	37	26	28	33	36	35	42	34
	(2.8)	(3.0)	(2.4)	(2.1)	(2.3)	(2.9)	(2.1)	(3.3)	(3.0)												
Howard Leight Industries 4061 Glencoe Avenue Marina Del Rey, CA 90292 310-396-3838 800-327-1110 310-301-0390 (fax)																					
Howard Leight AS1/30	22.9	24.8	28.9	31.8	35.4	40.5	43.1	40.1	38.1	27	26	29	34	33	21	23	26	29	32	40	35
	(1.6)	(1.7)	(2.0)	(2.0)	(2.7)	(2.1)	(2.9)	(3.1)	(3.0)												

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB)									Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn												
										EPA	(ISO 4896-2.2)				Perceived Noise Reduction							
	125	250	500	1000	2000	3150	4000	6300	8000	NRR	HML_L	HML_M	HML_H	SNR	125	250	500	1000	2000	4000	8000
Howard Leight Industries 4061 Glencoe Avenue Marina Del Rey, CA 90292 310-396-3838 800-327-1110 310-301-0390 (fax)																						
Howard Leight	33.5	33.5	36.0	37.5	39.4	42.5	43.9	43.7	45.2	30	32	34	37	37	29	30	32	34	35	38	40
LPF1/30	(3.6)	(3.4)	(3.2)	(3.5)	(3.5)	(3.4)	(5.1)	(4.3)	(5.1)												
Howard Leight	33.1	36.3	36.8	38.4	38.7	44.1	45.9	45.4	46.0	34	35	37	39	39	30	34	34	36	36	43	43
MAX1/30	(2.7)	(1.8)	(2.1)	(1.7)	(2.1)	(2.3)	(2.2)	(2.2)	(2.4)												
Howard Leight	22.3	22.7	24.8	30.9	39.4	42.9	44.8	44.9	45.7	25	23	27	35	31	19	19	22	28	36	41	40
QB2-U	(3.0)	(2.9)	(2.1)	(2.2)	(2.8)	(3.4)	(3.4)	(4.6)	(4.8)												
Howard Leight	30.8	31.8	31.7	32.7	34.3	39.8	42.8	46.3	45.1	26	29	30	32	33	27	27	29	29	30	38	39
QD1/30	(3.6)	(4.3)	(2.7)	(3.1)	(4.3)	(4.9)	(4.0)	(5.1)	(5.6)												
Howard Leight	16.0	18.0	26.0	33.0	38.0	39.0	36.0	35.0	35.0	24	19	26	34	29	14	16	23	30	35	33	32
QM23-O	(1.6)	(1.7)	(2.4)	(2.3)	(2.1)	(2.4)	(2.3)	(2.1)	(2.8)												
Howard Leight	18.0	21.0	27.0	34.0	38.0	38.0	37.0	38.0	37.0	24	21	27	34	30	15	18	24	31	35	33	34
QM24-O	(2.9)	(2.8)	(3.0)	(2.3)	(2.5)	(2.3)	(3.4)	(3.5)	(2.9)												
Howard Leight	17.0	20.0	27.0	37.0	37.0	37.0	36.0	38.0	38.0	25	21	28	35	31	15	18	24	34	34	33	34
QM25-O	(1.5)	(1.9)	(2.9)	(2.1)	(2.7)	(2.5)	(2.2)	(3.0)	(3.1)												
Howard Leight	19.0	24.0	30.0	34.0	41.0	41.0	40.0	39.0	38.0	27	24	30	37	33	16	21	27	32	38	38	35
QM27-O	(2.2)	(2.5)	(2.1)	(1.8)	(2.1)	(1.8)	(1.1)	(2.2)	(2.1)												
Howard Leight	19.0	21.0	32.0	37.0	38.0	40.0	43.0	43.0	41.0	28	23	30	37	33	17	19	29	35	35	40	37
QM27H	(1.5)	(1.6)	(2.4)	(1.6)	(2.3)	(2.2)	(2.9)	(4.0)	(3.3)												
Quiet Talk	26.0	26.0	36.0	33.0	37.0	41.0	44.0	37.0	34.0	29	28	32	35	34	23	23	33	31	35	41	31
QT1000	(2.3)	(2.1)	(2.1)	(1.9)	(1.7)	(2.7)	(3.0)	(2.6)	(2.1)												
Quiet Talk	19.0	21.0	32.0	37.0	38.0	40.0	43.0	43.0	41.0	28	23	30	37	33	17	19	29	35	35	40	37
QT1000H	(1.5)	(1.6)	(2.4)	(1.6)	(2.3)	(2.2)	(2.9)	(4.0)	(3.3)												
Quiet Talk	26.0	26.0	36.0	33.0	37.0	41.0	44.0	37.0	34.0	29	28	32	35	34	23	23	33	31	35	41	31
QT800	(2.3)	(2.1)	(2.1)	(1.9)	(1.7)	(2.7)	(3.0)	(2.6)	(2.1)												
Quiet Talk	19.0	21.0	32.0	37.0	38.0	40.0	43.0	43.0	41.0	28	23	30	37	33	17	19	29	35	35	40	37
QT800H	(1.5)	(1.6)	(2.4)	(1.6)	(2.3)	(2.2)	(2.9)	(4.0)	(3.3)												

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn (ISO 4896-2.2) EPA NRR	HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Insta-Mold Products, Inc.																					
640 Hollow Road PO Box 439																					
Oaks, PA 19456																					
215-935-7270 800-523-4081 215-935-7271 (fax)																					
InstaMold	34.1	33.9	35.4	32.8	36.4	44.6	45.1	46.4	46.9	27	30	31	34	35	28	28	30	30	32	41	42
II	(5.9)	(5.4)	(4.7)	(2.8)	(3.9)	(3.5)	(3.7)	(4.1)	(4.7)												
Jackson Products																					
5801 Safety Dr,NE																					
Belmont, MI 49306																					
616-784-6200																					
Cap-Mounted	12.3	18.3	30.6	36.6	36.1	34.0	41.2	37.7	35.3	20	16	25	33	28	9	14	26	32	31	37	29
SA301MB	(2.8)	(4.0)	(4.5)	(4.6)	(4.3)	(4.5)	(3.6)	(5.9)	(5.6)												
Low Profile	12.3	14.0	23.3	28.8	27.3	30.8	34.1	35.3	34.1	19	15	22	27	25	9	12	20	26	25	31	30
SA-50W	(2.7)	(1.6)	(2.6)	(2.4)	(2.3)	(2.9)	(3.0)	(3.1)	(3.2)												
Noise-Ban	10.3	15.4	17.0	20.3	31.5	33.9	30.8	30.8	31.2	17	14	18	26	22	8	13	15	18	28	28	27
SA-10-U	(2.0)	(2.0)	(1.8)	(1.9)	(2.8)	(2.1)	(2.0)	(1.9)	(3.4)												
Noise-Muff	9.8	18.1	28.5	35.6	36.5	31.7	31.6	34.3	34.4	21	16	25	32	27	8	15	24	32	33	29	30
SA-301B	(1.7)	(3.1)	(4.4)	(3.4)	(2.6)	(2.5)	(2.2)	(2.1)	(4.2)												
Noise-Muff	10.1	19.6	29.7	36.4	37.6	34.0	33.4	34.8	35.9	23	17	27	33	29	8	17	26	33	35	30	32
SA-301O	(1.7)	(2.1)	(3.0)	(3.2)	(2.4)	(3.5)	(2.8)	(2.2)	(3.8)												
Noise-Muff	10.1	17.7	27.8	36.4	35.3	31.4	30.9	32.4	32.0	21	16	25	31	27	8	15	24	34	33	28	27
SA-301U	(1.5)	(2.6)	(3.1)	(2.1)	(2.3)	(2.8)	(2.2)	(3.1)	(4.7)												
McKeon Products, Inc.																					
PO BOX 69009																					
Pleasent Ridge, MI 48069																					
313-548-7560 313-548-7592 (fax)																					
Mack's Earplugs	23.7	23.3	25.0	27.3	34.3	39.2	38.9	38.2	37.4	22	22	25	30	29	19	19	22	24	30	34	32
	(4.0)	(3.6)	(2.8)	(2.7)	(4.0)	(4.3)	(4.2)	(4.5)	(4.5)												

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Mid-States Laboratories, Inc. PO Box 1140 Wichita, KS 67201 316-262-7013 800-247-3669																					
NoiseBraker SOLID	29.3 (2.8)	31.4 (3.0)	36.0 (2.4)	38.1 (2.1)	38.2 (2.3)	44.2 (2.9)	44.6 (2.1)	39.4 (3.3)	37.5 (3.0)	31	31	35	37	37	26	28	33	36	35	42	34
NoiseBraker VENTED	9.7 (1.8)	13.1 (1.7)	22.9 (2.7)	30.0 (2.1)	34.2 (1.8)	43.4 (2.1)	41.1 (2.4)	32.8 (3.1)	32.7 (2.5)	20	14	22	32	25	7	11	20	27	32	38	30
Mine Safety Appliance Company PO Box 426 Pittsburg, PA 15230 412-967-3000																					
ACCU-FIT	28.9 (3.5)	28.0 (2.7)	29.2 (2.2)	32.6 (1.9)	35.8 (3.0)	40.2 (3.6)	36.6 (4.0)	36.4 (2.6)	35.1 (3.3)	26	27	30	32	32	25	25	27	30	32	32	31
Ear Defenders	26.1 (3.6)	26.1 (3.4)	25.1 (3.8)	30.5 (2.9)	34.3 (3.1)	40.0 (3.3)	38.0 (4.8)	33.9 (4.8)	31.8 (4.5)	22	24	26	30	29	22	22	21	27	31	33	27
Ear Defenders II	30.1 (3.3)	29.8 (3.2)	29.1 (2.8)	34.0 (2.9)	38.7 (3.4)	42.5 (2.9)	41.7 (4.8)	40.1 (5.7)	38.0 (4.1)	27	28	30	35	34	26	26	26	31	35	36	33
Noise Foe MrkIV-U	19.4 (3.9)	24.5 (3.7)	30.4 (4.0)	33.2 (2.6)	35.7 (4.4)	36.8 (4.2)	35.7 (3.7)	34.6 (3.7)	32.9 (3.2)	23	23	28	31	31	15	20	26	30	31	32	29
Noise Foe MrkIV-O	13.9 (2.1)	21.2 (2.7)	29.3 (3.1)	36.0 (2.8)	32.6 (2.4)	39.4 (3.4)	37.2 (2.9)	35.1 (2.8)	36.1 (3.9)	24	20	28	32	30	11	18	26	33	30	34	32
Noise Foe MrkIV-B	14.9 (2.8)	21.5 (3.3)	27.0 (3.4)	33.6 (3.3)	31.3 (2.9)	37.2 (3.1)	34.9 (3.6)	35.3 (4.2)	31.6 (3.2)	22	19	26	30	28	12	18	23	30	28	31	28
Noise Foe MrkV-B	18.3 (3.2)	22.8 (2.6)	28.1 (2.8)	36.7 (3.5)	34.2 (2.9)	38.5 (2.8)	31.9 (2.4)	31.0 (2.8)	31.6 (3.3)	23	22	28	30	30	15	20	25	33	31	29	28
Noise Foe MrkV-O	18.2 (2.7)	22.9 (2.3)	31.2 (2.4)	39.3 (3.0)	35.8 (2.3)	39.4 (3.1)	32.6 (2.9)	33.2 (2.6)	37.4 (3.1)	25	23	30	33	32	15	20	28	36	33	29	34

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB)									Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn												
	125	250	500	1000	2000	3150	4000	6300	8000	EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Mine Safety Appliance Company PO Box 426 Pittsburg, PA 15230 412-967-3000																						
Noise Foe	19.4	22.8	28.6	36.6	32.9	39.2	32.9	32.9	32.4	24	23	29	30	30	16	20	26	33	30	29	29
MrkV-U	(3.1)	(2.5)	(2.3)	(2.7)	(2.7)	(2.8)	(3.1)	(2.7)	(3.1)												
Moldex-Metric, Inc. 4671 Leahy Street Culver City, CA 90230 213-870-9121 310-837-9563 (fax)																						
Pura-Band	27.1	25.9	25.3	25.3	31.9	38.2	40.2	41.9	44.5	20	22	23	28	27	23	21	21	21	27	36	39
6500-U	(4.0)	(4.1)	(3.7)	(3.7)	(4.1)	(3.5)	(3.8)	(4.3)	(4.6)												
Pura-Band	27.1	27.0	25.9	26.6	32.7	37.0	40.0	40.6	43.5	20	23	24	29	28	23	23	22	22	28	33	39
6500-B	(3.2)	(3.9)	(3.7)	(3.8)	(4.2)	(5.8)	(6.2)	(5.7)	(4.3)												
PuraFit	32.8	34.7	37.9	38.1	38.5	42.8	44.6	44.7	43.9	31	33	35	37	38	28	30	34	35	35	41	39
6800	(4.0)	(3.8)	(3.1)	(3.0)	(2.9)	(2.9)	(3.6)	(4.1)	(4.6)												
North Consumer Products 2664-B Saturn Street Brea, CA 92621 714-524-1655 800-421-3841 714-524-7944 (fax)																						
COM-FIT	29.6	27.6	30.0	31.7	34.3	40.3	42.1	45.7	45.6	26	27	29	34	33	26	24	26	29	32	38	41
	(3.0)	(3.3)	(3.5)	(2.2)	(2.0)	(2.5)	(4.1)	(4.5)	(4.6)												
Gun Muffler	18.0	23.0	29.9	39.2	34.4	32.7	32.5	37.8	37.5	24	22	29	32	31	14	20	26	35	31	30	33
U	(3.8)	(2.5)	(3.0)	(3.5)	(2.9)	(3.1)	(2.5)	(4.1)	(3.6)												

Appendix D. Hearing Protector List by Supplier Alphabetically

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with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
North Consumer Products 2664-B Saturn Street Brea, CA 92621 714-524-1655 800-421-3841 714-524-7944 (fax)																					
Gun Muffler B	14.9	21.6	30.8	39.8	33.9	33.6	33.0	33.9	33.8	23	19	28	31	30	11	18	28	35	31	30	29
	(3.5)	(3.2)	(2.4)	(3.9)	(2.9)	(2.6)	(2.7)	(4.5)	(4.8)												
Gun Muffler O	14.1	23.3	31.6	41.2	36.5	34.4	33.9	36.5	37.8	25	20	29	34	31	11	20	29	38	34	31	35
	(3.1)	(2.7)	(2.5)	(2.9)	(2.5)	(2.3)	(2.7)	(2.2)	(2.3)												
Noise Husher	37.4	40.9	44.8	43.8	36.3	41.9	42.6	46.1	47.3	29	36	36	34	37	31	35	41	40	31	39	44
	(5.7)	(5.0)	(3.3)	(3.6)	(4.9)	(3.0)	(3.1)	(3.5)	(2.7)												
Sonic II HrgPrtr	6.7.	5.8	5.3	13.3	22.7	23.1	21.3	27.9	23.7	6	5	8	17	12	4	2	2	11	19	18	20
	(2.5)	(3.0)	(2.4)	(2.3)	(2.8)	(2.2)	(2.8)	(3.4)	(3.2)												
North Health Care 1515 Elmwood Rd Rockford, IL 61103 815-877-2531																					
ATTENUATOR HP O	20.8	26.0	31.8	41.5	41.7	42.6	38.6	34.9	36.0	29	26	33	37	35	18	24	30	39	39	35	33
	(2.4)	(1.7)	(1.4)	(2.0)	(2.4)	(2.6)	(2.7)	(2.9)	(2.7)												
COM-FIT	29.6	27.6	30.0	31.7	34.3	40.3	42.1	45.7	45.6	26	27	29	34	33	26	24	26	29	32	38	41
	(3.0)	(3.3)	(3.5)	(2.2)	(2.0)	(2.5)	(4.1)	(4.5)	(4.6)												
DECIDAMP	37.4	40.9	44.8	43.8	36.3	41.9	42.6	46.1	47.3	29	36	36	34	37	31	35	41	40	31	39	44
	(5.7)	(5.0)	(3.3)	(3.6)	(4.9)	(3.0)	(3.1)	(3.5)	(2.7)												
Dielectric HP BH	15.6	17.1	25.9	31.3	36.3	38.8	37.8	37.6	37.2	21	18	25	33	28	12	14	23	28	32	34	32
	(3.2)	(2.5)	(2.8)	(2.7)	(3.7)	(3.4)	(3.3)	(3.3)	(4.3)												
Dielectric HP OH	15.2	17.6	28.1	33.5	36.1	39.3	41.2	39.9	40.3	23	18	26	34	29	12	15	25	30	32	38	37
	(2.6)	(2.5)	(2.8)	(3.3)	(3.6)	(3.6)	(3.1)	(2.9)	(3.1)												
Dielectric HP UC	14.6	17.4	26.4	31.1	35.6	38.9	38.7	36.8	37.1	22	18	25	33	29	12	15	23	29	32	35	32
	(2.4)	(1.8)	(2.9)	(2.1)	(2.9)	(3.3)	(3.0)	(3.2)	(4.3)												

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with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB)									Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn (ISO 4896-2.2)												
	125	250	500	1000	2000	3150	4000	6300	8000	EPA NRR	HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
North Health Care **1515 Elmwood Rd** **Rockford, IL 61103** **815-877-2531**																						
Industrial HP	14.9	21.6	30.8	39.8	33.9	33.6	33.0	33.9	33.8	23	19	28	31	30	11	18	28	35	31	30	29
BH	(3.5)	(3.2)	(2.4)	(3.9)	(2.9)	(2.6)	(2.7)	(4.5)	(4.8)												
Industrial HP	14.1	23.3	31.6	41.2	36.5	34.4	33.9	36.5	37.8	25	20	29	34	31	11	20	29	38	34	31	35
OH	(3.1)	(2.7)	(2.5)	(2.9)	(2.5)	(2.3)	(2.7)	(2.2)	(2.3)												
Industrial HP	18.0	23.0	29.9	39.2	34.4	32.7	32.5	37.8	37.5	24	22	29	32	31	14	20	26	35	31	30	33
UC	(3.8)	(2.5)	(3.0)	(3.5)	(2.9)	(3.1)	(2.5)	(4.1)	(3.6)												
Silent Band-It	18.0	23.7	26.6	29.7	35.8	41.1	42.0	41.2	38.4	25	22	27	34	31	15	20	24	28	34	40	36
BH	(2.1)	(2.8)	(2.3)	(1.6)	(1.3)	(1.8)	(1.9)	(2.7)	(2.4)												
Silent Band-It	17.8	23.5	26.7	30.4	36.5	42.3	42.5	41.6	41.7	26	22	28	35	31	14	21	25	28	34	41	39
OH	(3.4)	(2.1)	(1.5)	(1.8)	(1.7)	(2.0)	(1.5)	(2.2)	(2.7)												
Silent Band-It	17.5	22.2	25.2	29.0	35.6	39.7	40.9	41.3	38.5	25	22	27	34	30	15	20	23	27	34	39	36
UC	(1.9)	(1.7)	(1.7)	(1.5)	(1.5)	(1.5)	(1.4)	(2.2)	(1.7)												
Silent Partner	18.1	23.9	26.7	29.7	36.8	42.0	42.5	41.7	42.0	25	22	28	35	31	15	21	24	28	34	40	39
	(2.8)	(2.5)	(1.9)	(1.6)	(2.5)	(1.4)	(1.7)	(1.7)	(2.2)												
Sonic Ear Valvs	6.7	5.8	5.3	13.3	22.7	23.1	21.3	27.9	23.7	6	5	8	17	12	4	2	2	11	19	18	20
	(2.5)	(3.0)	(2.4)	(2.3)	(2.8)	(2.2)	(2.8)	(3.4)	(3.2)												
Sound-Off CMHP	17.2	20.0	27.5	33.8	34.6	39.3	35.5	34.1	32.1	22	20	27	32	29	13	17	24	30	31	33	29
H	(3.9)	(2.7)	(3.0)	(3.5)	(3.5)	(3.6)	(2.0)	(2.5)	(2.8)												
Sound-Off HP	14.4	19.0	26.8	35.8	38.5	40.9	36.7	36.0	35.5	23	18	26	35	29	11	16	24	32	35	34	32
BH	(2.9)	(2.4)	(2.8)	(2.9)	(2.6)	(3.2)	(2.3)	(2.5)	(2.7)												
Sound-Off HP	16.8	22.0	27.4	36.9	39.5	40.9	37.8	36.3	36.5	25	21	29	36	32	14	20	24	34	36	35	34
OH	(2.3)	(2.0)	(2.7)	(2.8)	(2.9)	(2.0)	(2.1)	(2.2)	(2.1)												
Sound-Off HP	17.0	19.3	27.6	35.8	39.0	41.9	37.5	36.2	35.0	25	20	27	35	31	14	17	24	33	36	35	33
UC	(2.1)	(1.8)	(3.1)	(2.3)	(2.2)	(2.0)	(2.1)	(2.5)	(1.7)												
Sound-Off LFHP	16.8	20.4	26.7	32.7	36.2	39.1	37.0	35.5	35.2	23	20	27	34	30	14	17	24	30	34	34	33
BH	(2.6)	(3.3)	(2.3)	(2.6)	(2.0)	(2.1)	(2.6)	(2.3)	(1.9)												

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
North Health Care 1515 Elmwood Rd Rockford, IL 61103 815-877-2531																					
Sound-Off LFHP OH	20.4	24.9	30.8	37.6	41.0	41.2	37.4	35.8	35.8	28	25	31	36	34	18	22	28	35	38	35	33
	(2.3)	(2.0)	(2.3)	(2.2)	(2.4)	(2.8)	(1.8)	(1.8)	(2.8)												
Sound-Off LFHP UC	13.3	19.5	24.6	30.7	34.4	36.3	34.0	34.7	33.9	21	18	25	31	28	11	16	21	27	31	31	32
	(2.3)	(3.5)	(3.0)	(3.2)	(2.5)	(2.5)	(2.2)	(1.9)	(1.8)												
Pacific Coast Laboratories, Inc. PO BOX 7981 San Francisco, CA 94120 415-351-2770 800-351-2770																					
Rockstars I Solid	33.2	34.5	36.6	34.6	36.5	42.4	44.1	43.9	44.9	28	31	32	35	35	29	30	32	31	32	39	41
	(3.7)	(3.8)	(4.3)	(3.6)	(3.7)	(3.8)	(4.3)	(4.8)	(3.8)												
Sound Waves	33.2	34.5	36.6	34.6	36.5	42.4	44.1	43.9	44.9	28	32	32	35	35	29	30	32	31	32	39	41
	(3.7)	(3.8)	(4.3)	(3.6)	(3.6)	(3.8)	(4.3)	(4.8)	(3.8)												
Peltor Inc. Peltor Park 63 Commercial Way E.Providence, RI 02914 401-438-4800 800-EAR-MUFF 401-434-1708 (fax)																					
Bull's Eye	32.8	34.7	37.9	38.1	38.5	42.8	44.6	44.7	43.9	31	33	35	37	38	28	30	34	35	35	41	39
	(4.0)	(3.8)	(3.1)	(3.0)	(2.9)	(2.9)	(3.6)	(4.1)	(4.6)												
Bull's Eye 7-O	17.2	24.0	29.7	38.4	40.0	45.0	39.6	38.8	38.2	27	22	31	37	33	14	22	27	36	37	37	34
	(2.8)	(1.8)	(1.9)	(2.2)	(2.1)	(3.7)	(2.6)	(3.9)	(3.8)												

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Peltor Inc. Peltor Park 63 Commercial Way E.Providence, RI 02914 401-438-4800 800-EAR-MUFF 401-434-1708 (fax)																					
Bull's Eye	13.4	16.4	24.7	32.4	37.5	39.3	38.5	35.2	34.5	22	17	25	34	28	12	13	22	30	35	37	31
9-O	(1.4)	(2.7)	(2.2)	(2.0)	(2.3)	(1.9)	(1.3)	(2.0)	(2.6)												
Bull's Eye	11.0	13.6	22.8	32.5	34.4	43.1	40.2	37.5	35.7	19	14	22	32	25	7	11	19	28	31	37	31
H6B/V	(3.1)	(2.0)	(2.9)	(3.6)	(3.0)	(2.3)	(2.5)	(2.5)	(4.0)												
Bull's Eye	15.0	21.9	28.8	36.6	38.1	33.8	36.8	39.7	38.6	24	20	28	34	31	12	20	26	32	34	33	34
Presdnt	(2.9)	(1.7)	(2.4)	(3.9)	(3.7)	(2.4)	(3.2)	(4.5)	(4.2)												
Bull's Eye	12.6	12.8	23.2	32.1	34.9	44.3	40.2	40.1	38.3	21	15	23	33	26	10	11	21	29	32	38	34
Shotgnr	(2.1)	(1.4)	(1.4)	(2.2)	(2.3)	(3.1)	(1.4)	(3.2)	(3.8)												
Bull'sEyeLitCom	17.2	24.0	29.7	38.4	40.0	45.0	39.6	38.8	38.2	27	22	31	37	33	14	22	27	36	37	37	34
MT7H7A	(2.8)	(1.8)	(1.9)	(2.2)	(2.1)	(3.7)	(2.6)	(2.4)	(3.8)												
PELTOR	17.5	25.7	38.8	42.2	38.8	37.7	41.6	41.8	42.7	30	24	33	38	36	15	23	36	40	35	38	41
H10A-O	(1.8)	(2.0)	(2.5)	(2.1)	(3.1)	(2.3)	(3.3)	(1.7)	(1.7)												
PELTOR	14.2	20.8	28.3	38.0	37.5	38.4	33.8	32.5	32.6	22	18	27	33	29	10	17	24	34	34	31	28
H3A-O	(3.3)	(3.6)	(3.6)	(3.1)	(3.0)	(2.9)	(2.8)	(3.1)	(3.7)												
PELTOR	14.1	19.7	27.3	36.7	36.8	38.9	34.3	31.9	32.2	22	19	26	32	29	11	16	23	33	33	32	28
H3P3e-H	(2.7)	(2.8)	(3.7)	(3.2)	(3.1)	(2.4)	(2.3)	(2.6)	(3.7)												
PELTOR	12.1	13.2	23.2	32.5	34.6	43.6	39.2	38.7	36.6	20	15	23	33	26	10	11	21	30	31	36	33
H6A/v-O	(1.9)	(2.2)	(1.6)	(2.5)	(3.2)	(3.6)	(2.6)	(2.4)	(2.8)												
PELTOR	11.0	13.6	22.8	32.5	34.4	43.1	40.2	37.5	35.7	19	14	22	32	25	7	11	19	28	31	37	31
H6B/v-B	(3.1)	(2.0)	(2.9)	(3.6)	(3.0)	(2.3)	(2.5)	(2.5)	(4.0)												
	Comments: backband hearing protector																				
PELTOR	12.6	12.8	23.2	32.1	34.9	44.3	40.2	40.1	38.3	21	15	23	33	26	10	11	21	29	32	38	34
H6F/v-O	(2.1)	(1.4)	(1.4)	(2.2)	(2.3)	(3.1)	(1.4)	(3.2)	(3.8)												
PELTOR	11.5	13.7	23.7	32.5	33.8	41.7	40.3	37.9	35.6	20	15	23	33	26	9	11	21	29	31	37	31
H6P3e/v	(2.1)	(1.9)	(1.9)	(2.9)	(2.3)	(3.4)	(2.5)	(2.7)	(3.8)												
PELTOR	17.2	24.0	29.7	38.4	40.0	45.0	39.6	38.8	38.2	27	22	31	37	33	14	22	27	36	37	37	34
H7A-O	(2.8)	(1.8)	(1.9)	(2.2)	(2.1)	(3.7)	(2.6)	(3.9)	(3.8)												

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB)									Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn												
										EPA	(ISO 4896-2.2)				Perceived Noise Reduction							
	125	250	500	1000	2000	3150	4000	6300	8000	NRR	HML_L	HML_M	HML_H	SNR	125	250	500	1000	2000	4000	8000
Peltor Inc. **Peltor Park 63 Commercial Way** **E.Providence, RI 02914** **401-438-4800 800-EAR-MUFF 401-434-1708 (fax)**																						
PELTOR H7B-B	13.8	20.3	27.3	37.8	38.0	38.9	35.5	34.0	35.0	22	18	27	34	29	10	16	24	34	35	32	31
	(3.5)	(3.4)	(2.8)	(3.3)	(3.0)	(2.2)	(3.5)	(3.7)	(4.0)												
	Comments: backband hearing protector																				
PELTOR H7F-O	15.0	21.9	28.8	36.6	38.1	33.8	36.8	39.7	38.6	24	20	28	34	31	12	20	26	32	34	33	34
	(2.9)	(1.7)	(2.4)	(3.9)	(3.7)	(2.4)	(3.2)	(4.5)	(4.2)												
PELTOR H7P3e-H	14.1	18.8	28.1	36.2	35.6	38.4	35.0	35.5	36.4	24	19	27	34	30	12	16	25	34	33	32	34
	(2.1)	(2.0)	(3.0)	(2.1)	(2.2)	(2.3)	(2.1)	(2.1)	(2.4)												
PELTOR H9A-O	13.4	16.4	24.7	32.4	37.5	39.3	38.5	35.2	34.5	22	17	25	34	28	12	13	22	30	35	37	31
	(1.4)	(2.7)	(2.2)	(2.0)	(2.3)	(1.9)	(1.3)	(2.0)	(2.6)												
PELTOR H9P3e-H	10.5	15.3	23.0	32.6	36.1	39.1	36.1	32.9	32.3	20	15	23	32	26	8	12	20	29	32	33	29
	(2.3)	(2.4)	(2.7)	(2.7)	(3.2)	(3.2)	(2.9)	(3.6)	(3.3)												
PELTOR LITE-COM HTM7A-O	17.2	24.0	29.7	38.4	40.0	45.0	39.6	38.8	38.2	27	22	31	37	33	14	22	27	36	37	37	34
	(2.8)	(1.8)	(1.9)	(2.2)	(2.1)	(3.7)	(2.6)	(2.4)	(3.8)												
PELTOR LITE-COM MT7H7AO	17.2	24.0	29.7	38.4	40.0	45.0	39.6	38.8	38.2	27	22	31	37	33	14	22	27	36	37	37	34
	(2.8)	(1.8)	(1.9)	(2.2)	(2.1)	(3.7)	(2.6)	(2.4)	(3.8)												
PELTOR LITE-COM MT7H7P3	14.1	18.8	28.1	36.2	35.6	38.4	35.0	35.5	36.4	24	19	27	34	30	12	16	25	34	33	32	34
	(2.1)	(2.0)	(3.0)	(2.1)	(2.2)	(2.3)	(2.1)	(2.1)	(2.4)												
PELTOR LITE-COM MT7H7bB	13.8	20.3	27.3	37.8	38.0	38.9	35.5	34.0	35.0	22	18	27	34	29	10	16	24	34	35	32	31
	(3.5)	(3.4)	(2.8)	(3.3)	(3.0)	(2.2)	(3.5)	(3.7)	(4.0)												
	Comments: backband headset																				
PELTOR LITE-COM MT9H6bO	11.0	13.6	22.8	32.5	34.4	43.1	40.2	37.5	35.7	19	14	22	32	25	7	11	19	28	31	37	31
	(3.1)	(2.0)	(2.9)	(3.6)	(3.0)	(2.3)	(2.5)	(2.5)	(4.0)												
	Comments: for wear with sandblasting helmet																				
PELTOR LITE-COM MT9H7AO	17.2	24.0	29.7	38.4	40.0	45.0	39.6	38.8	38.2	27	22	31	37	33	14	22	27	36	37	37	34
	(2.8)	(1.8)	(1.9)	(2.2)	(2.1)	(3.7)	(2.6)	(2.4)	(3.8)												

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with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Peltor Inc. Peltor Park 63 Commercial Way E.Provident, RI 02914 401-438-4800 800-EAR-MUFF 401-434-1708 (fax)																					
PELTOR LITE-COM	14.1	18.8	28.1	36.2	35.6	38.4	35.0	35.5	36.4	24	19	27	34	30	12	16	25	34	33	32	34
MT9H7P3	(2.1)	(2.0)	(3.0)	(2.1)	(2.2)	(2.3)	(2.1)	(2.1)	(2.4)												
PELTOR Lumberjk	14.1	19.7	24.7	32.4	37.5	39.3	38.5	35.2	34.5	21	18	25	33	28	11	16	21	29	34	36	30
G413b/c	(2.7)	(2.8)	(3.7)	(3.2)	(3.1)	(2.4)	(2.3)	(2.6)	(3.7)												
	Comments: metal or nylon mesh visor																				
PolyPlug Corporation PO Box 70066 Marietta, GA 30007-0066 404-998-0585 404-998-0585 (fax)																					
PolyPlug	26.1	29.5	33.3	34.5	37.8	42.1	44.7	45.5	45.3	25	26	30	36	34	20	24	27	29	34	40	40
PT01	(5.6)	(4.9)	(5.4)	(4.6)	(2.9)	(3.9)	(4.7)	(4.2)	(4.5)												
Precision Earmold Lab 830 Sunshine Lane AltamonteSpring, FL 3271 407-774-8022 800-327-4792																					
Etymotic	14.8	14.5	14.4	13.8	13.4	14.3	13.8	13.9	19.1	7	12	11	11	13	11	11	12	11	10	11	15
ER-15	(3.7)	(2.6)	(2.3)	(2.3)	(3.2)	(2.2)	(2.1)	(2.7)	(3.9)												
Etymotic	20.5	22.4	24.9	25.0	25.6	25.5	22.3	23.1	35.1	16	20	22	22	23	15	18	21	22	21	19	31
ER-25	(5.4)	(4.4)	(3.3)	(2.7)	(3.9)	(1.9)	(2.4)	(4.3)	(4.1)												
HI-FI	14.5	15.3	16.9	18.9	22.5	23.0	19.8	22.3	24.6	12	14	16	18	19	10	12	14	15	19	17	22
ER-20	(3.8)	(2.8)	(2.5)	(3.0)	(3.4)	(3.0)	(2.8)	(2.9)	(2.6)												

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Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn with NOISE REDUCTION VALUES: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Precision Earmold Lab 830 Sunshine Lane AltamonteSpring, FL 3271 407-774-8022 800-327-4792																					
Comfort Ear	29.2	29.8	28.3	30.5	37.0	42.4	45.3	44.3	44.1	24	26	27	34	31	24	24	23	27	34	40	38
Catamor	(5.0)	(5.0)	(4.5)	(3.5)	(3.0)	(3.5)	(4.5)	(4.5)	(6.0)												
Precision Hearing Instruments,Inc. 202 Thiselda Lane Sebring, FL 33872 813-471-6000 800-432-7321																					
Etymotic	14.5	15.3	16.9	18.9	22.5	23.0	19.8	22.3	24.6	12	14	16	18	19	10	12	14	15	19	17	22
ER-20	(3.8)	(2.8)	(2.5)	(3.0)	(3.4)	(3.0)	(2.8)	(2.9)	(2.6)												
Protect Ear International #681-7789 - 134th Street Surrey, BC V3W9E9 Canad 604-599-1311 604-599-7377 (fax)																					
Convertible w/c	27.6	30.0	29.9	29.1	34.3	41.0	43.6	44.2	42.2	24	26	27	32	31	23	26	26	25	31	39	39
497A	(3.7)	(3.8)	(3.8)	(3.2)	(3.3)	(3.1)	(3.7)	(3.6)	(3.1)												
Solid	31.0	31.3	32.3	31.2	35.8	41.5	43.7	42.7	42.7	26	29	29	34	33	27	27	28	28	32	41	39
499A	(3.9)	(3.4)	(4.1)	(3.2)	(2.9)	(2.6)	(2.0)	(3.6)	(3.6)												
VENTED G	27.6	28.7	27.5	28.1	34.5	40.1	42.7	43.3	41.9	23	25	26	31	30	23	25	23	24	31	39	38
495A	(3.9)	(3.6)	(3.6)	(3.3)	(3.4)	(2.8)	(2.9)	(3.2)	(3.3)												
Racal Health & Safety, Inc. 7305 Executive Way Frederick, MD 21701 301-695-8200 800-682-9500 301-695-4413 (fax)																					
Classic	11.3	13.3	23.5	30.9	36.3	37.1	39.9	39.2	36.7	20	14	22	33	26	9	11	21	27	33	37	32
1-O	(2.2)	(2.1)	(2.2)	(3.1)	(3.0)	(2.9)	(2.3)	(2.7)	(3.9)												

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with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB)									Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn												
	125	250	500	1000	2000	3150	4000	6300	8000	EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Racal Health & Safety, Inc. 7305 Executive Way Frederick, MD 21701 301-695-8200 800-682-9500 301-695-4413 (fax)																						
Classic 2-O	12.7	17.9	24.6	33.2	36.3	41.3	38.5	38.1	37.7	22	17	25	34	28	9	15	22	30	33	35	34
	(2.8)	(2.8)	(2.0)	(2.5)	(2.9)	(4.0)	(3.0)	(3.1)	(3.1)												
Classic 3-O	17.5	21.9	30.2	36.5	39.6	44.5	44.7	43.1	40.9	26	21	29	37	32	14	19	27	33	35	41	37
	(3.1)	(2.5)	(2.9)	(2.7)	(3.8)	(3.7)	(3.0)	(2.3)	(3.3)												
Santa Barbara Medco, Inc. PO Box 6843 Santa Barbara, CA 93160 805-683-1486 800-346-3326 805-683-4864 (fax)																						
EAR PUTTY	22.8	23.5	22.5	25.7	34.7	30.1	33.4	33.8	33.3	17	20	22	27	26	17	19	19	21	30	29	25
	(5.2)	(4.2)	(3.3)	(4.5)	(4.3)	(5.3)	(4.1)	(9.5)	(7.5)												
MEDCO MOLD	17.4	22.2	25.2	23.8	32.8	24.8	29.3	35.1	33.9	18	20	22	26	26	14	18	22	20	28	25	30
	(2.5)	(3.5)	(2.6)	(3.1)	(4.4)	(3.9)	(4.2)	(4.9)	(3.9)												
Sound Master	24.3	20.0	21.8	20.3	27.5	26.6	28.6	30.7	31.9	15	18	19	22	22	21	17	19	16	22	25	27
	(3.0)	(2.6)	(2.8)	(3.5)	(5.2)	(5.3)	(3.4)	(4.0)	(4.8)												
Sellstrom Manufacturing Co. Sellstrom Industrial Park 1 Sellstrom Dr Palatine, IL 60067 708-358-2000 800-323-7402 708-358-8564 (fax)																						
Sellstrom 23461	27.2	27.2	28.3	32.2	37.4	41.9	38.5	36.4	34.3	24	25	28	33	31	23	23	23	28	34	33	30
	(3.4)	(3.4)	(4.4)	(3.4)	(2.8)	(3.4)	(4.6)	(3.4)	(3.6)												

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB)									Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn												
										EPA	(ISO 4896-2.2)				Perceived Noise Reduction							
	125	250	500	1000	2000	3150	4000	6300	8000	NRR	HML_L	HML_M	HML_H	SNR	125	250	500	1000	2000	4000	8000
Sellstrom Manufacturing Co. **Sellstrom Industrial Park 1 Sellstrom Dr** **Palatine, IL 60067** **708-358-2000 800-323-7402 708-358-8564 (fax)**																						
Sellstrom	11.2	14.8	24.0	32.3	35.1	42.8	38.6	36.8	34.9	21	15	24	33	27	9	12	22	30	32	36	33
404-O	(2.0)	(1.9)	(1.5)	(1.6)	(3.0)	(1.9)	(2.0)	(2.2)	(1.7)												
Silencio **56 Coney Island Dr, Bldg #22** **Sparks, NV 89431** **702-359-4451 800-648-1812 702-359-1074 (fax)**																						
Silencio	20.8	26.0	31.8	41.5	41.7	42.6	38.6	34.9	36.0	29	26	33	37	35	18	24	30	39	39	35	33
CDS-80O	(2.4)	(1.7)	(1.4)	(2.0)	(2.4)	(2.6)	(2.7)	(2.9)	(2.7)												
Silencio	4.1	6.4	9.6	12.7	21.0	27.5	25.7	26.3	27.5	7	6	10	17	14	2	3	7	9	17	21	22
FUN-85	(1.8)	(2.7)	(2.2)	(3.2)	(3.8)	(4.8)	(4.2)	(6.8)	(5.3)												
Silencio	17.2	20.0	27.5	33.8	34.6	39.3	35.5	34.1	32.1	22	20	27	32	29	13	17	24	30	31	33	29
HHA-H	(3.9)	(2.7)	(3.0)	(3.5)	(3.5)	(3.6)	(2.0)	(2.5)	(2.8)												
Silencio	8.2	14.4	23.9	31.9	31.9	32.8	28.1	32.9	34.0	17	12	21	29	24	4	12	20	28	28	26	31
KPA-84O	(3.9)	(2.3)	(3.5)	(3.5)	(3.3)	(2.8)	(2.1)	(1.6)	(2.9)												
Silencio	16.8	20.4	26.7	32.7	36.2	39.1	37.0	35.5	25.2	22	20	27	30	28	14	17	24	30	34	34	23
LIQ-71B	(2.6)	(3.3)	(2.3)	(2.6)	(2.0)	(2.1)	(2.6)	(2.3)	(1.9)												
Silencio	13.3	19.5	24.6	30.7	34.4	36.3	34.0	34.7	33.9	21	18	25	31	28	11	16	21	27	31	31	32
LIQ-71U	(2.3)	(3.5)	(3.0)	(3.2)	(2.5)	(2.5)	(2.2)	(1.9)	(1.8)												
Silencio	20.4	24.9	30.8	37.6	41.0	41.2	37.4	35.6	35.6	28	25	31	36	34	18	22	28	35	38	35	32
LIQ-71O	(2.3)	(2.0)	(2.3)	(2.2)	(2.4)	(2.8)	(1.8)	(1.6)	(2.8)												
Silencio	14.4	19.0	26.8	35.8	38.5	40.9	36.7	36.0	35.5	23	18	26	35	29	11	16	24	32	35	34	32
RBW-71B	(2.9)	(2.4)	(2.8)	(2.9)	(2.6)	(3.2)	(2.3)	(2.5)	(2.7)												
Silencio	17.0	19.3	27.6	35.8	39.0	41.9	37.5	36.2	35.0	25	20	27	35	31	14	17	24	33	36	35	33
RBW-71U	(2.1)	(1.8)	(3.1)	(2.3)	(2.2)	(2.0)	(2.1)	(2.5)	(1.7)												

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Silencio 56 Coney Island Dr, Bldg #22 Sparks, NV 89431 702-359-4451 800-648-1812 702-359-1074 (fax)																					
Silencio RBW-71M	16.8 (2.3)	22.0 (2.0)	27.4 (2.7)	36.9 (2.8)	39.5 (2.9)	40.9 (2.0)	37.8 (2.1)	36.3 (2.2)	36.5 (2.1)	25	21	29	36	32	14	20	24	34	36	35	34
Silencio SDI-100	22.9 (1.6)	24.8 (1.7)	28.9 (2.0)	31.8 (2.0)	35.4 (2.7)	40.5 (2.1)	43.1 (2.9)	40.1 (3.1)	38.1 (3.0)	27	26	29	34	33	21	23	26	29	32	40	35
Starkey Labs, Inc. 6700 Washington Ave S. Eden Prairie, MN 55344 612-941-6401 800-733-2636 612-828-9262 (fax)																					
Sharpshooter	37.4 (5.7)	40.9 (5.0)	44.8 (3.3)	43.8 (3.6)	36.3 (4.9)	41.9 (3.0)	42.6 (3.1)	46.1 (3.5)	47.3 (2.7)	29	36	36	34	37	31	35	41	40	31	39	44
Supply One PO Box 12900 Roanoke, VA 24022 703-890-5411 703-890-5441 (fax)																					
EMTECH Hearsavr AC	17.0 (6.2)	17.0 (4.8)	17.0 (3.6)	26.0 (3.1)	31.0 (3.6)	39.0 (4.1)	40.0 (4.6)	39.0 (5.1)	37.0 (4.9)	15	14	19	28	23	10	12	13	22	27	35	32
EMTECH Hearsavr HP	27.7 (1.8)	30.2 (2.0)	32.9 (1.7)	33.2 (2.0)	34.8 (2.0)	40.6 (2.0)	40.0 (2.4)	40.8 (3.2)	40.0 (3.3)	29	30	32	34	35	25	28	31	31	32	37	36
Tasco Corp 37 Tripps Lane E.Providence, RI 02915 401-438-9200 800-343-2311																					
Tasco H-1	20.0 (2.0)	22.0 (2.0)	24.0 (2.0)	28.0 (2.0)	34.0 (2.0)	36.0 (3.0)	37.0 (3.0)	37.0 (3.0)	37.0 (3.0)	23	22	26	32	29	18	20	22	26	32	34	34

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Tasco Corp **37 Tripps Lane** **E.Providence, RI 02915** **401-438-9200 800-343-2311**																					
Tasco	27.2	27.2	28.3	32.2	37.4	41.9	38.5	36.4	34.3	24	25	28	33	31	23	23	23	28	34	33	30
RD 1	(3.4)	(3.4)	(4.4)	(3.4)	(2.8)	(3.4)	(4.6)	(3.4)	(3.6)												
Tasco	20.0	18.9	18.1	23.1	29.2	33.1	31.4	28.6	27.2	17	18	20	25	23	17	16	15	21	26	28	23
SwivelB	(2.7)	(2.1)	(2.6)	(2.0)	(2.9)	(2.5)	(3.2)	(2.5)	(3.5)												
Tasco	15.7	17.0	19.6	26.2	31.1	33.8	32.2	29.0	29.9	18	17	21	27	24	13	14	16	23	28	30	26
SwivelO	(2.4)	(2.8)	(3.2)	(3.2)	(2.7)	(1.6)	(1.9)	(2.7)	(3.7)												
Tasco	21.1	19.5	17.8	22.6	29.3	32.0	29.5	27.3	27.5	17	18	20	26	23	18	16	15	20	27	27	24
SwivelU	(3.1)	(2.8)	(2.8)	(1.9)	(2.3)	(2.3)	(1.9)	(1.9)	(2.9)												
Tasco	10.3	15.4	17.0	20.3	31.5	33.9	30.8	30.8	31.2	17	14	18	26	22	8	13	15	18	28	28	27
T-100-U	(2.0)	(2.0)	(1.8)	(1.9)	(2.8)	(2.1)	(2.0)	(1.9)	(3.4)												
Tasco	12.3	18.3	30.6	36.6	36.1	34.0	41.2	37.7	35.3	20	16	25	33	28	9	14	26	32	31	37	29
T-1000H	(2.8)	(4.0)	(4.5)	(4.6)	(4.3)	(4.5)	(3.6)	(5.9)	(5.6)												
Tasco	12.3	14.0	23.3	28.8	27.3	30.8	34.1	35.3	34.1	19	15	22	27	25	9	12	20	26	25	31	30
T-2-B	(2.7)	(1.6)	(2.6)	(2.4)	(2.3)	(2.9)	(3.0)	(3.1)	(3.2)												
	Comments: behind-the-head only																				
Tasco	12.0	17.4	24.0	26.5	30.4	32.6	37.9	35.8	34.2	20	16	23	29	26	9	14	21	24	27	34	30
T-2000H	(2.7)	(2.9)	(2.8)	(2.4)	(2.5)	(3.4)	(3.0)	(3.4)	(3.8)												
Tasco	12.4	19.2	26.4	35.2	37.8	37.4	37.2	36.3	34.8	23	17	26	35	29	9	16	24	33	36	34	32
T-250-U	(2.9)	(2.4)	(1.6)	(1.5)	(1.4)	(1.8)	(2.3)	(2.7)	(2.3)												
Tasco	12.2	19.8	28.3	38.9	40.2	35.8	36.3	39.2	38.8	24	18	27	37	30	9	17	25	37	38	34	35
T-250-O	(2.7)	(2.2)	(2.8)	(1.9)	(1.8)	(1.9)	(1.9)	(2.7)	(3.1)												
Tasco	11.8	19.1	25.6	35.2	37.4	36.4	35.8	35.7	34.8	23	17	26	35	29	9	16	23	33	35	34	32
T-250-B	(2.6)	(2.3)	(2.5)	(1.8)	(1.7)	(1.5)	(1.5)	(1.8)	(1.9)												
Tasco	10.1	19.6	29.7	36.4	37.6	34.0	33.4	34.8	35.9	23	17	27	33	29	8	17	26	33	35	30	32
T-275-O	(1.7)	(2.1)	(3.0)	(3.2)	(2.4)	(3.5)	(2.8)	(2.2)	(3.8)												
Tasco	10.1	17.7	27.8	36.4	35.3	31.4	30.9	32.4	32.0	21	16	25	31	27	8	15	24	34	33	28	27
T-275-U	(1.5)	(2.6)	(3.1)	(2.1)	(2.3)	(2.8)	(2.2)	(3.1)	(4.7)												

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Tasco Corp 37 Tripps lane E.providence, RI 02915 401-438-9200 800-343-2311																					
Tasco	9.8	18.1	28.5	35.6	36.5	31.7	31.6	34.3	34.4	21	16	25	32	27	8	15	24	32	33	29	30
T-275-B	(1.7)	(3.1)	(4.4)	(3.4)	(2.6)	(2.5)	(2.2)	(2.1)	(4.2)												
Tasco	32.5	31.5	32.0	29.5	36.8	43.7	45.7	46.1	46.4	25	28	28	33	32	29	28	27	26	33	40	41
Tri-Fit	(2.9)	(3.3)	(4.5)	(3.4)	(3.2)	(4.1)	(5.6)	(3.5)	(4.6)												
Tasco	21.8	23.8	29.0	32.6	36.1	38.2	40.7	40.4	38.8	26	24	29	35	32	19	21	25	30	33	39	35
Tri-Grd	(2.6)	(2.0)	(3.1)	(2.3)	(2.3)	(2.4)	(1.4)	(2.8)	(3.0)												
Tasco ULTIMUFF	17.7	22.4	33.7	38.6	34.8	33.2	33.8	37.1	36.4	25	22	30	33	32	14	19	30	35	32	31	33
2592-H	(3.2)	(2.7)	(2.9)	(3.2)	(2.8)	(2.3)	(2.6)	(2.4)	(2.5)												
Tasco ULTIMUFF	19.0	23.8	33.7	39.7	36.2	33.2	35.2	34.9	35.5	27	24	31	34	33	17	21	30	37	33	32	33
2792-O	(2,7)	(1.9)	(3.0)	(2.5)	(2.7)	(1.8)	(2.4)	(2.6)	(2.3)												
Westone Laboratories, Inc. PO Box 15100 ColoradoSprings, CO 8093 719-634-8817 800-525-5071 719-634-0563 (fax)																					
Etymotic	14.8	14.5	14.4	13.8	13.4	14.3	13.8	13.9	19.1	7	12	11	11	13	11	11	12	11	10	11	15
ER-15	(3.7)	(2.6)	(2.3)	(2.3)	(3.2)	(2.2)	(2.1)	(2.7)	(3.9)												
Etymotic	20.5	22.4	24.9	25.0	25.6	25.5	22.3	23.1	35.1	16	20	22	22	23	15	18	21	22	21	19	31
ER-25	(5.4)	(4.4)	(3.3)	(2.7)	(3.9)	(1.9)	(2.4)	(4.3)	(4.1)												
HI-FI	14.5	15.3	16.9	18.9	22.5	23.0	19.8	22.3	24.6	12	14	16	18	19	10	12	14	15	19	17	22
ER-20	(3.8)	(2.8)	(2.5)	(3.0)	(3.4)	(3.0)	(2.8)	(2.9)	(2.6)												
Westone	28.7	29.1	30.9	34.8	36.9	42.9	41.5	39.5	39.2	25	27	30	34	33	23	24	26	29	34	37	35
#40	(5.0)	(4.9)	(4.2)	(5.3)	(2.4)	(2.6)	(3.7)	(4.8)	(4.2)												
Westone	28.7	29.1	30.0	30.6	35.4	41.0	42.4	44.4	44.4	24	26	28	33	32	23	24	26	26	31	39	39
#40	(5.0)	(4.5)	(3.8)	(3.8)	(3.8)	(3.1)	(2.6)	(3.5)	(5.4)												

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB)									Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn												
										EPA	(ISO 4896-2.2)				Perceived Noise Reduction							
Model	125	250	500	1000	2000	3150	4000	6300	8000	NRR	HML_L	HML_M	HML_H	SNR	125	250	500	1000	2000	4000	8000
Westone Laboratories, Inc. PO Box 15100 ColoradoSprings, CO 8093 719-634-8817 800-525-5071 719-634-0563 (fax)																						
Westone	11.5	11.9	12.9	15.2	25.9	29.6	29.0	22.3	18.2	9	10	13	18	16	7	8	9	12	22	26	14
#42	(3.7)	(3.3)	(3.7)	(3.0)	(3.6)	(3.2)	(2.8)	(4.1)	(4.1)												
Westone	28.7	29.1	30.9	34.8	36.9	42.9	41.5	39.5	39.2	25	27	30	34	33	23	24	26	29	34	37	35
#44	(5.0)	(4.9)	(4.2)	(5.3)	(2.4)	(2.6)	(3.7)	(4.8)	(4.2)												
Westone	18.0	20.0	23.3	27.0	31.5	36.6	37.4	39.0	36.7	18	18	23	29	26	12	15	19	23	27	33	31
#47	(5.2)	(4.4)	(3.7)	(3.3)	(3.9)	(3.8)	(3.5)	(4.5)	(5.5)												
Willson Safety Products PO Box 622 Reading, PA 19603-0622 215-376-6161 215-371-7725 (fax)																						
Sound Silencer+	31.2	35.2	39.2	39.2	34.5	41.3	42.2	45.5	46.3	27	31	33	33	35	24	28	34	35	30	39	43
EP 300	(6.4)	(6.4)	(4.9)	(4.0)	(4.1)	(2.7)	(2.5)	(3.3)	(2.9)												
Sound Ban	26.0	22.0	19.0	22.0	40.0	49.0	49.0	43.0	42.0	18	19	20	28	25	21	18	16	19	35	44	36
10-B	(4.2)	(3.1)	(2.3)	(2.8)	(4.2)	(3.2)	(4.3)	(5.3)	(6.0)												
Sound Ban	24.0	21.0	19.0	22.0	40.0	50.0	49.0	44.0	42.0	18	19	20	28	24	20	18	15	19	35	45	36
10-O	(3.7)	(2.4)	(3.1)	(2.5)	(4.9)	(3.0)	(3.7)	(5.9)	(6.0)												
Sound Ban	27.0	22.0	17.0	21.0	39.0	48.0	45.0	43.0	42.0	18	18	19	28	24	22	17	14	19	36	41	37
10-U	(4.5)	(4.2)	(2.5)	(1.7)	(3.0)	(3.0)	(3.4)	(7.1)	(5.0)												
Sound Ban	28.0	25.0	21.0	22.0	35.0	46.0	48.0	47.0	45.0	19	21	21	28	26	24	21	18	19	32	43	41
20-B	(3.5)	(3.2)	(2.8)	(2.6)	(2.5)	(2.6)	(4.2)	(4.1)	(3.7)												
Sound Ban	25.0	24.0	22.0	24.0	36.0	46.0	47.0	48.0	46.0	22	22	23	31	28	22	21	20	22	33	44	42
20-U	(2.6)	(2.1)	(2.0)	(1.8)	(2.4)	(2.5)	(2.5)	(4.7)	(3.9)												
Sound Barrier	11.0	15.0	21.0	31.0	35.0	41.0	35.0	31.0	32.0	20	15	23	32	26	8	13	18	28	32	33	29
155-B	(2.6)	(1.6)	(2.1)	(2.1)	(2.4)	(2.5)	(1.9)	(2.6)	(2.3)												

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB) 125	250	500	1000	2000	3150	4000	6300	8000	Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn: EPA NRR	(ISO 4896-2.2) HML_L	HML_M	HML_H	SNR	Perceived Noise Reduction 125	250	500	1000	2000	4000	8000
Willson Safety Products PO Box 622 Reading, PA 19603-0622 215-376-6161 215-371-7725 (fax)																					
Sound Barrier	15.0	20.0	25.0	33.0	37.0	41.0	36.0	34.0	34.0	23	19	26	33	29	11	17	22	30	34	33	30
155A-B	(3.3)	(2.8)	(2.1)	(2.1)	(2.7)	(3.0)	(2.9)	(2.9)	(3.4)												
Sound Barrier	11.0	16.0	23.0	32.0	33.0	33.0	34.0	28.0	25.0	19	15	23	28	25	8	13	20	29	31	32	21
351-O	(2.3)	(2.8)	(2.4)	(2.5)	(2.0)	(1.9)	(1.7)	(3.5)	(3.5)												
Sound Barrier	15.0	20.0	25.0	34.0	34.0	31.0	32.0	30.0	28.0	23	20	26	30	28	12	18	22	31	32	30	25
351A-O	(2.1)	(1.8)	(2.1)	(2.7)	(1.5)	(1.4)	(1.4)	(2.0)	(2.7)												
Sound Barrier	14.0	17.0	24.0	34.0	32.0	30.0	33.0	31.0	27.0	21	18	25	30	27	12	15	21	32	30	31	25
358A-O	(2.0)	(2.0)	(2.5)	(1.6)	(1.8)	(1.4)	(1.5)	(1.6)	(1.8)												
	Comments: corrosion resistant																				
Sound Barrier	14.0	19.0	29.0	36.0	37.0	36.0	37.0	39.0	38.0	23	18	27	35	30	11	16	25	32	34	34	35
365-B	(2.7)	(2.8)	(3.1)	(3.6)	(2.1)	(1.8)	(2.2)	(1.9)	(2.2)												
Sound Barrier	17.0	20.0	30.0	38.0	39.0	37.0	38.0	40.0	40.0	25	21	28	37	31	15	17	26	35	37	36	36
365-O	(1.9)	(2.5)	(3.6)	(2.9)	(2.0)	(1.9)	(1.4)	(2.3)	(3.1)												
Sound Barrier	13.0	18.0	27.0	34.0	36.0	36.0	37.0	39.0	38.0	22	17	25	34	28	10	15	23	30	34	34	35
365-U	(2.4)	(2.9)	(4.0)	(3.3)	(1.9)	(2.0)	(2.2)	(1.7)	(2.7)												
Sound Barrier	18.0	23.0	29.0	37.0	37.0	36.0	38.0	38.0	39.0	26	22	30	36	32	14	21	26	34	35	36	36
365A-B	(3.5)	(1.8)	(2.3)	(2.7)	(1.9)	(1.5)	(1.9)	(1.7)	(2.1)												
Sound Barrier	21.0	21.0	29.0	38.0	39.0	38.0	38.0	39.0	40.0	26	23	29	37	32	19	18	26	35	37	36	37
365A-O	(1.5)	(2.2)	(2.9)	(2.8)	(2.0)	(1.9)	(1.4)	(1.5)	(2.2)												
Sound Barrier	18.0	22.0	29.0	35.0	36.0	37.0	37.0	39.0	39.0	25	22	29	35	32	15	18	27	31	34	34	36
365A-U	(2.5)	(3.1)	(1.8)	(3.3)	(1.7)	(2.1)	(2.7)	(2.3)	(2.4)												
Sound Barrier	9.0	14.0	21.0	29.0	34.0	36.0	37.0	39.0	39.0	19	14	22	32	25	7	12	18	26	32	35	36
381-B	(1.7)	(1.8)	(2.2)	(2.2)	(1.9)	(1.7)	(1.7)	(2.6)	(2.6)												
Sound Barrier	10.0	14.0	21.0	31.0	34.0	37.0	37.0	40.0	40.0	19	14	22	32	25	8	11	18	28	31	34	38
381-O	(1.9)	(2.3)	(2.5)	(2.3)	(2.4)	(1.7)	(2.4)	(1.7)	(2.0)												
Sound Barrier	9.0	13.0	20.0	29.0	34.0	35.0	36.0	36.0	35.0	19	13	21	32	24	6	11	18	27	32	34	33
381-U	(2.1)	(2.0)	(1.8)	(2.0)	(1.6)	(1.8)	(1.7)	(1.9)	(1.7)												

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB)									Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn												
										EPA	(ISO 4896-2.2)				Perceived Noise Reduction							
	125	250	500	1000	2000	3150	4000	6300	8000	NRR	HML_L	HML_M	HML_H	SNR	125	250	500	1000	2000	4000	8000
Willson Safety Products PO Box 622 Reading, PA 19603-0622 215-376-6161 215-371-7725 (fax)																						
Sound Barrier	12.0	16.0	23.0	30.0	36.0	37.0	38.0	39.0	40.0	22	16	24	34	27	10	14	21	28	34	36	37
381A-B	(2.0)	(2.0)	(1.4)	(1.9)	(1.7)	(1.7)	(1.9)	(2.3)	(2.2)												
Sound Barrier	13.0	17.0	27.0	34.0	37.0	38.0	38.0	40.0	41.0	23	17	25	36	29	10	14	24	32	35	36	39
381A-O	(2.2)	(2.6)	(2.4)	(1.5)	(1.6)	(1.9)	(1.8)	(2.0)	(1.9)												
Sound Barrier	11.0	15.0	22.0	30.0	35.0	36.0	37.0	37.0	35.0	21	15	23	33	26	9	13	19	28	33	34	32
381A-U	(1.8)	(1.9)	(2.2)	(1.9)	(1.6)	(2.1)	(2.2)	(2.0)	(2.1)												
Sound Barrier	12.0	18.0	25.0	35.0	35.0	34.0	37.0	37.0	34.0	22	17	25	33	28	9	15	23	32	32	34	31
390-H	(2.9)	(2.2)	(2.0)	(2.2)	(2.3)	(3.0)	(2.8)	(3.4)	(2.8)												
Sound Barrier	15.0	19.0	26.0	36.0	38.0	34.0	37.0	38.0	35.0	24	19	27	35	30	13	16	23	33	36	34	32
390A-H	(2.0)	(2.5)	(2.2)	(2.4)	(2.0)	(2.3)	(3.0)	(3.7)	(2.6)												
Sound Barrier	14.7	19.3	26.2	35.8	37.7	34.5	36.7	38.0	35.5	24	19	27	35	30	12	16	24	33	35	33	32
390AL-H	(2.0)	(2.5)	(2.2)	(2.4)	(2.0)	(2.3)	(3.0)	(3.7)	(2.6)												
Sound Barrier	19.5	23.5	23.9	32.6	32.7	32.5	32.8	34.5	35.1	22	21	26	30	29	15	20	21	30	29	29	31
459AL-O	(3.8)	(3.3)	(2.7)	(2.2)	(3.0)	(3.4)	(3.3)	(2.6)	(3.6)												
Sound Barrier	20.4	23.2	24.6	34.0	34.1	34.5	35.5	36.0	36.8	23	22	26	32	30	17	20	21	31	31	32	33
460A-O	(3.3)	(2.5)	(3.6)	(2.4)	(2.3)	(2.5)	(3.3)	(3.7)	(2.9)												
Sound Barrier	20.6	23.3	23.4	34.5	34.0	33.8	35.3	36.9	36.9	22	22	26	32	29	17	20	20	32	32	32	33
462A-O	(3.4)	(2.5)	(3.3)	(2.5)	(1.8)	(2.2)	(3.3)	(4.1)	(3.2)												
Sound BarrierII	18	20.9	24.2	33.6	35.8	40.1	38.8	36.5	34.8	22	20	25	33	29	15	16	21	30	32	36	32
665-B	(2.7)	(4.0)	(3.2)	(3.5)	(3.4)	(3.6)	(2.6)	(4.5)	(2.7)												
Sound BarrierII	16.4	19.9	24.7	33.4	34.2	38.9	38.3	35.0	35.4	21	19	25	31	28	14	17	20	29	30	35	30
665-O	(2.2)	(2.7)	(4.3)	(3.8)	(3.9)	(3.9)	(3.1)	(4.6)	(4.5)												
Sound BarrierII	18.5	20.6	25.5	32.9	36.2	38.8	40.5	35.2	33.8	22	20	26	33	29	15	17	22	30	32	37	29
665-U	(2.7)	(3.6)	(3.0)	(2.6)	(3.4)	(3.5)	(3.1)	(3.8)	(3.9)												
Sound BarrierII	16.3	20.7	29.5	36.9	36.3	38.5	36.5	34.3	32.5	22	20	27	32	30	14	17	24	34	32	32	28
665A-B	(2.3)	(2.8)	(4.9)	(2.8)	(3.6)	(4.3)	(4.5)	(4.0)	(4.0)												

Appendix D. Hearing Protector List by Supplier Alphabetically

LIST OF HEARING PROTECTION DEVICES and ATTENUATION DATA as SUPPLIED by MANUFACTURERS and DISTRIBUTORS
with NOISE REDUCTION VALUES

Make / Model	Average Attenuation in dB vs Frequency in Hz (Standard Deviation in dB)									Estimation of Effective A-weighted SPLs When Hearing Protectors are Worn												
										EPA	(ISO 4896-2.2)				Perceived Noise Reduction							
	125	250	500	1000	2000	3150	4000	6300	8000	NRR	HML_L	HML_M	HML_H	SNR	125	250	500	1000	2000	4000	8000
Willson Safety Products PO Box 622 Reading, PA 19603-0622 215-376-6161 215-371-7725 (fax)																						
Sound BarrierII 665A-O	15.8 (2.8)	21.8 (2.7)	28.4 (3.0)	36.9 (3.9)	34.4 (3.1)	39.9 (4.0)	36.4 (4.1)	35.2 (5.2)	33.9 (4.6)	23	20	28	32	30	13	19	25	33	31	32	29
Sound BarrierII 665A-U	15.8 (2.5)	19.5 (3.3)	29.7 (4.6)	37.1 (3.5)	35.2 (3.9)	39.0 (3.0)	35.8 (4.3)	34.1 (4.0)	32.8 (3.5)	22	19	27	32	29	13	16	25	33	31	31	29
Sound BarrierII 690-H	11.5 (2.5)	14.7 (2.2)	23.7 (2.3)	32.3 (3.2)	33.8 (5.6)	39.6 (3.2)	38.4 (5.1)	35.2 (3.5)	32.3 (3.0)	19	15	23	30	26	9	12	21	29	28	33	29
Sound Silencer 100/1EP	27.0 (3.9)	29.0 (2.9)	31.0 (3.0)	33.0 (3.0)	37.0 (4.0)	43.0 (3.4)	45.0 (3.6)	40.0 (4.2)	36.0 (4.3)	26	28	30	34	33	23	26	28	30	33	41	31
Wisconsin Ear Mold Co. 3059 N. 124th Street Brookfield, WI 53005-385 414-784-0440 414-784-0858 (fax)																						
Wisconsin Custom	22.5 (6.7)	24.7 (6.5)	27.8 (7.4)	32.0 (4.5)	36.6 (5.5)	38.0 (5.6)	40.3 (6.7)	43.5 (5.7)	36.5 (6.5)	18	20	25	31	28	15	18	20	27	31	33	30