

Hearing Conservation Program

(EHS Program Manual 7.2)



1.0 Overview

Environmental Health and Safety (EHS) at Weill Cornell Medicine (WCM) has developed this Hearing Conservation Program. The Hearing Conservation Program is designed to address work tasks, equipment, and environments that may cause exposure to excessive noise levels and to implement measures to reduce hearing loss due to occupational noise exposure.

The program complies with the Occupational Safety and Health Administration (OSHA) Occupational Noise Exposure Standard (29 Code of Federal Regulations 1910.95).

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3.0 Objectives

Excessive exposure to high noise levels over a short or long period can cause hearing damage, which is typically irreversible. Many tasks and processes, either during normal operation or in abnormal circumstances, produce high noise levels that can be harmful to the ears and the ability to hear.

OSHA requires the establishment of a hearing conservation program when employee noise exposures equal or exceed an 8-hour Time-Weighted Average (TWA) of 85 decibels measured on the A scale (dBA) (slow response), or equivalently, a dose of 50 percent, based on the OSHA Permissible Exposure Limit (PEL) of 90 dBA for an 8-hour TWA.

The Hearing Conservation Program (HCP) aims to guide managers, supervisors, and employees in complying with the HCP and all its applicable rules and regulations. The HCP also intends to protect the hearing of those employees who could potentially be exposed to occupational noise levels over 85 dBA as an 8-hour TWA, or the equivalent dose of 50 percent, as determined by the National Institute of Occupational Safety and Health (NIOSH) Criteria for a Recommended Standard.

The Hearing Conservation program should be used in conjunction with other EHS safe work practices, including but not limited to:

- The use of hearing protection Personal Protective Equipment (PPE),
- Reduction of noisy operations,
- Use of engineering controls to reduce noise in work operations and
- Limiting the time spent performing high-noise tasks or working in areas with high noise levels during the workday.

4.0 Applicability

This program applies to all personnel at WCM who may have an occupational noise exposure equal to or greater than a daily noise dose of 50%, based on the NIOSH criteria, as an Action Level (AL) for an 8-hour Time-Weighted Average or the NIOSH Recommended Exposure Level (REL) of 85 dBA for an 8-hour TWA.

Where employees are confirmed to have exposures above the REL, these shall be reduced by implementing engineering, administrative, or PPE controls, as specified in this manual.

No employee shall be exposed to noise above the NIOSH Recommended Exposure Limit (REL) of 85 dBA TWA, incorporating the attenuation levels provided by appropriate personal hearing protection.

Note: Noise levels below 85 dBA are considered nuisance noise. While these levels may cause increased stress, distractions, or discomfort, they are not expected to result in permanent hearing loss. Where nuisance noise levels are identified, EHS will advise the area representative in question of feasible means to reduce sound levels to provide a workplace that is as comfortable and conducive to productivity as possible.

5.0 Roles and Responsibilities

5.1 ENVIRONMENTAL HEALTH AND SAFETY (EHS)

EHS responsibilities include:

- Develop, administer, manage, and periodically review the HCP.
- Conduct baseline noise monitoring in areas of concern.
- Conduct personnel exposure monitoring utilizing a noise dosimeter on individuals with potential exposures above the action level based on the results of baseline noise monitoring.
- Identify areas, equipment, or processes that require noise abatement, signage posting, or PPE.
- Provide comprehensive initial and annual training to all employees included in the HCP.
- Advise all parties (e.g., Departments, Capital Planning, Engineering & Maintenance) on noise reduction through administrative and/or engineering controls.
- Identify appropriate Noise Reduction Rating (NRR) required for hearing protection in high noise areas.
- Maintain a record of employee noise exposures measured during noise dosimetry.
- Maintain a list of all titles and tasks included in the HCP.
- Maintain a record of all equipment that produces high noise levels and areas where this equipment is used.
- Notify Departments of titles and tasks that must be included in the HCP.
- Re-evaluate any area where a Standard Threshold Shift (STS) for any employee has taken place, and ensure the proper hearing protection is available and utilized in the correct manner in high-noise areas.

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5.2 WORKFORCE HEALTH AND SAFETY (WHS)

WHS responsibilities include:

- Provide initial (baseline) and annual audiometric testing of employees currently in the HCP or who could potentially be in the HCP due to their normal work duties.
- Interpret audiometric test results.
- Evaluate and compare current audiograms with an employee's baseline audiogram to determine if a Standard Threshold Shift (STS) has occurred.
- Review problem audiograms or audiograms that indicate an STS, and determine if further evaluation is required.
- Refer employees for clinical audiological evaluation or an otological examination if additional testing is necessary.
- Retest employees who have experienced an STS within thirty (30) days. If the STS is suspected of being related to a temporary clinical condition such as an infection, the employee must be retested as soon as clinically cleared. Use the results of the test as the annual audiogram.
- Review the results of the audiogram with the employee being evaluated.
- Maintain audiometric test records within the employee's health file.
- Ensure audiometric measuring instruments, audiometric test rooms, and acoustic calibration of audiometers is in accordance with Appendices C, D, and E, respectively, of 29 CFR 1910.25.
- Provide copies of audiograms to EHS.
- Notify EHS when an STS has taken place. Include the job task and location of the employee experiencing the STS.

5.3 DEPARTMENT/DIVISION SUPERVISORS

WCM Supervisors must:

- Notify EHS of potentially excessive noise-generating tasks conducted by employees, and when new potentially high-noise-generating sources and operations are introduced.
- Minimize noise exposure in work areas using administrative and engineering controls.
- Ensure that employees whose titles or tasks fall under the scope of the HCP receive training within six months of inclusion in the program and annually thereafter.
- Ensure at least 14 hours of "quiet time" prior to audiograms.
- Provide employees with hearing protection that has an NRR appropriate for the associated noise exposure.
- Offer a variety of approved hearing protectors.
- Post hazard signs in areas identified as having excessive noise and where hearing protection is required.
- Notify EHS of changes in tasks, processes, equipment, or engineering/administrative controls that would require a re-evaluation of an employee's exposure.
- Notify employees of the results of exposure, monitoring where the exposure was above the REL, and when changes in hearing protection requirements occur.
- Ensure employees are using hearing protection in the correct manner during their work tasks and notify EHS if lapses in proper use of hearing protection occur.

5.4 PRINCIPAL INVESTIGATORS (PIS), MANAGERS, AND SUPERVISORS

PIs, Managers, and Supervisors responsibilities include:

- Notify EHS of work areas or tasks suspected of having high noise levels or excessive noise problems. These are considered tasks that interfere with normal speech.
- Ensure that all personnel subject to the HCP wear hearing protection in areas posted as requiring it or when performing tasks known to cause excessive noise exposures.
- Ensure that the correct hearing protection is provided to employees and used when required.
- Notify EHS or the Department of areas of concern or changes in tasks, processes, equipment, or engineering/administrative controls that would require re-evaluating an employee's exposure.

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5.5 EMPLOYEES

Employees must:

- Report noise-related concerns to immediate supervisor. If no action is taken, employees should report concerns directly to EHS.
- Attend annual HCP training, if applicable.
- Receive audiometric testing as scheduled.
- Utilize the appropriate hearing protection as required.

6.0 Monitoring

6.1 INITIAL EVALUATION

EHS will conduct an evaluation upon notification or installation of tasks, processes, or equipment that may expose employees to excessive noise levels, or upon notification of an STS for employees in areas not evaluated previously.

This evaluation may include:

- Determining and comparing employee work locations to those known to contain high levels of noise, such as those listed in [Appendix A](#).
- Measuring area or source of noise with a sound level meter.
- Reviewing equipment specifications or literature to determine noise output levels.
- Revising processes or work tasks to identify sources of noise that can be reduced or eliminated.

EHS will document and keep the results of all evaluations to determine follow-up actions. Information may be recorded as a chart or a map of the area, with noise levels recorded in the spot on the map corresponding with the location they were found. The initial evaluation of an area or equipment should include the source of the noise, the distance to the source where the measurement was taken, the noise levels, and the duration and interval of the noise.

If the initial evaluation indicates definitively that employees will not be exposed above the REL, EHS will notify the department of these findings and make recommendations as necessary.

Evaluation will also occur upon modification of existing equipment when said modifications may alter existing noise levels.

6.2 EMPLOYEE EXPOSURE MONITORING

When information indicates that an employee's exposure may equal or exceed the REL of 85 dBA for an 8-hour TWA, EHS will monitor exposure levels. Affected employees shall be notified of the results of monitoring where levels are found to be at or above the REL.

Monitoring activities may consist of:

- Sound level measurements for locations where the noise level is stationary and expected to be continuous or occurring at predictable intervals, and/or;
- Personal noise dosimetry for work operations which are highly mobile or random in noise level.

Re-monitoring is to occur if a change in equipment, process, or controls increases the noise level to the extent that:

- Additional employees may be exposed at or above the REL;
- The attenuation provided by the hearing protectors used by employees does not reduce the exposure to below 85 dBA for an 8-hour TWA; and/or
- Follow-up monitoring if an STS has occurred.

During monitoring activities, affected employees will get the opportunity to observe noise measurements.

Should exposure monitoring indicate that an employee is exposed above the REL, EHS will provide the Department with a written report which includes details of the activities monitored, recommendations for the reduction of noise levels, the required NRR for hearing protection deployed, and the requirement to include employees in the HCP.

If follow-up monitoring determines that an employee is no longer required to be in the HCP, the employee will remain in the program until they receive their next audiometric test.

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If exposure monitoring determines exposures above the REL, the area where the exposure occurs will be designated a “High Noise Area” requiring hearing protection. A sign must be posted at or near the entrance of these areas, and hearing protection is to be made available near the entrance and provided to all entrants. For certain areas, hearing protection may only be required if employees are to be working in a room for a designated period of time. This value is to be posted on the sign as well. The determination for this length of time is based on NIOSH “Criteria for a Recommended Standard” and detailed in [Appendix B](#).

6.3 REMOVAL OF HIGH NOISE AREAS

If EHS inspections show that the source of high noise levels has been removed from an area, the area may be removed from the High Noise Area listing and will no longer be deemed as a high noise area. This may be done on the discretion of EHS and may occur after two inspections show that the noise hazard is no longer present. The high noise area will remain in the EHS Salute database but will be marked as “inactive” so that inspection records can remain.

7.0 Signage

All high noise areas must have signage posted at or near the area entrance indicating that the area being entered requires hearing protection. High noise areas may not require hearing protection any time they are entered. Rather, hearing protection may be required for prolonged exposure to certain noise levels. Therefore, high noise areas will be indicated with the sign:

CAUTION
HIGH NOISE AREA
HEARING PROTECTION REQUIRED WHEN WORKING IN ROOM FOR _ HOURS

The duration of the length of time listed on the above sign will be based on sound level measurements performed in that area. These levels will be compared to those listed in [Appendix B](#). The length of time listed on that table for the corresponding sound level measurement, rounded up to the next highest decibel level, will be listed on the sign.

8.0 Training

Training must be provided within six months of an employee’s inclusion in the HCP, whether as a new employee, as a change in work tasks or operations assigned to that employee, or a change in operations resulting in the introduction of high noise levels, and at least annually thereafter. Departments must coordinate training with EHS to ensure all employees in the HCP are trained.

During training, each employee will be informed of the following:

- Effect of noise on hearing.
- High-noise area locations at WCM.
- Purpose of hearing protection.
- Advantages and disadvantages of different types of hearing protection.
- Attenuation of various types of hearing protection.
- Instruction on selection, care, and proper use of hearing protection.
- Purpose of audiometric testing and explanation of test procedure.
- Updated information consistent with changes in protective equipment or work processes.

If the supervisor determines that an employee has not retained the lessons of training in the HCP, or if an employee has consistently demonstrated that they are not properly protecting their hearing, that employee will receive retraining. This session will focus on the portions of the HCP where that employee has demonstrated a lack of understanding.

Employees who have not received training on the HCP are not permitted to work in High Noise Areas.

9.0 Audiometric Testing

Employees with job duties that fall in the HCP shall be included in an audiometric testing program administered by Workforce Health and Safety. This testing program shall include baseline testing as part of the onboarding physical examination, and annual testing to determine whether an STS has taken place.

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When scheduling employees for testing, the Department must ensure that they are:

- Scheduled for baseline audiometric testing. This is typically done during the onboarding medical appointment, but must be done within six (6) months of hiring or the assignment of work tasks where the employee would experience noise exposures above the REL, and;
- Not exposed to occupational noise above the REL for at least fourteen (14) hours prior to a scheduled baseline audiometric test by either scheduling the test immediately after an employee's regular day off or at the very beginning of their work shift, by ensuring they do not engage in tasks where they may be exposed to noise above the REL on the day of the test, or by ensuring they wear appropriate hearing protection while working. Employees must be notified of this requirement.

Employees identified as part of the HCP are responsible for undergoing annual audiometric testing to determine if an STS has taken place. It is the employee's responsibility to schedule annual audiometric testing with Workforce Health and Safety. As with the baseline testing, there is a requirement for 14 hours of "quiet time" prior to being tested.

10.0 Noise Exposure Control

10.1 EMPLOYEE EXPOSURE MONITORING

Wherever feasible, employee noise exposures should be reduced below the Recommended Exposure Limit without the use of PPE.

The following noise control measures should be implemented if possible:

- Planned equipment purchases or modifications should be reviewed by the Department purchasing the equipment or the Capital Project Manager for that project to determine if the equipment will or could have an adverse effect on workplace noise levels.
- New equipment design specifications should aim to limit the noise generated by the equipment to 85 dBA or less.
- When purchases of new equipment, or modification or use of existing equipment, will result in the generation of noise levels in an area above 85 dBA; the Department must consider the implementation of engineering controls such as acoustical barriers, source enclosure, vibration isolation, or exhaust muffling in order to reduce noise levels in the work environment.
- As noise levels decrease with distance, noisy equipment should be placed away from the workstations of as many employees as feasible.

10.2 ADMINISTRATIVE CONTROLS

Where engineering controls are either not feasible or are insufficient in reducing employee exposures below the Recommended Exposure Limit, administrative controls should be implemented if possible. Administrative controls are changes in the work schedule or operational modifications that change the deployment of personnel to hazardous areas at peak noise-producing times. These controls will not reduce the noise produced by any machinery but can reduce an employee's exposure to noise levels throughout the day, resulting in a decreased exposure level.

Examples of administrative controls include:

- Rotating workers to reduce the time of exposure.
- Increasing the distance between workers and noise sources.
- Restricting access to areas with high noise levels to essential employees.
- Reducing the time an employee is required to be in a high-noise area.
- Placing signage near the entrance of a high-noise area to communicate the noise hazard present to all affected employees.

11.0 Personal Protective Equipment - Hearing Protection

When engineering and administrative noise control measures are either not feasible or insufficient to reduce employee exposures below the Recommended Exposure Limit, employees must use hearing protection designed to reduce their exposure below the REL. Work in high-noise areas is not permitted without proper hearing protection.

Employees whose noise exposure level is below the REL (85 dBA) but above the AL (82 dBA) are not required to wear hearing protection, although it is encouraged that they do so.

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11.1 SELECTION

The following criteria must be considered when selecting hearing protectors:

- Hearing protectors must be assessed and approved by EHS in order to ensure adequate hearing protection.
- Hearing protectors must be provided at no cost to the employee.
- Hearing protectors are generally one of two types: earplugs, which are designed to fit inside the ear canal, and ear muffs, which are intended to fit over the ear. Employees must be offered a choice of the type of hearing protector they wish to use, provided noise exposure is sufficiently reduced by all offered protectors.
- Reusable hearing protectors must be cleaned, using methodology recommended by the manufacturer, after each day's use, and after each use if the hearing protectors are shared.
- Reusable hearing protection that is shared by individuals in an area must be placed back in its designated location following use and cleaning.
- The Noise Reduction Rating (NRR) must be sufficient to reduce an employee's exposure to 85 dBA or less.

11.1.1 Calculating Actual Noise Exposures

All hearing protection that is utilized in the workplace is assigned a Noise Reduction Rating (NRR). This value indicates the levels by which, if used perfectly, the hearing protection method will reduce noise exposure. However, as hearing protection is never perfectly utilized in the field due to human error and facial structure variations, the noise exposure reduction will be less than the NRR listed on the hearing protector's packaging. Because of this, OSHA has implemented a calculated NRR value to indicate the attenuation provided by a hearing protector.

To calculate attenuation levels provided by one piece of hearing protection, subtract 7 dBA from the NRR listed on the packaging and divide the value obtained by two. So, if a pair of earplugs has an NRR of 33 listed on the packaging, the actual attenuation would be $(33 - 7)/2 = 13$ dBA.

If two hearing protection methods are utilized simultaneously (i.e., earplugs and earmuffs), the actual attenuation level would be calculated by adding 5 dBA to the adjusted NRR of the hearing protector with the higher NRR value.

11.2 USE AND CARE OF HEARING PROTECTORS

Hearing protectors are only effective if they are fitted and used correctly. Improper use of hearing protectors may result in exposure to excessive levels of noise, skin irritation, or ear infections. Due to the perception that noise exposure is reduced, improper use of hearing protection may result in greater noise exposure than if no hearing protection was used at all.

The following guidelines should be followed when using hearing protection:

- Employees should be fitted and trained by EHS in the proper use of hearing protection before its use.
- Disposable earplugs must be discarded once they become dirty or damaged or end a work shift.
- Reusable hearing protectors must be cleaned according to the manufacturer's directions after each day of use or between users if shared.
- Hearing protectors must be replaced when worn, stiff, or misshapen.

See [Appendix C](#) for a guideline for the proper use of foam earplugs.

11.3 VOLUNTARY USE OF HEARING PROTECTORS

If employees are concerned about noise exposure and its effects in the workplace, they may choose to wear hearing protection. Where exposures are not above the REL, but employees elect to wear hearing protection, it is important that they be properly fitted and trained to prevent injury or infection.

While the use of hearing protection is recommended for employees whose exposure is above the AL (82 dBA), but below the REL (85 dBA), it is not mandatory unless:

- The employee has not received an audiogram, and no baseline audiogram has been established, or;
- There are less than 14 hours to the employee's audiogram, or;
- A physician requires the use of hearing protection or;
- The employee has experienced an STS.

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NOTE: The use of personal earbud-type earphones may generate noise levels that may result in permanent hearing damage and can interfere with communication. As such, their use is not permitted when working in areas or performing tasks that pose a recognized noise hazard due to the potential for cumulative negative effects.

12.0 Record Retention, Availability, and Review

12.1 RECORDKEEPING

12.1.1 Exposure Records

EHS will maintain copies of all exposure-monitoring reports for no less than two years following the date of measurement.

12.1.2 Audiometric Test Records

Workforce Health and Safety will maintain records of all audiometric tests for the duration of the affected employee's employment. Records will include:

- The name and job classification of the employee,
- The date of the audiogram,
- Audiogram results,
- The examiner's name,
- The date and results of the employee's most recent noise exposure assessment, and
- Measurements of background sound pressure levels in audiometric test rooms.

The date of the last acoustic or exhaustive calibration of the audiometer will be recorded in a logbook and maintained on-site.

12.2 PROGRAM REVIEW

EHS will review this program on a yearly basis and make changes as necessary.

Reassessments of all "High Noise Areas" will be performed at a minimum every five years, and will be performed with an increased frequency if an STS has occurred.

12.3 TRAINING RECORDS

The most recent training records for all employees in the HCP will be kept for the duration of the employee's participation in the HCP.

13.0 Definitions

- **Action Level:** An 8-hour Time-Weighted Average (TWA) of 82 decibels measured on the A-weighted scale, slow response; or, equivalently, a dose of 50% based on the NIOSH Criteria for a Recommended Standard, using a dose of 100% for an 8-hour TWA of 85 dBA and a 3 dBA exchange rate. This is the level of sound exposure at which employee monitoring should occur and which voluntary use of hearing protectors is encouraged.
- **Audiogram:** A chart, graph, or table resulting from an audiometric test showing an individual's hearing threshold levels as a function of frequency.
- **A-Weighted Sound Level (dBA):** The weighting of sound levels that represents the function of the human ear.
- **Audiometric Testing Program:** The portion of the Hearing Conservation Program that consists of measuring an employee's hearing threshold to establish a baseline, which is used for subsequent comparisons.
- **Baseline Audiogram:** The audiogram against which future audiograms are compared.
- **Decibel (dB):** Logarithmic unit of measurement used to identify the intensity of a sound.
- **Dose:** A ratio of noise exposure relative to the noise criterion of choice, expressed as a percentage. According to the NIOSH criteria, 85 dBA represents a dose of 100% over an 8-hour work shift. Dose percent is based on the exchange rate specified in the criteria being used, which in the NIOSH case is 3 dBA. Dose may be determined from the equation given in Table 1 in [Appendix B](#), or estimated from Table 3 based on the TWA.

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- **Hearing Conservation Program (HCP):** A written program that establishes procedures to ensure the protection of employees from high noise areas or operations, in compliance with the OSHA Occupational Noise Regulation 29 CFR 1910.95.
- **Noise Dosimeter:** An instrument that integrates a function of sound pressure over a period of time in such a manner that it directly indicates a noise dose.
- **Noise Induced Hearing Loss:** The OSHA recordable occupationally related hearing loss, as defined by 29 CFR 1904.10 and 29 CFR 1904.5. This includes a Standard Threshold Shift (STS) of 10 dB, with age correction, averaged over the 2K, 3K, and 4K frequencies from baseline in either ear, and a 25 dB shift from audiometric zero, in the same ear as the 10 dB STS at the same frequencies.
- **Noise Monitoring:** The sampling of noise levels using a sound level meter, octave band analyzer, or personal noise dosimeter.
- **Noise Reduction Rating (NRR):** The theoretical maximum amount of noise reduction that can be achieved by using a particular hearing protection device.
- **Permissible noise Exposure Limit (PEL):** The maximum daily noise exposure, as legally enforced by OSHA, which may be experienced by employees not using hearing protectors from a continuous 8-hour exposure to a sound level of 90 dBA or equivalent dose of 100%.
- **Recommended Exposure Limit (REL):** The maximum daily noise exposure recommended by NIOSH that may be experienced not using hearing protectors from a continuous 8-hour exposure to a sound level of 85 dBA or equivalent dose of 100% using the criteria set forth by "NIOSH Criteria for a Recommended Standard". This is the level at which employee participation in the hearing conservation program is mandatory, as noise above this level over a long period of time may cause hearing damage.
- **Standard Threshold Shift (STS):** A change in hearing threshold, relative to the most recent audiogram for that employee, of an average of 10 decibels (dB) or more at 2000, 3000, and 4000 hertz in one or both ears and substantiated within 30 days with a follow-up audiogram.
- **Time-Weighted Average (TWA):** The (equivalent) noise level, in dB, based on an 8-hour exposure time frame. If the noise level is not constant over an 8-hour exposure, then a calculated 8-hour TWA will be made based on the actual exposure, either as displayed by the noise dosimeter or by using the equation found in Table 1 in [Appendix B](#).

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Appendix A: WCM Areas with Identified High Noise Levels

ID	Description	Location	PI/Director	Date Last Inspected	Due Date
1010000194	Monitor MER	A-11	Murphy, Michael	10/11/2024	10/11/2025
1010000193	MER	A-SB (A-0034 & A-0036)	Murphy, Michael	10/11/2024	10/11/2025
1010000195	Monitor MER	C-8, C-826 (MER)	Murphy, Michael	10/11/2024	10/11/2025
1010000197	Monitor MER	LC-1102 (MER)	Murphy, Michael	10/11/2024	10/11/2025
1010001209	Feeds Waste Bedding Dispenser System pump room	BB.0M.10	Murphy, Michael	10/11/2024	10/11/2025

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Appendix B: TWA Calculations and Reference Durations (Based on NIOSH Criteria)

Table 1: Calculating Noise Dose

$$D = [C_1/T_1 + C_2/T_2 + \dots + C_n/T_n] \times 100$$

Where:

- C_n = total time of exposure at a specified noise level, and
- T_n = exposure duration for which noise at this level becomes hazardous

The daily dose can be converted into an 8-hour TWA, based on the NIOSH criteria, according to the following formula (or as shown in Table 3):

$$TWA = 10.0 \times \text{Log}(D/100) + 85$$

Table 2: Noise exposure levels and durations that no worker shall equal or exceed

Exposure level, <i>L</i> (dBA)	Duration, <i>T</i>			Exposure level, <i>L</i> (dBA)	Duration, <i>T</i>		
	Hours	Minutes	Seconds		Hours	Minutes	Seconds
80	25	24	—	106	—	3	45
81	20	10	—	107	—	2	59
82	16	—	—	108	—	2	22
83	12	42	—	109	—	1	53
84	10	5	—	110	—	1	29
85	8	—	—	111	—	1	11
86	6	21	—	112	—	—	56
87	5	2	—	113	—	—	45
88	4	—	—	114	—	—	35
89	3	10	—	115	—	—	28
90	2	31	—	116	—	—	22
91	2	—	—	117	—	—	18
92	1	35	—	118	—	—	14
93	1	16	—	119	—	—	11
94	1	—	—	120	—	—	9
95	—	47	37	121	—	—	7
96	—	37	48	122	—	—	6
97	—	30	—	123	—	—	4
98	—	23	49	124	—	—	3
99	—	18	59	125	—	—	3
100	—	15	—	126	—	—	2
101	—	11	54	127	—	—	1
102	—	9	27	128	—	—	1
103	—	7	30	129	—	—	1
104	—	5	57	130-140	—	—	<1
105	—	4	43	—	—	—	—

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Table 3: Daily noise dose as an 8-hour TWA

Dose (%)	dBA as 8-hr TWA	Dose (%)	dBA as 8-hr TWA	Dose (%)	dBA as 8-hr TWA
20	78.0	2,000	98.0	450,000	121.5
30	79.8	2,500	99.0	500,000	122.0
40	81.0	3,000	99.8	600,000	122.8
50	82.0	3,500	100.4	700,000	123.5
60	82.8	4,000	101.0	800,000	124.0
70	83.5	4,500	101.5	900,000	124.5
80	84.0	5,000	102.0	1,000,000	125.0
90	84.5	6,000	102.8	1,100,000	125.4
100	85.0	7,000	103.5	1,200,000	125.8
110	85.4	8,000	104.0	1,300,000	126.1
120	85.8	9,000	104.5	1,400,000	126.5
130	86.1	10,000	105.0	1,600,000	127.0
140	86.5	12,000	105.8	1,800,000	127.6
150	86.8	14,000	106.5	2,000,000	128.0
170	87.3	16,000	107.0	2,200,000	128.4
200	88.0	18,000	107.6	2,400,000	128.8
250	89.0	20,000	108.0	2,600,000	129.1
300	89.8	25,000	109.0	2,800,000	129.5
350	90.4	30,000	109.8	3,000,000	129.8
400	91.0	35,000	110.4	3,500,000	130.4
450	91.5	40,000	111.0	4,000,000	131.0
500	92.0	45,000	111.5	4,500,000	131.5
550	92.4	50,000	102.0	5,000,000	132.0
600	92.8	60,000	112.8	6,000,000	132.8
650	93.1	70,000	113.5	7,000,000	133.5
700	93.5	80,000	114.0	8,000,000	134.0
750	93.8	90,000	114.5	9,000,000	134.5
800	94.0	100,000	115.0	10,000,000	135.0
900	94.5	110,000	115.4	12,000,000	135.8
1,000	95.0	120,000	115.8	14,000,000	136.5
1,050	95.2	130,000	116.1	16,000,000	137.0
1,100	95.4	140,000	116.5	18,000,000	137.6
1,150	95.6	150,000	116.8	20,000,000	138.0
1,200	95.8	175,000	117.4	22,000,000	138.4
1,300	96.1	200,000	118.0	24,000,000	138.8
1,400	96.5	225,000	118.5	26,000,000	139.0
1,500	96.8	250,000	119.0	28,000,000	139.5
1,600	97.0	275,000	119.4	30,000,000	139.8
1,700	97.3	300,000	119.8	32,500,000	140.1
1,800	97.6	350,000	120.4		
1,900	97.8	400,000	121.0		

$$*TWA = 10 \times \text{Log}(D/100) + 85$$


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Appendix C: Proper Application of Foam Earplugs

Putting in soft foam earplugs

To get the best protection from your soft foam earplugs, remember to **roll**, **pull**, and **hold** when putting them in. Use clean hands to keep from getting dirt and germs into your ears!


- 

1. Roll the earplugs up into a small, thin "snake" with your fingers. You can use one or both hands.
- 

2. Pull the top of your ear *up and back* with your opposite hand to straighten out your ear canal. The rolled-up earplug should slide right in.
- 

3. Hold the earplug in with your finger—as far as it will go. Count to 20 or 30 *out loud* while waiting for the plug to expand and fill the ear canal. Your voice will sound muffled when the plug has made a good seal.

Check the fit when you're all done. The entire foam body of the earplug should be within the ear canal. Try cupping your hands tightly over your ears. If sounds are much more muffled with your hands in place, the earplug may not be sealing properly. Take them out and try again.


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