A Guide to Hearing Safety



SECTION 1:

INTRODUCTION

Approximately 30 million American workers are exposed to hazardous levels of noise in the workplace. Exposure to hazardous levels of noise can cause noise-induced hearing loss (NIHL) by damaging the ear. Initially, the noise exposure may cause a temporary hearing loss. Repeated exposures may lead to permanent damage to the ear and permanent and irreversible hearing loss. Exposure to high levels of noise can also cause other harmful health effects as well, such as stress, chronic ringing in the ears, and high blood pressure. In addition, unprotected workers in high noise environments have more lost time accidents, are less productive, have higher absenteeism rates, and have more discipline problems.

If your workplace has high noise levels, your business is required by the California Occupational Safety and Health Administration (Cal/OSHA) to have a “Hearing Conservation Program (HCP).” You may also be required to lower the noise level.

This product is designed to help you:

- Find out whether your business needs a HCP and noise controls.
- Start up your HCP, if needed.

SECTION 2:

DO I NEED NOISE MONITORING

Signs that you may need noise monitoring:

- People in your workplace need to raise their voices to be heard by someone standing at arm’s length.
- Workers are experiencing ringing or buzzing (tinnitus) in the ears or temporary hearing loss after leaving the work area.
- Workers have evidence of permanent hearing loss.
- Workers are complaining about the noise level.

REGULATORY REQUIREMENTS

Cal/OSHA Action Level (AL): The average employee noise exposure for an 8 hour day, which when reached or exceeded requires the implementation of activities (the HCP) to reduce the risk of noise-induced hearing loss. The Cal/OSHA Action Level (AL) for

noise is 85 dBA.

Cal/OSHA Permissible Exposure Limit: Permissible Exposure Limit: The average employee noise exposure for an 8 hour day, 40 hour work week at which nearly all employees may be exposed without adverse health effects. The Cal/OSHA Permissible Exposure Limit (PEL) is 90 dBA.

NOTE: (1) Type 2 sound level meters are typically used for occupational noise evaluations. Cal/OSHA recognizes an error factor of plus or minus 2 dBA with this equipment, something that should be kept in mind when determining if the AL or PEL is being exceeded. (2) The AL and PEL are intended to protect most, not all exposed employees.(3) Adjustments are made where employees work shifts greater than 8 hours.

DEFINITION

Noise Dosimetry: A type of sound level monitoring where specialized equipment (noise dosimeters) are placed on a representative number of employees for the entire shift. These instruments measure the sound level and will give an average sound level for the time sampled (TWA) and are designed to calculate whether the sound level will meet or exceed the AL or the PEL of 90 dBA, 8-hour TWA.

TAKING NOISE MEASUREMENTS

Start with a sound level meter (a Type 1 or Type 2 – Type 2 is most common and less expensive) survey of various areas throughout your facility during the busiest, noisiest shifts. Be sure to follow the equipment's instructions on proper use for occupational noise evaluations, and calibration. Don't forget to include the equipment that repair and maintenance personnel work on, such as compressors, boilers, and machine shop equipment. (Use Form I – Sound Level Meter Survey Record to help you document the noise levels.) Use the sound level meter to take instantaneous readings to identify individuals that could be exposed to high levels of noise, and areas where high levels of noise exist.

If you get any sound level readings near or exceeding 85 decibels measured on the A-scale (dBA), have a qualified health and safety professional conduct noise dosimetry. The Cal/OSHA "Action Level" is an 8-hour time-weighted average (TWA) of 85 dBA. Peak sound levels from impulsive or impact noise should not exceed 140 dB, so be sure to make a special note of sound levels that approach this number – noise controls may be necessary. Peak/impulse sound levels are measured a little differently, so be sure to follow the equipment's instructions accordingly.

Once a particular job or area is identified as having a TWA at or above 85 dBA, all employees who perform that job or work in that area must be in a HCP. The employees that are monitored are representative of other employees in their department, job, or location.

Some industries are exempt from having to implement a HCP. Agriculture, Construction, and Oil and Gas Well drilling and servicing operations are exempt from the HCP requirement. All industries are required to control their employee noise exposures so that they do not exceed the PEL.

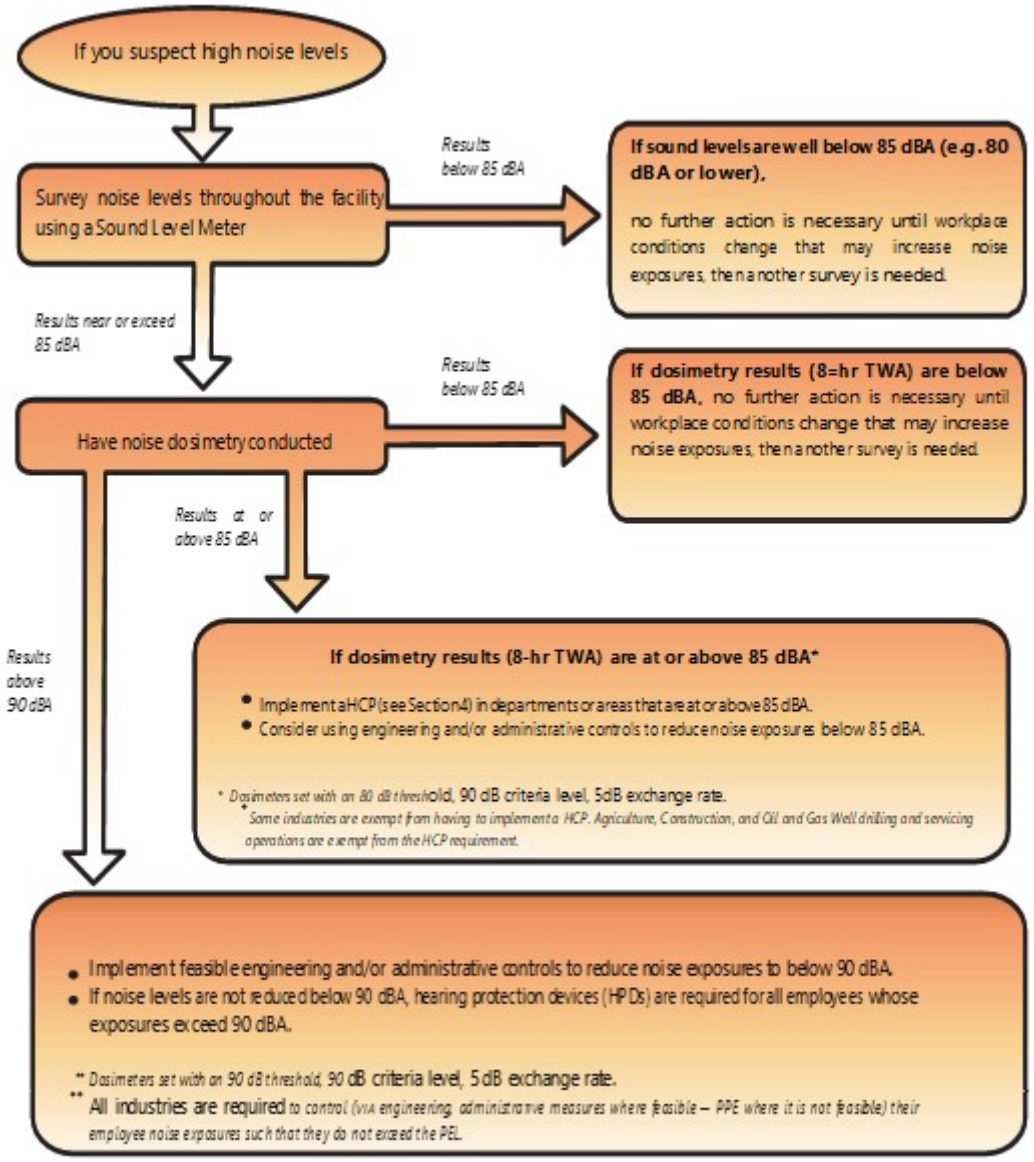
Be sure to document all surveys well and notify all affected employees of monitoring results. (Form II – Noise Dosimetry Survey Record can be used to help you document noise monitoring.) See the recordkeeping portion for details about keeping records.

This booklet contains forms and information to help you comply with Cal/OSHA requirements. You can avoid the need for a HCP by reducing your workplace noise so

that your employees' noise exposure does not exceed 85 dBA on an 8-hour time weighted average. It is recommended that you contact an acoustical engineer or consultant and implement control measures to reduce your employees' exposure to less than 85 dBA. Acoustical engineers can be found by typing **acoustical engineer** followed by the location, or typing **directory of acoustical consultants** into a computer search engine.

SECTION 3

NOISE MONITORING DECISION CHART



SECTION 4:

HEARING CONSERVATION PROGRAM ELEMENTS

Your business needs a HCP if employee 8-hour TWA noise exposures are equal to or greater than 85 dBA, and your business is not Agriculture, Construction, and Oil and Gas Well drilling and servicing operations which are exempt from the HCP requirement.

There are five main elements of HCPs:

Noise Monitoring	**Sound level meter surveys or noise dosimetry surveys to identify jobs and areas that require controls and compliance**
Audiometry (Hearing Tests)	**A surveillance program of hearing tests to track whether employee hearing loss is being prevented**
Training	**At least annually, the employer must train employees on how hearing loss occurs and the proper way to wear and maintain HPDs**
Hearing Protection Devices	**A variety of HPDs must be supplied and maintained at the employer's expense**
Recordkeeping	**The employer must keep records of audiometry, noise monitoring, and employee training**

In the add forms section of this product are the "Hearing Conservation Program Compliance Checklists." Filling these out will guide you through each program element. When these checklists are complete they can be integrated into your written Injury and Illness Prevention Program or safety program.

NOISE MONITORING – WHEN IT MAY BE NEEDED

When information indicates that any employee's exposure may equal or exceed an 8-hour TWA of 85 dBA, the employer shall develop and implement a monitoring program.

It is necessary to periodically update noise data because noise levels can change over time. Equipment that is out of balance or that needs a tune-up can become louder. Adding new equipment will add to the noise level. Replacing old equipment with new equipment can also change the noise level – sometimes lowering it. Also, changing job tasks can change employee noise exposure levels.

Cal/OSHA requires that monitoring be repeated whenever a change in production, process, equipment or controls increases noise exposures to levels where additional employees are exposed above the AL or where the hearing protectors used may no longer be adequate. However, it is a good idea to re-monitor when any changes are made to ensure that your program is just right.

AUDIOMETRY (HEARING TESTS)

Audiometry is crucial to the success of the HCP. It is the only way to determine whether hearing loss is being prevented. Because hearing loss is gradual and not painful, the affected employee will not notice the change until a loss has occurred. Hearing loss due to noise overexposure is permanent. Employees who receive feedback from the audiologist about their hearing status are much more likely to assume responsibility for preserving their hearing.

The audiometric monitoring program:

- Educates and motivates the employee.
- Assesses overall program effectiveness.
- Provides a health screening benefit.

A baseline (first) audiometric test within six months of the first exposure at or above the AL (Test must be preceded by 14 hours without workplace noise exposure – 80 dBA or less.) OR if a mobile test van is used, a baseline audiometric test within one year of the first exposure at or above the AL
Cal/OSHA requires that employees who are in HCPs receive audiometric tests as follows:

AUDIOMETRIC TESTS AT LEAST ANNUALLY THEREAFTER

* Be aware that if a mobile test van is used and employees will be working more than six months without a first (baseline) audiometric test, employers must require these employees to wear hearing protectors until the baseline audiogram is obtained.

Annual audiograms are compared with the baseline audiogram to determine whether hearing loss has occurred. Cal/OSHA considers a Standard Threshold Shift (STS) to be an indication of hearing loss.

DEFINITION

Standard Threshold Shift (STS): A change in the hearing threshold relative to the baseline audiogram of an average of 10 decibels or more at frequencies of 2000, 3000, and 4000 hertz in either ear.

In other words, if the audiologist must turn the audiometer volume up an average of 10 decibels so that the worker can hear these tones, it denotes a STS. Cal/OSHA allows some hearing loss from aging (presbycusis) to be factored into the calculation of the STS.

When an employee is found to have a STS (confirmed by a retest within 30 days) the employee must be:

- Informed, in writing, within 21 days.
- Provided with and required to wear HPDs, if he or she doesn’t already have them. Refitted and retrained in the use of HPDs and provided with hearing protectors offering greater protection if necessary.
- Employees with a STS must have HPDs that decrease their exposure to 85 dBA or below, instead of 90 dBA or below.

Use Form IV – Audiometry Program Evaluation Checklist, to help you assess potential providers.

TRAINING

A HCP that overlooks the importance of education and motivation is not likely to be successful, because employees will not understand why it is in their best interest to cooperate and management will fail to show the necessary commitment.

A training program must be instituted for all employees who are exposed to noise at or above an 8-hour TWA of 85 dBA.

The training program must be repeated annually for each employee included in the HCP. Information provided in the training program shall be updated to be consistent with changes in protective equipment and work processes.

Training must include:

- The effects of noise on hearing.
- The purpose of HPDs, the advantages, disadvantages, and attenuation of various types, and instructions on selection, fitting, use, and care.
- The purpose of audiometric testing and an explanation of test procedures.

You must also make copies of the Occupational Noise Regulation (California Code of Regulations, Title 8, General Industry Safety Orders, Occupational Noise, Control of

Noise Exposures, Sections 5095 through 5100) available to affected employees or their representatives and post a copy in the workplace.

Thoroughly document all training. Use Form V – “Employee Training Record” to help you.

EFFECTIVE TRAINING STRATEGIES:

- Have current, relevant training.
- Train an individual employee before he or she is exposed to noise – don’t just wait for the annual training.
- Limit content to short simple presentations of the most relevant facts.
- Focus on real-life losses employees may experience; use testimonials from well-respected peers.
- Have the audiologist explain audiometry results to individual employees.
- Refer to off-the-job exposures as well as on-the-job exposures.
- Tailor the training to the specific group and industry.
- Train in small groups to encourage interaction.
- Encourage questions from employees.
- Include hands-on practice with hearing protectors.
- Use films and pamphlets as supplemental reinforcement only; use current materials.
- Use opportunities other than the formal training sessions (e.g. the annual audiometric test).

HEARING PROTECTION DEVICES

Personal hearing protection devices (HPDs), or hearing protectors, can be worn to reduce the harmful effects of sound. Earplugs and earmuffs are the two most commonly used types of HPDs. Other important types are ear canal caps and helmets. Each employee reacts differently to the use of these devices and a successful HCP should be able to respond to the needs of each employee. It is important to ensure that HPDs are worn consistently and properly.

Cal/OSHA Requirements for HPDs:

- HPDs are required to be worn when:
- Controls have not decreased noise exposure levels to at or below 90 dBA.
- Baseline audiometric tests have not been done and noise levels are at or above than 85 dBA.
- There is a Standard Threshold Shift (STS) and noise levels are greater than 85 dBA.

HPDs must be made available to employees when:

- Noise exposure levels are at or above 85 dBA (8-hour time-weighted average).
- Employers must provide workers with a variety of HPD types to choose from.
- Employers must ensure proper initial fitting and provide training on the proper use and care of HPDs.
- Employers must ensure that the HPDs reduce employee exposures to an 8-hour TWA of 90 dBA or less and 85 dBA or less when an employee has experienced a STS.

To know how to comply with this last requirement you need to know what the Noise Reduction Rating (NRR) is and understand how it works.

DEFINITION

Noise Reduction Rating (NRR): The NRR is a single-number rating method which attempts to describe a HPD based on how much the overall noise level is reduced by use of the HPD. When estimating A-weighted noise exposures (measured on the dBA scale) it is important to remember to first subtract 7 dB from the NRR and then subtract the remainder from the A-weighted noise level.

(The Cal/OSHA Occupational Noise Regulation, Appendix E, lists four methods to estimate the adequacy of hearing protectors, the simplest of which is to subtract 7 dB from the stated NRR. You must adjust the NRR of the HPD used at your workplace by using one of the Cal/OSHA methods.)

In addition to this adjustment, you can factor in a margin of safety. Using a 50% safety factor is a standard approach. For example, for an earplug with a NRR of 29 dB: First subtract 7 to get 22 dB. Then divide 22 in half (50%) to get a final, adjusted NRR of 11 dB. This earplug is adequate to protect most workers exposed to sound levels up to 101 dBA. (101 dBA – 11 = 90 dBA) Earmuffs can be combined with earplugs to increase protection by 5 decibels over the higher of the two adjusted NRR ratings.

Recordkeeping

Too many companies have found that their recordkeeping system was inadequate only when accurate information was most needed. Remember: if it isn’t documented, it didn’t happen.

Cal/OSHA regulations require that you must maintain accurate records of all:

- Employee exposure measurements for at least 2 years.
- Audiometric tests for the duration of the worker’s employment.

The audiograms shall include:

- The name and job classification of the employee.
- The date of the audiogram.
- The examiner’s name.
- The date of the last audiometer calibration.
- The employee’s most recent noise exposure assessment.

You must also maintain accurate records of the background sound pressure levels in audiometric test rooms.

These records are to be provided, upon request, to employees, former employees, representatives of the employee, and to representatives of regulatory agencies.

If you sell your business the records must be transferred to the new employer.

In addition, you should also keep copies of all training records: sign-in sheets, training agenda or curriculum, list of materials used, and completed quizzes. (See Form V. Employee Training Record).

SECTION 5: BENEFITS OF A GOOD HEARING CONSERVATION PROGRAM (HCP)

How Can You Develop a Good HCP?

- Strive for excellence rather than just meeting minimal requirements.
- Ensure that management and supervisors support hearing conservation goals and

actively contribute to a safety climate that encourages and enables employees to engage in good practices.
- Integrate the HCP into the company's overall written safety program.
- Educate and motivate employees so that hearing conservation practices become an integral part of their behavior on and off the job.
- Designate a key person as coordinator and implementer of the program.
- Strive for simplification and continuity of the program's operating procedures.
- Involve the employees in the process of developing and implementing HCPs.
- Establish quality assurance practices to make sure that all information used in the program is accurate and current.
- Review the program's effectiveness no less than annually and make modifications when needed.

From: A Practical Guide to Preventing Hearing Loss DHHS (NIOSH) Publication #96-110, National Institute for Occupational Safety & Health, Cincinnati, Ohio, June, 1996

SECTION 6: WHO NEEDS NOISE CONTROL

You are required to install or implement feasible administrative or engineering controls to reduce employee exposure to noise if you have employees who are exposed to 8-hour TWA noise levels over 90 dBA*. If noise levels are still over 90 dBA after these controls are in place, employees will need to be protected from noise exposure with HPDs.

When noise levels are decreased, workers are not only better protected from hearing loss, but they can communicate better and hear warnings and alarms more easily. Lower noise levels make for a safer, more productive workplace.

Consider the benefits of using administrative or engineering controls if noise levels are between 85 and 90 dBA. If you can decrease levels to below 85 dBA you are no longer required to have a HCP. When you weigh the ongoing time and costs of audiometry, training, HPDs, and recordkeeping against the costs of implementing noise controls, you may decide that implementing controls is a better idea.

*Dosimeters set with a 90 dB threshold

SECTION 7: NOISE CONTROL INFORMATION

There are two basic types of noise control – engineering and administrative.

ENGINEERING CONTROL INFORMATION

Engineering controls are any engineering methods used to reduce or control the sound level of a noise source by modifying or replacing equipment or making any physical changes along the transmission path. Engineering controls address the root causes of noise and are the best long-term control measures. In order to work there must be a clear determination of the cause of the noise. HPDs are not a type of engineering control.

Examples of engineering noise controls:

- Maintenance and repair of equipment (tune-ups, rebalancing, etc.).
- Enclosures (enclose the source or enclose the worker – sound shields, control rooms).
- Sound absorbing materials (thick, soft, porous, fuzzy materials are good sound absorbers).
- Modification of mechanical impacts (reduce driving force, reduce the distance

between impacting parts).
- Reducing air or fluid velocity.
- Vibration damping.
- Vibration isolation.
- Noise cancellation technology.
- Silencers and mufflers.
- Replacement of machines with quieter equipment.
- Increasing the distance between the noise source and the employee.

You should consult with an acoustical engineer or consultant to determine the best engineering control measure for your workplace. Acoustical engineers can be found by typing “acoustical engineer” followed by the location, or typing “directory of acoustical consultants” into a computer search engine.

ADMINISTRATIVE CONTROL INFORMATION

Administrative controls are any managerial decisions that impact worker noise exposures. Examples of these are:

- Job rotation – modify jobs so employees are alternating quieter tasks with noisy tasks.
- Work scheduling – modify work schedules or production schedules so fewer employees are working when noisy machinery is operating.

To make administrative controls work, you must have a good characterization of noise exposure from different job tasks. Conduct further noise dosimetry to validate that job rotation or work scheduling have really decreased exposure levels for the targeted workers. You do not want to create a situation where you have more workers exposed above 85 dBA than when you started.

To assist employers in administratively controlling noise exposures, Cal/OSHA has published Table N-1 in Cal/OSHA regulations Title 8 Section 5096. Table N-1 lists the amount of time an employee can be exposed to various noise levels without exceeding the Permissible Exposure Limit for an 8 hour day exposure.

EXAMPLES

- If an employee’s exposure is 95 dBA for an 8-hour day from operating machinery, then the employee should only be exposed to the noise level of 95 dBA for 4 hours. The employer could possibly control the exposure by having 2 employees work 4 hours operating machinery, and 4 hours doing another task in a quiet area.
- You can be exposed for 30 minutes at 110 dBA or .5 of an hour without exceeding the 90 dBA PEL.

Table N-1 Permissible Noise Exposure1 Permitted Duration Sound Per Workday per Workday Level