ORANGE COUNTY SANITATION DISTRICT	SOP-106 (Ver. 3) Hearing Conservation Program
Standard Operating Procedure (SOP)	Effective: 1/25/2022 Supersedes: 11/02/2020
Approved By: James D. Herberg General Manager	

I. Purpose

A. The purpose of the Hearing Conservation Program is to provide a standard policy on the health and safety requirements and processes for all employees with potential exposure to excessive noise and to comply with occupational exposure limits. This is completed through equipment selection, exposure assessments, training, and annual hearing tests.

B. It is the policy of Orange County Sanitation District (OC San) to protect its employees from occupational injuries by implementing and enforcing safe work practices, including the appointment of qualified persons to manage this program.

C. OC San has developed this program in accordance with the state of California Occupational Safety and Health Administration (Cal/OSHA) Article 105 Control of Noise Exposure. Cal/OSHA mandates employees be provided with protection against noise exposure when sound levels exceed 90dBA 8-hour TWA and the OC San Hearing Conservation Program is applied when employee noise exposures meet the action level, 85 dBA 8-hour TWA.

II. Background

A. This program applies to all OC San employees. All employees conducting work where the potential for noise exposure exceeds 85 dBA as an 8-hour time-weighted average (TWA), or a dose of 50 percent, shall be supplied with appropriate hearing protection devices as required by this policy, at no cost.

III. Definitions

Action Level: An 8-hour time weighted average of 85 decibels measured on the A-scale, slow *response, or equivalently, a dose of 50 percent.*

Audiogram: A chart, graph, or table resulting from an audiometric test showing an individual's *hearing threshold levels as a function of frequency.*

Baseline Audiogram: The audiogram against which future audiograms are compared.

Decibel (dB): The unit of measure of sound level.

dBA (decibels-A-Weighted): A unit of measurement of sound level corrected to the A-weighted scale, as defined in ANSI S1.4-1971, using a reference level of 20 micropascals (0.00002 Newton per square meter.)

Hertz (Hz): A unit of measurement of frequency, numerically equal to cycles per second.

High Noise Area: An area where equipment operates more than 85 dBA.

Noise Dosimeter: An instrument used to measure sound level over the course of a work shift.

Noise Reduction Rating (NRR): Measure of the estimated attenuation capacity of a hearing protector to represent the approximate noise reduction, in dBA.

Otological Examination: A medical exam performed by an otologist (physician specialized in diagnosing and treating illnesses and injuries related to the ear).

Similar Exposure Group: Group of workers having the same general exposure profile for the agent(s) being studied because of the similarity and frequency of the tasks performed, the materials and processes with which they work, and the similarity of the way they perform tasks.

Sound Level: A measurement derived from the mathematical derivation of the measured A weighted
average sound level when compared to a standard reference pressure of 20 micropascals.

Sound Level Meter: An instrument used for the measurement of sound level.

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

Time-Weighted Average (TWA): The average time, over a given work period (e.g., 8-hour workday) of a person's exposure to a chemical or an agent. The average is determined by sampling for the contaminant throughout the period sampled.

IV. Responsibilities

A. Risk Management

1. The Hearing Conservation Program shall be managed and administered by the Risk Management Division. The division shall be responsible for the program development, including annual review.
2. Provide and coordinate initial and refresher training. Maintain training logs and rosters.
3. Administer noise monitoring, coordination of audiometric testing, and employee training.
4. Receive and review employee reports of occupational noise hazards and coordinate a response, including but not limited to, performing specialized noise hazard evaluations, and providing corrective actions.
5. Record a confirmed work-related average threshold shift in either ear of 10dB HL in 2000, 3000 and 4000 Hertz after applying the standard age correction methodology on the OSHA log within 6 days of identification.
6. Post noise hazard signage when noise levels exceed established noise action levels.
7. Coordinate with Divisions to ensure that appropriate noise controls are specified for new or retrofitted equipment.

B. Supervision

1. Ensure that all employees working in potentially hazardous noise areas (as defined herein) are familiar with the contents of this program.

2. Take appropriate steps to minimize the risk of noise-inducted hearing loss that may include implementing noise control measures, as well as the provision of hearing protection devices, as required.
3. Communicating in with and appropriately managing employees and contractors, ensuring that employees have appropriate training and qualifications, and for ensuring requirements of this program are met.
4. Request occupational noise evaluations when in their judgement they are needed. They may be guided by reports of noise that causes interference with conversing (face to face, via radio or via telephone) or by repeated complaints about loud and intrusive noise, ringing in the ears following exposure to noise, etc.

C. Employees

1. Wear assigned hearing protective devices where noise levels exceed 85 dBA as an 8-hour time-weighted average or in identified high noise areas.
2. Participate in medical surveillance program, including annual audiogram and hearing conservation training, as applicable.
3. Participate in exposure monitoring and noise assessment studies, as required.
4. Report areas of concern related to potentially high noise to supervision and Risk Management. Maintain hearing protective devices in sanitary condition and proper working order.
5. Shall be provided their acoustic and audiometric records upon request to the employee/former employee requesting the documentation, representatives designated by the employee and OSHA.

V. Exposure Monitoring and Assessments

A. Noise surveys and dosimetry shall be completed to determine areas where hearing protection is required and determine which employees must be included in this hearing conservation program, as dictated by the action level of 8-hour TWA of 85 dBA.

1. General Requirements
    a. When information indicates that an employee’s exposure may equal or exceed the action level, or equivalently a dose of 50 percent, OC San will obtain measurements for employees who will be exposed at or above that level.
    b. Monitoring will be completed either by area monitoring or personal monitoring that is representative of the employee’s exposure. Where there is high worker mobility, significant variation in sound, or component of impact sounds, representative personal dosimetry sampling will be used.
    c. Generally, buildings that contain loud pumps, motors, fans, and other mechanical equipment will be evaluated. OC San will not perform monitoring of administrative offices, storage buildings, or warehouses. The purpose of the assessment is to evaluate potential engineering/administrative controls and to assist in identifying the necessity for hearing protective devices.
    d. Measurements of the A-weighted sound pressure level in a workplace shall be performed instantaneously, during normal working conditions, using the slow response setting of a sound level meter.

e. Noise exposure levels will be determined through the integration of all continuous, intermittent, and impulsive sounds between 80 dB and 130 dB. Tasks and observations with regards to the potential noise exposure shall be documented, with recommendations respecting the measures collected to limit the employee's exposure to noise.

f. Exposure assessment equipment (sound level meters, dosimeters, acoustic calibrators) shall be properly calibrated and maintained.

g. Monitoring will be repeated whenever a change in production, process, equipment, or controls increase the noise exposures to where an employee may be exposed over the action level, or attenuation provided by hearing protective devices is rendered inadequate.

h. If an employee's noise exposure exceeds an 8-hour TWA of 85 dBA, or equivalently, a dose of 50 percent, monitoring shall be repeated every 2 years for the affected exposure group.

i. Monitoring shall be repeated within 3 months when there is a change in equipment, production processes or maintenance routines.

2. Area Monitoring and Personal Monitoring

a. Noise surveys shall be conducted in areas where noise exposures may exceed 80 dBA and where employees are most likely to work. Surveys will be performed to evaluate controls to reduce noise exposures, and to establish where signage is needed.

b. In areas where noise exposures exceed 80 dBA, an area or personal monitoring will be used to determine if employees noise exposures exceed an 8-hour TWA of 85 dBA.

c. Monitoring may be repeated at increased frequency if employees are developing significant threshold shifts.

d. If employees move around frequently, similar exposure groups (SEG) will be created to determine representative noise exposures.

e. If area monitoring is used to determine an employee's exposure, Attachment A will be used to compute the noise exposures.

f. Results of area monitoring will be documented on facility maps. The completed area noise surveys are available in Attachment B.

g. Employees will be notified of the monitoring results in writing as soon as they are available if they are exposed at or above the action level.

VI. Reduction / Control of Noise Exposure

A. Where reasonably practicable, OC San will utilize engineering controls or other physical means other than hearing protective devices to reduce the exposure to sound of employees to a level that does not exceed an 8-hour TWA of 85 dBA or equivalently, a dose of 50 percent.

B. Hierarchy of noise controls will be followed:

1. Elimination – where feasible the noise source will be eliminated to prevent risks to employees.

2. Engineering Controls – to reduce the noise at the source to eliminate the need for hearing protection, audiometric testing, and other elements of the hearing conservation program. Possible controls include reduction of noise at the source, enclosure of the noise source,

enclosure of employees, acoustical treatment of the rom, separating workers from the noise, or combination thereof.

3. Administrative Controls – education and training will be provided as a primary administrative control. Controls can also include work-rest cycles and infrequent work tasks. These controls are aimed at reducing time worker is exposed.

4. Use of Personal Protective Equipment (PPE) – when engineering controls cannot remove or reduce the noise hazard, hearing protective devices in the form of ear plugs and/or earmuffs shall be used.

VII. Warning Signs

A. Employees shall be notified of work locations in which noise levels exceed 85 dBA by signs, appropriately posted, indicating the requirement of hearing protection.

B. Signs shall be placed in conspicuous locations, easily seen by employees prior to entering an area with a noise hazard.

VIII. Hearing Protection Devices

A. General

1. OC San makes hearing protective devices available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater at no cost to the employees.

2. The Sanitation District shall ensure that hearing protectors are worn by all employees:

   a. Exposed to an 8-hour time-weighted average of 85 decibels or greater, or equivalently, a dose of 50 percent.

   b. When a baseline audiogram has not yet been established and exposure to high noise levels is anticipated, and

   c. Those who have experienced a standard threshold shift.

3. Employees shall be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by the employer. The improper fit or selection of hearing protection can lead to permanent hearing loss.

B. Hearing Protection Attenuation

1. Based upon sound levels measured, Risk Management will determine the minimum sound level attenuation required. Hearing protection device manufacture's published NRR are adjusted for employee anatomy variance. To calculate an employee's noise exposure when wearing hearing protection devices:

   a. Obtain the employee's A-weighted TWA.

   b. Take the hearing protection device manufacturer's published Noise Reduction Rating (NRR) of the hearing protection device and subtract 7 dB and this will give you the adjusted NRR. Subtract this adjusted NRR from the A-weighted TWA to obtain the employees noise exposure when equipped with that specific hearing protection device.

Example: If the NRR for an ear plug is 32 you would subtract 7 from the 32 and get a true NRR of 25 dB. So, if the noise level were 105 dB in an area you would subtract 25 dB from 105 dB to get 80 dB exposure to the employee.

c. The hearing protection device NRR is adjusted by to account for the hearing protection device manufacturer's testing methods to determine the NRR. The published NRR is calculated from an average attenuation provided by the hearing protection device to a testing pool. Due to anatomical differences that may lead to varied fit, the 7dB adjustment is used to account for potential overestimations when manufacturers assign NRR ratings.

C. Dual Hearing Protection

1. Earmuffs and ear plugs Noise Reduction Rating (NRR) cannot be directly added together.

2. If earmuffs and ear plugs are used together, 5 dB NRR are added to the higher noise reduction rated device.

3. With combined hearing protection devices, the user must take greater care due to the potential for inability to hear his or her surroundings.

IX. Employee Training

A. The success of this Hearing Conservation Program depends largely on effective employee education regarding all aspects of the program.

B. The primary focus of the training must be on the workers, and they must be informed about the reasons for and the requirements of the Hearing Conservation Program.

C. Annual training is provided to employees enrolled in the Hearing Conservation Program. Employees in the Hearing Conservation Program are employees who are exposed to 85 dBA or greater on an 8-hour time weighted average for 12 or more days per year and/or exceed a peak noise level of 140 dB linear peak.

D. The training shall cover hazards and effects of noise; the purpose, advantages, and disadvantages of various types of hearing protectors; the selection, fitting, and care of protectors; the purpose and procedures of audiometric testing and noise exposure data.

X. Audiometric Testing

A. General

1. All audiograms obtained shall meet the requirements of Cal-OSHA requirements found in Appendix B of Title 8, California Code of Regulations, Section 5097(c).

2. The audiometric testing includes both baseline and annual audiometry for all employees enrolled in the Hearing Conservation Program. The data from these tests shall be maintained by Risk Management.

3. Testing is performed by qualified, third-party audiometric technicians or by approved consultants who specializes in audiometric examinations. The test is made available to employees within one year of an employee's first exposure at or above the action level.

4. Testing is to be provided at no cost to the employees.

B. Baseline audiogram

1. The reference against which future audiograms are compared, should be obtained prior to an employee's first exposure to noise that equals or exceeds the action level. It shall be obtained as soon as possible, but no longer than 6 months, after it becomes known that the employee will be or is exposed to noise that equals or exceeds the action level. Testing to establish a baseline audiogram for employees shall be preceded by at least 14 hours without exposure to workplace noise.

2. This requirement may be met by wearing hearing protectors which will reduce the employee's exposure to a sound level of 85 dBA or below.

3. Risk Management will notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination.

C. Annual Audiogram

1. They are given to all employees exposed to 85 dBA, as an 8-hour time-weighted average, for 12 or more days per year and/or exceed a noise level of 140 dB linear peak. The results are compared to the baseline audiogram to determine if an employee's audiogram is valid and if a standard threshold shift (STS) has occurred. The STS is either a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more in 2000, 3000, and 4,000 Hertz (Hz) in either ear, after applying the standard age correction methodology shift of 25 dB HL or more in the same ear and frequency on two consecutive tests at frequencies between 1000 and 6000 hertz. The Offsite Occupational Clinic shall review problem audiograms to determine whether there is a need for further evaluation or referral. If an STS is identified, the employee shall be informed of this fact in writing within 21 days of the determination and shall be fitted or refitted with adequate hearing protectors and required to wear them.

2. If an STS is indicated because of the mobile van audiometric testing, the employee will have a follow-up test to confirm whether the STS is valid. This test shall be conducted at the Offsite Occupational Clinic.

3. At termination of work for the Sanitation District, an employee who has been exposed to noise is required to have an audiometric test performed as well.

4. Audiometric tests shall be pure tone, air conduction, hearing threshold examinations, with test frequencies including, as a minimum, 500, 1000, 2000, 3000, 4000, and 6000 Hz. Tests of each frequency shall be run separately for each ear.

D. Standard Threshold Shift

1. If a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift in one, or both ears, and the employee’s total hearing level is 25 dB or more above audiometric 0 (averaged at 2000, 3000, and 4000 Hz in the same ear(s) as the STS, the injury is to be recorded in the Cal/OSHA Log 300. The employee shall be informed of the STS, in writing, within 21 days of the determination.

   a. Retesting can occur within 30 days of the first test. If the retest does not show an STS, it is not required to be recorded in the Cal/OSHA Log 300. If it does confirm the STS, then it must be recorded on the log within 7 days of the STS. If subsequent testing performed

under the program indicates that an STS is not present, then you may erase or line-out the recorded Log 300 entry.

2. Unless a physician determines that the standard threshold shift is not work related or aggravated by occupational noise exposure, the Safety & Health Division shall ensure that the following steps are taken when a standard threshold shift occurs:
   a. An employee not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them; and
   b. A job restriction stating “Must wear hearing protection if exposed to noise levels exceeding 85 dBA” shall be placed in the employee’s medical file.
   c. The STS will be recorded on the OSHA 300 log as an injury.
   d. The new audiogram will then become the baseline for future comparisons.
3. The employee and his/her supervisor shall be notified of this restriction in writing.
4. The supervisor shall be responsible to ensure the employee properly wears hearing protection
5. An employee already using hearing protectors shall be refitted and retrained in the use of hearing protectors by the Safety and Health Division and provided with hearing protectors offering greater attenuation if necessary.
6. Refer the employee for a clinical audiological evaluation or an otological examination, as appropriate, if additional testing is necessary or if the district suspects that a medical pathology of the ear is caused or aggravated by the wearing of hearing protectors.
7. Inform the employee of the need for an otological examination if a medical pathology of the ear which is unrelated to the use of hearing protectors is suspected.
8. If subsequent audiometric testing of an employee whose exposure to noise is less than an 8-hour time-weighted average of 85 decibels indicates that a standard threshold shift is not persistent, the Risk Management Division:
   a. Shall inform the employee of the new audiometric interpretation; and
   b. May discontinue the required use of hearing protectors for that employee.
9. As used in this section, a standard threshold shift is a change in hearing threshold relative to the baseline audiogram of an average of 10 dB or more in 2000, 3000 and 4000 Hz in either ear.
10. In determining whether a standard threshold shift has occurred, allowance may be made for the contribution of aging (presbycusis) to the change in hearing level by correcting the annual audiogram according to the procedure described in 8 CCR Article 105, Appendix F: Determination and Application of Age Correction to Audiograms.

XI. Recordkeeping

All records created or generated during this procedure shall be legible and stored in a way that they are readily retrievable in facilities or electronic document/content management systems that provide a suitable environment to prevent damage, deterioration, or loss. Records may be in the form of any type of media, such as hard copy or electronic media. The OC San Records Retention Schedule is the

official procedure governing the retention, retirement, and destruction of District records. Document owners should use these schedules to determine the item and series that best fit their records. Document owners are responsible for ensuring that documents are properly marked, indexed, and filed for their projects or area of responsibility.

Noise exposure measurement records and audiometric test records shall be retained in the Safety Division office in accordance with District recordkeeping requirements. The audiometric record shall include:

1. Name and job classification of the employee.
2. Date of the audiogram.
3. Examiner's name.
4. Date of last acoustic calibration of the audiometer.
5. Employee's most recent noise exposure assessment.
6. Date of the last hearing conservation training and the name of the person conducting the training.

XII. References

SOP-102 Personal Protective Equipment

SOP-642 Industrial Hygiene Program

Title 8, California Code of Regulations Article 105, Control of Noise Exposure

XIII. Revision History

Version	Date	By	Reason
1	01/27/2009	Bauer, Welsey	New
2	08/06/2020	Huynh, Brian	Periodic Update – Refer to Program Change Log
3	12/07/2021	Huynh, Brian	Annual Policy Update – Refer to Program Change Log

XIV. Attachments

Attachment A: Noise Exposure Computation

Attachment B: Area Noise Maps

Attachment A

Noise Exposure Computation

I. Computation of Employee Noise Exposure

A. Noise dose is computed using Table A-1 as follows: When the sound level, L, is constant over the entire work shift, the noise dose, D, in percent, is given by: D = 100C/T where C is the total length of the work day, in hours, and T is the reference duration corresponding to the measured sound level, L, as given in Table A-1 or by the formula shown as a footnote to that table.

B. When the work shift noise exposure is composed of two or more periods of noise at different levels, the total noise dose over the work day is given by: D = 100 (C1/T1 + C2/T2 + . . . + Cn/Tn), where Cn indicates the total time of exposure at a specific noise level, and Tn indicates the reference duration for that level as given by Table A-1.

C. The eight-hour time-weighted average sound level (TWA), in decibels, may be computed from the dose, in percent, by means of the formula: TWA = 16.61 log10(D/100) + 90. For an eight-hour work shift with the noise level constant over the entire shift, the TWA is equal to the measured sound level.

D. A table relating dose and TWA is given in Section II.

Table A-1

A-weighted sound level, L (decibel)	Reference Duration, T (hour)	A-weighted sound level, L (decibel)	Reference Duration, T (hour)
80	32.0	106	0.87
81	27.9	107	0.76
82	24.3	108	0.66
83	21.1	109	0.57
84	18.4	110	0.50
85	16.0	111	0.44
86	13.9	112	0.38
87	12.1	113	0.33
88	10.6	114	0.29
89	9.2	115	0.25
90	8.0	116	0.22
91	7.0	117	0.19
92	6.1	118	0.16
93	5.3	119	0.14
94	4.6	120	0.125
95	4.0	121	0.11
96	3.5	122	0.095
97	3.0	123	0.082
98	2.6	124	0.072
99	2.3	125	0.063
100	2.0	126	0.054

101	1.7	127	0.047
102	1.5	128	0.041
103	1.3	129	0.036
104	1.1	130	0.031
105	1.0		

II. Conversion Between "Dose" and "8-Hour Time-Weighted Average" Sound Level.

A. Noise exposure is usually measured with an audio dosimeter which gives a readout in terms of "dose." Dosimeter readings can be converted to an 8-hour time-weighted average sound level (TWA).

B. In order to convert the reading of a dosimeter into TWA, use Table A-2. This table applies to dosimeters that are set to calculate dose or percent exposure according to the relationships in Table A-1. So, for example, a dose of 91 percent over an eight hour day results in a TWA of 89.3 dB, and a dose of 50 percent corresponds to a TWA of 85 dB.

C. If the dose as read on the dosimeter is less than or greater than the values found in Table A-2, the TWA may be calculated by using the formula:

D. TWA = 16.61 log10 (D/100) + 90 where TWA = 8-hour time-weighted average sound level and D = accumulated dose in percent exposure.

Table A-2: Conversion From “Percent Noise Exposure” or “Dose” to “8-Hour Sound Level (TWA)”

Dose or percent noise exposure	TWA
10	73.4
15	76.3
20	78.4
25	80.0
30	81.3
35	82.4
40	83.4
45	84.2
Dose or percent noise exposure	TWA
50	85.0
55	85.7
60	86.3
65	86.9
70	87.4
75	87.9
80	88.4
81	88.5
82	88.6
83	88.7
84	88.7
85	88.8
86	88.9
87	89.0
88	89.1
89	89.2
90	89.2
91	89.3
92	89.4
93	89.5

94	89.6
95	89.6
96	89.7
97	89.8
98	89.9
99	89.9
100	90.0
101	90.1
102	90.1
103	90.2
104	90.3
105	90.4
106	90.4
107	90.5
108	90.6
109	90.6
110	90.7
111	90.8
112	90.8
113	90.9
114	90.9
115	91.1
116	91.1
117	91.1
118	91.2
119	91.3
120	91.3
125	91.6

130	91.9
135	92.2
140	92.4
145	92.7
150	92.9
155	93.2
160	93.4
165	93.6
170	93.8
175	94.0
180	94.2
185	94.4
190	94.6
195	94.8
200	95.0
210	95.4
220	95.7
230	96.0
240	96.3
250	96.6
260	96.9
270	97.2
280	97.4
290	97.7
300	97.9
310	98.2
320	98.4
330	98.6

340	98.8
350	99.0
360	99.2
370	99.4
380	99.6
390	99.8
400	100.0
410	100.2
420	100.4
430	100.5
440	100.7
450	100.8
460	101.0
470	101.2
480	101.3
490	101.5
500	101.6
510	101.8
520	101.9
530	102.0
540	102.2
550	102.3
560	102.4
570	102.6
580	102.7
590	102.8
600	102.9
610	103.0

620	103.2
630	103.3
640	103.4
650	103.5
660	103.6
670	103.7
680	103.8
690	103.9
700	104.0
710	104.1
720	104.2
730	104.3
740	104.4
750	104.5
760	104.6
770	104.7
780	104.8
790	104.9
800	105.0
810	105.1
820	105.2
830	105.3
840	105.4
850	105.4
860	105.5
870	105.6
880	105.7
890	105.8

900	105.8
910	105.9
920	106.0
930	106.1
940	106.2
950	106.2
960	106.3
970	106.4
980	106.5
990	106.5
999	106.6

Attachment A: Noise Exposure Computation

Attachment B

Area Noise Maps

Link to Plant 1 Area Noise Maps:

http://myocsd/hr/safety/Documents/Area%20Noise%20Maps/Plant%201

Link to Plant 2 Area Noise Maps:

http://myocsd/hr/safety/Documents/Area%20Noise%20Maps/Plant%202

Link to Outlying Pump Station Area Noise Maps:

http://myocsd/hr/safety/Documents/Area%20Noise%20Maps/Collections