City of Crystal Lake

Noise Dosimeter Survey
May 20 and 21, 2024

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TITAN
Safety Management, Inc.

PURPOSE AND SCOPE OF SURVEY

On May 20 and 21, 2024, a Noise Dosimeter Survey was conducted for the City of Crystal Lake located at 100 W. Woodstock Street, Crystal Lake, IL 60014. The purpose of the survey was to provide noise measurements on work being conducted for several positions. The survey was conducted by using five Cirrus Research CR:120A noise dosimeters and three Cirrus Research CR:110A noise dosimeters over a period of two days, resulting in a total of fourteen noise dosimeter samples. In addition, sound level readings were obtained using a Cirrus Research Optimus Red CR 162B Type 2 Sound Level Meter, Serial Number G303620. The survey also included the use of a MV:200EH High-Level Noise Measurement Microphone System when obtaining samples in the Police Department range.

SUMMARY

Noise

A noise dosimeter survey was conducted to evaluate the exposure levels of thirteen Public Works Department employees operating and working in the vicinity of City-owned equipment.

Survey results indicate that 8-hour time-weighted-average noise levels did not exceed the OSHA Action Level (AL) or the Permissible Exposure Limit (PEL) on any of noise samples taken (Table 1 & 2). Estimated attenuation of the hearing protectors has been calculated and documents that the hearing protectors offered are capable of maintaining or reducing the exposure below the PEL. (Table 3 & 4)

Sound level samples on specific pieces of equipment were also obtained in the Public Works Department (Table 5), Fire Department (Table 6), and Police Department (Table 7). Several of the sound level samples obtained do have the potential to reach both the AL and/or PEL if exposure occurs for extended periods.

The Fire Department sound level readings presented scenarios (Appendix C) below the AL; however, extended exposures have the potential to exceed the AL. While an extended exposure is less probable, the Department should continue to implement their Hearing Conservation program.

The Police Department scenarios (Appendix E) produced exposures levels over the Action Level (AL) on an eight-hour time weighted basis. In addition, the discharge of each firearm sampled exceeded the allowable peak impulse noise of 140 dbA. When feasible, hearing protection for the Police Department should incorporate the use of double hearing protection when discharging a firearm on the gun range. Where feasible, the Department should implement administrative and engineering controls to reduce noise levels.

Based on the noise dosimeter samples obtained, the City is required to establish a Hearing Conservation Program for employees performing tasks that may meet or exceed an eight-hour time-weighted average of 85 dBA (Action Level).

Survey Findings

Noise Dosimeters

During the survey thirteen Public Works employees wore noise dosimeters with the dosimeter's microphone located on the shoulder of the employee. A periodic inspection of the work performed by these employees was documented and noted that hearing protectors were available and worn by some of the employees participating in the survey. Where needed, a comparison of the attenuation provided by hearing protectors was completed. (Table 3 & 4)

Six of the thirteen noise dosimeters recorded an Overload, meaning the dosimeter input was too high for the dosimeter's range. These events were short durations and were most likely due to brushing or blowing across the microphone. Noise sources capable of producing noise levels near 140 dBA in the Public Works Department were not noted during the dosimeter survey. One dosimeter sample obtained by Cameron Pukas should be disregarded. This dosimeter was removed by the employee at approximately 11:30 a.m. and placed within his truck in the garage for the remainder of the shift. [1]

One additional dosimeter was placed in the gun range to obtain an area sample. This dosimeter registered numerous overloads due to the sound levels produced by firearm discharge.

Sound Level Meter

Noise exposure was also documented using a Sound Level Meter to assist in the identification of potential tasks and/or equipment that may produce a significant exposure. Readings were taken at 28 locations and/or pieces of equipment in the Public Works Department (Table 5) and 27 locations and/or pieces of equipment within the Fire Department (Table 6). Similarly, 15 readings were taken on the Police Department Gun Range and near squad cars (Table 7). Readings taken on the range included the use of MV:200EH High Level Noise Measurement Microphone System.

Readings were taken at head height of the operator where the employee would generally stand or sit while working in the vicinity of the machinery or completing the required task. All readings were taken at the maximum sound level on the A scale and Fast Time weighting (LAFMax). Readings also documented the Leq which is the Average Sound Level over the measurement period. A windscreen was used over the sound level meters microphone.

Hearing Protection

Hearing protectors provided to the Public Works employees consisted of 3M Express Pod Plugs with a Noise Reduction Rating (NRR) of 25, Howard Leight by Honeywell L3 Ear Muffs with a NRR of 30, Howard Leight Max ear plugs with a NRR of 33, Moldex 6645 ear plugs with a NRR of 33, 3m Peltor ear muffs with a NRR of 25, Howard Leight Thunder T2 ear muffs with a NRR of 28, and Stihl Advanced Procom Tree (Earmuffs that attach to helmet) with a NRR of 24.

The Fire Department provides in cab FireCom FH-10 headsets which have a NRR of 24, Tasco Nextera ear muffs with a NRR of 30, and Stanley RST63002 ear plugs with a NRR of 32. The Police Department provides Bilsom ear muffs with a NRR of 25.

Three of the employees participating in the survey wore hearing protection during the survey. Hearing protection was readily available to all employees.

Hearing protector use is mandatory for employees with time-weighted noise levels exceeding 90 dBA and for all employees who have experienced a Standard Threshold Shift in hearing. Additional hearing protection or administrative and/or engineering controls should be applied for employees with a Standard Threshold Shift and for those who work in areas where the attenuated eight-hour TWA (Time-Weighted Average) noise levels exceed 90 dBA.

DISCUSSION

Noise results from the Industrial Hygiene study conducted on May 20 and 21, 2024, identified time-weighted noise levels ranging from 61.8 dBA to 80.5 dBA. Sound levels were recorded between 61.4 dBA and 109.4 dBA (LAeq) within the Public Works Department and between 42.5 dBA and 109.7 dBA (LAeq) within the Fire Department. The Police Department recorded sound levels between 51.0 dBA and 124.1 dBA (LAeq). The maximum impulse noise on the range was 161.3 dB (LAPeak).

Noise Dosimeter Results

Thirteen Public Works Department employees were selected for noise monitoring which consisted of using personal audio dosimeters to measure their exposure to noise. Noise sampling data (Table 1 & 2) lists the survey duration, peak noise level, the TWA for the measured period, the percent dose for the eight-hour work-shift, the eight-hour TWA based on the actual work-shift, and calibration levels.

Operations during the study were considered to be normal or typical for this employer, although the exposures may vary based on work activity and duration. Results obtained during this study indicate that noise levels did not exceed the eight-hour Action Level (AL) of 85 dBA or the eight-hour Permissible Exposure Limit (PEL) of 90 dBA for the Public Works employees. The type of work performed by the employees during the survey included:

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Jake Hanetho: This employee worked at the wastewater treatment plant and conducted equipment inspections and sampling. Some equipment maintenance was also conducted. This employee did not wear hearing protection; however, hearing protection was readily available to the employee. This employee's eight-hour time-weighted noise exposure was 73.7 dBA.

Cameron Pukas: This employee works in the Water and Sewer Department and assisted in a watermain repair using a backhoe. The employees sample should be disregarded as the employee removed the noise dosimeter at approximately 11:30 a.m. and left the dosimeter within the truck in the garage for the remainder of the shift. Removal of the dosimeter invalidates the sample. The employee stated that he removed the dosimeter because he did not want to damage it during the watermain repair. Hearing protection was worn and available to the employee.

Ron Nunes: This employee worked in the Streets Department picking up brush at approximately 20 locations. The employee operated a dump truck during the task and was exposed to noise from a nearby front-end loader assisting with the task. This employee did not wear hearing protection; however, hearing protection was readily available to the employee. This employee's eight-hour time-weighted noise exposure was 76.1 dBA.

Wayne Markgraff: This employee worked as a mechanic for the entire shift. Tasks included driving vehicles, completing an oil change, and using various hand tools to perform vehicle maintenance. This employee did not wear hearing protection; however, hearing protection was readily available to the employee. This employee's eight-hour time-weighted noise exposure was 61.8 dBA.

Gun Range: An area sample was obtained when conducting a firearm qualification simulation. The dosimeter was placed in the gun range within approximately 10 feet of the officer completing the qualification simulation. This sample's time-weighted noise exposure was 81.3 dBA.

Luis Gonzalez: This employee worked in the Wastewater Division completing preventative maintenance checks, operating valves, and working in louder environments such as the blower building and digester building. This employee did not wear hearing protection; however, hearing protection was readily available to the employee. This employee's eight-hour time-weighted noise exposure was 80.5 dBA.

Dan Oates: This employee worked in the Water Department and completed utility locates for much of the day. The employee drove a service van between locations. This employee did not wear hearing protection; however, hearing protection was readily available to the employee. This employee's eight-hour time-weighted noise exposure was 72.6 dBA.

Jeremy Lennon: This employee worked in the Streets Department picking up brush at approximately 20 locations. The employee operated a front-end loader during the task and was exposed to noise from a nearby dump truck assisting with the task. This employee did not wear hearing protection; however, hearing protection was readily available to the employee. This employee's eight-hour time-weighted noise exposure was 76.5 dBA.

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Luis Gonzalez: This employee worked in the Wastewater Division testing samples of water and conducting inspections within louder environments such as the blower room. The employee also completed a repair to a sampling pump, using hand tools to complete the repair. This employee did not wear hearing protection; however, hearing protection was readily available to the employee. This employee's eight-hour time-weighted noise exposure was 78.2 dBA.

Jason Heisler: This employee worked in the Fleet Department making repairs on a Vactor. The employee primarily used hand tools throughout the shift. This employee did not wear hearing protection; however, hearing protection was readily available to the employee. This employee's eight-hour time-weighted noise exposure was 67.7 dBA.

Jeremy Lennon: This employee worked in the Streets Department picking up brush at approximately 35 locations. The employee operated a front-end loader during the task and was exposed to noise from a nearby dump truck assisting with the task. This employee did not wear hearing protection; however, hearing protection was readily available to the employee. This employee's eight-hour time-weighted noise exposure was 63.7 dBA.

Kelsey Snell: This employee worked in the Water Department cleaning a trailer. The employee also saw cut a sink hole and filled it with cold patch. A partner saw was used to cut the asphalt. This employee wore ear plugs during the use of the saw. The ear plugs had a NRR of 25. This employee's eight-hour time-weighted noise exposure was 66.3 dBA.

Jake Hanetho: This employee worked in the Wastewater Division obtaining stream samples of water and conducting inspections. A pickup truck was used to drive between inspection locations. This employee did not wear hearing protection; however, hearing protection was readily available to the employee. This employee's eight-hour time-weighted noise exposure was 71.8 dBA.

Andrew Salazar: This employee worked in the garage cleaning the floors with a power washer. The employee also set up tables and chairs for a City event. This employee did not wear hearing protection; however, hearing protection was readily available to the employee. This employee's eight-hour time-weighted noise exposure was 72.7 dBA.

Sound Level Meter Results

Fire Department

A total of 27 readings were obtained in the Fire Department. Readings were obtained during the beginning of the shift while firefighters were conducting equipment checks. These readings documented the noise levels that are routinely produced each shift. Readings were also obtained within and around apparatus at idle, outside the apparatus with the siren running, and in the cab of the apparatus with the siren running and windows closed. This data was then used to create case scenarios based on the Department's typical call exposures and when on an extended call. Typical response times and various task durations were provided by Bureau Chief Heidi Olson. The scenarios generally used response times of 6 – 7 minutes. The scenarios developed used durations that were based on typical exposures and more involved events, such as a fire scene that may produce exposures for several hours. Fire Department sound level readings are outlined in Table 6, Sound Level Meter readings are provided in Appendix B, and Sound Level Reading Scenarios and provided in Appendix C.

Two of the scenarios established assumed an extended exposure and are based on the worst-case scenario described during the survey. This scenario estimated a fire scene exposure time near the apparatus for four (4) hours and included additional noise exposures such as those encountered during a normal shift. While each of the scenarios produced noise levels below the Action Level, one scenario was just over this level. Therefore, under extended exposure scenarios including the use of saws and other similar equipment the firefighters could potentially be exposed to noise levels over the Action Level. As a result, it is recommended that the Department continue to implement their Hearing Conservation Program.

Police Department

A total of 15 readings were obtained in the Police Department. Noise samples were obtained within the gun range under simulated firearm qualifications (Appendix D). Scenarios were developed based on examples provided by Patrol Commander Scott Miller. These scenarios used samples of an officer qualifying using a 40-caliber handgun, an AR-15 rifle, and a shotgun (Appendix E). Each qualification was based on 30 - 40 rounds. The scenario also included 3 response calls with the siren operating for 2 minutes each. The scenario produced estimated time-weighted results of approximately 86.7 dBA.

When obtaining samples on the range, the Sound Level Meter noted peak impact sound levels of 161.3 dBA (LAPeak) when using the shotgun. Similar levels of exposure were also noted when using other firearms. The 40-caliber handgun peak impulse sound level was 155.2 dBA, while the AR-15 223-caliber rifle produced a peak impulse noise level of 159.0 dBA. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level. The Department should establish a formal Hearing Conservation Program, incorporate the use of administrative and engineering controls, and when feasible should utilize double hearing protection while qualifying or using the gun range.

Public Works Department

A total of 28 readings were obtained in the Public Works Department. These readings documented the noise levels that are routinely present on each shift. While employees are not normally working next to louder equipment for extended periods, some of the Sound Level Meter readings were significant such as when working in the blower building generator or near the air compressor. A summary of these readings can be found in Table 3 and Sound Level Meter readings are provided in Appendix F.

The Public Works Department also has several louder pieces of equipment that were not tested including a wood chipper, concrete/partner saws, Vactors, etc. Exposure to noise levels produced by these types of machinery commonly produces exposures over the AL and PEL.

Samples obtained from the noise dosimeters note that exposures did not exceed the OSHA Action Level (AL) or the Permissible Exposure Limit (PEL) on the survey date. The readings obtained with the Sound Level Meter noted various equipment that may exceed these levels. In addition, several pieces of equipment that were not tested may produce noise exposure levels over the Action Level. Therefore, based on the data obtained, hearing protection must be provided to the employees and their use becomes mandatory when work may meet or exceed the PEL. The Department must establish a formal Hearing Conservation Program.

Background

Hearing protectors were available and offered to all employees. Hearing protection consisted of earmuffs and inserts with Noise Reduction Ratings (NRR) between 21 and 33 in the Public Works Department. The Fire Department provided earmuffs and inserts with an NRR between 24 to 32, and the Police Department provided earmuffs and inserts with estimated NRR of 25.

The Public Works employees' use of hearing protection is mandatory when noise levels meet or exceed an eight-hour time-weighted average of 90 dBA. On the date of the survey, none of the samples obtained exceeded the PEL. However, other tasks involving louder equipment such as a chainsaw, backhoe, breaker, etc. for extended periods could also produce exposures over the PEL. Therefore, the City should require

and/or strongly encourage the use of hearing protectors during louder tasks such as forestry work, heavy equipment use, etc. In addition, the City should strongly encourage the use of hearing protection for tasks involving noise exposures of 85.0 dBA or higher.

Similarly, noise exposure in the Fire Department may produce exposures over the AL during longer exposure periods. This Department should continue to implement their hearing conservation program efforts.

The Police Department scenarios exceeded the AL and recommended peak impulse noise levels. The Department is required to establish a Hearing Conservation program that requires annual audiograms and, when feasible, should include the use of double hearing protection. Administrative and engineering controls should also be considered to further reduce the noise exposure in the gun range.

Engineering controls are the preferred method for reducing noise levels. Where noise levels exceed the 90 dBA PEL, OSHA mandates that, at minimum, effective controls be investigated. The City should consider documenting any attempts to control the noise sources exceeding the 90 dBA PEL and confirm their effectiveness. Note that this does not negate the requirement to look at viable solutions to reducing workplace noise. Methods of engineering controls include:

a. Enclosures. Full or partial enclosure of machines using materials which absorb and reflect noise energy. An alternative is to enclose the employee.
b. Barriers. A form of partial enclosure with reflective and/or absorptive characteristics to block the flow of noise energy past a given point.
c. Vibration Isolation. Techniques aimed at disassociating a vibrating member from the force causing it to vibrate, generally by placing "spongy" material between the force and the member.
d. Damping. The practice of reducing the vibration of machine parts by stiffening or affixing damping materials.
e. Silencers and Mufflers. To attenuate the noise of rapidly escaping air.
f. Room Treatments. Highly reflective floors, walls and ceilings add to the noise dose through reflected noise. Treating these surfaces with absorbing materials results in a reduction of the reflected noise.

CONCLUSIONS

The time weighted average sample obtained from the dosimeters worn by employees ranged from 61.8 dBA to 80.5 dBA. Sound levels were recorded between 61.4 dBA and 109.4 dBA (LAeq) within the Public Works Department and between 42.5 dBA and 109.7 dBA (LAeq) within the Fire Department. The Police Department sound levels ranged between 51.0 dBA and 124.1 dBA (LAeq); however, this department also produced a peak impulse sound level of 161.3 dB (LAPeak).

Based on the personal sample results obtained, participation in a Hearing Conservation Program is required for the employees completing the tasks with a time-weighted noise-level of 85.0 dBA or higher which is the OSHA Action Level (AL). Therefore, Hearing Conservation programs must be established in the Fire Department, Police Department, and Public Works Department.

Noise levels of specific tasks in the Fire Department did not exceed the AL and/or PEL due to their duration; however, these tasks when conducted together and/or over extended periods have the potential to exceed the AL. Similarly, time-weighted samples in the Public Works Department did not exceed the AL or PEL on the date of the survey. However, extended tasks with louder equipment does have the ability to reach both the AL and PEL. Therefore, both the Fire Department and Public Works Department employees who may be exposed to significant noise must participate in the Hearing Conservation Program. In addition, the Police Department must establish a Hearing Conservation Program for sworn employees due to the noise exposures incurred during firearm qualification.

The establishment of a Hearing Conservation Program should include training and annual audiograms for employees that may be exposed to noise levels at or above the AL. At a minimum, hearing protection must be offered to the employees exposed to noise levels with a time-weighted average of 85 dBA or higher; however, each department should continue with their practice of offering hearing protection to all employees and mandate the use of hearing protection when the time-weighted average may meet or exceed 90 dBA. When feasible, administrative and engineering controls along with double hearing protection should be utilized when firearms are discharged on the gun range.

A copy of this survey should be retained for a minimum of two years. Monitoring shall be repeated whenever a change in equipment or controls increases noise exposures to the extent that additional employees may be exposed at or above the Action Level; or the attenuation provided by hearing protectors being used by employees may be rendered inadequate to meet the requirements of 29 CFR 1910.95.

RECOMMENDATIONS

24-05-01 The Fire Department, Police Department and Public Works Department are required to establish a written Hearing Conservation Program meeting the requirements of 29 CFR 1910.95(c).

24-05-02 The Fire, Police, and Public Works Department employees that may be exposed to noise levels above 85 dBA for an eight-hour time-weighted average must have an annual audiogram as required by 29 CFR 1910.95(g).

24-05-03 The Fire, Police, and the Public Works Departments are required to provide annual training on noise exposures and on the use of hearing protectors to ensure that employees are knowledgeable about the effects of noise and to ensure proper use of hearing protection.

24-05-04 The Police, Fire, and the Public Works Departments should continue to provide hearing protection for employees working in areas where exposure to the Action Level of 85 dBA TWA is possible. Hearing protection is mandatory when exposure levels meet or exceed 90 dBA.

24-05-05 When feasible, the Police Department should use double hearing protection when discharging a firearm on the gun range.

24-05-06 The Police Department should investigate the use of administrative and engineering controls to further reduce the employees' exposure to noise on the range. All attempts to investigate and/or reduce the exposure to noise should be documented. Additional testing should be completed to confirm the effectiveness of the applied engineering controls.

24-05-07 Consider posting signs requiring the use of hearing protection within buildings/rooms where the noise levels may routinely meet or exceed 90 dBA.

24-05-08 Employees should be informed of the results of this survey.

24-05-09 Retain the results of this survey for at least two years.

24-05-10 Noise level and/or noise dosimeter surveys should be completed when exposures change or on at least a periodic basis.

Appendix

Technical Appendix – 29 CFR 1910.95

Appendix A – doseBadge Measurement Reports (Attachments)

Appendix B – Fire Department Sound Level Meter Readings (Attachments)

Appendix C – Fire Department Sound Level Scenarios (Attachments)

Appendix D – Police Department Sound Level Meter Readings (Attachments)

Appendix E – Police Department Sound Level Scenarios (Attachments)

Appendix F – Public Works Department Sound Level Meter Readings (Attachments)

City of Crystal Lake

Table 1: Audio Dosimeter Survey Results

May 20, 2024

TITAN Safety Management, Inc.

Dosimeter ID	Employee	Job/Task Description	Test Started	Test Stopped	Measured Time (Hr:Mn:Sec)	Peak (LASMAX)	TWA (HC)	% Noise Dose	Calibration	
									Pre	Post
MK 502362	Jake Hanetho	Wastewater Treatment Plant #2	05/20/2024 07:23 AM	05/20/2024 02:19 PM	06:56:22	109.2 dB	73.7 dBA	10.4%	114.0 dB 05/20/2024 6:45 AM	114.0 dB 05/20/2024 6:20 PM
MK 502363	Cameron Pukas †	Water and Sewer	05/20/2024 07:26 AM	05/20/2024 03:52 PM	08:26:40	107.1 dB	70.1 dBA	6.3%	114.0 dB 05/20/2024 6:45 AM	114.0 dB 05/20/2024 6:21 PM
MK 502364	Ron Nunes	Brush Pick-up	05/20/2024 07:28 AM	05/20/2024 02:06 PM	06:37:51	109.8 dB	76.1 dBA	14.5%	114.0 dB 05/20/2024 6:45 AM	114.0 dB 05/20/2024 6:21 PM
MK 502365	Wayne Markgraff	Mechanic	05/20/2024 07:33 AM	05/20/2024 02:17 PM	06:43:58	103.3 dB	61.8 dBA	1.9%	114.0 dB 05/20/2024 6:45 AM	114.0 dB 05/20/2024 6:21 PM
MK 502366	Gun Range	Area Sample	05/20/2024 10:27 AM	05/20/2024 10:43 AM	00:15:30	124.7 dB	81.3 dBA	29.8%	114.0 dB 05/20/2024 6:46 AM	114.0 dB 05/20/2024 6:21 PM
Dosimeter ID	**Employee**	**Job/Task Description**	**Test Started**	**Test Stopped**	**Measured Time (Hr:Mn:Sec)**	**Peak (LC Peak)**	**TWA (HC)**	**% Noise Dose**	**Calibration**	
									Pre	**Post**
CA 5235	Luis Gonzalez	Wastewater	05/20/2024 07:23 AM	05/20/2024 01:44 PM	06:21:59	132.5 dB	80.5 dBA	26.0%	114.0 dB 05/20/2024 6:31 AM	114.0 dB 05/20/2024 6:13 PM
CA 5236	Dan Oates	Water Department	05/20/2024 07:26 AM	05/20/2024 12:41 PM	05:15:43	125.7 dB	72.6 dBA	9.0%	114.0 dB 05/20/2024 6:32 AM	114.0 dB 05/20/2024 6:14 PM
CA 5237	Jeremy Lennon	Brush Pick-up	05/20/2024 07:29 AM	05/20/2024 02:12 PM	06:43:18	139.9 dB	76.5 dBA	15.0%	114.0 dB 05/20/2024 6:33 AM	114.0 dB 05/20/2024 6:16 PM

† Sample should be dis-regarded. Participant removed noise dosimeter and left the dosimeter in his truck for most of the shift.

City of Crystal Lake

Table 2: Audio Dosimeter Survey Results

May 21, 2024

TITAN Safety Management, Inc.

Dosimeter ID	Employee	Job/Task Description	Test Started	Test Stopped	Measured Time (Hr:Mn:Sec)	Peak (LASMAX)	TWA (HC)	% Noise Dose	Calibration	
									Pre	Post
MK 502362	Luis Gonzalez	Wastewater	05/21/2024 07:08 AM	05/21/2024 11:44 AM	04:35:28	117.5 dB	78.2 dBA	19.5%	114.0 dB 05/21/2024 6:43 AM	114.0 dB 05/21/2024 12:04 PM
MK 502363	Jason Heisler	Vactor	05/21/2024 07:12 AM	05/21/2024 11:55 AM	04:42:53	115.2 dB	67.7 dBA	4.5%	114.0 dB 05/21/2024 6:43 AM	114.0 dB 05/21/2024 12:04 PM
MK 502364	Jeremy Lennon	Loader Operator	05/21/2024 07:14 AM	05/21/2024 11:48 AM	04:34:33	92.4 dB	63.7 dBA	2.6%	114.0 dB 05/21/2024 6:43 AM	114.0 dB 05/21/2024 12:05 PM
MK 502365	Kelsey Snell	Water Department	05/21/2024 07:23 AM	05/21/2024 11:46 AM	04:23:19	116.3 dB	66.3 dBA	3.7%	114.0 dB 05/21/2024 6:43 AM	114.0 dB 05/21/2024 12:05 PM
Dosimeter ID	**Employee**	**Job/Task Description**	**Test Started**	**Test Stopped**	**Measured Time (Hr:Mn:Sec)**	**Peak (LC Peak)**	**TWA (HC)**	**% Noise Dose**	**Calibration**	
									Pre	**Post**
CA 5235	Jake Hanetho	Wastewater Treatment Plant #2	05/21/2024 07:09 AM	05/21/2024 11:44 AM	04:35:01	130.4 dB	71.8 dBA	8.0%	114.0 dB 05/21/2024 6:32 AM	114.0 dB 05/21/2024 11:50 AM
CA 5236	Andrew Salazar	Power Washer	05/21/2024 07:23 AM	05/21/2024 11:46 AM	04:23:27	124.4 dB	72.7 dBA	9.0%	114.0 dB 05/21/2024 6:33 AM	114.0 dB 05/21/2024 11:53 AM

City of Crystal Lake

Table 3: Estimated Noise Reduction Effectiveness of Hearing Protectors

May 20, 2024

TITAN Safety Management, Inc.

Dosimeter ID	Employee	TWA (HC)	Ear Plug / Muff NRR	Calculation with NRR correction factor and de-rating factor	Estimated Exposure (Attenuated)	Double Hearing Protection Ear Muff NRR	Second Correction	Estimated Exposure (Attenuated)
MK 502362	Jake Hanetho	73.7 dBA	*	-	73.7 dBA	*	-	73.7 dBA
MK 502363	Cameron Pukas †	70.1 dBA	25	(25-7)/2	61.1 dBA	*	-	61.1 dBA
MK 502364	Ron Nunes	76.1 dBA	*	-	76.1 dBA	*	-	76.1 dBA
MK 502365	Wayne Markgraff	61.8 dBA	*	-	61.8 dBA	*	-	61.8 dBA
MK 502366	Gun Range	81.3 dBA	25	(25-7)/2	72.3 dBA	*	-	72.3 dBA
CA 5235	Luis Gonzalez	80.5 dBA	*	-	80.5 dBA	*	-	80.5 dBA
CA 5236	Dan Oates	72.6 dBA	*	-	72.6 dBA	*	-	72.6 dBA
CA 5237	Jeremy Lennon	76.5 dBA	*	-	76.5 dBA	*	-	76.5 dBA

*Hearing protection not worn during survey.

City of Crystal Lake

Table 4: Estimated Noise Reduction Effectiveness of Hearing Protectors

May 21, 2024

TITAN Safety Management, Inc.

Dosimeter ID	Employee	TWA (HC)	Ear Plug / Muff NRR	Calculation with NRR correction factor and de-rating factor	Estimated Exposure (Attenuated)	Double Hearing Protection Ear Muff NRR	Second Correction	Estimated Exposure (Attenuated)
MK 502362	Luis Gonzalez	78.2 dBA	*	-	78.2 dBA	*	-	78.2 dBA
MK 502363	Jason Heisler	67.7 dBA	*	-	67.7 dBA	*	-	67.7 dBA
MK 502364	Jeremy Lennon	63.7 dBA	*	-	63.7 dBA	*	-	63.7 dBA
MK 502365	Kelsey Snell	66.3 dBA	25	(25-7)/2	57.3 dBA	*	-	57.3 dBA
CA 5235	Jake Hanetho	71.8 dBA	*	-	71.8 dBA	*	-	71.8 dBA
CA 5236	Andrew Salazar	72.7 dBA	*	-	72.7 dBA	*	-	72.7 dBA

*Hearing protection not worn during survey.

City of Crystal Lake

Table 5: Estimated Noise Exposure – Public Works – (OSHA)

May 21, 2024

TITAN Safety Management, Inc.

Location / Task	Sound Level (LAeq)	Sound Level (LAFMax)
Wastewater Treatment Plant #2		
#1 - Raw Station- Mid Level - 1 Pump Running	74.5 dB	76.7 dB
#2 - Raw Station- Lower Level - 1 Pump Running	72.5 dB	77.9 dB
#3 - Grit - Fines Screen Room	72.3 dB	76.7 dB
#4 - Primary Electrical Room	65.1 dB	68.0 dB
#5 - Primary Pump Room - Grinder Running	75.1 dB	76.1 dB
#6 - GBT Building	84.0 dB	88.1 dB
#7- Chemical Feed Building	61.4 dB	73.9 dB
#8 - Blower Building - 1 Blower Running	76.9 dB	77.7 dB
#9 - Blower Building - Lower-Level RAS Pump	72.2 dB	72.8 dB
#10 - Blower Building – Generator	109.4 dB	114.0 dB
#11 - Secondary Clarifier - Near Door	69.8 dB	70.4 dB
#12 - Secondary Clarifier - Near Motor	71.0 dB	72.7 dB
#13 - Sand Filter Building	78.6 dB	79.2 dB
#14 - Aeration Tank 12	73.5 dB	74.3 dB
#15 - Centrifuge Building	86.6 dB	97.0 dB
#16 - Digester 1 w Boilers Running	78.1 dB	81.4 dB
#17 - Digester 1 Recirculation Pump	74.7 dB	75.8 dB
#18 - Digester Waste Gas Burner Room	63.5 dB	64.5 dB
#19 - Digester 2 Recirculation Pump	72.5 dB	74.9 dB
#20 - Digester 2 w Boiler Running	69.6 dB	73.0 dB
Well 6		
#21 - Well 6	86.9 dB	87.8 dB
Water Plant 2		
#22 - Water Plant 2 Pump Room	78.7 dB	79.4 dB
#23 - Water Plant 2 Softener Room	76.3 dB	80.0 dB
#24 - Water Plant 2 Softener Room w Compressor Air Dump	101.1 dB	103.2 dB
#25 - Water Plant 2 Softener Room w Compressor Running	83.2 dB	84.0 dB
#26 - Water Plant 2 MCC Room	81.8 dB	83.0 dB
#27 - Water Plant 2 Chlorine Scrubber Outdoors	87.7 dB	91.3 dB
#28 - Water Plant 2 Generator Outdoors	83.2 dB	85.2 dB

City of Crystal Lake

Table 6: Estimated Noise Exposure – Fire Department – (OSHA)

May 20, 2024

TITAN Safety Management, Inc.

Location / Task	Sound Level (LAeq)	Sound Level (LAFMax)
#1 - Gear Dryer	87.1 dB	87.7 dB
#2 - Ambulance - Outside Idle	69.5 dB	76.0 dB
#3 - Ambulance - Outside Siren	100.2 dB	108.6 dB
#4 - Ambulance - Inside Idle	62.9 dB	73.2 dB
#5 - Ambulance - Inside Siren	72.3 dB	80.2 dB
#6 - Apparatus 6811 - Outside Idle	83.5 dB	89.8 dB
#7 - Apparatus 6811 - Outside Siren	109.7 dB	114.2 dB
#8 - Apparatus 6811 - Inside Idle	71.9 dB	72.9 dB
#9 - Apparatus 6811 - Inside Siren	86.6 dB	91.1 dB
#10 - Apparatus 6811 - Pump Test	85.4 dB	86.7 dB
#11 - Apparatus 6811 - Downriggers	75.8 dB	91.3 dB
#12 - Apparatus 6811 - Hurst Generator	87.8 dB	89.9 dB
#13 - Apparatus 6811 - Husqvarna K970 Saw	101.4 dB	108.0 dB
#14 - Apparatus 6811 - Stihl MS460 Chainsaw	108.2 dB	111.0 dB
#15 - Apparatus 6811 - MSA Air Pack Test	97.6 dB	109.0 dB
#16 - Apparatus 1592 - Outside Idle	71.8 dB	72.9 dB
#17 - Apparatus 1592 - Outside Siren	110.1 dB	114.7 dB
#18 - Apparatus 1592 - Inside Idle	56.4 dB	59.2 dB
#19 - Apparatus 1592 - Inside Siren	81.1 dB	86.4 dB
#20 - Apparatus 1592 - Pump Test	85.7 dB	104.8 dB
#21 - Apparatus 1592 - Blowhard Fan	89.2 dB	91.7 dB
#22 - Apparatus 1592 - Honda Generator	73.3 dB	80.8 dB
#23 - Apparatus 3255 - Outside Idle	59.8 dB	62.0 dB
#24 - Apparatus 3255 - Outside Siren	102.9 dB	112.2 dB
#25 - Apparatus 3255 - Inside Idle	42.5 dB	50.5 dB
#26 - Apparatus 3255 - Inside Siren	83.8 dB	90.8 dB
#27 - Bauer Compressor Unicus III	86.6 dB	91.1 dB

City of Crystal Lake

Table 7: Estimated Noise Exposure – Police Department – (OSHA)

May 20, 2024

TITAN Safety Management, Inc.

Location / Task	Sound Level (LAeq)	Sound Level (LAFMax)
#1 - Squad Car 1025 - Outside Idle	57.4 dB	58.6 dB
#2 - Squad Car 1025 - Outside Siren	94.8 dB	104.6 dB
#3 - Squad Car 1025 - Inside Idle	51.0 dB	69.4 dB
#4 - Squad Car 1025 - Inside Siren	69.4 dB	74.2 dB
#5 - Firearm Qualification - 40 Cal 180 Grain - 40 rounds	117.2 dB	131.1 dB
#6 - Firearm Qualification - 40 Cal 180 Grain - 2 rounds	113.8 dB	130.8 dB
#7 - Firearm Qualification - 40 Cal 180 Grain - 3 rounds	116.9 dB	131.1 dB
#8 - Firearm Qualification - 40 Cal 180 Grain - 5 rounds	120.1 dB	131.9 dB
#9 - Firearm Qualification - AR15 223 Cal - 30 rounds	123.8 dB	134.5 dB
#10 - Firearm Qualification - AR15 223 Cal - 2 rounds	119.3 dB	135.1 dB
#11 - Firearm Qualification - AR15 223 Cal - 2 rounds	120.5 dB	134.8 dB
#12 - Firearm Qualification - AR15 223 Cal - 3 rounds	124.1 dB	136.2 dB
#13 - Firearm Qualification - AR15 223 Cal - 3 rounds	122.1 dB	135.1 dB
#14 - Firearm Qualification - AR15 223 Cal - 2 rounds	120.0 dB	134.4 dB
#15 - Firearm Qualification - Shotgun - 12 Gauge - 7 rounds	122.2 dB	138.2 dB

The following is technical, background information on the potential hazards evaluated and the methods and standards applied for this survey.

STANDARDS

Noise

The current PEL for continuous and intermittent noise, established in 1971, is based on the sound pressure level (measured in A-weighted decibels-dBA) and the duration of exposure. 29 CFR 1910.95 states: "Protection against the effects of noise exposure shall be provided when the sound levels exceed those shown in Table G-16."

Table G-16
PERMISSIBLE NOISE EXPOSURES

Duration per day, hours	Sound level, dBA Slow Response
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

Since 1971, it has been recognized by OSHA and ACGIH that a significant portion of the population risks disabling hearing loss at exposures below 90 dBA for eight (8) hours. In 1976, an 8-hour average of 85 dBA was adopted as the ACGIH TLV and in 1981, 29 CFR 1910.95 was amended to include an 8-hour average of 85 dBA as the Action Level.

When noise exposures equal or exceed the Action Level, a Hearing Conservation Program is required.

HAZARD – EXPOSURES EXCEEDING LIMITS

Noise

Prolonged exposure to excessive noise (i.e., above the recommended or statutory limits) can produce "Noise-Induced Hearing Loss (NIHL)". This gradual loss of hearing is the result of damage to the inner ear (cochlea) and is not reversible. Unabated, the hearing loss can reach disabling levels and qualify for hearing loss compensation in most States.

The damaging effects of noise are dependent on the sound pressure level (loudness) and frequency distribution of the noise, the duration of exposure and an individual's susceptibility. From studies of hearing loss, the National Institute for Occupational Safety and Health (NIOSH) estimated that from prolonged exposure to 90 dBA, about 1 employee in 5 will develop disabling NIHL. At 100 dBA, nearly half of the employees exposed will develop disabling NIHL.

The following table lists the average sound levels in A-weighted decibels and the percent of exposed work place population expected to be at excess risk of developing disabling hearing loss (corrected for aging).

Sound Pressure Level (dBA)	80	85	90	95	100
% Population at Risk	1	9	21	35	49

METHODS

Noise

Noise measurements were taken using Cirrus Research PLC CR: 120A Noise Dosimeters and Cirrus Research CR:110A noise dosimeters. Sound level checks were periodically conducted using a Cirrus Research Optimus Red CR 162B Type 2 Sound Level Meter. An MV:200EH High Level Noise Measurement Microphone System was used when taking readings on the Police Department Gun Range. Pre and post calibrations were performed on the study day using a Cirrus Research CR: 518 Calibrator for the CR: 120A dosimeters and Optimus Red CR 162B Type 2 Sound Level Meter. A RC 110A doseBadge reader was used to calibrate the CR:110A dosimeters. The dosimeters used the following parameters for calculating the noise data displayed in Table 1: 80 dB threshold, 90 dB criterion and 5 dB doubling, slow response, on the A scale. There were no significant variations found between the pre and post calibrations.

TECHNICAL APPENDIX

Noise exposure evaluation involves the measurement of the sound pressure levels an employee is exposed to and the duration of exposure to each recorded level. A Noise dose is then calculated by the following equation:

$$\frac{D_1}{P_1} + \frac{D_2}{P_2} + \ldots \frac{D_n}{P_n} \times 100 = \%\,\text{NoiseDose, where}$$

D = duration of time that employee was exposed at a specified sound pressure level, and

P = the reference duration for that specified level as listed in 29 CFR 1910.95 Appendix A. (For example, if the sound pressure level measured is 90 dBA, P equals eight.)

For this survey, sound pressure levels of 80 dBA and above were included in the computation of the Noise Dose. When the Noise Dose equals or exceeds 50%, the Action Level has been reached. A 50% Noise Dose is equivalent to an 8-hour average exposure to 85 dBA.

To determine exposures that can be compared to the PEL, a second Noise Dose may be calculated using only sound pressure levels of 90 dBA and above. When a Noise Dose exceeds 100% using 90 dBA as the recording threshold, the PEL has been exceeded.

In order to account for noise exposure during unsampled shift time, the measured noise dose was extrapolated to a full shift noise dose using Equation #2.

$$\frac{\text{ExposureTime(min)}}{\text{MeasuredTime(min)}} \times \begin{matrix}\text{Measured}\\ \%\,\text{Dose}\end{matrix} = \begin{matrix}\text{Full Shift}\\ \%\,\text{Dose}\end{matrix} \qquad \text{Eq. \#2.}$$

CODE OF FEDERAL REGULATION

OSHA NOISE STANDARD

29 CFR 1910.95

12/12/2008

Occupational Noise Exposure

1910.95(a)

Protection against the effects of noise exposure shall be provided when the sound levels exceed those shown in Table G-16 when measured on the A scale of a standard sound level meter at slow response. When noise levels are determined by octave band analysis, the equivalent A-weighted sound level may be determined as follows:

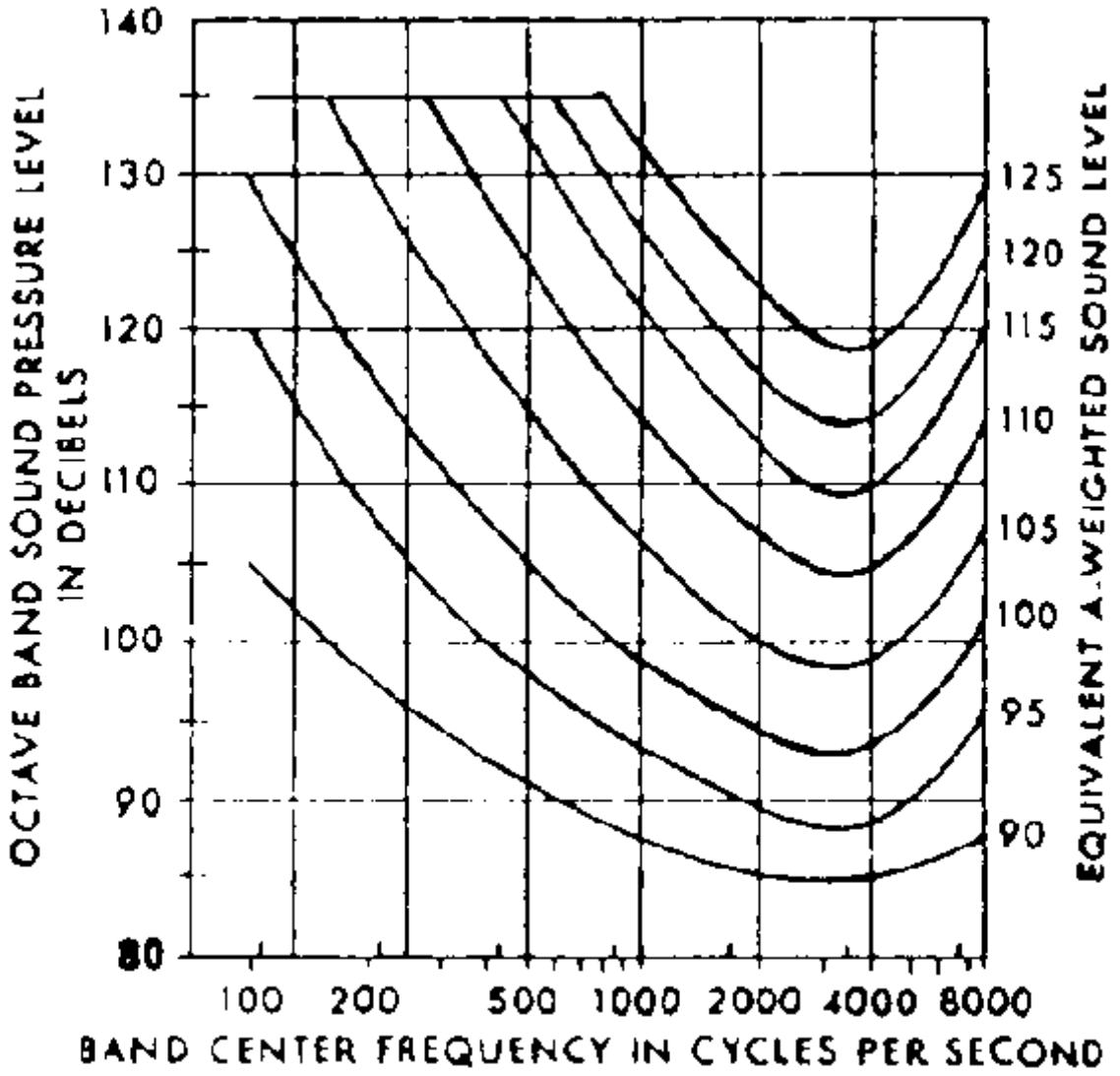


FIGURE G-9

Equivalent sound level contours. Octave band sound pressure levels may be converted to the equivalent A-weighted sound level by plotting them on this graph and noting the A-weighted sound level corresponding

to the point of highest penetration into the sound level contours. This equivalent A-weighted sound level, which may differ from the actual A-weighted sound level of the noise, is used to determine exposure limits from Table 1.G-16.

1910.95(b)(1)

When employees are subjected to sound exceeding those listed in Table G-16, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of Table G-16, personal protective equipment shall be provided and used to reduce sound levels within the levels of the table.

1910.95(b)(2)

If the variations in noise level involve maxima at intervals of 1 second or less, it is to be considered continuous.

TABLE G-16 - PERMISSIBLE NOISE EXPOSURES (1)

Duration per day, hours	Sound level dBA slow response
8	90
6	92
4	95
3	97
2	100
1 1/2	102
1	105
1/2	110
1/4 or less	115

Footnote(1) When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: C(1)/T(1) + C(2)/T(2) C(n)/T(n) exceeds unity, then, the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

1910.95(c)

"Hearing conservation program."

1910.95(c)(1)

The employer shall administer a continuing, effective hearing conservation program, as described in paragraphs (c) through (o) of this section, whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level (TWA) of 85 decibels measured on the A scale (slow response) or,

equivalently, a dose of fifty percent. For purposes of the hearing conservation program, employee noise exposures shall be computed in accordance with appendix A and Table G-16a, and without regard to any attenuation provided by the use of personal protective equipment.

1910.95(c)(2)

For purposes of paragraphs (c) through (n) of this section, an 8-hour time-weighted average of 85 decibels or a dose of fifty percent shall also be referred to as the action level.

1910.95(d)

"Monitoring."

1910.95(d)(1)

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

1910.95(d)(1)(i)

The sampling strategy shall be designed to identify employees for inclusion in the hearing conservation program and to enable the proper selection of hearing protectors.

1910.95(d)(1)(ii)

Where circumstances such as high worker mobility, significant variations in sound level, or a significant component of impulse noise make area monitoring generally inappropriate, the employer shall use representative personal sampling to comply with the monitoring requirements of this paragraph unless the employer can show that area sampling produces equivalent results.

1910.95(d)(2)(i)

All continuous, intermittent and impulsive sound levels from 80 decibels to 130 decibels shall be integrated into the noise measurements.

1910.95(d)(2)(ii)

Instruments used to measure employee noise exposure shall be calibrated to ensure measurement accuracy.

1910.95(d)(3)

Monitoring shall be repeated whenever a change in production, process, equipment or controls increases noise exposures to the extent that:

1910.95(d)(3)(i)

Additional employees may be exposed at or above the action level; or

1910.95(d)(3)(ii)

The attenuation provided by hearing protectors being used by employees may be rendered inadequate to meet the requirements of paragraph (j) of this section.

1910.95(e)

"Employee notification." The employer shall notify each employee exposed at or above an 8-hour time-weighted average of 85 decibels of the results of the monitoring.

1910.95(f)

"Observation of monitoring." The employer shall provide affected employees or their representatives with an opportunity to observe any noise measurements conducted pursuant to this section.

1910.95(g)

"Audiometric testing program."

1910.95(g)(1)

The employer shall establish and maintain an audiometric testing program as provided in this paragraph by making audiometric testing available to all employees whose exposures equal or exceed an 8-hour time-weighted average of 85 decibels.

1910.95(g)(2)

The program shall be provided at no cost to employees.

1910.95(g)(3)

Audiometric tests shall be performed by a licensed or certified audiologist, otolaryngologist, or other physician, or by a technician who is certified by the Council of Accreditation in Occupational Hearing Conservation, or who has satisfactorily demonstrated competence in administering audiometric examinations, obtaining valid audiograms, and properly using, maintaining and checking calibration and proper functioning of the audiometers being used. A technician who operates microprocessor audiometers does not need to be certified. A technician who performs audiometric tests must be responsible to an audiologist, otolaryngologist or physician.

1910.95(g)(4)

All audiograms obtained pursuant to this section shall meet the requirements of Appendix C: "Audiometric Measuring Instruments."

1910.95(g)(5)

"Baseline audiogram."

1910.95(g)(5)(i)

Within 6 months of an employee's first exposure at or above the action level, the employer shall establish a valid baseline audiogram against which subsequent audiograms can be compared.

1910.95(g)(5)(ii)

"Mobile test van exception." Where mobile test vans are used to meet the audiometric testing obligation, the employer shall obtain a valid baseline audiogram within 1 year of an employee's first exposure at or above the action level. Where baseline audiograms are obtained more than 6 months after the employee's first exposure at or above the action level, employees shall wear hearing protectors for any period exceeding six months after first exposure until the baseline audiogram is obtained.

1910.95(g)(5)(iii)

Testing to establish a baseline audiogram shall be preceded by at least 14 hours without exposure to workplace noise. Hearing protectors may be used as a substitute for the requirement that baseline audiograms be preceded by 14 hours without exposure to workplace noise.

1910.95(g)(5)(iv)

The employer shall notify employees of the need to avoid high levels of non-occupational noise exposure during the 14-hour period immediately preceding the audiometric examination.

1910.95(g)(6)

"Annual audiogram." At least annually after obtaining the baseline audiogram, the employer shall obtain a new audiogram for each employee exposed at or above an 8-hour time-weighted average of 85 decibels.

1910.95(g)(7)

"Evaluation of audiogram."

1910.95(g)(7)(i)

Each employee's annual audiogram shall be compared to that employee's baseline audiogram to determine if the audiogram is valid and if a standard threshold shift as defined in paragraph (g)(10) of this section has occurred. This comparison may be done by a technician.

1910.95(g)(7)(ii)

If the annual audiogram shows that an employee has suffered a standard threshold shift, the employer may obtain a retest within 30 days and consider the results of the retest as the annual audiogram.

1910.95(g)(7)(iii)

The audiologist, otolaryngologist, or physician shall review problem audiograms and shall determine whether there is a need for further evaluation. The employer shall provide to the person performing this evaluation the following information:

1910.95(g)(7)(iii)(A)

A copy of the requirements for hearing conservation as set forth in paragraphs (c) through (n) of this section;

1910.95(g)(7)(iii)(B)

The baseline audiogram and most recent audiogram of the employee to be evaluated;

1910.95(g)(7)(iii)(C)

Measurements of background sound pressure levels in the audiometric test room as required in Appendix D: Audiometric Test Rooms.

1910.95(g)(7)(iii)(D)

Records of audiometer calibrations required by paragraph (h)(5) of this section.

1910.95(g)(8)

"Follow-up procedures."

1910.95(g)(8)(i)

If a comparison of the annual audiogram to the baseline audiogram indicates a standard threshold shift as defined in paragraph (g)(10) of this section has occurred, the employee shall be informed of this fact in writing, within 21 days of the determination.

1910.95(g)(8)(ii)

Unless a physician determines that the standard threshold shift is not work related or aggravated by occupational noise exposure, the employer shall ensure that the following steps are taken when a standard threshold shift occurs:

1910.95(g)(8)(ii)(A)

Employees not using hearing protectors shall be fitted with hearing protectors, trained in their use and care, and required to use them.

1910.95(g)(8)(ii)(B)

Employees already using hearing protectors shall be refitted and retrained in the use of hearing protectors and provided with hearing protectors offering greater attenuation if necessary.

1910.95(g)(8)(ii)(C)

The employee shall be referred for a clinical audiological evaluation or an otological examination, as appropriate, if additional testing is necessary or if the employer suspects that a medical pathology of the ear is caused or aggravated by the wearing of hearing protectors.

1910.95(g)(8)(ii)(D)

The employee is informed of the need for an otological examination if a medical pathology of the ear that is unrelated to the use of hearing protectors is suspected.

1910.95(g)(8)(iii)

If subsequent audiometric testing of an employee whose exposure to noise is less than an 8-hour TWA of 90 decibels indicates that a standard threshold shift is not persistent, the employer:

1910.95(g)(8)(iii)(A)

Shall inform the employee of the new audiometric interpretation; and

1910.95(g)(8)(iii)(B)

May discontinue the required use of hearing protectors for that employee.

1910.95(g)(9)

"Revised baseline." An annual audiogram may be substituted for the baseline audiogram when, in the judgment of the audiologist, otolaryngologist or physician who is evaluating the audiogram:

1910.95(g)(9)(i)

The standard threshold shift revealed by the audiogram is persistent; or

1910.95(g)(9)(ii)

The hearing threshold shown in the annual audiogram indicates significant improvement over the baseline audiogram.

1910.95(g)(10)

"Standard threshold shift."

1910.95(g)(10)(i)

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 at 2000, 3000, and 4000 Hz in either ear.

1910.95(g)(10)(ii)

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 Appendix F: "Calculation and Application of Age Correction to Audiograms."

1910.95(h)

"Audiometric test requirements."

1910.95(h)(1)

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 at each frequency shall be taken separately for each ear.

1910.95(h)(2)

Audiometric tests shall be conducted with audiometers (including microprocessor audiometers) that meet the specifications of, and are maintained and used in accordance with, American National Standard Specification for Audiometers, S3.6-1969, which is incorporated by reference as specified in Sec. 1910.6.

1910.95(h)(3)

Pulsed-tone and self-recording audiometers, if used, shall meet the requirements specified in Appendix C: "Audiometric Measuring Instruments."

1910.95(h)(4)

Audiometric examinations shall be administered in a room meeting the requirements listed in Appendix D: "Audiometric Test Rooms."

1910.95(h)(5)

"Audiometer calibration."

1910.95(h)(5)(i)

The functional operation of the audiometer shall be checked before each day's use by testing a person with known, stable hearing thresholds, and by listening to the audiometer's output to make sure that the output is free from distorted or unwanted sounds. Deviations of 10 decibels or greater require an acoustic calibration.

1910.95(h)(5)(ii)

Audiometer calibration shall be checked acoustically at least annually in accordance with Appendix E: "Acoustic Calibration of Audiometers." Test frequencies below 500 Hz and above 6000 Hz may be omitted from this check. Deviations of 15 decibels or greater require an exhaustive calibration.

1910.95(h)(5)(iii)

An exhaustive calibration shall be performed at least every two years in accordance with sections 4.1.2; 4.1.3.; 4.1.4.3; 4.2; 4.4.1; 4.4.2; 4.4.3; and 4.5 of the American National Standard Specification for Audiometers, S3.6-1969. Test frequencies below 500 Hz and above 6000 Hz may be omitted from this calibration.

1910.95(i)

"Hearing protectors."

1910.95(i)(1)

Employers shall make hearing protectors available to all employees exposed to an 8-hour time-weighted average of 85 decibels or greater at no cost to the employees. Hearing protectors shall be replaced as necessary.

1910.95(i)(2)

Employers shall ensure that hearing protectors are worn:

1910.95(i)(2)(i)

By an employee who is required by paragraph (b)(1) of this section to wear personal protective equipment; and

1910.95(i)(2)(ii)

By any employee who is exposed to an 8-hour time-weighted average of 85 decibels or greater, and who:

1910.95(i)(2)(ii)(A)

Has not yet had a baseline audiogram established pursuant to paragraph (g)(5)(ii); or

1910.95(i)(2)(ii)(B)

Has experienced a standard threshold shift.

1910.95(i)(3)

Employees shall be given the opportunity to select their hearing protectors from a variety of suitable hearing protectors provided by the employer.

1910.95(i)(4)

The employer shall provide training in the use and care of all hearing protectors provided to employees.

1910.95(i)(5)

The employer shall ensure proper initial fitting and supervise the correct use of all hearing protectors.

1910.95(j)

"Hearing protector attenuation."

1910.95(j)(1)

The employer shall evaluate hearing protector attenuation for the specific noise environments in which the protector will be used. The employer shall use one of the evaluation methods described in Appendix B: "Methods for Estimating the Adequacy of Hearing Protection Attenuation."

1910.95(j)(2)

Hearing protectors must attenuate employee exposure at least to an 8-hour time-weighted average of 90 decibels as required by paragraph (b) of this section.

1910.95(j)(3)

For employees who have experienced a standard threshold shift, hearing protectors must attenuate employee exposure to an 8-hour time-weighted average of 85 decibels or below.

1910.95(j)(4)

The adequacy of hearing protector attenuation shall be re-evaluated whenever employee noise exposures increase to the extent that the hearing protectors provided may no longer provide adequate attenuation. The employer shall provide more effective hearing protectors where necessary.

1910.95(k)

"Training program."

1910.95(k)(1)

The employer shall train each employee who is exposed to noise at or above an 8-hour time weighted average of 85 decibels in accordance with the requirements of this section. The employer shall institute a training program and ensure employee participation in the program.

1910.95(k)(2)

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

1910.95(k)(3)

The employer shall ensure that each employee is informed of the following:

1910.95(k)(3)(i)

The effects of noise on hearing;

1910.95(k)(3)(ii)

The purpose of hearing protectors, the advantages, disadvantages, and attenuation of various types, and instructions on selection, fitting, use, and care; and

1910.95(k)(3)(iii)

The purpose of audiometric testing, and an explanation of the test procedures.

1910.95(l)

"Access to information and training materials."

1910.95(l)(1)

The employer shall make available to affected employees or their representatives copies of this standard and shall also post a copy in the workplace.

1910.95(l)(2)

The employer shall provide to affected employees any informational materials pertaining to the standard that are supplied to the employer by the Assistant Secretary.

1910.95(l)(3)

The employer shall provide, upon request, all materials related to the employer's training and education program pertaining to this standard to the Assistant Secretary and the Director.

1910.95(m)

"Recordkeeping" -

1910.95(m)(1)

"Exposure measurements." The employer shall maintain an accurate record of all employee exposure measurements required by paragraph (d) of this section.

1910.95(m)(2)

"Audiometric tests."

1910.95(m)(2)(i)

The employer shall retain all employee audiometric test records obtained pursuant to paragraph (g) of this section:

1910.95(m)(2)(ii)

This record shall include:

1910.95(m)(2)(ii)(A)

Name and job classification of the employee;

1910.95(m)(2)(ii)(B)

Date of the audiogram;

1910.95(m)(2)(ii)(C)

The examiner's name;

1910.95(m)(2)(ii)(D)

Date of the last acoustic or exhaustive calibration of the audiometer; and

1910.95(m)(2)(ii)(E)

Employee's most recent noise exposure assessment.

1910.95(m)(2)(ii)(F)

The employer shall maintain accurate records of the measurements of the background sound pressure levels in audiometric test rooms.

1910.95(m)(3)

"Record retention." The employer shall retain records required in this paragraph (m) for at least the following periods.

1910.95(m)(3)(i)

Noise exposure measurement records shall be retained for two years.

1910.95(m)(3)(ii)

Audiometric test records shall be retained for the duration of the affected employee's employment.

1910.95(m)(4)

"Access to records." All records required by this section shall be provided upon request to employees, former employees, representatives designated by the individual employee, and the Assistant Secretary. The provisions of 29 CFR 1910.1020 (a)-(e) and (g)-

1910.95(m)(4)(i)

apply to access to records under this section.

1910.95(m)(5)

"Transfer of records." If the employer ceases to do business, the employer shall transfer to the successor employer all records required to be maintained by this section, and the successor employer shall retain them for the remainder of the period prescribed in paragraph (m)(3) of this section.

1910.95(n)

"Appendices."

1910.95(n)(1)

Appendices A, B, C, D, and E to this section are incorporated as part of this section and the contents of these appendices are mandatory.

1910.95(n)(2)

Appendices F and G to this section are informational and are not intended to create any additional obligations not otherwise imposed or to detract from any existing obligations.

1910.95(o)

"Exemptions." Paragraphs (c) through (n) of this section shall not apply to employers engaged in oil and gas well drilling and servicing operations.