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Occupational Noise Exposure Evaluation of Airline Ramp Workers

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by

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Dedication

This thesis is dedicated to my beautiful and supportive wife, Elizabeth Enikanoselu, my lovely daughter Desire-Oluwa Emily-Rose Ogunyemi, my mother Stella Ogunyemi and my family. Thank you all for your support and words of encouragement. I love you all.

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Table of Contents

List of Tables ii

List of Abbreviations iii

Abstract iv

Introduction and Background 1

Literature Review 4

Methods 6
- Site Selection 6
- Personal Dosimeter 6

Results 8
- Ground Operation Worker 1 8
- Ground Operation Worker 2 9
- Ground Operation Worker 3 11
- Ground Operation Worker 4 12
- Analysis of Personal Noise Exposure 14
- Summary of Result for All Ground Operation Workers 16

Discussion 17
- Baggage Handling 18
- Sources of Noise and Turnaround Activities 19

Conclusion 21

References 22

Appendix A: IRB Determination Letter 25

Appendix B: List of Equipment and Instrumentation 27

Appendix C: Personal Noise Monitoring Reports 28

List of Tables

Table I: OSHA Allowed Noise Level 2

Table II: OSHA PEL & Hearing Conservation Act (HCA) 8-hr TWA Noise Monitoring results for Ground Operation Worker 1 8

Table III: OSHA PEL & Hearing Conservation Act (HCA) 8-hr TWA Noise Monitoring results for Ground Operation Worker 2 10

Table IV: OSHA PEL & Hearing Conservation Act (HCA) 8-hr TWA Noise Monitoring results for Ground Operation Worker 3 11

Table V: OSHA PEL & Hearing Conservation Act (HCA) 8-hr TWA Noise Monitoring results for Ground Operation Worker 4 16

Table VI: Integrator Configuration 16

Table VII: OSHA PEL & HC 8-hr TWA Results for all (GOW) presented in dBA 16

List of Abbreviations & Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists
APU	Auxiliary Power Unit
ASHA	American Speech-Language-Hearing Association
Dba	Decibels, A-weighting
HHE	Health Hazard Evaluation
GPU	Ground Power Unit
NIHL	Noise-Induced Hearing Loss
NIOSH	National Institutes for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	Allowed Exposure Limit
SLM	Sound Level Meter
TLV	Threshold Limit Value
TTS	Temporary Threshold Shift
TWA	Time Weighted Average
GOW	Ground Operation Worker

Abstract

Noise exposure is a common hazard to workforce in general although at varying degrees depending on the occupation, as many workers are exposed for long periods of time to potentially hazardous noise.

Every year, twenty-two million workers are exposed to potentially damaging noise at work. In 2015 U.S. businesses paid over $1.5 million in penalties for not protecting workers from noise. (OSHA, 2016). There may be a direct or indirect consequence of the possibilities of overexposure to noise notwithstanding the compulsory hearing protection requests for the occupations with potential hazards, and these exposures usually arise from the various types of heavy repair equipment and tools related to the job functions.

In the United States ten million people have noise related hearing loss (CDC, 2016) and damage done to the ear is not noticed until earing diminishes significantly.

One of the noisiest occupations there are include the flight ground crews and flight maintenance personnel otherwise categorized as Ground Operation Workers. These categories of workers have varying functions in the noisiest area at the ramp, and this exposes them to noise that could lead to hearing impairment or permanent ear damage.

This study was focused on workers on the ramps at the international airport of a large US city. These workers also are known as ground handling staff, and these employees perform different tasks on the airline ramp, which include unloading luggage from the airline, picking up and moving luggage from the belt room, and to loading baggage onto the airline.

This study was conducted using personal dosimeters which were calibrated before and after each sampling event out on four different employees over a period of four days and the collected data were downloaded to a personal computer for further analysis.

From the results of this study, the highest noise exposures occurred on a ground operation worker 3 (GOW3) with an 8-hr TWA exposure of 85.6 dBA using OSHA PEL measurement specifications and this occurred on the fourth day of sampling which was a Saturday. The second highest exposure occurred on ground operation worker 1 (GOW1) on the fourth day with an 8-hr TWA exposure of 85.0 dBA. For ground operations worker 2 (GOW2) and ground operation worker 4 (GOW4), the highest exposure occurred on the second day with 79.8 dBA and 73.4 dBA as their time weighted averages, respectively. None of the workers exposures exceeded the OSHA permissible exposure limit of 90 dBA. The United States Navy uses the OSHA noise standard to evaluate noise exposure on ships and all Navy installations.

According to University of South Florida institutional review Board, this study is categorized as a program evaluation that has no intervention with human subjects. The

workers that participated in this study did so voluntarily.

Introduction and Background

One rather common occupational illness for a certain class of workers is Noise Induced Hearing Loss (NIHL) is common among a certain class of workers, this noise damage is preventable, but its effects leave a permanent damage on its sufferers. Exposure to noise acts as the most significant health risk for employees as certain level of exposure cause irreversible hearing damages (Otieno, 2010). NIHL occurs over a long period of time and does not show symptoms or any signs.

During this evaluation, four Airplanes were parked in an open area on the ramp overnight. The Airplanes were arranged in four columns within the ramp where the ramp personnel worked three shifts undertaking various tasks that included management of baggage, maintenance of the Airplanes as well as lavatory services.

After being stationed, the pilot will switch off the Airplanes' drivers thus effectively switching off the onboard aeration system. Hence when the morning shift workers come in to get the Airplane ready for operation in the morning, since they must keep the air in the cabin cool or heated – as might be required, they must use a combination or any of the APU, GPU and air-conditioning unit (AC). The APU is an onboard engine that supplies power to the Airplane and the ventilation system situated in the tail of the Airplane, while the GPU, Ground Power Unit is a vehicle capable of supplying power to Airplane parked on the ground (CDC). There is a

belt room, where all passenger bags go to once it is dropped at the airline counter. The GOW drives a tractor about one thousand feet which is attached to a small trailer, to the belt room to pick up luggage and then arrange them in the Airplane.

The APU, CPU, AU Unit, the trailer, and the Airplane are the primary sources of the noise.

This goes to show that noise is inevitable in the Airplane industry and as such all ramp employees are exposed to noise hazard.

During ground handling, APU is always running. It produces 102-109 decibel output (Rietveld, 2010). When exposed to this type of noise for more than 30 minutes daily, individuals can suffer from permanent hearing damage.

The table below shows the OSHA allowed noise levels.

Table I: OSHA Allowed Noise level

Duration Per Day (Hours)	Decibel Sound Level
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼ or less	115

In 1998, the National Institute for Occupational Safety and Health (NIOSH) established the Recommended Exposure Limits (REL) for occupational noise as 85 dBA for an 8 hours TWA, any exposure at or above this level is considered hazardous.

These RELs are based on the assumption that workers' exposure occurs during five-week days of work and the rest of the days are spent in a normal noise free environment which is quiet. As at the period of this assessment, Airplanes were located on the tarmac and were made ready for boarding. The total number of ramp workers on duty was about 10 for the morning shift with varying but similar job functions. The airplanes are parked and the engines are left to run.

During this sampling, Noise dosimeter was used to measure the amount of noise that each ground operation workers was exposed to. The measurement was done for 8 hours daily for four days.

Literature Review

Generally, Sound is defined as a vibration that disseminates through a specific medium such as air or water. Properties of sound include frequency, wavelength, and intensity. The unit of measurement of frequency is Hertz (Hz). The frequency of a sound increases as the number of cycles per second increase. The human ear is capable of hearing sounds with frequencies between 20 Hz to 20,000 Hz (Industrial Hygiene handout). “The frequency of a sound is the number of cycles of a sound wave in one second (Industrial Hygiene handout).

According to OSHA, more than 30 million professional in the USA are not protected from hazardous noise (Simmons, 2017). One of the most occurring hazards in the workplace is noise, though the resulting hearing loss could be prevented but there is a tremendous increase in hearing loss sustained because of work exposure to noise. Once there is a hearing loss, the loss is permanent and cannot be restored by a medical procedure.

To understand effect of hearing loss, one needs to know about human ear structure and how it functions. The human ear functions include, detection, transmission, and the movement of sound to the brain. Sound movement to the brain goes from the outer, to the middle and the inner ear. Sound waves gathered by the outer ear is directed through the ear canal, these waves makes the eardrum vibrate. There are three small bones in the inner ear, these bones are Stapes, malleus and incus which are collectively known as ossicles. The ossicles moves the generated vibration in the inner ear to cochlea. The cochlea contains fluid and 30,000 hair cells

that respond to frequency (pitch) and intensity (loudness) of sound. The hair cells are connected to nerve fibers that translate sound as electrical signals to the brain. This is the process that enables us to capture information. Hearing impairment happens when the hairs cells are subjected to extraordinary levels of sound. After the hair cells strands are destroyed, they cannot be repaired.

Methods

Study Site Selection

The sampling was carried out at an airline tarmac. The assessment days were from Wednesday to Saturday from early hours of the day, precisely 5.00 am to 1300pm. During the day shifts, four employees wore 3M noise dosimeters. The dosimeter was calibrated every morning before use and after use every day. Each dosimeter had an attached earpiece and then attached to the workers shirt. The earpiece was fixed such that it is visible at the level of employee's ears.

At the end of each shift, the dosimeter was paused to stop statistics assembly, then removed from the workers shirt and the data was downloaded to a personal laptop. This process was repeated every day for the four days of sampling. The workers work eight hours shift each day and are entitled to thirty minutes break.

Personal Noise Dosimeter

The employees noise assessment was done using 3M edge model EG5 personal noise dosimeters. The Dosimeter has three different programming and measuring parameter options. One of the options is OSHA Conservation Amendment measurement parameters: A weighting, slow response, 80 dB criteria threshold, and 5 dB exchange rate. Another measuring parameter

is the OSHA Noise Standard compliance parameters: A weighting, slow response, 90 dB criteria threshold, and 5 dB exchange rate. The third measuring parameter is the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) measurement parameters: A weighting, slow response, 80 dB criteria threshold, and 3 dB exchange rate (Fundamentals of Industrial Hygiene). I used the manufacturer docking station and the detection management software to program the dosimeter. The noise dosimeters were then separately calibrated at a frequency of 1000 hertz (Hz) and 114.0 dBA before and after each assessment, using the manufacturer calibrator (Acoustical AC-300, 3M).

At 5 am, I turned the dosimeters on and hooked it to the workers shirt in the breathing zone as defined by OSHA and the dosimeter was paused at 1300 and then turned off.

Results

The result of each ground operation workers is presented below, each ground operation worker started their shift at 0500 and ended their shift at 1330, they were allowed thirty minutes break and the noise dosimeter was on their collar during the break period.

Ground Operation Worker 1

GOW 1 major duty was to load baggage on the aircraft, he collects baggage from the baggage room and takes it to the airline where it is loaded on the aircraft. The result of his noise exposure testing is displayed in Table II.

Table II: OSHA'S PEL & Hearing Conservation Act (HCA) 8-hr TWA Noise Monitoring results for Ground Operation Worker 1

Ground Operation Worker 1				
O S H A P E L				
	Wednesday	Thursday	Friday	Saturday
8-HR TWA (dBA)	**75.7**	**79.8**	**74**	**81.8**
8-HR (% Dose)	**13.8**	**24.5**	**10.9**	**32.5**
O S H A H CA				
	Wednesday	Thursday	Friday	Saturday
8-HR TWA (dBA)	**80.6**	**83.7**	**80.1**	**85**
8-HR (% Dose)	**27.4**	**41.9**	**25.4**	**50.2**

Ground operation worker 1 (GOW1) noise exposure was between 75.7 dBA and 81.8 dBA using OSHA PEL 8-hr TWA and the average of exposure is 77.8 dBA for a period of four days.
GOW1 has a percentage of dose that ranged between 13.8 % to 32.5 %, with an overall dose average of 20.4 %. During the testing, GOW1 has highest exposure on Saturday which was the last day of testing with an exposure of 81.8 dBA. There was no overexposure during this testing when the result is compared with OSHA PEL 90 dBA for TWA of 8-hrs.
Using the OSHA HCA noise exposure, GOW1 noise exposure was between 80.6 dBA and 85 dBA with an average exposure of 82.4 dBA for a period of four days.
GOW1 has a percentage of dose that ranged between 27.4 % to 50.2 %, with an overall dose average of 36.2 %. During the testing, GOW1 has highest exposure on Saturday which was the last day of testing with an exposure of 85 dBA. There was no overexposure during this testing when the result is compared with OSHA HCA 85 dBA for TWA of 8-hrs.

Ground Operation Worker 2

GOW 2 major duty was to sit in the bag room and put together all the luggage coming from the ticket counter. He is often referred to as the bag room agent/ baggage handler. All the baggage checked in at the counter is loaded on a belt that takes it to the bag room. The baggage handler then sorts this baggage so that it is loaded on the right flight. The result of his noise exposure testing is displayed in Table III.

Table III: OSHA'S PEL & Hearing Conservation Act (HCA) 8-hr TWA Noise Monitoring results for Ground Operation Worker 2

Ground Operation Worker 2				
O S H A P E L				
	Wednesday	Thursday	Friday	Saturday
8-HR TWA (dBA)	**71.5**	**73.3**	**71.9**	**63.2**
8-HR (% Dose)	**7.9**	**9.9**	**8.2**	**2.5**
O S H A H CA				
	Wednesday	Thursday	Friday	Saturday
8-HR TWA (dBA)	**79.9**	**77.8**	**78.0**	**82.5**
8-HR (% Dose)	**25.3**	**18.6**	**19.0**	**36.8**

Ground operation worker 2 (GOW2) noise exposure was between 63.2 dBA and 73.3 dBA using OSHA PEL 8-hr TWA and the average of exposure is 70 dBA for a period of four days.
GOW2 has a percentage of dose that ranged between 2.5 % to 9.9 %, with an overall dose average of 7.1 %. During the testing, GOW2 has highest exposure on Thursday which was the second day of testing with an exposure of 73.3 dBA. There was no overexposure during this testing when the result was compared with OSHA PEL 90 dBA for TWA of 8-hrs.

Using the OSHA HCA noise exposure, GOW2 noise exposure was between 77.8 dBA and 82.5 dBA with an average exposure of 80 dBA for a period of four days.
GOW2 has a percentage of dose that ranged between 18.6 % to 36.8 %, with an overall dose average of 25 %. During the testing, GOW2 has highest exposure on Wednesday which was the

first day of testing with an exposure of 85 dBA. There was no overexposure during this testing when the result was compared with OSHA HCA 85 dBA for TWA of 8-hrs.

Ground Operation Worker 3

GOW 3 major duty was to collect baggage from the bag room and give to GOW1 that loads the baggage on the airplane. GOW3 drives a vehicle from the ramp to the bag room to get the baggage. He is often referred to as the transfer agent. He also helps with loading of the baggage on the airplane when necessary. The result of his noise exposure testing is displayed in Table IV.

Table IV: OSHA'S PEL & Hearing Conservation Act (HCA) 8-hr TWA Noise Monitoring results for Ground Operation Worker 3

Ground Operation Worker 3				
O S H A P E L				
	Wednesday	Thursday	Friday	Saturday
8-HR TWA (dBA)	**70.3**	**65.6**	**60.7**	**83.50**
8-HR (% Dose)	**6.5**	**3.4**	**1.70**	**41.00**
O S H A H CA				
	Wednesday	Thursday	Friday	Saturday
8-HR TWA (dBA)	**77.7**	**75.3**	**79.8**	**85.6**
8-HR (% Dose)	**18.3**	**13.1**	**24.6**	**54.3**

Ground operation worker 3 noise exposure was between 60.7 dBA and 83.5 dBA using OSHA PEL 8-hr TWA and the average of exposure is 70 dBA for a period of four days.

GOW 3 has a percentage of dose that ranged between 1.7 % to 41 %, with an overall dose average of 13.2 %. During the testing, GOW3 had the highest exposure on Saturday which was the last day of testing with an exposure of 83.5 dBA. There was no overexposure during this testing when the result was compared with OSHA PEL 90 dBA for TWA of 8-hrs.

Using the OSHA HCA noise exposure, GOW3 noise exposure was between 75.3 dBA and 85.6 dBA with an average exposure of 80 dBA for a period of four days.

GOW3 has a percentage of dose that ranged between 13.1 % to 54.3 %, with an overall dose average of 27.6 %. During the testing, GOW3 had the highest exposure on Saturday which was the last day of testing with an exposure of 85.6 dBA. There was no overexposure during this testing when the result was compared with OSHA HCA 85 dBA for TWA of 8-hrs.

Ground Operation Worker 4

GOW 4 major duty was to supervise the team, he worked with all the team members to ensure smooth collection of luggage and loading of luggage on the airplane. All other team members reports to him if there is any issue in their area. He also helps with loading of luggage when necessary. The result of his noise exposure testing is displayed in Table V.

Table V: OSHA'S PEL & Hearing Conservation Act (HCA) 8-hr TWA Noise Monitoring results for Ground Operation Worker 4

Ground Operation Worker 4				
O S H A P E L				
	Wednesday	Thursday	Friday	Saturday
8-HR TWA (dBA)	**77.6**	**79.8**	**75.1**	**78.6**
8-HR (% Dose)	**17.9**	**24.3**	**12.8**	**20.7**
OS H A H CA				
	Wednesday	Thursday	Friday	Saturday
8-HR TWA (dBA)	**82.5**	**83.5**	**79.9**	**82.9**
8-HR (% Dose)	**36.0**	**40.8**	**24.5**	**37.8**

Ground operation worker 4 noise exposure was between 75.1 dBA and 79.8 dBA using OSHA PEL 8-hr TWA and the average of exposure is 77.8 dBA for a period of four days.

GOW 4 has a percentage of dose that ranged between 12.8 % to 24.3 %, with an overall dose average of 19 %. During the testing, GOW4 had the highest exposure on Thursday which was the second day of testing with an exposure of 79.8 dBA. There was no overexposure during this testing when the result was compared with OSHA PEL 90 dBA for TWA of 8-hrs.

Using the OSHA HCA noise exposure, GOW4 noise exposure was between 82.5 dBA and 83.5 dBA with an average exposure of 82.2 dBA for a period of four days.

GOW4 has a percentage of dose that ranged between 24.5 % to 40.8 %, with an overall dose

average of 34.8 %. During the testing, GOW4 had the highest exposure on Thursday which was the second day of testing with an exposure of 83.5 dBA. There was no overexposure during this testing when the result was compared with OSHA HCA 85 dBA for TWA of 8-hrs.

Analysis of Personal Noise Exposure

Looking at the result from the testing, all four ramp workers were exposed to varying degree of noise. The area each GOW worked affected the level of noise they were each exposed to.

It can also be inferred from the result that the values using OSHA PEL and OSHA HC are different.

From the practical comparison, it's clear to see that for the same physical noise, the values of the noise exposure reported by the two-occupational noise exposure standard are different. Noise exposure regarding the sound pressure in which the workers are exposed is similar for the distinct integers. The lowest percentage dose value (OSHA PEL) indicates noise exposure of 1.7. The highest OSHA HC shows the same noise exposure as 13.1. This implies that what may appear as a simple difference in the outline of the integers can lead to different results. Even though the noise is from the same sources, the figures reported by the two standards are different. Measurement of similar sound can have mixed results in the occupational noise standards. The effects of varying time weightings (TWA), threshold levels, criterion levels as well as exchange rates combined gives the different results. None of the two measurements can be said to be correct or wrong (Jones, 2015). It's only the results of occupational standards that are different. From the results, the difference in reported noise

exposure levels between the two professional standards may arise from the different exchange rates, threshold levels as well as the time weightings (Walcott, 2013).

The importance of measuring, assessing, and controlling occupation noise is to minimize the risks destruction to hearing amongst the ramp workers. Reduction of exposure to noise acts as a priority in all countries that consider occupational health critical (Rietveld, 2010). This may appear that all regions use guidelines as well as regulations that are same or even like a casual observer (Simmons, 2017). Nevertheless, there are just a few parameters that are different in this regulation and this results in a myriad of different requirements as well as standards. For instance, a review of noise exposure revealed that there are 14 various regulations in Canada. Some of the provinces use exchange rate with a 90dB criterion level. Others use 5dB exchange rate and 85dB criterion label while others use 3dB conversation rate with 90db benchmark level. In USA, the army service requires the values to be more severe compared to those set OSHA. United States air force in addition to the army applies 85dB exchange rate and a criterion of 3dB (Hubbard, 2006). ACGIH established the exposure strategies for exposure related to job environment in its threshold values. The policies are founded on the 3dB exchange rate to the 5dB that is recommended by OSHA (Jones, 2015). Nevertheless, application of slow time weighting as well as the 85dB remained constant. Additionally, NIOSH recommended a 3dB rate of exchange and retained the use of slow time weighting with a threshold of 85dB. Below is a tabular representation of the integrator configurations.

Table VI: Integrator Configuration

Name	OSHA HC	OSHA PEL	NIOSH
Exchange Rate	5dB	5dB	3dB
Time Weighting	Slow	Slow	Slow
Frequency Weighting	dB(A)	dB(A)	dB(A)
Threshold	80dB	90dB	80dB
Criterion Time	8 hrs	8 hrs	8 hrs
Criterion Level	90dB	90dB	85dB

Summary of Result for all Ground Operation Workers

Table VII below shows OSHA PEL and OSHA Hearing Conservation Amendment (HCA) for 8-hr TWA results of the tested ground operation workers. The sampling was carried for four days starting on a Wednesday.

Table VII: OSHA PEL & HC 8-hr TWA Results for all (GOW) presented in dBA

Sampling Days	GOW1		GOW2		GOW3		GOW4	
	PEL	HCA	PEL	HCA	PEL	HCA	PEL	HCA
DAY 1	75.7	80.6	71.5	79.8	70.3	77.7	77.6	82.5
DAY 2	79.8	83.7	73.3	77.8	65.6	75.3	79.8	83.5
DAY 3	74.0	80.1	71.9	78.0	60.7	79.8	75.1	79.9
DAY 4	81.8	85.0	63.2	82.5	83.5	85.6	78.6	82.9

Discussion

The result shows that the highest exposure occurred on the fourth day with ground operation worker three that drives back and forth between the bag room and the airline. This shows that most of the noise comes from the trailer. Looking at the overall result, it is within OSHA permissible exposure limit.

It was also observed that the ramp operation workers wear ear plugs at all times and those that didn't wear the ear plugs had headset on at all times.

Most of the daily operations at the airport ramp pose a lot of challenges as well as hazards to the employees. Therefore, a high volume of severe injuries in the airline industry occur in and around the ramp operations.

Ramp operation areas are significant features of airports. It is an environment that produces increasing amount of noise (Lake, 2008). This necessitates the creation as well as to the execution of ear conservation plans. Ramp employers are expected to administer continuous and effective hearing conservation program anytime workers are exposed to levels of uproar that exceeds the eight-hour TWA of 85 dBA. It is critical to engage in period measuring as well as testing of employees who are affected (National Research Council, 2011). Additionally, employers need to provide hearing aid to the employees. Hearing protection offered ought to

have a noise reducing rate (NRR) high enough to temper employee exposure level to less than 90dB TWA. Occupation noise exposure provides more details with regards to monitoring and assessment.

Employers are obligated to make records of hearing loss arising from work in case an employee test reveals significant hearing loss. Sometimes, a worker's hearing loss assessment may show that such worker has suffered job-related set threshold swing (STS) in hearing loss in one ear or both. In the situation where an employee has suffered hearing loss level up to 25 dB or lower in the same ear affected by the STS, such an instance ought to be recorded in the OSHA 300 log (National Research Council, 2011).

Employers ought to make modifications to hearing loss that arises from aging. There is a need to contact a physician to determine if the injury is linked to work and hence conduct more hearing verification tests.

A typical threshold swing is the changes in hearing inception comparative to the benchmark audiogram for the worker. It is a mean value of about 10dB or even higher at 4000, 3000 as well as 2000 Hz in one or both ears (Lake, 2008). Workers should be informed if there is STS and it should be recorded on the OSHA 300 log.

Baggage Handling

Most of the injuries in the airline industry arise from baggage handling (Hubbard, 2006). They account for the massive amount of expenses in this industry. The ramp employees are the ones who handle baggage being the first either in a bag room or even in the planeside. The handling

process is made difficult because bags come in different shapes, weights and sizes. Regional Airplanes as well as to other heavy Airplanes operators have baggage handling operation complicated by physical constraint of Airplane cargo compartments (Simmons, 2017). Majority of the planes have cargo bins been few feet's high above the optimum posture. This makes the ramp workers suffer from shoulder injuries arising from this operation. Additionally, most of the ramp workers engage in an unusual amount of repetitive motions on a daily basis. This is because of the form of work they do as well as the amount of cargo that must be handled in a given shift. The airline is an industry that works under a time constraint as a result of rigid schedules. This makes the ramp workers operate under pressure which sometimes results in injuries.

Since baggage handlers work close to the Airplanes, they are exposed to the high level of noise generated by the Airplane's engine, APU, GPU and the baggage trailer.

Sources of Noise and Turnaround Activities

Determination of occupational noise exposure requires the definition of the sources of the noise as there are different sources of what could be referred to as noise within the airport environment, however source of occupational noise in the airport environment can be divided into two categories (Walmer, 2014). This includes the aeronautic sources and the ramp equipment.

An Airplane generates noise when it lands and at take-off (Azizi, 2010). According to Wikipedia, the jet engine or propeller of a moving Airplane causes compression and rarefaction of air, producing motion of air molecules. This movement propagates through

the air as pressure waves. If these pressure waves are strong enough and within the audible frequency spectrum, a sensation of hearing is produced. Different Airplane types have different noise levels and frequencies. The noise comes from three main sources:

- Aerodynamic noise: Noise due to aerodynamics is caused by the flow of air across the surface of the airplane. The air flow causes the extremely rapid compression and expansion of the surrounding air resulting in noise. This noise will increase as the Airplane speed increases. It will also be higher pitched at lower altitudes due to higher air pressure.
- Engine and other mechanical noise: the major noise comes from jet engine and this happens during flight take-off and landing. Research has shown that the noise that comes from the jet engine is corresponds to the speed of the jet during take-off and landing.
- Noise from Airplane systems: Noise within the Airplane system comes from the cabin and the cockpit. The power unit generates the power needed to start the airplane engine and also provides the electricity needed to control the electronics inside the airplane. Studies have shown that the noise produced at the time of take-off is more when you compare it to the noise generated at the time of landing. This noise differs depending on the type and size of airplane in consideration.

Conclusion

The purpose of this research study was to measure the occupational noise exposure of an airline ramp operation workers. It can be concluded from the research result that the ground operation workers at this airline and at the time of this research were not exposed to excessive noise above OSHA PEL. It is recommended that noise evaluation should be done periodically to ensure that nothing has changed.

There are many reasons for maintaining sound levels in reasonable range in different working environments. Sound levels that are above certain levels are viewed as noise (Rietveld, 2010). Excessive noise can be destructive to the workforce and hence resulting to unsafe environments. On the extreme, it can result into hearing loss which is irreversible condition. Workers who are destructed by excess noise are less productive and become irritable. Noise levels that are too high makes a worker not to hear warning signs as well as instructions. Prolonged periods of exposure into high noise levels results into irreversible hearing loss. Existence of such conditions requires an employer to look for control measures, reduce as well as eliminate sources of noise (National Research Council, 2011).

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Appendix A

IRB Determination Letter

USF
UNIVERSITY OF
SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX(813)974-7091

November 22, 2017

Adekunle Ogunyemi
Environmental and Occupational Health
Tampa, FL 33612

RE: **Not Human Subjects Research Determination**
IRB#: Pro00033032
Title: Noise exposure of workers at an airline ramp

Dear A.. Ogunyemi:

The Institutional Review Board (IRB) has reviewed your application. This study qualifies as Not Human Subjects Research (NHSR) as per USF HRPP Policy. The data being collected is not about the airline ramp workers, but instead about the environment. Also, no private information is being collected from airline ramp workers. Thus, this study does not involve human subjects. As such, the activities do not meet the definition of human subject research under USF IRB policy, and USF IRB approval and oversight are therefore not required.

While not requiring USF IRB approval and oversight, your study activities should be conducted in a manner that is consistent with the ethical principles of your profession. If the scope of your project changes in the future, please contact the IRB for further guidance.

If you will be obtaining consent to conduct your study activities, please remove any references to "research" and do not include the assigned Protocol Number or USF IRB contact information.

If your study activities involve collection or use of health information, please note that there may be requirements under the HIPAA Privacy Rule that apply. For further information, please contact a HIPAA Program administrator at (813) 974-5638.

Sincerely,

Kristen Salomon, Ph.D., Vice Chairperson
USF Institutional Review Board

Appendix B

List of Equipment and Instrumentation

3M Edge 5 Personal Noise Dosimeter (2) Model No: eg5 Serial No.: ESN080202, ESN080203 Manufacturer Calibration Date: 08/20/2014 3M Detection Solutions 1060 Corporate Center Drive Oconomowoc, WI 53066

3M AcoustiCal AC-300 Calibrator Model No.: AC-300 Serial No.: AC300004123 Calibration Date: 08/22/2014 3M Detection Solutions 1060 Corporate Center Drive Oconomowoc, WI 53066.

Appendix C:

Personal Noise Monitoring Reports

Dosimetry Report

1/31/2018

General Information

Name	ESN080199_20171025_103420
Comments	
Location	
User Name	
Start Time	9/22/2016 12:35:21 PM
Stop Time	9/22/2016 8:37:26 PM
Run Time	08:02:05
Model Type	Edge eg-5
Serial Number	ESN080199
Device Firmware Rev	R.22C
Company Name	
Description	

OSHA HC

Description	Meter	Value	Description	Meter	Value
Dose	1	27.4 %	Pdose (8:00)	1	27.3 %
Lavg	1	80.6 dB	Leq	1	--
Weigh ng	1	A	RangeCeiling	1	140 dB
TWA	1	80.6 dB	UL Time	1	00:00:01
Response	1	SLOW	Integra ng Threshold	1	80 dB
Criterion Level	1	90 dB	ULL	1	115 dB
SEL	1	154.7 dB	ProjectedTWA (8:00)	1	80.6 dB
Dynamic Range	1	80 dB	Exchange Rate	1	5 dB
Mn me	1	9/22/2016 1:35:55 PM	Mx me	1	9/22/2016 **2:03:42 PM**

PK me 1 9/22/2016 6:14:10 PM Lasmx 1 117.1 dB Alarm Level 1 1 -- AlarmLevel2 1 --

Dosimeter Name	1	OSHA HC			
Lafmx	1	--	Lcsmx	1	--
Lcfmx	1	--	Lasmn	1	60.1 dB
Lafmn	1	--	Lcsmn	1	--
Lcfmn 1 --	Lcpk 1	-Lzpk 1	139.2 dB	Lapk 1	--

OSHA PEL

Description	Meter	Value	Description	Meter	Value
Dose	2	13.8 %	Pdose (8:00)	2	13.8 %
Lavg	2	75.7 dB	Leq	2	--
Weigh ng	2	A	Range Ceiling	2	--
TWA	2	75.7 dB	UL Time	2	00:00:01
Response 2 SLOW Integra ng Threshold 2 90 dB Criterion Level 2 90 dB ULL 2 115 dB					
SEL	2	149.8 dB	ProjectedTWA (8:00)	2	75.7 dB
Dynamic Range	2	--	Exchange Rate	2	5 dB
Mn me	2	9/22/2016 1:35:55 PM	Mx me	2	9/22/2016 **2:03:42 PM**
PK me	2	9/22/2016 6:14:10 PM		Lasmx	2 117.1 dB
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	OSHA PEL			
Lafmx	2	--	Lcsmx	2	--
Lcfmx	2	--	Lasmn	2	60.1 dB
Lafmn	2	--	Lcsmn	2	--
Lcfmn	2	--	Lcpk	2	--
Lzpk	2	139.2 dB	Lapk	2	--

ACGIH

Description	Meter	Value	Description	Meter	Value
Dose	3	130.2 %	Pdose (8:00)	3	129.7 %
Lavg	3	86.1 dB	Leq	3	--
Weigh ng	3	A	Range Ceiling	3	--
TWA	3	86.1 dB	UL Time	3	00:00:01
Response	3	SLOW	Integra ng Threshold	3	80 dB
Criterion Level	3	85 dB	ULL	3	115 dB
SEL	3	130.7 dB	ProjectedTWA (8:00)	3	86.1 dB
Dynamic Range	3	--	Exchange Rate	3	3 dB
Mn me	3	9/22/2016 1:35:55 PM	Mx me	3	9/22/2016

2:03:42 PM

PK me 3 9/22/2016 6:14:10 PM Lasmx 3 117.1 dB Alarm Level 1 3
-- AlarmLevel2 3 --
Dosimeter Name 3 ACGIH
Lafmx 3 -- Lcsmx 3 --
Lcfmx 3 -- Lasmn 3 60.1 dB Lafmn 3 -- Lcsmn 3 --

Lcfmn 3 -- Lcpk 3 --
Lzpk 3 139.2 dB Lapk 3 --

Dosimetry Report

1/29/2018

General Information

Name	ESN080199_20171026_131949
Comments	
Location	
User Name	
Start Time	9/22/2016 12:35:21 PM
Stop Time	9/23/2016 8:40:05 PM
Run Time	16:02:32
Model Type	Edge eg-5
Serial Number	ESN080199
Device Firmware Rev	R.22C
Company Name	
Description	

OSHA HC

Description	Meter	Value	Description	Meter	Value
Dose	1	69.3 %	Pdose (8:00)	1	34.5 %
Lavg	1	82.3 dB	Leq	1	--

Weigh ng 1 A RangeCeiling 1 140 dB TWA 1 87.3 dB UL Time 1 00:00:04

Response	1	SLOW	Integra ng Threshold	1	80 dB
Criterion Level	1	90 dB	ULL	1	115 dB
SEL	1	161.4 dB	ProjectedTWA (8:00)	1	82.3 dB
Dynamic Range	1	80 dB	Exchange Rate 1	5 dB Mn me 1	9/22/2016

1:35:55 PM Mx me 1 9/23/2016
2:13:20 PM

PK me	1	9/23/2016 1:01:27 PM		Lasmx	1
	117.3 dB				
Alarm Level 1	1	--	AlarmLevel2	1	--
Dosimeter Name	1	OSHA HC			
Lafmx	1	--	Lcsmx	1	--
Lcfmx	1	--	Lasmn	1	60.1 dB
Lafmn	1	--	Lcsmn	1	--
Lcfmn	1	--	Lcpk	1	--
Lzpk	1	141.2 dB	Lapk	1	--

OSHA PEL

Description	Meter	Value	Description	Meter	Value
Dose	2	38.4 %	Pdose (8:00)	2	19.1 %
Lavg	2	78 dB	Leq	2	--
Weigh ng	2	A	Range Ceiling	2	--
TWA	2	83.1 dB	UL Time	2	00:00:04
Response	2	SLOW	Integra ng Threshold	2	90 dB
Criterion Level	2	90 dB	ULL	2	115 dB
SEL	2	157.1 dB	ProjectedTWA (8:00)	2	78 dB
Dynamic Range	2	--	Exchange Rate	2	5 dB
Mn me	2	9/22/2016 1:35:55 PM	Mx me	2	9/23/2016 2:13:20 PM
PK me	2	9/23/2016 1:01:27 PM		Lasmx	2
	117.3 dB				
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	OSHA PEL			
Lafmx	2	--	Lcsmx	2	--
Lcfmx	2	--	Lasmn	2	60.1 dB
Lafmn	2	--	Lcsmn	2	--
Lcfmn	2	--	Lcpk	2	--
Lzpk	2	141.2 dB	Lapk	2	--

ACGIH

Description	Meter	Value	Description	Meter	Value
Dose	3	352.1 %	Pdose (8:00)	3	175.6 %
Lavg 3	87.4 dB	Leq 3	-Weigh ng 3	A	Range Ceiling 3
--					

TWA	3	90.4 dB	UL Time	3	00:00:04
Response	3	SLOW	Integra ng Threshold	3	80 dB

Criterion Level 3 85 dB ULL 3 115 dB SEL 3 135 dB Projected TWA (8:00) 3 87.4 dB

Dynamic Range	3	--	Exchange Rate	3	3 dB
Mn me	3	9/22/2016 1:35:55 PM	Mx me	3	9/23/2016 2:13:20 PM
PK me	3	9/23/2016 1:01:27 PM	Lasmx	3	117.3 dB
Alarm Level 1	3	--	AlarmLevel2	3	--
Dosimeter Name	3	ACGIH			
Lafmx	3	--	Lcsmx	3	--

Lcfmx 3 -- Lasmn 3 60.1 dB Lafmn 3 -- Lcsmn 3 --

Lcfmn	3	--	Lcpk	3	--
Lzpk	3	141.2 dB	Lapk	3	--

Dosimetry Report

1/29/2018

General Information

Name	ESN080199_20171027_141932
Comments	
Location	
User Name	
Start Time	9/22/2016 12:35:21 PM
Stop Time	10/27/2017 1:16:06 PM
Run Time	1.00:03:11
Model Type	Edge eg-5
Serial Number	ESN080199
Device Firmware Rev	R.22C
Company Name	
Description	

OSHA HC

Description	Meter	Value	Description	Meter	Value
Dose	1	94.8 %	Pdose (8:00)	1	31.5 %

Lavg	1	81.6 dB	Leq	1	--

Weigh ng 1 A RangeCeiling 1 140 dB TWA 1 89.6 dB UL Time 1 00:00:04

Response	1	SLOW	Integra ng Threshold	1	80 dB
Criterion Level	1	90 dB	ULL 1	115 dB SEL 1	163.6 dB

ProjectedTWA (8:00) 1 81.6 dB

Dynamic Range	1	80 dB	Exchange Rate	1	5 dB
Mn me	1	9/22/2016 1:35:55 PM	Mx me	1	9/23/2016 2:13:20 PM
PK me	1	9/23/2016 1:01:27 PM	Lasmx	1	117.3 dB
Alarm Level 1	1	--	AlarmLevel2	1	--
Dosimeter Name	1	OSHA HC			
Lafmx	1	--	Lcsmx	1	--
Lcfmx	1	--	Lasmn	1	60.1 dB
Lafmn	1	--	Lcsmn	1	--
Lcfmn	1	--	Lcpk	1	--
Lzpk	1	141.2 dB	Lapk	1	--

OSHA PEL

Description	Meter	Value	Description	Meter	Value
Dose	2	49.3 %	Pdose (8:00)	2	16.4 %
Lavg	2	76.9 dB	Leq	2	--
Weigh ng	2	A	Range Ceiling	2	--
TWA	2	84.9 dB	UL Time	2	00:00:04
Response	2	SLOW	Integra ng Threshold	2	90 dB
Criterion Level	2	90 dB	ULL	2	115 dB
SEL	2	158.9 dB	ProjectedTWA (8:00)	2	76.9 dB
Dynamic Range	2	--	Exchange Rate	2	5 dB
Mn me	2	9/22/2016 1:35:55 PM	Mx me	2	9/23/2016 2:13:20 PM
PK me	2	9/23/2016 1:01:27 PM	Lasmx	2	117.3 dB
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	OSHA PEL			
Lafmx	2	--	Lcsmx	2	--

Lcfmx 2 -- Lasmn 2 60.1 dB Lafmn 2 -- Lcsmn 2 --

Lcfmn	2	--	Lcpk	2	--
Lzpk	2	141.2 dB	Lapk	2	--

ACGIH

Description	Meter	Value	Description	Meter	Value
Dose	3	442.6 %	Pdose (8:00)	3	147.2 %
Lavg	3	86.6 dB	Leq	3	--
Weigh ng	3	A	Range Ceiling	3	--
TWA	3	91.4 dB	UL Time	3	00:00:04
Response	3	SLOW	Integra ng Threshold	3	80 dB
Criterion Level	3	85 dB	ULL	3	115 dB
SEL	3	136 dB	ProjectedTWA (8:00)	3	86.6 dB
Dynamic Range	3	--	Exchange Rate	3	3 dB
Mn me	3	9/22/2016 1:35:55 PM	Mx me	3	9/23/2016 2:13:20 PM
PK me	3	117.3 dB	9/23/2016 1:01:27 PM	Lasmx	3
Alarm Level 1	3	--	AlarmLevel2	3	--
Dosimeter Name	3	ACGIH			
Lafmx	3	--	Lcsmx	3	--
Lcfmx	3	--	Lasmn	3	60.1 dB
Lafmn	3	--	Lcsmn	3	--
Lcfmn	3	--	Lcpk	3	--

Dosimetry Report

1/29/2018

General Information

Name	ESN080199_20171028_155407
Comments	
Location	
User Name	
Start Time	9/22/2016 12:35:21 PM
Stop Time	10/28/2017 1:09:13 PM
Run Time	1.08:03:50
Model Type	Edge eg-5
Serial Number	ESN080199
Device Firmware Rev	R.22C
Company Name	
Description	

OSHA HC

Description	Meter	Value	Description	Meter	Value
Dose	1	145.1 %	Pdose (8:00)	1	36.2 %
Lavg	1	82.6 dB	Leq	1	--
Weigh ng 1 A RangeCeiling 1 140 dB TWA 1 92.6 dB UL Time 1 00:00:07					
Response	1	SLOW	Integra ng Threshold	1	80 dB
Criterion Level	1	90 dB	ULL	1	115 dB
SEL 1 166.7 dB ProjectedTWA (8:00) 1 82.6 dB Dynamic Range 1 80 dB Exchange Rate 1 5 dB					
Mn me	1	9/22/2016 1:35:55 PM	Mx me	1	9/23/2016 2:13:20 PM
PK me	1	10/28/2017 5:39:19 AM	Lasmx	1	117.3 dB
Alarm Level 1	1	--	AlarmLevel2	1	--
Dosimeter Name	1	OSHA HC			
Lafmx	1	--	Lcsmx	1	--
Lcfmx	1	--	Lasmn	1	60.1 dB
Lafmn	1	--	Lcsmn	1	--
Lcfmn	1	--	Lcpk	1	--
Lzpk	1	142.2 dB	Lapk	1	--

OSHA PEL

Description	Meter	Value	Description	Meter	Value
Dose	2	81.8 %	Pdose (8:00)	2	20.4 %
Lavg	2	78.5 dB	Leq	2	--
Weigh ng 2 A Range Ceiling 2 -TWA 2 88.5 dB UL Time 2 00:00:07					
Response	2	SLOW	Integra ng Threshold	2	90 dB
Criterion Level	2	90 dB	ULL	2	115 dB
SEL	2	162.6 dB	ProjectedTWA (8:00)	2	78.5 dB
Dynamic Range	2	--	Exchange Rate	2	5 dB
Mn me	2	9/22/2016 1:35:55 PM	Mx me	2	9/23/2016 2:13:20 PM
PK me	2	10/28/2017 5:39:19 AM	Lasmx	2	117.3 dB
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	OSHA PEL			
Lafmx	2	--	Lcsmx	2	--
Lcfmx 2 -- Lasmn 2 60.1 dB Lafmn 2 -- Lcsmn 2 --					
Lcfmn	2	--	Lcpk	2	--
Lzpk	2	142.2 dB	Lapk	2	--

ACGIH

Description	Meter	Value	Description	Meter	Value
Dose	3	772.3 %	Pdose (8:00)	3	192.6 %
Lavg	3	87.8 dB	Leq	3	--
Weigh ng	3	A	Range Ceiling	3	--
TWA	3	93.8 dB	UL Time	3	00:00:07
Response	3	SLOW	Integra ng Threshold	3	80 dB
Criterion Level	3	85 dB	ULL	3	115 dB
SEL	3	138.4 dB	ProjectedTWA (8:00)	3	87.8 dB
Dynamic Range	3	--	Exchange Rate	3	3 dB
Mn me	3	9/22/2016 1:35:55 PM	Mx me	3	9/23/2016 2:13:20 PM
PK me	3	10/28/2017 5:39:19 AM	Lasmx	3	117.3 dB
Alarm Level 1	3	--	AlarmLevel2	3	--
Dosimeter Name	3	ACGIH			
Lafmx	3	--	Lcsmx	3	--
Lcfmx	3	--	Lasmn	3	60.1 dB
Lafmn	3	--	Lcsmn	3	--

Dosimetry Report

1/29/2018

General Information

Name	ESN080200_20171025_103436
Comments	
Loca on	
User Name	
Start Time	9/22/2016 12:05:34 PM
Stop Time	9/22/2016 8:18:16 PM
Run Time	08:12:42
Model Type	Edge eg-5
Serial Number	ESN080200
Device Firmware Rev	R.22C

Company Name
Descrip on

OSHA HC

Description	Meter	Value	Description	Meter	Value
Dose	1	25.3 %	Pdose (8:00)	1	24.7 %
Lavg	1	79.9 dB	Leq	1	--
Weigh ng	1	A	RangeCeiling	1	140 dB
TWA	1	80.1 dB	UL Time	1	00:00:01
Response	1	SLOW	Integra ng Threshold	1	80 dB
Criterion Level	1	90 dB	ULL	1	115 dB
SEL	1	154.1 dB	ProjectedTWA (8:00)	1	79.9 dB
Dynamic Range	1	80 dB	Exchange Rate	1	5 dB
Mn me	1	9/22/2016 2:01:31 PM	Mx me	1	9/22/2016 5:37:40 PM
PK me	1	9/22/2016 5:37:40 PM	Lasmx	1	117.8 dB
Alarm Level 1	1	--	AlarmLevel2	1	--
Dosimeter Name	1	OSHA HC			
Lafmx	1	--	Lcsmx	1	--
Lcfmx	1	--	Lasmn	1	60.1 dB
Lafmn	1	--	Lcsmn	1	--
Lcfmn	1	--	Lcpk	1	--
Lzpk	1	127.8 dB	Lapk	1	--

OSHA PEL

Description	Meter	Value	Description	Meter	Value
Dose	2	7.9 %	Pdose (8:00)	2	7.7 %
Lavg	2	71.5 dB	Leq	2	--
Weigh ng	2	A	Range Ceiling	2	--

TWA	2	71.7 dB	UL Time	2	00:00:01
Response	2	SLOW	Integra ng Threshold	2	90 dB
Criterion Level	2	90 dB	ULL	2	115 dB

SEL 2 145.8 dB ProjectedTWA (8:00) 2 71.5 dB Dynamic Range 2 -- Exchange Rate 2 5 dB

Mn me	2	9/22/2016 2:01:31 PM	Mx me	2	9/22/2016 5:37:40 PM
PK me	2	9/22/2016 5:37:40 PM	Lasmx	2	117.8 dB
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	OSHA PEL			
Lafmx	2	--	Lcsmx	2	--
Lcfmx	2	--	Lasmn	2	60.1 dB
Lafmn	2	--	Lcsmn	2	--
Lcfmn	2	--	Lcpk	2	--
Lzpk	2	127.8 dB	Lapk	2	--

ACGIH

Description	**Meter**	**Value**	**Description**	**Meter**	**Value**
Dose	3	102.1 %	Pdose (8:00)	3	99.5 %
Lavg	3	84.9 dB	Leq	3	--

Weigh ng 3 A Range Ceiling 3 -TWA 3 85 dB UL Time 3 00:00:01

Response	3	SLOW	Integra ng Threshold	3	80 dB
Criterion Level 3	85 dB	ULL 3	115 dB SEL 3	129.6 dB	ProjectedTWA (8:00) 3 84.9 dB
Dynamic Range	3	--	Exchange Rate	3	3 dB
Mn me	3	9/22/2016 2:01:31 PM	Mx me	3	9/22/2016 5:37:40 PM
PK me	3	9/22/2016 5:37:40 PM	Lasmx	3	117.8 dB
Alarm Level 1	3	--	AlarmLevel2	3	--
Dosimeter Name	3	ACGIH			
Lafmx	3	--	Lcsmx	3	--
Lcfmx	3	--	Lasmn	3	60.1 dB
Lafmn	3	--	Lcsmn	3	--
Lcfmn	3	--	Lcpk	3	--
Lzpk	3	127.8 dB	Lapk	3	--

Dosimetry Report

1/29/2018

General Information

Name	ESN080200_20171026_132012
Comments	
Loca on	
User Name	
Start Time	9/22/2016 12:05:34 PM
Stop Time	9/23/2016 8:21:10 PM
Run Time	16:12:51
Model Type	Edge eg-5
Serial Number	ESN080200
Device Firmware Rev	R.22C
Company Name	
Descrip on	

OSHA HC

Description	Meter	Value	Description	Meter	Value
Dose	1	44 %	Pdose (8:00)	1	21.7 %
Lavg	1	78.9 dB	Leq	1	--
Weigh ng 1 A Range	Ceiling 1 140 dB TWA 1 84 dB UL Time 1 00:00:01				
Response	1	SLOW	Integra ng Threshold	1	80 dB
Criterion Level	1	90 dB	ULL	1	115 dB
SEL	1	158.1 dB	ProjectedTWA (8:00)	1	78.9 dB
Dynamic Range	1	80 dB	Exchange Rate 1	5 dB Mn me	1	9/22/2016 2:01:31 PM
Mx me 1	9/22/2016 5:37:40 PM				
PK me	1	9/22/2016 5:37:40 PM	Lasmx	1	117.8 dB
Alarm Level 1	1	--	AlarmLevel2	1	--
Dosimeter Name	1	OSHA HC			
Lafmx	1	--	Lcsmx	1	--
Lcfmx	1	--	Lasmn	1	60.1 dB
Lafmn	1	--	Lcsmn	1	--
Lcfmn	1	--	Lcpk	1	--
Lzpk	1	127.8 dB	Lapk	1	--

OSHA PEL

Description	Meter	Value	Description	Meter	Value
Dose	2	17.9 %	Pdose (8:00)	2	8.8 %
Lavg	2	72.5 dB	Leq	2	--
Weigh ng	2	A	Range Ceiling	2	--
TWA	2	77.6 dB	UL Time	2	00:00:01
Response	2	SLOW	Integra ng Threshold	2	90 dB
Criterion Level	2	90 dB	ULL	2	115 dB
SEL	2	151.6 dB	ProjectedTWA (8:00)	2	72.5 dB
Dynamic Range	2	--	Exchange Rate	2	5 dB
Mn me	2	9/22/2016 2:01:31 PM	Mx me	2	9/22/2016 5:37:40 PM
PK me	2	9/22/2016 5:37:40 PM	Lasmx	2	117.8 dB
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	OSHA PEL			
Lafmx	2	--	Lcsmx	2	--
Lcfmx	2	--	Lasmn	2	60.1 dB
Lafmn	2	--	Lcsmn	2	--
Lcfmn	2	--	Lcpk	2	--
Lzpk	2	127.8 dB	Lapk	2	--

ACGIH

Description	Meter	Value	Description	Meter	Value
Dose	3	212 %	Pdose (8:00)	3	104.6 %
Lavg 3 85.1 dB Leq 3 -Weigh ng 3 A Range Ceiling 3 --					
TWA	3	88.2 dB	UL Time	3	00:00:01
Response	3	SLOW	Integra ng Threshold	3	80 dB
Criterion Level	3	85 dB	ULL	3	115 dB
SEL	3	132.8 dB	ProjectedTWA (8:00)	3	85.1 dB
Dynamic Range	3	--	Exchange Rate	3	3 dB
Mn me	3	9/22/2016 2:01:31 PM	Mx me	3	9/22/2016 5:37:40 PM
PK me	3	9/22/2016 5:37:40 PM	Lasmx	3	117.8 dB
Alarm Level 1	3	--	AlarmLevel2	3	--
Dosimeter Name	3	ACGIH			
Lafmx	3	--	Lcsmx	3	--

Lcfmx 3 -- Lasmn 3 60.1 dB Lafmn 3 -- Lcsmn 3 --

Lcfmn	3	--	Lcpk	3	--
Lzpk	3	127.8 dB	Lapk	3	--

Dosimetry Report

1/29/2018

General Information

Name	ESN080200_20171027_142005
Comments	
Loca on	
User Name	
Start Time	9/22/2016 12:05:34 PM
Stop Time	10/27/2017 1:13:10 PM
Run Time	1.00:13:37
Model Type	Edge eg-5
Serial Number	ESN080200
Device Firmware Rev	R.22C
Company Name	
Descrip on	

OSHA HC

Description	Meter	Value	Description	Meter	Value
Dose	1	63 %	Pdose (8:00)	1	20.8 %
Lavg	1	78.6 dB	Leq	1	--

Weigh ng 1 A RangeCeiling 1 140 dB TWA 1 86.6 dB UL Time 1 00:00:01

Response	1	SLOW	Integra ng Threshold	1	80 dB
Criterion Level	1	90 dB	ULL 1	115 dB SEL 1	160.7 dB
ProjectedTWA (8:00)	1	78.6 dB			
Dynamic Range	1	80 dB	Exchange Rate	1	5 dB
Mn me	1	9/22/2016 2:01:31 PM	Mx me	1	9/22/2016 5:37:40 PM
PK me	1	10/27/2017 6:06:28 AM	Lasmx	1	117.8 dB
Alarm Level 1	1	--	AlarmLevel2	1	--

Dosimeter Name	1	OSHA HC			
Lafmx	1	--	Lcsmx	1	--
Lcfmx	1	--	Lasmn	1	60.1 dB
Lafmn	1	--	Lcsmn	1	--
Lcfmn	1	--	Lcpk	1	--
Lzpk	1	143 dB	Lapk	1	--

OSHA PEL

Description	Meter	Value	Description	Meter	Value
Dose	2	26.1 %	Pdose (8:00)	2	8.6 %
Lavg	2	72.3 dB	Leq	2	--
Weigh ng	2	A	Range Ceiling	2	--
TWA	2	80.3 dB	UL Time	2	00:00:01
Response	2	SLOW	Integra ng Threshold	2	90 dB
Criterion Level	2	90 dB	ULL	2	115 dB
SEL	2	154.3 dB	ProjectedTWA (8:00)	2	72.3 dB
Dynamic Range	2	--	Exchange Rate	2	5 dB
Mn me	2	9/22/2016 2:01:31 PM	Mx me	2	9/22/2016 5:37:40 PM
PK me	2	10/27/2017 6:06:28 AM	Lasmx	2	117.8 dB
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	OSHA PEL			
Lafmx	2	--	Lcsmx	2	--
Lcfmx 2 -- Lasmn 2 60.1 dB Lafmn 2 -- Lcsmn 2 --					
Lcfmn	2	--	Lcpk	2	--
Lzpk	2	143 dB	Lapk	2	--

ACGIH

Description	Meter	Value	Description	Meter	Value
Dose	3	286.9 %	Pdose (8:00)	3	94.7 %
Lavg	3	84.7 dB	Leq	3	--
Weigh ng	3	A	Range Ceiling	3	--
TWA	3	89.5 dB	UL Time	3	00:00:01
Response	3	SLOW	Integra ng Threshold	3	80 dB
Criterion Level	3	85 dB	ULL	3	115 dB
SEL	3	134.1 dB	ProjectedTWA (8:00)	3	84.7 dB
Dynamic Range	3	--	Exchange Rate	3	3 dB
Mn me	3	9/22/2016 2:01:31 PM	Mx me	3	9/22/2016

PK me	3	10/27/2017 6:06:28 AM	Lasmx	3	117.8 dB
Alarm Level 1	3	--	AlarmLevel2	3	--
Dosimeter Name	3	ACGIH			
Lafmx	3	--	Lcsmx	3	--
Lcfmx	3	--	Lasmn	3	60.1 dB
Lafmn	3	--	Lcsmn	3	--
Lcfmn	3	--	Lcpk	3	--
Lzpk	3	143 dB	Lapk	3	--

Dosimetry Report

1/29/2018

General Information

Name	ESN080200_20171028_155446
Comments	
Loca on	
User Name	
Start Time	9/22/2016 12:05:34 PM
Stop Time	10/28/2017 1:31:58 PM
Run Time	1.08:33:06
Model Type	Edge eg-5
Serial Number	ESN080200
Device Firmware Rev	R.22C
Company Name	
Descrip on	

OSHA HC

Description	Meter	Value	Description	Meter	Value
Dose	1	99.9 %	Pdose (8:00)	1	24.5 %
Lavg	1	79.8 dB	Leq	1	--
Weigh ng	1 A	RangeCeiling	1 140 dB TWA	1 89.9 dB	UL
Time	1 00:00:01				
Response	1	SLOW	Integra ng Threshold	1	80 dB

Criterion Level	1	90 dB	ULL	1	115 dB

SEL 1 164 dB ProjectedTWA (8:00) 1 79.8 dB Dynamic Range 1 80 dB Exchange Rate 1 5 dB

Mn me	1	9/22/2016 2:01:31 PM	Mx me	1	9/22/2016 5:37:40 PM
PK me	1	10/27/2017 6:06:28 AM	Lasmx	1	117.8 dB
Alarm Level 1	1	--	AlarmLevel2	1	--
Dosimeter Name	1	OSHA HC			
Lafmx	1	--	Lcsmx	1	--
Lcfmx	1	--	Lasmn	1	60.1 dB
Lafmn	1	--	Lcsmn	1	--
Lcfmn	1	--	Lcpk	1	--
Lzpk	1	143 dB	Lapk	1	--

OSHA PEL

Description	Meter	Value	Description	Meter	Value
Dose	2	28.7 %	Pdose (8:00)	2	7 %
Lavg	2	70.8 dB	Leq	2	--

Weigh ng 2 A Range Ceiling 2 -TWA 2 80.9 dB UL Time 2 00:00:01

Response	2	SLOW	Integra ng Threshold	2	90 dB

Criterion Level 2 90 dB ULL 2 115 dB SEL 2 155 dB ProjectedTWA (8:00) 2 70.8 dB

Dynamic Range	2	--	Exchange Rate	2	5 dB
Mn me	2	9/22/2016 2:01:31 PM	Mx me	2	9/22/2016 5:37:40 PM
PK me	2	10/27/2017 6:06:28 AM	Lasmx	2	117.8 dB
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	OSHA PEL			
Lafmx	2	--	Lcsmx	2	--

Lcfmx 2 -- Lasmn 2 60.1 dB Lafmn 2 -- Lcsmn 2 --

Lcfmn	2	--	Lcpk	2	--
Lzpk	2	143 dB	Lapk	2	--

ACGIH

Description	Meter	Value	Description	Meter	Value
Dose	3	371.7 %	Pdose (8:00)	3	91.3 %
Lavg	3	84.6 dB	Leq	3	--
Weigh ng	3	A	Range Ceiling	3	--

TWA	3	90.7 dB	UL Time	3	00:00:01
Response	3	SLOW	Integra ng Threshold	3	80 dB
Criterion Level	3	85 dB	ULL	3	115 dB
SEL	3	135.2 dB	ProjectedTWA (8:00)	3	84.6 dB
Dynamic Range	3	--	Exchange Rate	3	3 dB
Mn me	3	9/22/2016 2:01:31 PM	Mx me	3	9/22/2016 5:37:40 PM
PK me	3	10/27/2017 6:06:28 AM	Lasmx	3	117.8 dB
Alarm Level 1	3	--	AlarmLevel2	3	--
Dosimeter Name	3	ACGIH			
Lafmx	3	--	Lcsmx	3	--
Lcfmx	3	--	Lasmn	3	60.1 dB
Lafmn	3	--	Lcsmn	3	--
Lcfmn	3	--	Lcpk	3	--
Lzpk	3	143 dB	Lapk	3	--

Dosimetry Report

1/29/2018

General Information

Name	ESN080201_20171025_103457
Comments	
Loca on	
User Name	
Start Time	9/21/2016 6:50:53 PM
Stop Time	9/22/2016 8:16:33 PM
Run Time	08:00:03
Model Type	Edge eg-5
Serial Number	ESN080201
Device Firmware Rev	R.22C
Company Name	
Descrip on	

OSHA HC

Description	Meter	Value	Description	Meter	Value
Dose	1	18.3 %	Pdose (8:00)	1	18.3 %

Lavg	1	77.7 dB	Leq	1	--
Weigh ng 1 A RangeCeiling 1 140 dB TWA 1 77.7 dB UL Time 1 00:00:00					
Response	1	SLOW	Integra ng Threshold	1	80 dB
Criterion Level	1	90 dB	ULL	1	115 dB
SEL	1	151.8 dB	ProjectedTWA (8:00)	1	77.7 dB
Dynamic Range	1	80 dB	Exchange Rate 1	5 dB Mn me	1 9/22/2016 2:46:29 PM
Mx me 1	9/22/2016 12:55:35 PM				
PK me	1	9/22/2016 12:47:54 PM	Lasmx	1	112.8 dB
Alarm Level 1	1	--	AlarmLevel2	1	--
Dosimeter Name	1	OSHA HC			
Lafmx	1	--	Lcsmx	1	--
Lcfmx	1	--	Lasmn	1	60.7 dB
Lafmn	1	--	Lcsmn	1	--
Lcfmn	1	--	Lcpk	1	--
Lzpk	1	142.4 dB	Lapk	1	--

OSHA PEL

Description	Meter	Value	Description	Meter	Value
Dose	2	6.5 %	Pdose (8:00)	2	6.5 %
Lavg	2	70.3 dB	Leq	2	--
Weigh ng	2	A	Range Ceiling	2	--
TWA	2	70.3 dB	UL Time	2	00:00:00
Response	2	SLOW	Integra ng Threshold	2	90 dB
Criterion Level	2	90 dB	ULL	2	115 dB
SEL	2	144.4 dB	ProjectedTWA (8:00)	2	70.3 dB
Dynamic Range	2	--	Exchange Rate	2	5 dB
Mn me	2	9/22/2016 2:46:29 PM	Mx me	2	9/22/2016 12:55:35 PM
PK me	2	9/22/2016 12:47:54 PM	Lasmx	2	112.8 dB
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	OSHA PEL			
Lafmx	2	--	Lcsmx	2	--
Lcfmx	2	--	Lasmn	2	60.7 dB
Lafmn	2	--	Lcsmn	2	--
Lcfmn	2	--	Lcpk	2	--
Lzpk	2	142.4 dB	Lapk	2	--

ACGIH

Description	Meter	Value	Description	Meter	Value
Dose	3	62 %	Pdose (8:00)	3	62 %
Lavg 3 82.9 dB Leq 3 -Weigh ng 3 A Range Ceiling 3 --					
TWA	3	82.9 dB	UL Time	3	00:00:00
Response	3	SLOW	Integra ng Threshold	3	80 dB
Criterion Level	3	85 dB	ULL	3	115 dB
SEL	3	127.5 dB	ProjectedTWA (8:00)	3	82.9 dB
Dynamic Range	3	--	Exchange Rate	3	3 dB
Mn me	3	9/22/2016 2:46:29 PM	Mx me	3	9/22/2016 12:55:35 PM
PK me	3	9/22/2016 12:47:54 PM	Lasmx	3	112.8 dB
Alarm Level 1	3	--	AlarmLevel2	3	--
Dosimeter Name	3	ACGIH			
Lafmx	3	--	Lcsmx	3	--
Lcfmx 3 -- Lasmn 3 60.7 dB Lafmn 3 -- Lcsmn 3 --					
Lcfmn	3	--	Lcpk	3	--
Lzpk	3	142.4 dB	Lapk	3	--

Dosimetry Report

1/29/2018

General Information

Name	ESN080201_20171026_132913
Comments	
Loca on	
User Name	
Start Time	9/21/2016 6:50:53 PM
Stop Time	9/23/2016 8:18:57 PM
Run Time	15:59:03
Model Type	Edge eg-5
Serial Number	ESN080201
Device Firmware Rev	R.22C
Company Name	
Descrip on	

OSHA HC

Description	Meter	Value	Description	Meter	Value

Dose	1	31.4 %	Pdose (8:00)	1	15.7 %
Lavg	1	76.6 dB	Leq	1	--

Weigh ng 1 A RangeCeiling 1 140 dB TWA 1 81.6 dB UL Time 1 00:00:00

Response	1	SLOW	Integra ng Threshold	1	80 dB

Criterion Level 1 90 dB ULL 1 115 dB SEL 1 155.7 dB ProjectedTWA (8:00) 1 76.6 dB

Dynamic Range	1	80 dB	Exchange Rate	1	5 dB
Mn me	1	9/22/2016 2:46:29 PM	Mx me	1	9/22/2016 12:55:35 PM
PK me	1	9/22/2016 12:47:54 PM	Lasmx	1	112.8 dB
Alarm Level 1	1	--	AlarmLevel2	1	--
Dosimeter Name	1	OSHA HC			
Lafmx	1	--	Lcsmx	1	--
Lcfmx	1	--	Lasmn	1	60.7 dB
Lafmn	1	--	Lcsmn	1	--
Lcfmn	1	--	Lcpk	1	--
Lzpk	1	142.4 dB	Lapk	1	--

OSHA PEL

Description	Meter	Value	Description	Meter	Value
Dose	2	10 %	Pdose (8:00)	2	5 %
Lavg	2	68.4 dB	Leq	2	--
Weigh ng	2	A	Range Ceiling	2	--
TWA	2	73.3 dB	UL Time	2	00:00:00
Response	2	SLOW	Integra ng Threshold	2	90 dB
Criterion Level	2	90 dB	ULL	2	115 dB
SEL	2	147.4 dB	ProjectedTWA (8:00)	2	68.4 dB
Dynamic Range	2	--	Exchange Rate	2	5 dB
Mn me	2	9/22/2016 2:46:29 PM	Mx me	2	9/22/2016 12:55:35 PM
PK me	2	9/22/2016 12:47:54 PM	Lasmx	2	112.8 dB
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	OSHA PEL			
Lafmx	2	--	Lcsmx	2	--

Lcfmx 2 -- Lasmn 2 60.7 dB Lafmn 2 -- Lcsmn 2 --

Lcfmn	2	--	Lcpk	2	--
Lzpk	2	142.4 dB	Lapk	2	--

ACGIH

Description	Meter	Value	Description	Meter	Value
Dose	3	100.1 %	Pdose (8:00)	3	50.1 %
Lavg	3	81.9 dB	Leq	3	--
Weigh ng	3	A	Range Ceiling	3	--
TWA	3	85 dB	UL Time	3	00:00:00
Response	3	SLOW	Integra ng Threshold	3	80 dB
Criterion Level	3	85 dB	ULL	3	115 dB
SEL	3	129.5 dB	ProjectedTWA (8:00)	3	81.9 dB
Dynamic Range	3	--	Exchange Rate	3	3 dB
Mn me	3	9/22/2016 2:46:29 PM	Mx me	3	9/22/2016 12:55:35 PM
PK me	3	9/22/2016 12:47:54 PM	Lasmx	3	112.8 dB
Alarm Level 1	3	--	AlarmLevel2	3	--
Dosimeter Name	3	ACGIH			
Lafmx	3	--	Lcsmx	3	--
Lcfmx	3	--	Lasmn	3	60.7 dB
Lafmn	3	--	Lcsmn	3	--
Lcfmn	3	--	Lcpk	3	--
Lzpk	3	142.4 dB	Lapk	3	--

Dosimetry Report

1/29/2018

General Information

Name	ESN080201_20171028_155525
Comments	
Loca on	
User Name	
Start Time	9/21/2016 6:50:53 PM
Stop Time	10/28/2017 1:08:13 PM
Run Time	1.08:01:44
Model Type	Edge eg-5
Serial Number	ESN080201
Device Firmware Rev	R.22C
Company Name	
Descrip on	

OSHA HC

Description	Meter	Value	Description	Meter	Value
Dose	1	110.4 %	Pdose (8:00)	1	27.5 %
Lavg	1	80.7 dB	Leq	1	--
Weigh ng	1	A	RangeCeiling	1	140 dB
TWA	1	90.7 dB	UL Time	1	00:00:00
Response	1	SLOW	Integra ng Threshold	1	80 dB
Criterion Level	1	90 dB	ULL	1	115 dB
SEL	1	164.7 dB	ProjectedTWA (8:00)	1	80.7 dB
Dynamic Range	1	80 dB	Exchange Rate	1	5 dB
Mn me	1	9/22/2016 2:46:29 PM	Mx me	1	10/28/2017 8:43:24 AM
PK me	1	9/22/2016 12:47:54 PM	Lasmx	1	114.3 dB
Alarm Level 1	1	--	AlarmLevel2	1	--
Dosimeter Name	1	OSHA HC			
Lafmx	1	--	Lcsmx	1	--
Lcfmx	1	--	Lasmn	1	60.7 dB
Lafmn	1	--	Lcsmn	1	--
Lcfmn	1	--	Lcpk	1	--
Lzpk	1	142.4 dB	Lapk	1	--

OSHA PEL

Description	Meter	Value	Description	Meter	Value
Dose	2	52.8 %	Pdose (8:00)	2	13.1 %
Lavg	2	75.3 dB	Leq	2	--
Weigh ng 2 A Range Ceiling 2 -TWA 2 85.3 dB UL Time 2 00:00:00					
Response 2 SLOW Integra ng Threshold 2 90 dB Criterion Level 2 90 dB ULL 2 115 dB					
SEL	2	159.4 dB	ProjectedTWA (8:00)	2	75.3 dB
Dynamic Range	2	--	Exchange Rate	2	5 dB
Mn me	2	9/22/2016 2:46:29 PM	Mx me	2	10/28/2017 8:43:24 AM
PK me	2	9/22/2016 12:47:54 PM	Lasmx	2	114.3 dB
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	OSHA PEL			
Lafmx	2	--	Lcsmx	2	--
Lcfmx	2	--	Lasmn	2	60.7 dB
Lafmn 2 -- Lcsmn 2 -Lcfmn 2 -- Lcpk 2 --					
Lzpk	2	142.4 dB	Lapk	2	--

ACGIH

Description	Meter	Value	Description	Meter	Value
Dose	3	472.2 %	Pdose (8:00)	3	117.9 %
Lavg	3	85.7 dB	Leq	3	--
Weigh ng 3 A Range Ceiling 3 -TWA 3 91.7 dB UL Time 3 00:00:00					
Response	3	SLOW	Integra ng Threshold	3	80 dB
Criterion Level	3	85 dB	ULL	3	115 dB
SEL 3 136.3 dB ProjectedTWA (8:00) 3 85.7 dB Dynamic Range 3 -- Exchange Rate 3 3 dB					
Mn me	3	9/22/2016 2:46:29 PM	Mx me	3	10/28/2017 8:43:24 AM
PK me	3	9/22/2016 12:47:54 PM	Lasmx	3	114.3 dB
Alarm Level 1	3	--	AlarmLevel2	3	--
Dosimeter Name	3	ACGIH			
Lafmx	3	--	Lcsmx	3	--
Lcfmx	3	--	Lasmn	3	60.7 dB
Lafmn	3	--	Lcsmn	3	--
Lcfmn	3	--	Lcpk	3	--
Lzpk	3	142.4 dB	Lapk	3	--

Dosimetry Report

1/29/2018

General Information

Name	ESN080202_20171025_170026
Comments	
Loca on	
User Name	
Start Time	9/22/2016 12:42:30 PM
Stop Time	9/22/2016 8:49:46 PM
Run Time	08:07:16
Model Type	Edge eg-5
Serial Number	ESN080202
Device Firmware Rev	R.22C
Company Name	
Descrip on	

OSHA HC

Description	Meter	Value	Description	Meter	Value
Dose	1	36 %	Pdose (8:00)	1	35.4 %
Lavg	1	82.5 dB	Leq	1	--
Weigh ng	1	A	RangeCeiling	1	140 dB
TWA	1	82.6 dB	UL Time	1	00:00:00
Response	1	SLOW	Integra ng Threshold	1	80 dB
Criterion Level	1	90 dB	ULL	1	115 dB
SEL	1	156.7 dB	ProjectedTWA (8:00)	1	82.5 dB
Dynamic Range	1	80 dB	Exchange Rate	1	5 dB
Mn me	1	9/22/2016 3:20:22 PM	Mx me	1	9/22/2016 2:02:18 PM
PK me	1	9/22/2016 1:29:54 PM	Lasmx	1	111 dB
Alarm Level 1	1	--	AlarmLevel2	1	--
Dosimeter Name	1	OSHA HC			
Lafmx	1	--	Lcsmx	1	--
Lcfmx	1	--	Lasmn	1	60.7 dB
Lafmn	1	--	Lcsmn	1	--
Lcfmn	1	--	Lcpk	1	--
Lzpk	1	139.9 dB	Lapk	1	--

OSHA PEL

Description	Meter	Value	Description	Meter	Value
Dose	2	17.9 %	Pdose (8:00)	2	17.6 %
Lavg	2	77.4 dB	Leq	2	--
Weigh ng	2	A	Range Ceiling	2	--
TWA	2	77.6 dB	UL Time	2	00:00:00
Response	2	SLOW	Integra ng Threshold	2	90 dB
Criterion Level	2	90 dB	ULL	2	115 dB

SEL 2 151.6 dB ProjectedTWA (8:00) 2 77.4 dB Dynamic Range 2 -- Exchange Rate 2 5 dB

Mn me	2	9/22/2016 3:20:22 PM	Mx me	2	9/22/2016 2:02:18 PM
PK me	2	111 dB	9/22/2016 1:29:54 PM	Lasmx	2
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	OSHA PEL			
Lafmx	2	--	Lcsmx	2	--
Lcfmx	2	--	Lasmn	2	60.7 dB
Lafmn	2	--	Lcsmn	2	--
Lcfmn	2	--	Lcpk	2	--
Lzpk	2	139.9 dB	Lapk	2	--

ACGIH

Description	Meter	Value	Description	Meter	Value
Dose	3	143 %	Pdose (8:00)	3	140.9 %
Lavg	3	86.4 dB	Leq	3	--

Weigh ng 3 A Range Ceiling 3 -TWA 3 86.5 dB UL Time 3 00:00:00

Response	3	SLOW	Integra ng Threshold	3	80 dB
Criterion Level	3	85 dB	ULL 3	115 dB SEL 3	131.1 dB
ProjectedTWA (8:00)	3	86.4 dB			
Dynamic Range	3	--	Exchange Rate	3	3 dB
Mn me	3	9/22/2016 3:20:22 PM	Mx me	3	9/22/2016 2:02:18 PM
PK me	3	111 dB	9/22/2016 1:29:54 PM	Lasmx	3
Alarm Level 1	3	--	AlarmLevel2	3	--
Dosimeter Name	3	ACGIH			
Lafmx	3	--	Lcsmx	3	--
Lcfmx	3	--	Lasmn	3	60.7 dB
Lafmn	3	--	Lcsmn	3	--
Lcfmn	3	--	Lcpk	3	--
Lzpk	3	139.9 dB	Lapk	3	--

Dosimetry Report

1/29/2018

General Information

Name	ESN080202_20171027_142106
Comments	
Loca on	
User Name	
Start Time	9/22/2016 12:42:30 PM
Stop Time	10/27/2017 1:13:03 PM
Run Time	1.00:04:33
Model Type	Edge eg-5
Serial Number	ESN080202
Device Firmware Rev	R.22C
Company Name	
Descrip on	

OSHA HC

Description	Meter	Value	Description	Meter	Value
Dose	1	101.3 %	Pdose (8:00)	1	33.6 %
Lavg	1	82.1 dB	Leq	1	--
Weigh ng	1	A	RangeCeiling	1	
Response	1	SLOW	Integra ng Threshold	1	80 dB
Criterion Level	1	90 dB	ULL	1	115 dB SEL 1 164.1 dB ProjectedTWA (8:00) 1 82.1 dB
Dynamic Range	1	80 dB	Exchange Rate	1	5 dB
Mn me	1	10/27/2017 8:41:37 AM	Mx me	1	10/27/2017 11:01:48 AM
PK me	1	10/27/2017 5:19:22 AM	Lasmx	1	120.1 dB
Alarm Level 1	1	--	AlarmLevel2	1	--
Dosimeter Name	1	OSHA HC			
Lafmx	1	--	Lcsmx	1	--
Lcfmx	1	--	Lasmn	1	60.5 dB
Lafmn	1	--	Lcsmn	1	--
Lcfmn	1	--	Lcpk	1	--
Lzpk	1	140.9 dB	Lapk	1	--

OSHA PEL

Description	Meter	Value	Description	Meter	Value
Dose	2	55 %	Pdose (8:00)	2	18.3 %
Lavg	2	77.7 dB	Leq	2	--
Weigh ng	2	A	Range Ceiling	2	--

TWA	2	85.6 dB	UL Time	2	00:00:04
Response	2	SLOW	Integra ng Threshold	2	90 dB
Criterion Level	2	90 dB	ULL	2	115 dB
SEL	2	159.7 dB	ProjectedTWA (8:00)	2	77.7 dB
Dynamic Range	2	--	Exchange Rate	2	5 dB
Mn me	2	10/27/2017 8:41:37 AM	Mx me	2	10/27/2017 11:01:48 AM
PK me	2	10/27/2017 5:19:22 AM	Lasmx	2	120.1 dB
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	OSHA PEL			
Lafmx	2	--	Lcsmx	2	--
Lcfmx 2 -- Lasmn 2 60.5 dB Lafmn 2 -- Lcsmn 2 --					
Lcfmn	2	--	Lcpk	2	--
Lzpk	2	140.9 dB	Lapk	2	--

ACGIH

Description	**Meter**	**Value**	**Description**	**Meter**	**Value**
Dose	3	496.8 %	Pdose (8:00)	3	165.1 %
Lavg	3	87.1 dB	Leq	3	--
Weigh ng	3	A	Range Ceiling	3	--
TWA	3	91.9 dB	UL Time	3	00:00:04
Response	3	SLOW	Integra ng Threshold	3	80 dB
Criterion Level	3	85 dB	ULL	3	115 dB
SEL	3	136.5 dB	ProjectedTWA (8:00)	3	87.1 dB
Dynamic Range	3	--	Exchange Rate	3	3 dB
Mn me	3	10/27/2017 8:41:37 AM	Mx me	3	10/27/2017 11:01:48 AM
PK me	3	10/27/2017 5:19:22 AM	Lasmx	3	120.1 dB
Alarm Level 1	3	--	AlarmLevel2	3	--
Dosimeter Name	3	ACGIH			
Lafmx	3	--	Lcsmx	3	--
Lcfmx	3	--	Lasmn	3	60.5 dB
Lafmn	3	--	Lcsmn	3	--
Lcfmn	3	--	Lcpk	3	--
Lzpk	3	140.9 dB	Lapk	3	--

Dosimetry Report

1/29/2018

General Information

Name	ESN080202_20171028_155604
Comments	
Loca on	
User Name	
Start Time	9/22/2016 12:42:30 PM
Stop Time	10/28/2017 1:08:57 PM
Run Time	1.08:05:06
Model Type	Edge eg-5
Serial Number	ESN080202
Device Firmware Rev	R.22C
Company Name	
Descrip on	

OSHA HC

Description	Meter	Value	Description	Meter	Value
Dose	1	139.2 %	Pdose (8:00)	1	34.7 %
Lavg	1	82.3 dB	Leq	1	--
Weigh ng	1	A	RangeCeiling	1	140 dB TWA 1 92.3 dB UL
Time	1	00:00:04			
Response	1	SLOW	Integra ng Threshold	1	80 dB
Criterion Level	1	90 dB	ULL	1	115 dB

SEL 1 166.4 dB ProjectedTWA (8:00) 1 82.3 dB Dynamic Range 1 80 dB Exchange Rate 1 5 dB

Mn me	1	10/27/2017 8:41:37 AM	Mx me	1	10/27/2017 11:01:48 AM
PK me	1	10/28/2017 6:07:04 AM	Lasmx	1	120.1 dB
Alarm Level 1	1	--	AlarmLevel2	1	--
Dosimeter Name	1	OSHA HC			
Lafmx	1	--	Lcsmx	1	--
Lcfmx	1	--	Lasmn	1	60.5 dB
Lafmn	1	--	Lcsmn	1	--
Lcfmn	1	--	Lcpk	1	--
Lzpk	1	142.9 dB	Lapk	1	--

OSHA PEL

Description	Meter	Value	Description	Meter	Value

Dose	2	75.8 %	Pdose (8:00)	2	18.9 %
Lavg	2	77.9 dB	Leq	2	--

Weigh ng 2 A Range Ceiling 2 -TWA 2 88 dB UL Time 2 00:00:04

Response	2	SLOW	Integra ng Threshold	2	90 dB

Criterion Level 2 90 dB ULL 2 115 dB SEL 2 162 dB ProjectedTWA (8:00) 2 77.9 dB

Dynamic Range	2	--	Exchange Rate	2	5 dB
Mn me	2	10/27/2017 8:41:37 AM	Mx me	2	10/27/2017 11:01:48 AM
PK me	2	10/28/2017 6:07:04 AM	Lasmx	2	120.1 dB
Alarm Level 1	2	--	AlarmLevel2	2	--
Dosimeter Name	2	OSHA PEL			
Lafmx	2	--	Lcsmx	2	--

Lcfmx 2 -- Lasmn 2 60.5 dB Lafmn 2 -- Lcsmn 2 --

Lcfmn	2	--	Lcpk	2	--
Lzpk	2	142.9 dB	Lapk	2	--

ACGIH

Description	**Meter**	**Value**	**Description**	**Meter**	**Value**
Dose	3	651.8 %	Pdose (8:00)	3	162.5 %
Lavg	3	87.1 dB	Leq	3	--
Weigh ng	3	A	Range Ceiling	3	--
TWA	3	93.1 dB	UL Time	3	00:00:04
Response	3	SLOW	Integra ng Threshold	3	80 dB
Criterion Level	3	85 dB	ULL	3	115 dB
SEL	3	137.7 dB	ProjectedTWA (8:00)	3	87.1 dB
Dynamic Range	3	--	Exchange Rate	3	3 dB
Mn me	3	10/27/2017 8:41:37 AM	Mx me	3	10/27/2017 11:01:48 AM
PK me	3	10/28/2017 6:07:04 AM	Lasmx	3	120.1 dB
Alarm Level 1	3	--	AlarmLevel2	3	--
Dosimeter Name	3	ACGIH			
Lafmx	3	--	Lcsmx	3	--
Lcfmx	3	--	Lasmn	3	60.5 dB
Lafmn	3	--	Lcsmn	3	--
Lcfmn	3	--	Lcpk	3	--

Lzpk	3	142.9 dB	Lapk	3	--