NIOSH HEALTH HAZARD EVALUATION REPORT

HETA #2005-0188-3038
L-3 Communications
Budd Lake, New Jersey

March 2007

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

PREFACE

The Hazard Evaluation and Technical Assistance Branch (HETAB) of the National Institute for Occupational Safety and Health (NIOSH) conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health (OSHA) Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employers or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

HETAB also provides, upon request, technical and consultative assistance to federal, state, and local agencies; labor; industry; and other groups or individuals to control occupational health hazards and to prevent related trauma and disease. Mention of company names or products does not constitute endorsement by NIOSH.

ACKNOWLEDGMENTS AND AVAILABILITY OF REPORT

This report was prepared by Randy L. Tubbs, Ph.D. of HETAB, Division of Surveillance, Hazard Evaluations and Field Studies (DSHEFS). Field assistance was provided by Robin Epp, M.D. (HETAB) and Mark R. Stephenson, Ph.D. of the Division of Applied Research and Technology. Desktop publishing was performed by Robin Smith. Editorial assistance was provided by Ellen Galloway.

For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

Highlights of the NIOSH Health Hazard Evaluation

The National Institute for Occupational Safety and Health (NIOSH) received a confidential employee request for a health hazard evaluation (HHE) at L-3 Communications in Budd Lake, New Jersey. The request was submitted because a few employees at the facility had experienced sudden deafness in one ear within a short time period. They were concerned that an occupational exposure, particularly a water mister system used for humidity control, could be the cause of their disorder. NIOSH investigators conducted an investigation at the facility in May 2005.

What NIOSH Did

- We measured area noise levels in the assembly areas where the misters were located.
- We measured temperature, relative humidity, and carbon dioxide levels throughout the work shift.
- We privately interviewed employees about symptoms they were having and any complaints about their work conditions.

What NIOSH Found

- None of the noise or air samples exceeded the evaluation guidelines used in the evaluation.
- No large areas of water leaks, water damage, or mold were seen by NIOSH investigators.
- No workplace exposure could explain the sudden deafness found in workers.

What L-3 Communications Managers Can Do

- Routinely check the mister systems for leaks and repair them immediately to prevent water damage to building materials.
- Form a management/labor health and safety committee to discuss workplace concerns and the steps taken to eliminate them.

What L-3 Communications Employees Can Do

- Report workplace conditions that they feel are affecting them.
- Participate on L-3 Communications' health and safety committee.

What To Do For More Information:
We encourage you to read the full report. If you would like a copy, either ask your health and safety representative to make you a copy or call 1-513-841-4252 and ask for HETA Report #2005-0188-3038

Health Hazard Evaluation Report 2005-0188-3038
L-3 Communications
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SUMMARY

On March 25, 2005, the National Institute for Occupational Safety and Health (NIOSH) received a confidential request from employees at L-3 Communications in Budd Lake, New Jersey. A few employees at the facility had experienced a sudden loss of hearing in one of their ears in close time proximity to each other. They were concerned that an occupational exposure may have caused their symptoms, particularly a water mister system that was used for humidity control in the assembly areas.

An evaluation of the facility was conducted by NIOSH on May 3-4, 2005. NIOSH investigators, including a physician, audiologist, and psychoacoustician, conducted environmental sampling and employee interviews during a full work shift at the facility. The sampling protocol included area spectral noise analyses and air sampling of indoor environmental quality (IEQ) parameters to assess the conditions at L-3 Communications. Private interviews were held with employees and the medical records of workers who had experienced sudden deafness were requested and received. The results of the evaluation revealed no workplace exposures that exceeded applicable occupational exposure limits.

Exposures found in the assembly areas of L-3 Communications were below the evaluation criteria used by the NIOSH investigators. It is the opinion of the NIOSH evaluation team that there were no exposures in the facility that would explain the sudden deafness exhibited by the employees and that the disorder was most likely from a virus. Recommendations for improving working conditions at the facility are offered in this report.

Keywords: NAICS 334511 (Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing), noise, spectral analysis, IEQ, temperature, relative humidity, carbon dioxide, sudden deafness

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INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) received a confidential request from employees at L-3 Communications in Budd Lake, New Jersey in March 2005. The employees were concerned about a mister system in the facility's manufacturing area used to maintain a relatively constant humidity level to meet the manufacturing specifications set by L-3 Communications' customers. The requesters reported that some employees had been stricken with sudden hearing loss along with respiratory illness since moving to their current facility. Some employees were concerned that the misters may be associated with the employees' symptoms.

NIOSH investigators visited the Budd Lake facility on May 3-4, 2005. An opening conference with L-3 Communications management personnel, a United Auto Workers Local 153 representative, and the NIOSH investigators was held prior to a walk-through survey of the manufacturing areas. Air and noise samples were collected periodically throughout the work shift on the following day. The NIOSH investigators met off site with several of the confidential requesters to discuss their individual concerns. Other employees were privately interviewed at the facility. A closing conference was held with the management and union representatives late in the day of May 4, 2005, where preliminary findings from the site visit were discussed.

BACKGROUND

L-3 Communications is a supplier of guidance and control products for air, land, and space systems. They manufacture aircraft indicators, control devices, gyroscopes, and other navigation and guidance systems for missiles and space applications. Their customers include airframe corporations in the U.S.A., the military, NASA, and other aerospace corporations. L-3 Communications acquired the manufacturing operations in December 1999, and moved to the Budd Lake, New Jersey location in May 2003.[1]

Between September and October 2004, three employees initiated medical actions because of their perceived unilateral hearing loss, which was investigated by the L-3 Communications' Medical Team. Two of the three employees were treated at local hospitals, but their problems were deemed not work related. The third employee did not seek treatment and had no symptom recurrence. This action lead to an indoor air quality (IAQ) evaluation of the manufacturing facility following changes in the Ring Laser Gyroscope (RLG) Assembly and Test areas identified by the Health, Safety, and Environment Department. The environmental services contractor issued a final report in January 2005, which concluded that no exposures were found exceeding normally accepted ranges for the indoor environment. Some ventilation deficiencies were identified and L-3 Communications contacted their heating, ventilating, and air conditioning (HVAC) contractor to make adjustments to the ventilation system to increase the number of air changes per hour in these areas. L-3 Communications considered the medical issues closed following these changes.

The confidential requesters felt that the changes made by the company were not sufficient to alleviate their symptoms of headache, dizziness, and unilateral hearing loss. Because of the high frequency hearing loss exhibited by a few employees, a mister system located in three areas of the facility that was clearly audible when on was identified as a possible source of their problems. The misters, used to control humidity levels in the manufacturing area to meet customers' assembly specifications, were operational for most of the work shift, particularly in the fall and winter months.

METHODS

NIOSH investigators devised a protocol to quantify the noise levels and indoor environmental quality comfort indicators in the manufacturing areas of the facility for a full work shift. Specifically, area spectral measurements of noise were collected at two different times during the shift at various

locations which included the three mister systems. Temperature, relative humidity (RH), and carbon dioxide (CO_2) were also monitored during the work shift. In addition to the environmental measurements, confidential interviews were held with any employee who wished to speak with a NIOSH investigator. The employees were told of the NIOSH site visit by management and union representatives following the opening conference. A representative of the Facilities Department was interviewed to obtain the specifics of the facility's ventilation system and mister system.

The spectral area noise measurements were made with a Larson-Davis Laboratory (Provo, Utah) Model 2800 Real-Time Analyzer and a Larson-Davis Laboratory Model 2559 ½" random incidence response microphone. The analyzer allows for the analysis of noise into its spectral components in a real-time mode. The ½"-diameter microphone has a frequency response range (± 2 decibels [dB]) from 4 Hertz (Hz) to 21 kilohertz (kHz) that allows for the analysis of sounds in the region of concern. One-third octave bands consisting of center frequencies from 25 Hz to 20 kHz were integrated for 30 seconds and stored in the analyzer for later analysis. The analyzer was calibrated with a Larson-Davis Laboratory Model CA250 Precision Acoustic Calibrator before and after each set of measurements.

Temperature and RH were measured with two types of instruments. Full-shift samples in the three mister locations were collected with a HOBO® H8 Pro Series H08-032-08 Logger (Onset Computer Corporation; Bourne, Massachusetts). These data loggers record temperature and RH over the entire shift and store each along with the time of day when they were logged. The data are transferred to the HOBO Shuttle for storage. Analysis is performed with the BoxCar Pro 4.3 Software. Area spot measurements for temperature, RH, and CO_2 at the misters and RLG area were made with a Model 8552/8554 Q-TRAK™ Plus IAQ Monitor (TSI® Incoporated; Shoreview, Minnesota). The IAQ Monitor displays the real-time readings from the temperature, RH, and CO_2 sensors.

EVALUATION CRITERIA

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for the assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects even though their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy). In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increases the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: (1) NIOSH Recommended Exposure Limits (RELs),[2] (2) the American Conference of Governmental Industrial Hygienists' (ACGIH®) Threshold Limit Values (TLVs®),[3] and (3) the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs).[4] Employers are encouraged to follow the OSHA limits, the NIOSH RELs, the ACGIH TLVs, or whichever are the more protective criteria.

OSHA requires an employer to furnish employees a place of employment that is free from recognized hazards that are causing or are likely to cause death or serious physical harm [Occupational Safety and Health Act of 1970, Public Law 91–596, sec. 5(a)(1)]. Thus, employers should understand that not all hazardous chemicals have specific OSHA exposure limits such as PELs and short-term exposure limits (STELs). An employer is still required by OSHA to protect their employees from hazards, even in the absence of a specific OSHA PEL.

Noise

Noise-induced loss of hearing is an irreversible, sensorineural condition that progresses with exposure. Although hearing ability declines with age (presbycusis) in all populations, exposure to noise produces hearing loss greater than that resulting from the natural aging process. This noise-induced loss is caused by damage to nerve cells of the inner ear (cochlea) and, unlike some conductive hearing disorders, cannot be treated medically.[5] While loss of hearing may result from a single exposure to a very brief impulse noise or explosion, such traumatic losses are rare. In most cases, noise-induced hearing loss is insidious. Typically, it begins to develop at 4000 or 6000 Hz (the hearing range is 20 Hz to 20000 Hz) and spreads to lower and higher frequencies. Often, material impairment has occurred before the condition is clearly recognized. Such impairment is usually severe enough to permanently affect a person's ability to hear and understand speech under everyday conditions. Although the primary frequencies of human speech range from 200 Hz to 2000 Hz, research has shown that the consonant sounds, which enable people to distinguish words such as "fish" from "fist," have still higher frequency components.[6]

The A-weighted decibel (dBA) is the preferred unit for measuring sound levels to assess worker noise exposures. The dBA scale is weighted to approximate the sensory response of the human ear to sound frequencies near the threshold of hearing. The decibel unit is dimensionless, and represents the logarithmic relationship of the measured sound pressure level to an arbitrary reference sound pressure (20 micropascals, the normal threshold of human hearing at a frequency of 1000 Hz). Decibel units are used because of the very large range of sound pressure levels which are audible to the human ear. Because the dB(A) scale is logarithmic, increases of 3 dBA, 10 dBA, and 20 dBA represent a doubling, tenfold increase, and hundredfold increase of sound energy, respectively. It should be noted that noise exposures expressed in decibels cannot be averaged by taking the simple arithmetic mean.

The OSHA standard for occupational exposure to noise (29 CFR 1910.95)[7] specifies a maximum PEL of 90 dBA for a duration of 8 hours per day. The regulation, in calculating the PEL, uses a 5 dB time/intensity trading relationship, or exchange rate. This means that a person may be exposed to noise levels of 95 dBA for no more than 4 hours, to 100 dBA for 2 hours, etc. Conversely, up to 16 hours exposure to 85 dBA is allowed by this exchange rate. The duration and sound level intensities can be combined in order to calculate a worker's daily noise dose according to the formula:

$$\text{Dose} = 100 \times (C1/T1 + C2/T2 + \ldots + Cn/Tn),$$

where Cn indicates the total time of exposure at a specific noise level and Tn indicates the reference duration for that level as given in Table G-16a of the OSHA noise regulation. During any 24-hour period, a worker is allowed up to 100% of his daily noise dose. Doses greater than 100% are in excess of the OSHA PEL.

The OSHA regulation has an additional action level (AL) of 85 dBA; an employer shall administer a continuing, effective hearing conservation program when the 8-hour time-weighted average (TWA) value exceeds the AL. The program must include monitoring, employee notification, observation, audiometric testing, hearing protectors, training, and record keeping. All of these requirements are included in 29 CFR 1910.95, paragraphs (c) through (o).

Finally, the OSHA noise standard states that when workers are exposed to noise levels in excess of the OSHA PEL of 90 dBA, feasible engineering or administrative controls shall be implemented to reduce the workers' exposure levels.

NIOSH, in its Criteria for a Recommended Standard,[8] and the ACGIH, propose exposure criteria of 85 dBA as a TWA for 8 hours, 5 dB less than the OSHA standard. The criteria also use a more conservative 3 dB time/intensity trading relationship in calculating exposure limits. Thus, a worker can be exposed to 85 dBA for 8 hours, but to no more than 88 dBA for 4 hours or 91 dBA for 2 hours. Twelve-hour exposures have to be 83 dBA or less according to the NIOSH REL.

Indoor Environmental Quality

Standards specific to the non-industrial indoor environment do not exist. Measurement of indoor environmental contaminants has seldom proved helpful in determining the cause of symptoms except where there are unusual sources, or a proven relationship between specific exposures and disease. With few exceptions, concentrations of frequently measured chemical substances in the indoor work environment fall well below the published occupational standards or recommended exposure limits set by NIOSH, OSHA, and ACGIH.[2,3,4] The American National Standards Institute (ANSI)/American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) has published recommended building ventilation and thermal comfort guidelines.[9,10] The ACGIH has also developed a manual of guidelines for approaching investigations of building-related symptoms that might be caused by airborne living organisms or their effluents.[11] Other resources that provide guidance for establishing acceptable indoor environmental quality (IEQ) are available through the Environmental Protection Agency (EPA) at www.epa.gov/iaq, especially the joint EPA/NIOSH document, Building Air Quality, A Guide for Building Owners and Facility Managers (www.epa.gov/iaq/largebldgs/baqtoc.html) and the EPA Indoor Air Quality Building Education and Assessment Model (I-BEAM) software available for downloading (www.epa.gov/iaq/largebls/ibeam_page.htm).

Heating, Ventilating, and Air-Conditioning

One of the most common deficiencies in the indoor environment is the improper operation and maintenance of ventilation systems and other building components.[12] NIOSH investigators have found correcting HVAC problems often reduces reported symptoms. Most studies of ventilation rates and building occupant symptoms have shown that rates below 10 liters per second per person (Ls^{-1}/person) (which equates to 20 cubic feet per minute per person [cfm/person]), are associated with one or more health symptoms. Moreover, higher ventilation rates, from 10 Ls^{-1}/person up to 20 Ls^{-1}/person, have been associated with further significant decreases in the prevalence of symptoms.[13] Thus, improved HVAC operation and maintenance, higher ventilation rates, and comfortable temperature and RH can all potentially serve to improve symptoms without ever identifying any specific cause-effect relationships. When conducting an IEQ survey, NIOSH investigators often measure ventilation and comfort indicators such as CO_2, temperature, and RH to provide information relative to the functioning and control of HVAC systems.

Carbon Dioxide

CO_2 is a normal constituent of exhaled breath and is not considered a building air pollutant. It is an indicator of whether sufficient quantities of outdoor air are being introduced into an occupied space. However, CO_2 is not an effective indicator of ventilation adequacy if the ventilated area is not occupied at its usual level at the time the CO_2 is measured. ASHRAE recommends that the indoor CO_2 concentration be within 700 ppm of the outdoor concentration for comfort (odor) reasons. Elevated CO_2 concentrations suggest that other indoor contaminants may also be increased. If CO_2 concentrations are elevated, the amount of

outdoor air introduced into the ventilated space needs to be increased. ASHRAE's most recently published ventilation standard, ANSI/ASHRAE 62.1-2004: Ventilation for Acceptable Indoor Air Quality, recommends outdoor air supply rates of 17 cfm/person for office spaces and libraries, 13 to 15 cfm/person for classrooms (depending on the students' age), 7 cfm/person for reception areas, and 5 cfm/person for auditoriums.

Temperature and Relative Humidity

Temperature and RH measurements are often collected as part of an IEQ investigation because these parameters affect the perception of comfort in an indoor environment. The perception of thermal comfort is related to one's metabolic heat production, the transfer of heat to the environment, physiological adjustments, and body temperature.[14] Heat transfer from the body to the environment is influenced by factors such as temperature, humidity, air movement, personal activities, and clothing. The ANSI/ASHRAE Standard 55-2004: Thermal Environmental Conditions for Human Occupancy, specifies conditions in which 80% or more of the occupants would be expected to find the environment thermally acceptable. Assuming slow air movement and 50% RH, the operative temperatures recommended by ASHRAE range from 68.5°F to 76°F in the winter, and from 75°F to 80.5°F in the summer. The difference between the two is largely due to seasonal clothing selection. ASHRAE also recommends that RH be maintained at or below 65%. Excessive humidity can promote the excessive growth of microorganisms and dust mites.

RESULTS

A management official from the Facilities Department described the ventilation and mister system used in the 108,000 square foot facility. The HVAC system uses hot and chilled water coils in the air handlers for temperature control. Both hot and chilled water coils are functional throughout the year. Outside air dampers are set at 60% – 80% of their maximum opening to allow introduction of filtered outside air into the facility at 15,000 – 30,000 cfm that equates to approximately 8 air changes per hour. L-3 Communications uses an outside contractor for preventative maintenance on the HVAC system that includes changing of filters on a quarterly basis. The RH is computer controlled to be optimally set at 45%. A de-ionized (DI) bulk water system is used in the manufacturing process, the clean room humidification, and the mister systems. The misters are a venturi system that uses 90 pounds per square inch (psi) compressed air to create a vacuum that pulls the DI water out of a 5-gallon holding tank into the mist heads located near the ceiling. The computer has a set point of 45% RH and a lower point at 42% RH. When the RH drops below 40%, the misters are constantly on and when the RH rises above 45%, they are cycled off. There are auxiliary, gas-fired heaters in the facility to assist with dehumidification when the RH is above 45%. Two humidity sensors are located in the facility, one near the front entrance and one in the middle of the building.

The noise levels measured throughout the facility were low, well below the occupational limits. Each of the area overall noise samples were found to be below 70 dBA (Table 1). The three areas where misters were located did exhibit the higher noise emissions, particularly in the store room and IEA area. The misters were not operating when the morning measurements were collected in the store room, but were on in the afternoon. Noise levels increased from 65 dBA to 70 dBA. The spectral analyses in the storeroom (Figure 1) revealed that the increase in overall noise level was the result of increased higher frequencies (above 2000 Hz) from the operation of the mister system. However, no third-octave band of sound was greater than 70 dB.

The full-shift temperature and RH monitors that were located near the three mister systems were programmed to turn on at the beginning of the work shift and turn off at the end of the day. However, an error in the programming prevented the units from operating in this pre-

programmed manner so that there were no logged data at the end of the sampling period. There were area spot measurements of the IEQ parameters that were collected throughout the day at five different times that characterized the facility's IEQ. Temperature, RH, and CO_2 measurements were made in the three locations where the misters operated, the RLG area, and outdoors (Table 2). Temperature inside the facility was fairly constant throughout the day, ranging from 68°F in the morning to 73°F in the afternoon. The RH showed little change over the work shift (33% – 44%) and the CO_2 levels were always within 700 ppm of the outdoor measurements.

At the time of the evaluation there were 191 employees. Thirteen employees were privately interviewed by the NIOSH physician and audiologist. Two employees complained of acute, unilateral hearing loss that occurred within 2 months of each other. These employees provided NIOSH investigators with medical records, including audiograms, which verified the hearing loss. These employees attributed their complaints to the mister system located near their work stations, but review of the medical records confirmed that the personal physicians were treating their patients as if the cause of the hearing loss was viral. None of the other 13 interviewed employees reported hearing loss as a symptom. Other complaints included noisy work areas, fumes from solvent usage, dust generated by the use of an abrader, and the potential for mold from the use of the mister systems.

DISCUSSION

All of the environmental samples were well below all evaluation criteria. The IEQ parameters were within ranges recommended by ASHRAE and showed no indication that the HVAC system could not effectively control the work environment.[9,10] The addition of humidity to a workspace can add the possibility of additional IEQ problems if the RH is not controlled. However, on the day of the survey there did not appear to be any obvious problems at L-3 Communications. The sound baffles in the ceiling area of the facility were clean and showed no evidence of water staining or microbial contamination. A few water-stained ceiling tiles noted in a hallway (E10) and in the RLG laboratory were pointed out to Facilities Department personnel.

Noise in the facility was at levels that would not put the employees at increased risk for occupational hearing loss. In one work area, the store room, the spectral sound measurements confirmed that the mister system did add about 5 dBA to the workspace. This increase in noise level would be perceptible by most employees and could draw their attention to it as a possible source of concern. However, there is not enough measured sound energy produced by the mister system to cause damage to employees' ears.

Sudden deafness or sudden sensorineural hearing loss (SSNHL) is defined as a new onset of unexplained hearing loss in one ear that develops over a 72-hour period or less. There is almost always some feeling of a plugged ear or ringing in the ear (tinnitus) and varying degrees of imbalance or vertigo that accompany the disorder.[15] SSNHL is commonly defined as a loss of at least 30 dB in three contiguous frequencies over the 72-hour time course. The incidence of the disorder is estimated at approximately 10 cases per 100,000 population.[16] Little is known about the specific causes of idiopathic SSNHL, however it is widely believed that viral infection, cochlear membrane breaks, and vascular occlusion account for the majority of cases. Of these, a viral source is thought to be the most common.[17,18] Evaluation and treatment of the disorder normally entails the administration of a steroid and/or antiviral drug along with audiometric testing, complete blood chemistry, and magnetic resonance imaging.[19]

CONCLUSIONS

It is the opinion of the NIOSH investigators that there was no exposure in the facility that would explain the symptoms of SSNHL exhibited by

the employees. Noise levels and IEQ parameters were below the relevant occupational exposure guidelines and recommendations. The review of the medical records from employees who experienced SSNHL confirm that the physicians treated the symptoms as though they were the result of a viral infection.

L-3 Communications' initial response to their employees sudden deafness by the Medical Team did lead to environmental sampling and changes to the work environment, particularly to the HVAC system. However, at the time of the NIOSH evaluation, there was no joint management/employee safety committee at the facility. A committee of this kind is an important vehicle for reporting changes in the workplace to all employees and provides a mechanism for discussing the conditions at the facility and ways in which they may be improved.

RECOMMENDATIONS

Based on the results of the environmental sampling, observations made at the facility, and interviews with employees, the NIOSH investigators offer the following recommendations to L-3 Communications to improve the working conditions at the Budd Lake, New Jersey location.

1. Form a joint management/labor safety committee at L-3 Communications. Both assembly and office workers should be represented on the committee. Employee concerns can be brought forward to this committee and discussed. Any changes or lack of changes and the reasons for the actions can be reported to this committee for dissemination to all workers. Open channels of communication where the employees feel that they can suggest changes or report perceived unsafe conditions and be sincerely heard may improve the work environment.

2. Inspect areas in and around the mister system routinely for water leaks. Repair the source of the leak and replace any damaged building materials (e.g., ceiling tiles).

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TABLES

Table 1

Area Noise Levels
L-3 Communications
Budd Lake, New Jersey
HETA 2005-0188-3038

AREA / LOCATION MARKER	NOISE LEVEL [dBA]	CONDITIONS
Hallway – First Aid Room		
Morning	60.0	
Afternoon	59.2	
Store Room – N10		
Morning	65.1	Mister off, ventilation fan on
Afternoon	69.9	Mister on
IEA – J9		
Morning	66.1	Mister on, employee break time
Afternoon	66.7	Mister on, some conversations
Machine Shop – D8 & E8		
Morning	60.2	Mister on, audible ceiling fan, employee break time
Afternoon	60.8	Mister on, audible ceiling fan
RLG		
Morning	58.1	Audible ventilation noise, employee break time
Afternoon	59.5	Some conversations
Front Hallway – B8		
Morning	54.4	
Afternoon	52.8	
Corner of Test Equipment Room		
Morning	58.6	
Afternoon	58.6	
Assembly Area – H5		
Morning	59.7	Employee break time
Afternoon	59.7	Some assembly, some conversations

Area A-weighted sound levels measured at two different times during the work shift. The store room, IEA, and machine shop are the three areas that have the mister systems. The noise levels are averaged over a 30-secend integration period.

Table 2

IEQ Indoor Comfort Parameters
L-3 Communications
Budd Lake, New Jersey
HETA 2005-0188-3038

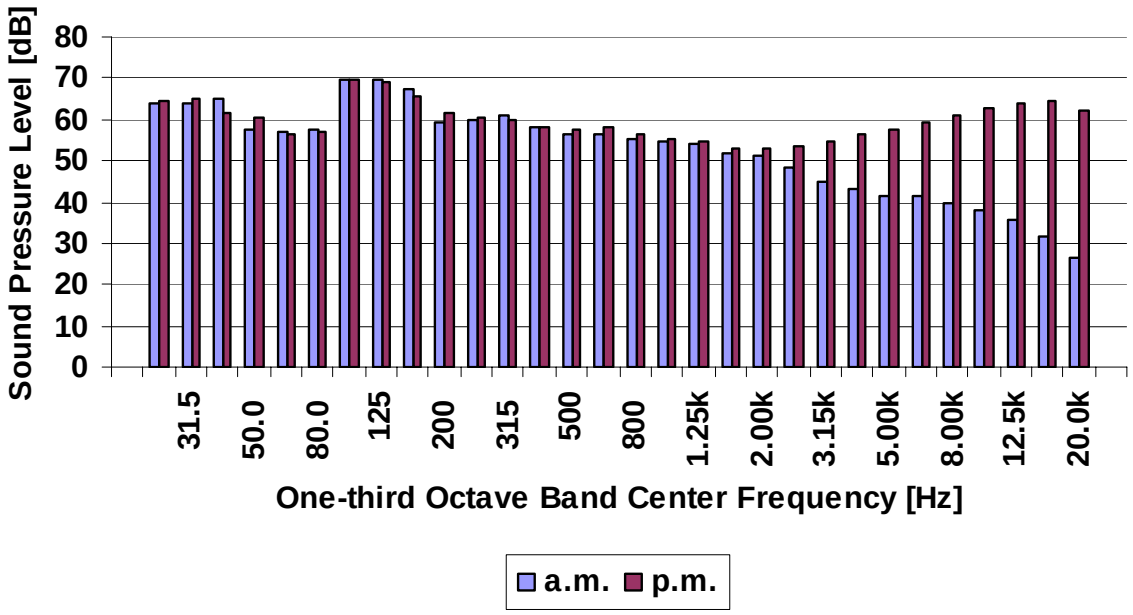
Location	Time	Temp. [°F]	RH [%]	CO_2 [ppm]	Occupants	Mister
Store Room						
	6:42 am	69.3	35.5	680	4	Off
	8:16 am	70.0	43.0	704	3	Off
	10:38 am	69.1	41.2	636	3	On
	12:29 pm	69.4	43.5	540	5	On
	2:54 pm	71.2	41.8	643	2	On
IEA						
	6:45 am	68.5	37.7	498	6	On
	8:19 am	69.8	42.1	566	6	On
	10:42 am	70.5	41.0	559	8	On
	12:33 pm	70.9	40.8	540	4	On
	2:57 pm	71.6	39.2	580	7	On
Machine Shop						
	6:53 am	68.7	40.2	525	2	On
	8:25 am	70.5	38.3	544	4	On
	10:46 am	71.8	36.6	850	7	On
	12:37 pm	72.7	34.8	680	4	On
	3:02 pm	73.0	34.1	731	5	On
RLG						
	6:58 am	68.9	40.0	645	9	N/A
	8:29 am	69.8	37.9	555	5	
	10:49 am	70.3	34.1	585	4	
	12:42 pm	71.1	33.6	675	7	
	3:06 pm	71.4	33.0	639	8	
Outdoors						
	7:09 am	41.5	63.0	600	1	N/A
	8:37 am	51.4	45.9	439	1	
	10:55 am	64.0	21.1	380	1	
	12:48 pm	63.9	15.7	372	1	
	3:10 pm	71.8	17.3	369	1	

Area temperature, relative humidity, and carbon dioxide measurements collected in the three work locations with misters, the RLG area, and outdoors. Occupants refer to the number of individuals present at the time of the measurement. The misters were either “on” or “off” or not (N/A) in the location.

FIGURE

Figure 1

One-Third Octave Band Spectral Levels – Store Room
L-3 Communications
Budd Lake, New Jersey
HETA 2005-0188-3038



The graph shows the comparison of the morning spectral levels with the misters not in operation to the afternoon measurement when the misters are on. The increased noise levels resulting from the misters' operation are in the high frequency region, above 2 kHz.

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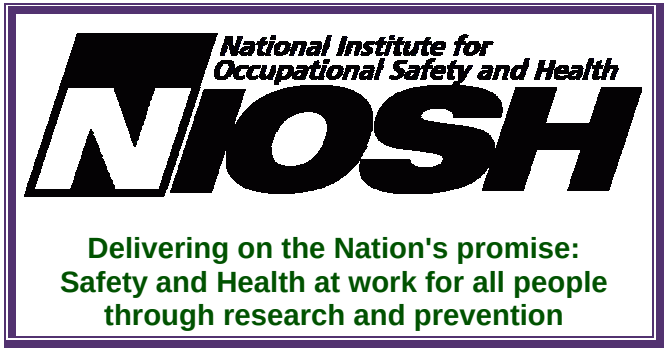

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