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**The Industrial Hygienist's Role
in the Determination of an
Employee's Enrollment in the
Hearing Conservation Program**

by

Tammy A. Lopez

Industrial Hygiene and Safety Professional 1

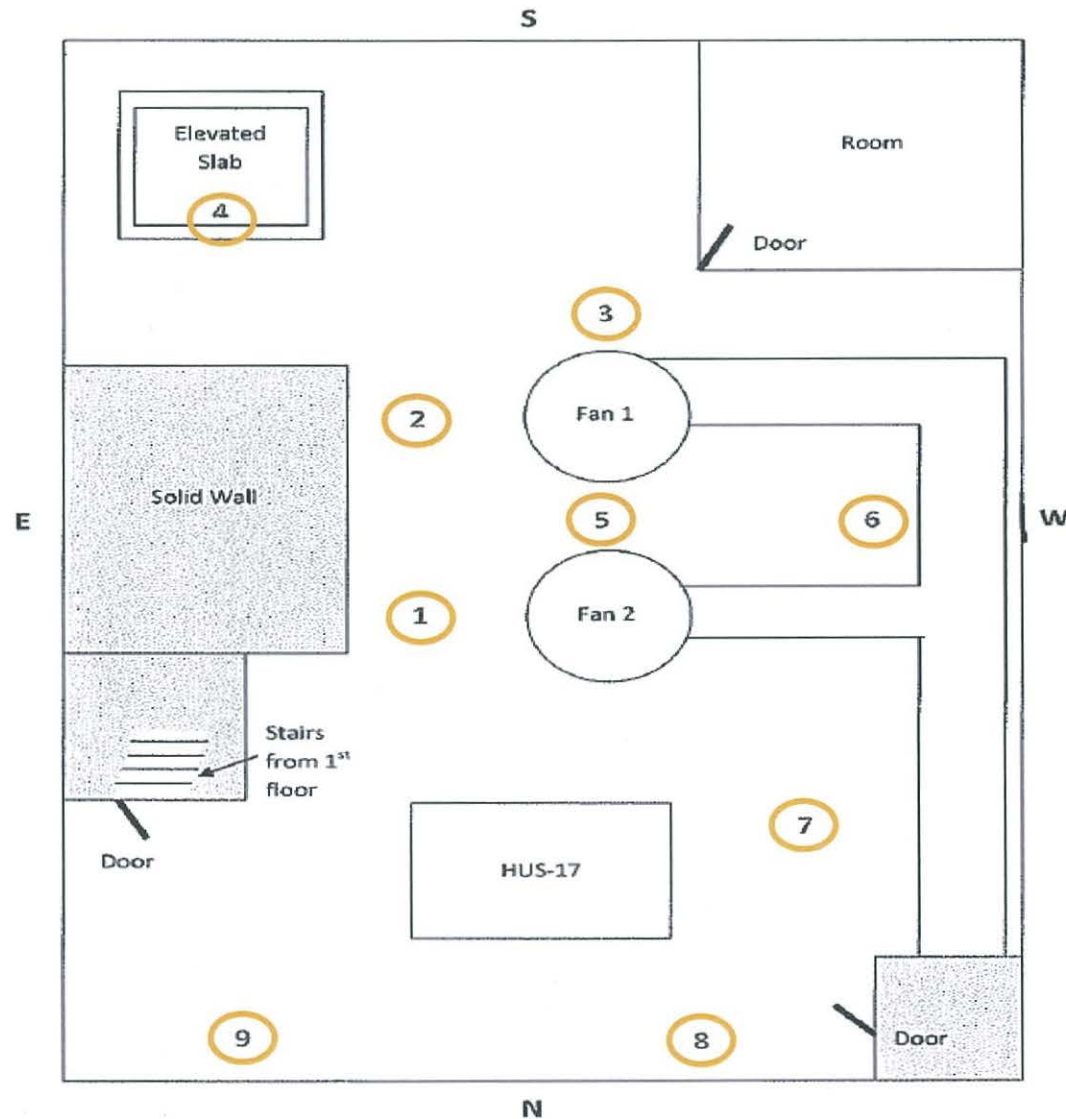
Introduction and Purpose

- Los Alamos National Laboratory (LANL) Hearing Conservation Program (HCP) Lead requested a noise exposure assessment for an employee (E1) to determine if E1 needed to be kept on the HCP list.
- E1 is a safety compliance inspector who is exposed to loud, heavy equipment and machinery on construction sites and buildings.
- In Bldg. 1, there is a mechanical room in which E1 conducts safety inspections approximately 8 times per month for a maximum time of 10 minutes each visit. This room has large industrial-sized fans operating 24/7.

Process

- A Quest Sound Level meter, which was calibrated with a Quest QC-10 calibrator at 114 dBA, was used for this exposure assessment.
- Sound pressure level measurements were taken around the room and an overall sound pressure level was calculated.
- E1 wears 3M E-A-R Ultrafit Plus Corded Earplugs with a Noise Reduction Rating (NRR) of 26 dB. Therefore, the effective noise reduction level was calculated.
- The ACGIH 2005 TLV booklet is the current standard reference that LANL is contractually obligated to use, therefore, all measurements will be compared to these standards.

Map of Bldg. 1 Mechanical Room



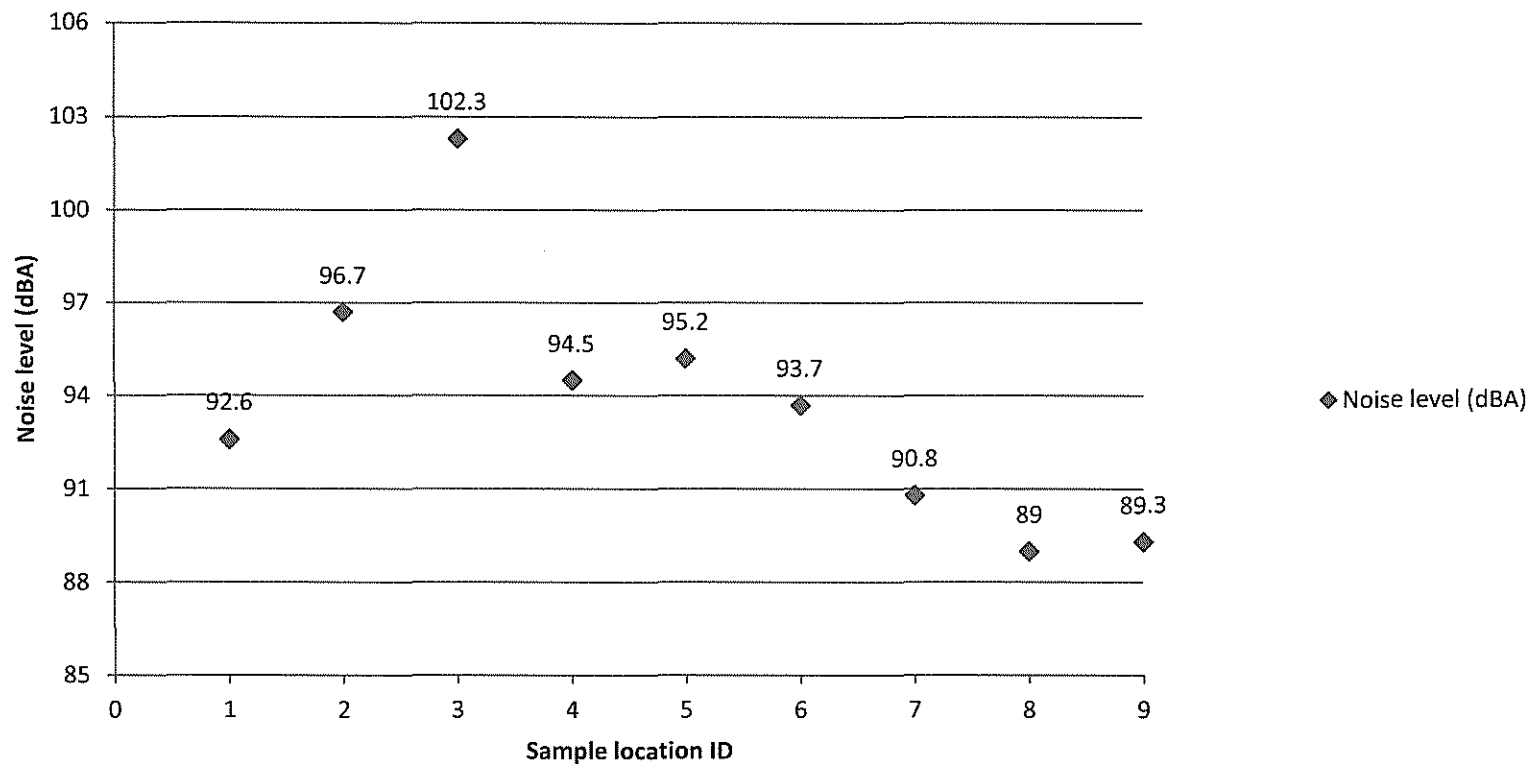
Sampling locations are circled in orange.

Table 1: Sampling Locations and Measurements

Sample ID	Sample location	Type	Result	Unit
Sample 1	E side of room and E of Fan 1	continuous noise	92.6	dBA
Sample 2	E side of room and E of Fan 2	continuous noise	96.7	dBA
Sample 3	S side of room and S of Fan 2	continuous noise	102.3	dBA
Sample 4	SE side of room, on top of an elevated slab	continuous noise	94.5	dBA
Sample 5	middle of room between Fans 1 and 2	continuous noise	95.2	dBA
Sample 6	W side of room in area between Fans 1 and 2 where large ducts were connected	continuous noise	93.7	dBA
Sample 7	NW side of room, W of HUS-17 unit and E of large duct that comes from fans 1 and 2	continuous noise	90.8	dBA
Sample 8	NW corner of room by NW side exit	continuous noise	89	dBA
Sample 9	NE side of room	continuous noise	89.3	dBA

Graph 1: Bldg. 1 Mechanical Room Sound Pressure Levels

Bldg. 1 Mechanical Room Sound Pressure Levels



Calculations

Overall Sound Pressure Level Calculation:

- $92.6/10 = 9.26 \rightarrow \text{antilog}(9.26) \rightarrow 1.820 \times 10^9$
- $96.7/10 = 9.67 \rightarrow \text{antilog}(9.67) \rightarrow 4.677 \times 10^9$
- $102.3/10 = 10.23 \rightarrow \text{antilog}(10.23) \rightarrow 1.698 \times 10^{10}$
- $94.5/10 = 9.45 \rightarrow \text{antilog}(9.45) \rightarrow 2.818 \times 10^9$
- $95.2/10 = 9.52 \rightarrow \text{antilog}(9.52) \rightarrow 3.311 \times 10^9$
- $93.7/10 = 9.37 \rightarrow \text{antilog}(9.37) \rightarrow 2.344 \times 10^9$
- $90.8/10 = 9.08 \rightarrow \text{antilog}(9.08) \rightarrow 1.202 \times 10^9$
- $89.0/10 = 8.9 \rightarrow \text{antilog}(8.9) \rightarrow 7.943 \times 10^8$
- $89.3/10 = 8.93 \rightarrow \text{antilog}(8.93) \rightarrow \underline{8.511 \times 10^8}$
- $\Sigma = 3.47974 \times 10^{10} \rightarrow \log(3.47974 \times 10^{10}) \times 10 = 105.4$
- **Overall sound pressure level = 105.4 dBA**
-

Noise Reduction Level using the OSHA A-weighted Protected Level Calculation Method with a 50% Margin of Safety (for 3M E-A-R Ultrafit Plus Earplugs with a NRR of 26 dB):

- A weighted protected level = $\text{dBA} - (\text{NRR} - 7) / 2$
- $= 105.4 \text{ dBA} - (26 \text{ dB} - 7) / 2$
- $= 95.9 \text{ dBA}$

Conclusions and Recommendations

- An overall sound pressure level exposure was calculated at 105.4 dBA; therefore, it is recommended that E1 stay enrolled in LANL's HCP, since the overall sound pressure level exceeds both the 7.5 minute ACGIH TLV of 103 dBA and the 15 minute ACGIH TLV of 100 dBA.
- If employees are exposed to levels exceeding the limits, feasible engineering, administrative, and protective protection equipment (PPE) controls must be implemented.
 - Currently, budget will not allow for implementation of engineering controls.
 - An audiogram will be conducted annually as a result of E1's HCP enrollment; this is an administrative control.
 - For the 3M E-A-R UltraFit Plus Corded Earplugs with a NRR of 26 dB, the noise reduction level was calculated to be 95.9 dBA. E1 is recommended to continue use of this PPE when in the mechanical room because they reduce the noise exposure level to below the ACGIH TLV for 7.5 and 15 minute exposures.