

## **Noise Exposure and Hearing Conservation in Construction**

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Anyone who has ever driven past a highway road construction site, or walked past a major construction project can attest that construction work can be very noisy. But exactly how noisy is it? How much noise exposure do construction workers receive on the job? And what are construction contractors doing to protect their employees' hearing? Researchers at the University of Washington (UW) have been doing research on noise exposure and hearing conservation in the construction industry since the mid 1990s to find answers to these questions. A number of other groups have also been looking at ways to protect the hearing of construction workers through hearing conservation and noise control efforts.

### **Construction Noise Exposure Standards**

Noise exposure in construction has historically received far less attention from regulatory groups such as the Occupational Safety and Health Administration (OSHA) than have exposures in fixed industries like manufacturing, and the occupational standards governing construction are much less comprehensive than those for general industry. There are several reasons for this, including the fact that the construction workforce is transient, with individual workers employed by numerous companies and at various worksites over the course of a year, and the fact that construction noise exposures are much more variable and irregular than those found in other industries. The OSHA construction noise standard requires that workers exposed to an 8-hour time-weighted average noise level of 90 dBA or above be included in a hearing conservation program designed to protect them from hearing loss. However, unlike the OSHA general industry noise standard, the construction noise standard does not list the required components of such a program, giving contractors little guidance on how to properly protect their employees. The National Institute for Occupational Safety and Health (NIOSH) and other agencies such as the Washington Industrial Safety and Health Administration in Washington state have set more protective standards, requiring that workers with an 8-hour exposure of 85 dBA be enrolled in a hearing conservation program, and setting forth the exact requirements of such a program. OSHA has recently acknowledged the need to update the construction noise standard, and has begun the lengthy process of revising the standard.

### **Construction and Non-Occupational Noise Exposure Levels**

Although the OSHA construction noise standard was issued over 30 years ago, until very recently there was very little information available on how high construction worker's noise exposures were. Part of the problem in measuring construction workers' noise exposures is that workers do a wide variety of tasks and use a large number tools, and often do several tasks in a single workshift, making accurate and comprehensive sound level meter measurements time-consuming and difficult.

UW researchers Noah Seixas and Rick Neitzel have conducted research on occupational noise exposures and hearing loss in commercial construction workers since 1997. Over 800 full-shift average measurements have been made on construction workers in 11 different construction trades to date using noise dosimeters. Overall, about 66% of all full-shift measurements they have made on construction workers have been above the 85 dBA limit specified by NIOSH. Ten percent have been above the 90 dBA OSHA construction noise standard. Although their exposure levels were often above 85 dBA, and therefore potentially damaging to hearing, the workers measured did not use hearing protection devices very often. On average, the workers reported using hearing protection less than half the time they were exposed above 85 dBA. Some trades were better than others; heavy equipment operators had the highest

average exposure level and tied with cement masons for the highest percentage of measurements above 85 dBA, but also had the highest use of hearing protectors. Cement masons, on the other hand, had the lowest reported usage of hearing protectors of any trade. Even trades that are usually thought of as “quiet” and which do not work with extremely loud equipment (like electricians and insulation workers) were frequently overexposed to noise, indicating that exposures from nearby work can contribute significantly to workers’ exposures.

In addition to assessing full-shift noise exposure levels, the levels associated with individual construction tasks and tools were also evaluated by combining information from the noise dosimeters with information from activity logs that the workers completed. Nearly three-quarters of all the construction tasks and tools measured had average levels which exceeded 85 dBA, and were therefore potentially hazardous to hearing. Many of the tasks and tools also had maximum levels of excess of 115 dBA, the level above which OSHA always requires hearing protection to be used.

As part of this research, non-occupational noise exposures such as attending concerts, riding motorcycles, and listening to music were evaluated for a number of construction workers. The measurements made indicated that, for the majority of construction workers, non-occupational noise contributes very little to their overall noise exposure, and that they receive almost all of their noise exposure from work activities. However, workers who shot firearms had much higher non-occupational noise exposures than those who did not shoot, even when their firearms use was not included.

### **Construction Hearing Conservation Programs**

A good hearing conservation program includes noise monitoring, noise controls, employee training, audiometric testing, and hearing protection. While it is relatively easy to offer hearing protection to noise exposed construction workers, the transient nature of the workforce makes it difficult to conduct comprehensive noise monitoring, insure workers are trained, and provide routine audiometric testing.

UW researchers Bill Daniell and Sue Swan have focused on the status of hearing conservation among heavy construction companies. They conducted a research project with 10 different heavy construction contractors and evaluated the presence and effectiveness of hearing conservation programs at each company. Over 200 employees and management representatives were interviewed regarding their company’s hearing conservation plan; noise measurements were also made on over 150 employees. The study found that 40% of the measured employees had full-shift average exposure levels over 85 dBA, and 11% were over 90 dBA, indicating that a hearing conservation program was needed. However, all of the construction companies examined had incomplete or absent hearing conservation programs. Few of the companies did annual audiometric testing, noise monitoring, or hearing conservation training, although most provided at least one type of hearing protector to their workers. There was little agreement between what workers and management knew regarding their hearing conservation program. As with the other UW studies, workers frequently did not use hearing protectors when their exposure levels exceeded 85 dBA. Supervisors were also found to have high exposure levels, contradicting the belief of many construction supervisors that their exposures are lower than those of the workers they supervise.

Researchers at NIOSH in Cincinnati have also been conducting projects to evaluate how well construction workers are able to protect themselves from noise using hearing protection devices, developing hearing conservation training materials appropriate for the construction industry, and examining the barriers to effective hearing conservation training in the construction workforce, which often includes workers who speak a primary language other than English.

The Building Trades Labor-Management Organization of Washington State, or Build It Smart, is a group which provides hearing conservation training and noise exposure assessment services to construction contractors in Washington. Build It Smart has come up with a novel solution to the problem of providing

hearing conservation programs for the transient construction workforce. The group has filed a petition to the State of Washington which, if enacted, would create a construction industry-wide hearing conservation program paid for by equal contributions from construction workers and contractors. The funds from this program would be used to administer hearing conservation training, noise monitoring, and audiometric testing to Washington state construction workers, and would also be used for construction hearing loss claims compensation. The Workers' Compensation Board of British Columbia has successfully used a similar approach for construction and other industries for over two decades. Although the Build it Smart petition has not been accepted by the legislature as of this date, this concept is one that deserves further consideration and exploration.

### **Construction Noise Controls**

Noise controls represent the most effective way to reduce noise exposure levels on construction sites, and a critical part of an effective hearing conservation program. Noise controls have often been seen as impractical for the construction industry, since the equipment on a construction site, and the site itself, is continually changing. However, there are noise control techniques which can be implemented in construction work, sometimes at low or no cost. Some of the available noise control strategies include modification or retrofit of equipment, replacement of loud equipment with quieter equipment (also called "Buy Quiet"), use of barriers or enclosures, and relocation of equipment to reduce exposure levels.

One group examining ways to reduce construction noise exposure levels is the Construction Noise Control Partnership. This organization, spearheaded by Scott Schneider at the Laborers' Health and Safety Fund of North America in Washington, DC, is made up of volunteers from labor unions, contractors, trade organizations, regulators, academics, and manufacturers. The group is working to identify noise control techniques which can be used to reduce the noise levels of construction equipment and thereby reduce construction workers' noise exposures, and plans to develop a best practices noise control guide for dissemination to construction contractors. Although there is a fair amount of information currently available on different techniques for controlling construction noise, it is scattered throughout a number of different documents and websites; the Construction Noise Control Partnership hopes to condense this existing information and other new information into a single construction noise control resource.

Researchers at NIOSH facilities in Cincinnati, Pittsburgh, and Spokane are conducting several projects designed to examine noise levels and noise controls for construction equipment. One project is examining handheld construction power tools, while the other is assessing heavy construction equipment. Eventually, the results of this research will be used to create a database of noise levels associated with various types of equipment, as well as the controls available for the equipment. This type of database will be a critical step towards giving contractors and workers the information they need to select quiet construction equipment.

### **Conclusion**

Recent research has shown that many construction workers are exposed to levels of noise which are high enough to cause permanent noise-induced hearing loss. In Washington state, construction workers represent approximately 7% of the workforce, but file 21% of accepted workers compensation hearing loss claims. Obviously construction noise exposure and the resulting hearing loss is a big problem. A number of research groups and regulatory agencies are working on ways to lower construction noise exposures and reduce hearing loss claims. While noise control efforts have the best chance at long-term success, effective hearing conservation programs will always be needed to insure that workers receive adequate training and protection from noise exposure.

**Websites for the organizations listed above:**

- UW Occupational Noise Exposure in the Construction Industry:  
<http://staff.washington.edu/rneitzel/index.htm>
- UW Occupational Hearing Loss Study:  
<http://depts.washington.edu/hearloss/>
- OSHA Construction and Hearing Conservation:  
<http://www.osha-slc.gov/SLTC/constructionnoise/index.html>
- NIOSH Work-Related Hearing Loss:  
<http://www.cdc.gov/niosh/topics/noise/>
- Build It Smart Hearing Conservation:  
<http://builditsmart.org/hearing.htm>
- Construction Noise Control Partnership:  
[http://www.lhsfna.org/html/\\_noise\\_partnership.html](http://www.lhsfna.org/html/_noise_partnership.html)

**Additional reading on noise exposure and hearing conservation in construction:**

- Suter AH. 2002. Construction noise: exposure, effects, and the potential for remediation; a review and analysis. *AIHA J* 63: 768-89.