Construction Industry Noise Exposures
Laborers

Department of
Environmental
and Occupational
Health Sciences

School of Public Health and Community Medicine, University of Washington

Contents

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Introduction

Many construction workers complain that they can't hear as well as they used to, and statistics back them up. Laborers and other construction workers are exposed to noises loud enough to cause permanent noise-induced hearing loss. In Washington state, construction workers are five times more likely to file workers' compensation claims for hearing loss than are workers in all occupations combined.

This report from the University of Washington looks at the noise exposures of laborers and makes recommendations applicable to their specific needs. It is based on six years of research in the construction trades. Since 1997, university researchers have collected information on noise exposures of construction workers in the Puget Sound area. We now have almost 900 full-shift measurements on workers from 11 trades, including 122 measurements on laborers.

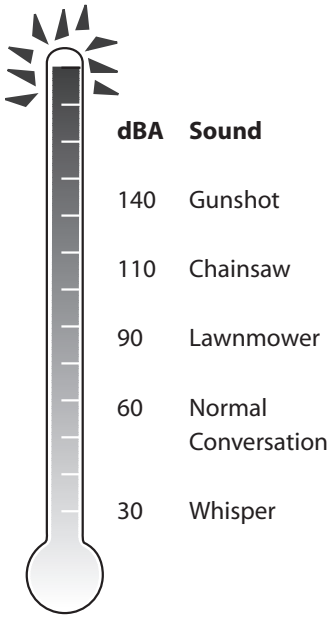
What is noise?

Noise is unwanted sound. Noise levels are measured on a decibel scale (dBA), which matches the ear's sensitivity to sound. A whisper is about 30 dBA, normal conversation is 60–70 dBA, and power tools are often between 90–110 dBA. If two people at arm's length must raise their voices to be heard, the noise level is above 85 dBA. Figure 1 shows the decibel levels of some familiar sounds.

Safe noise levels

Our noise measurements are based on the legal noise standard of the Washington Industrial Safety and Health Act (WISHA). In Washington state, the Permissible Exposure Limit (PEL) allows an 8-hour, full-shift average exposure of 85 dBA.* For every 5 dBA increase above this level, the allowable exposure time is cut in half (see figure 2 on page 3). Workers with a full-shift average exposure above 85 dBA are required to wear hearing protection devices (either earplugs or earmuffs). They also must be included in a hearing conservation program in which they receive annual hearing tests and training on noise exposure and hearing loss. Workers must ***always*** use hearing protection when levels exceed 115 dBA.

Figure 1.
Decibel levels (dBA) of familiar sounds

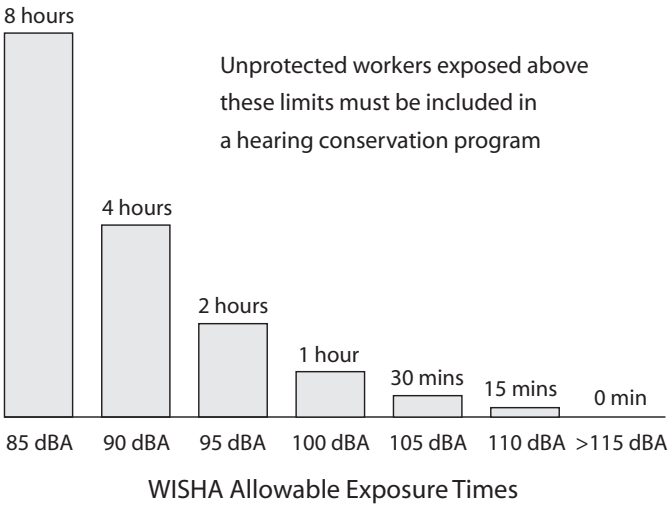


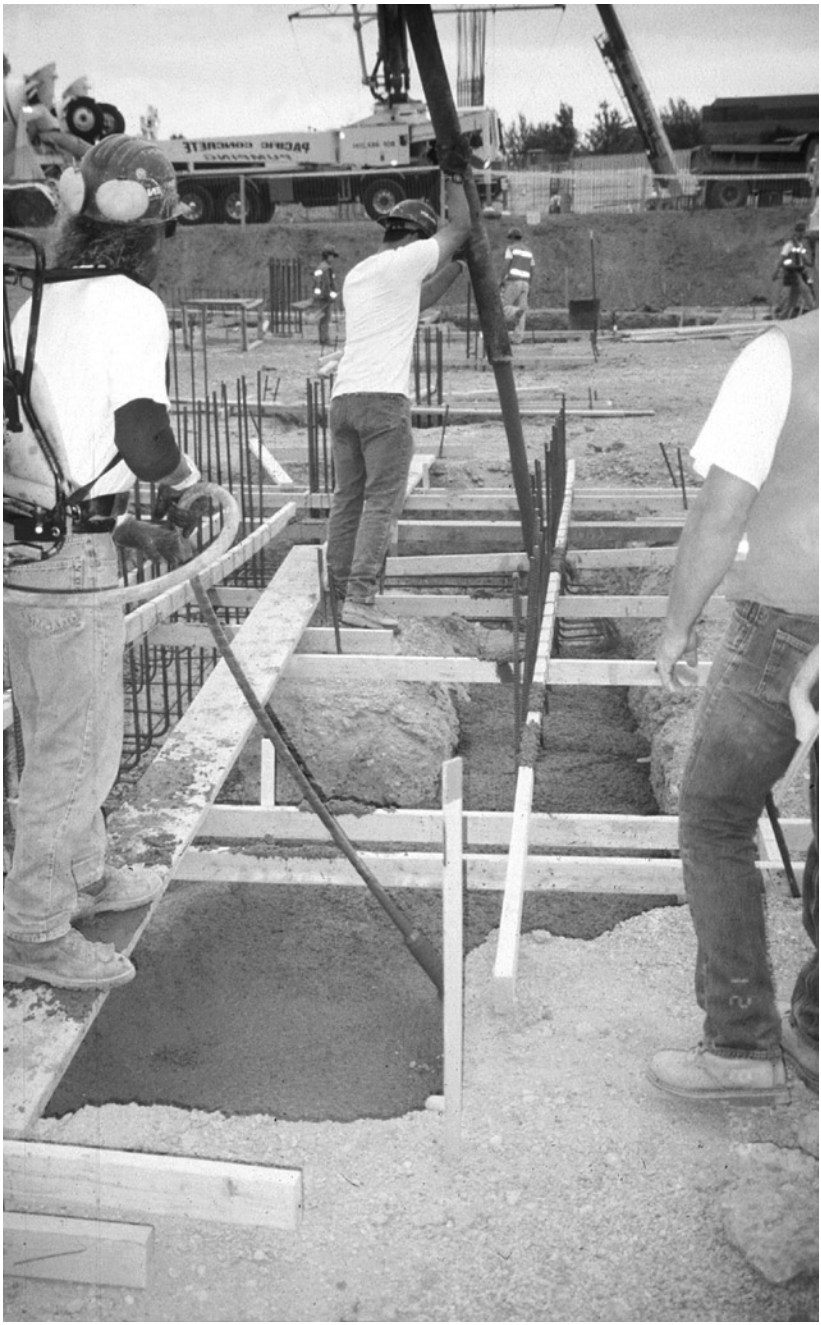
* The federal Occupational Safety and Health Administration (OSHA) PEL for construction noise is an eight-hour average of 90 dBA.

What happens if you are exposed to too much noise?

Noise exposures that are loud enough and last long enough can damage nerves in the inner ear, causing permanent and irreversible hearing loss. This damage can result from repeated exposure to levels above 85 dBA (such as years of working around construction noise without hearing protection), or from as little as one exposure above 140 dBA. Workers who have suffered hearing loss often become socially isolated because they can't communicate easily with others. They also may not be able to hear warning signals, which can lead to accidents and injuries. Our measurements show that most construction tasks and tools generate noise levels that require use of hearing protection. However, we found many situations in which workers rarely or never use hearing protection. This gap in hearing protector use puts laborers at risk for hearing loss.

Figure 2. WISHA allowable noise exposures





What we found in our research

Of the 887 full-shift noise measurements we made, 122 were on laborers. The majority were from commercial construction sites, with the remainder from industrial, residential, road, bridge, and highway work sites. The type and size of work sites are important factors in noise levels. The largest sites generally have the highest exposure levels.

Average noise exposures for laborers

Table 1 shows information from our full-shift measurements on laborers. The average level measured was 83.6 dBA. However, nearly half of all measurements were above 85 dBA, the WISHA 8-hour allowable limit. Above this level, hearing protectors are required. About one in ten measurements was above 90 dBA. Almost two-thirds of all measurements also included exposure above 115 dBA, the level above which hearing protectors are always required.

Table 1. Work shift noise level information on 122 laborers

Category	Result
Average full-shift noise level	83.6 dBA
Average length of measured work shifts	8 hr 25 min
% of full-shift average levels above 85 dBA	44%
% of full-shift average levels over 90 dBA	15%
% of work shifts with any noise above 115 dBA	64%

Task and tool exposures for laborers

We measured noise levels for each task reported by laborers in our study (see table 2). Almost every task (including breaks, lunch, and cleanup) had an average level above 85 dBA, meaning that workers should have worn hearing protection. Similarly, we measured noise levels for the

Table 2. Tasks, in order of increasing average noise level

Tasks	Average noise level (dBA)	Maximum noise level (dBA)
Layout	80.1	103.1
Manual Material Handling	82.7	106.5
Interior Finish	85.2	110.5
Operating Forklift	85.3	114.6
Finishing Concrete	85.3	114.7
Grouting	86.1	116.0
Wood Framing	86.5	112.8
Floor Leveling	87.5	109.6
Hanging Plastic	88.6	113.9
Placing Concrete	91.5	116.6
Stripping Forms	91.7	117.8
Building Forms	92.1	115.8
Break, Rest, Lunch, Cleanup	92.3	114.4
Rigging	92.6	128.6
"Other" Tasks	95.4	119.6
Demolition	99.3	112.1
Chipping Concrete	102.9	120.3

tools that laborers reported using (see table 3). The average noise levels exceeded 85 dBA for every tool used. None of the tasks or tools had an ***average*** noise level above 115 dBA, which would require use of hearing protectors, no matter how short the exposure.

Table 3. Tools, in order of increasing average noise level

Tools	Average noise level (dBA)	Maximum noise level (dBA)
Screw Gun, Drill Motor	85.8	112.5
Hand Power Saw	87.9	107.3
Stationary Power Tool	88.2	105.0
Chopsaw	88.2	114.2
Hammer, Mallet, Sledge	90.2	116.4
"Other" Tools	91.8	119.0
No Tool	92.8	118.0
Rotohammer	95.8	113.4
Rattle Gun	98.4	131.1
Chipping Gun	103.0	119.2

Noise exposures for all trades

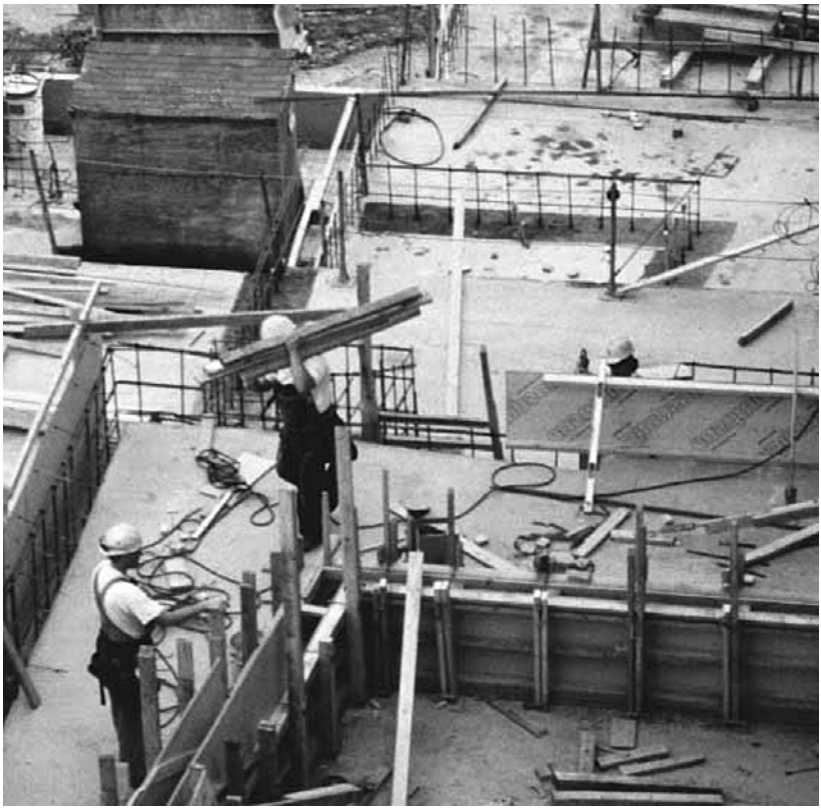
The average full-shift noise exposure level for ***all workers in all trades*** was 81.4 dBA. The percentage of full-shift measurements by trade that exceeded the WISHA 8-hour allowable limit of 85 dBA is shown in Table 4. The trades with the most exposures above the WISHA limit were operating engineer and cement mason (46% of full-shift measurements were above 85 dBA), while sheet metal workers had the fewest exposures above the WISHA limit (11% above 85 dBA).

The trade with the highest average work shift exposure was operating engineer (84.6 dBA); insulation workers had the lowest average work

Table 4. Percent of work shifts above WISHA 8-hour standard (in order of increasing percentages), percent of time hearing protection was used above 85 dBA, and average full shift noise level (by trade)

Trade	% of 8-hour work shifts > 85 dBA	% of time > 85 dBA hearing protection used	Average full-shift noise level (dBA)
Sheet Metal Worker	11%	66%	79.0
Insulation Worker	18%	14%	75.3
Tilesetter	20%	12%	76.0
Electrician	20%	18%	79.9
Bricklayer	26%	49%	82.6
Masonry Restoration	37%	56%	82.7
Carpenter	40%	43%	82.2
Ironworker	40%	13%	82.9
Laborer	**44%**	**NA**	**83.6**
Cement Mason	46%	8%	79.3
Operating Engineer	46%	70%	84.6
All Trades	**34%**	**39%**	**81.4**

shift exposure (75.3 dBA). About one-third of full-shift measurements for all trades were above the WISHA limit for workers not using hearing protectors. Even "quiet" trades such as electricians and insulation workers sometimes had full-shift measurements that were above the WISHA limit. Overall, workers in all trades reported using hearing protection less than 40% of the time they were exposed above 85 dBA, and about one-third of the time they were exposed at the much higher level of 115 dBA. Operating engineers had the highest use of hearing protection and cement masons had the lowest. For laborers, "NA" means hearing protection use was not evaluated.



How laborers can prevent hearing loss

Construction workers in ***all*** of the trades we examined have the potential for high exposure to noise. Although construction workers make up only 7% of the Washington state workforce, they file more than 21% of all accepted workers' compensation hearing-loss claims. The preferred way to prevent hearing damage is to reduce noise at its source. However, earplugs and earmuffs will always be necessary for some construction activities.

Almost half of all full-shift average measurements on laborers were above the WISHA standard for an 8-hour noise exposure. Laborers often got more noise exposure from activities going on around them than they did from their own work, and need to consider nearby activities as well as their own when choosing hearing protection.

Recommendations

Educational programs can help make laborers aware that almost all activities on the job site–including breaks and eating lunch–have potentially hazardous noise levels. All laborers in the construction industry should be enrolled in a hearing conservation program, and efforts should be made to reduce the noise levels of construction activities and to increase the use of hearing protection.

All hearing protectors are labeled with a Noise Reduction Rating (NRR), which is a laboratory estimate of how much noise the hearing protector will block. Typically, the NRR level is about two times higher than the protection most workers experience in actual use.

Almost all full-shift noise exposure measurements on laborers were below 97 dBA. To adequately protect against these average noise levels, we recommend hearing protectors with an NRR of 24 dB. For most activities, an NRR higher than this will provide too much protection,

interfering with normal communication and work. Workers who find that hearing protectors with a very high NRR (33 dB is the highest available) make it difficult to hear regular work sounds should try a different hearing protector with a lower NRR. On the other hand, workers exposed to very high levels of noise should use a hearing protector with a higher NRR. Workers exposed to intermittent noises should consider using earmuffs or banded earplugs, which can be removed and inserted quickly. A single type of hearing protector ***will not*** work for all workers and all exposure levels, so it is important to have several types and styles of hearing protectors available.

Summary

Almost all of the measured construction tasks exposed laborers to noises above 85 dBA, loud enough to warrant use of hearing protection. Seven of the seventeen tasks involved occasional exposures above 115 dBA, a level at which hearing protection is ***always*** required.

Likewise, all of the construction tools we measured exposed laborers to noise levels above 85 dBA, with five of the tools sometimes exceeding 115 dBA.

Workers exposed to loud noises without use of hearing protection risk losing their hearing. Properly worn hearing protection can prevent this loss. Training on the proper use of hearing protection is an important part of a hearing conservation program, and should take into account the need for construction workers to hear warning shouts and signals. In addition to providing hearing protectors and training, construction companies should look into reducing noise exposure levels by purchasing quieter equipment or shielding workers from the noisiest equipment.

For additional information

About the UW study and its results

University of Washington *Occupational Noise* Web site:
http://depts.washington.edu/occnoise
or contact Field Research and Consultation Group at 206-543-9711
or *cnstsafe@u.washington.edu*

For more information about noise and its effects on hearing

NIOSH web page: *http://www.cdc.gov/niosh/topics/noise/*
or WISHA hearing conservation web site:
http://www.lni.wa.gov/Safety/Topics/AtoZ/NoiseHearing/default.asp

For assistance in developing a hearing conservation program

Contact the WISHA consulting service for the nearest consultant
http://www.lni.wa.gov/Safety/KeepSafe/Assistance/Consultation/default.asp
or call 800-547-8367
Or contact Build It Smart, a local labor/management organization
for the construction industry, at *www.builditsmart.org*
or 360-596-9200

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University of Washington
School of Public Health
and Community Medicine

Noise and Hearing Loss in Construction Study
Department of Environmental and Occupational Health Sciences
Health Sciences Building
Box 357234
Seattle, WA 98195-7234