THE DANGER OF NOISE

BY BRIAN DALEY

"Huh?" "Whaddya say?" "Stop mumbling, I can't hear you!" Jim groused. The high-pitched whine of five grinders overwhelmed any attempt to communicate on the plaza deck, where a group of workers were removing existing coating from a concrete slab to prepare it for a new waterproof coating. Jim's project manager yelled to him. Jim saw his mouth moving, but the words were lost, the noise from the grinders deafening, the electric motors screaming, and the grinder pads abrading the deck surface. Jim waved to his foreman, slashed a hand across his throat to signal the men to stop the grinding for a minute. He hated to stop the mens' progress—Jim prided himself on his jobs beating schedules and coming in under budget, so he equipped his men with the best tools for the job, then pushed them to produce. The noise from the grinders died away, but the echo rang inside Jim's head. The project manager now spoke rather than yelling, but there was no change in effect for Jim. The man's mouth was moving, but Jim still could not hear him.

Restoration job sites can be dangerous places, so property owners, design professionals, and contractors in our industry are paying increased attention to work-site safety. Use of equipment such as jackhammers and grinders (Fig. 1), reciprocating saws, impact drills, melting kettles, and torches pose risk of slashes and cuts, abrasions and burns, all of which leave scars—stark reminders of the hazards of the construction industry. However, one of the most prevalent job-site-related injuries, occupational noise-induced hearing loss, leaves no visible evidence, no bodily mark of trauma, and unlike singular events such as a twisted ankle or a cut hand, it can be gradual and progressive, its effect so incremental that sufferers may not even realize the degree to which they are affected by it.

According to the U.S. National Institute for Occupational Safety and Health (NIOSH), over 30 million workers in the United States are exposed to noise levels high enough to cause irreversible hearing loss.[1] Scientists studying hearing loss note that damage can occur both due to extremely loud and intense noises occurring in very short exposures, such as explosions or alarms, or due to extended exposure to noise at a lower but still progressively harmful level. Our lives are filled with noises every day—some overt, some background noise to which we pay no attention. Informal studies using noise meters find that even in "silent" rooms, noise levels are frequently measured in the 40 to 45 decibel (dBa) level range due to air movement from heating/air-conditioning; from the electronic "hum" of lights, refrigerators, and other appliances; and even from intermittent noises of building expansion and contraction due to external temperature changes. Add many other noises to which we are exposed in our daily lives, from iPods, radios, and TVs to cars, buses, and motorcycles zooming past, jets flying overhead, crying babies, yelling coworkers, and even the occasional book dropped on the floor with a jarring "bang," and we are all typically exposed to noises in the 60 to 80 dBa range.

So what is a dangerous noise level? The U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) Regulation 1926.101(a)[2] states, "Whenever it is not feasible to reduce the noise level or duration of exposures to those specified in Table D-2 (Fig. 2), Permissible

Fig. 1: Jackhammer and grinding equipment

TABLE D-2

Duration per day, hours	Sound level, decibel (dBa), slow response
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

Fig. 2: OSHA Permissible Noise Exposures

Noise Exposures (1926.52),[3] ear protective devices shall be provided and used." The cited chart shows that over an 8-hour duration, an average decibel exposure level of 90 dBa or higher is considered dangerous. As the average decibel level increases, the allowable duration of exposure decreases, to 6 hours at 92 dBa, 4 hours at 95 dBa, 1 hour at 105 dBa, and 15 minutes or less at 115 dBa.

However, many of the most common tools and equipment used for concrete restoration projects create noise which exceeds the maximum exposure levels established by OSHA. The Center for Disease Control and Prevention (CDC)[4] provides charts on its website (**www.cdc.gov**) which indicate that its tests measure hammer drills at between 89 to 102 dBa; 4.5 in. (110 mm) electric grinders at between 96 to 102 dBa; reciprocating saws at 102 to 105 dBa; and a 60 lb (27 kg) jackhammer at 120 dBa. As points of comparison, typical rock concerts are measured at 100 dBa, and jet engines at 120 dBa.

The assault of vibrations from noise at dangerous levels for too long can cause damage to the human inner ear—the cochlea—a sensitive structure which converts sound wave vibrations to nerve impulses which the brain decodes as sounds (Fig. 3). Damage to the cochlea results in decreased ability to hear and could potentially lead to deafness. The physical costs of such conditions cannot be measured—the loss of ability to easily communicate, isolation and aloneness, and loss of the most simple pleasures such as music, the sound of rain on a roof, or of a loved one's voice.

Recognition and documentation of risks and results of occupational noise-induced hearing loss has been relatively recent, both by government and industries. Prior to 2004, statistics regarding hearing loss were included in the OSHA Survey of Occupational Injuries and Illnesses, which only recognized cases involving at least 1 day away from work due to a reported injury—a situation applicable to only a very small percentage of hearing-loss-related injury reports. OSHA added a line regarding hearing loss to its "300" injury event reporting form effective January 1, 2003, so the U.S. Bureau of Labor Statistics (BLS) has a relatively small 10-year accumulation of data regarding the problem. Those recent statistics are impacted by the process of self-reporting, where employers who complete the forms may not be aware of hearing problems being experienced by their employees. There is no ignoring the enormity of the problem, as hearing loss is listed by the BLS[5] as the cause of 12% of total nonfatal occupational illnesses in private industry in 2010.

Due to the relatively small amount of data concerning the economic cost of occupational noise-related hearing loss, the financial impact caused by it is difficult to define, but attempts have been made. A CDC document[1] titled "Work Related Hearing Loss" reports, "...occupational hearing loss costs an estimated $242.4 million per year in disability alone." The same document explains, "In British Columbia, in the five year period from 1994 to 1998, the worker's compensation board paid $18 million in permanent disability awards to 3207 workers suffering from hearing loss. An additional $36 million was paid out for hearing aids (total of $16,838 per person)." A U.S. National Institute of Health[6] abstract titled "Modeling the United States Government's Economic Cost of Noise-Induced Hearing Loss for a Military Population" determined that hearing loss damage experienced by Navy sailors exposed to 93 dBa of noise over a 6-year period created lifetime cost to the U.S. government of $13,472 per sailor. So if approximately 12% of the tens of thousands of annual reported work-related injuries in the construction industry are hearing-loss related, the direct cost to the industry extrapolates to hundreds of millions. Lost productivity costs and costs due to misunderstandings and miscommunications resulting from noise-induced hearing loss cannot be calculated.

Due to greater recognition by participants at all levels of the construction industry, administrative controls, engineered controls, and personal protective equipment (PPE) are being used to address causes of occupational noise-induced hearing loss. OSHA mandates Noise Monitoring Programs, which include baseline hearing tests for construction workers (and in many other industries) to use as a point of comparison for annual re-tests to identify any progressive hearing loss. Simple managerial processes, such as rotating workers on and off noisy tasks to limit exposure durations, and shutting down noisy equipment such as compressors and portable generators when not needed, help reduce decibel levels. Engineered controls, such as use of equipment with lower decibel ratings, tools which include mufflers, or erecting barriers to limit noise transmission from the noise source to other areas of the job site, also reduce total noise exposure during a project. Most important,

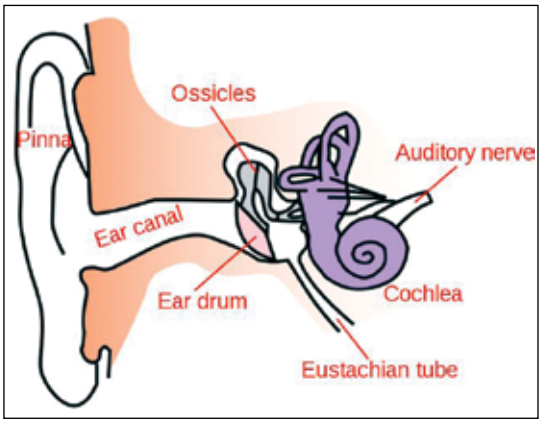

Fig. 3: The human ear

enforced use of appropriate PPE at all times can help reduce noise exposure and hopefully avoid noise-related hearing loss.

Many simple and effective PPE devices to protect hearing are available, including ear plugs and ear muffs in a variety of materials, configurations, and rated protection levels (Fig. 4). Manufacturers advertise decibel reductions of 10 to 30 dBa average exposure by using these products. Even the most basic corporate safety plans should mandate use of some form of hearing protection, provided by employers at no cost to workers, whenever a worker is to be exposed to noise levels exceeding 85 dBa. More sophisticated plans may describe fit tests and identify for worker benefit the appropriate type(s) of protection based on the tool to be used or the noisy condition to be encountered.

Unlike most other job-related accidents and illnesses documented by BLS, occupational noise-related hearing loss has been increasing since OSHA started tracking it. Officials believe this is due to increased awareness of the problem and more frequent worker reporting of occupational hearing loss concerns. However, like most construction job-site-related injuries, hearing loss is preventable. By monitoring job-site noise levels and implementing procedures and equipment to control noise impact, occupational noise-related hearing loss can be avoided. So when the project is over, everyone involved can hear the best words possible: "Thanks, you did a great job!"

Fig. 4: Personal protective equipment devices

REFERENCES

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2. U.S. Department of Labor's Occupational Safety and Health Administration (OSHA), Regulation 1926.101(a).

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Brian Daley *is Branch Manager of C.A. Lindman, Inc.'s Miami, FL-area office. He has over 30 years of construction management experience in sales, project management, and senior management positions for new construction and restoration contractors, including the last 15 years with C.A. Lindman. Daley has been active in industry associations including SWRI, the Stadium Managers' Association, the Association for Preservation Technology, the American Conservators Institute, and ICRI. He is a member of ICRI's Executive Committee and Chairs the ICRI Finance Committee and Committee 130, Procurement Methods and Relationship Arrangements.*