

141**Noise Exposure During Hand-Held Concrete Grinding - Effects of Dust Control Methods and Grinder Size**

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Hand-held concrete grinding activities impose several distinct hazards on workers, including noise, silica dust, vibration, and ergonomics issues. Noise exposure assessment during these activities is challenging because of many confounders such as those related to tools/accessories, work surfaces and set up, and worker's position and work habits. This study used noise dosimeters (Spark 705+, Larsen Davis) to examine the extent of personal noise exposure while a concrete grinding worker used a variety of grinder sizes, types, and attachments, including available dust control methods. Noise monitoring was conducted in an indoor field laboratory located in a concrete cutting firm for nine days, covering 44 grinding sessions from 5 minutes to 60 minutes. The worker's minute-time-weighted average (dBA) exposure during grinding was 95.4 ± 5.2 (mean \pm SD), ranging from 77.8 to 113.2. Background noise was 71.9 ± 4.6 , ranging from 58.5 to 82.7. The levels of noise exposure were different for three methods of dust control; traditional (no dust control) grinding created significantly higher noise levels (98.0 ± 5.8) than those of wet grinding (96.7 ± 5.1) or local exhaust grinding (93.5 ± 4.4). The levels of noise exposure were also different for four sizes of grinding diamond cups (blade); 7-inch (17.8 cm) grinder cup generated significantly higher noise levels (97.9 ± 4.7) than those of 5 inch (12.7 cm), with noise levels of 95.6 ± 5.2 , 4.5 inch (11.4 cm) with noise levels of 93.9 ± 2.3 , and 4 inch (10.2 cm) with noise levels of 91.8 ± 5.2 . There were no significant differences in the noise levels when grinding concrete in horizontal or inclined position or when the general ventilation in the shop was on or off. The results indicate that noise exposure levels during concrete grinding can exceed the recommended limits by ACGIH, and workers should be protected accordingly.

142**Moisture Management During the Construction Process**

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While water damage is a longstanding quality control issue at construction sites, recent concerns related to mold exposure have resulted in increased attention to prevention, assessment, control, and documentation of moisture during the construction process. We have adapted current industrial hygiene strategies for mold identification and remediation (developed for occupied buildings) to the unique conditions presented by building construction. Recognition of potential moisture pathways and material susceptibility is a prerequisite to the development of preventive measures and monitoring protocols. Assessment is based on visual inspection and moisture measurement. Remediation procedures emphasize replacement of water damaged materials and sanitizing work areas before project completion. Coordination with other construction activities presents many logistical challenges. Inves-

tigators must characterize observed moisture problems as to root cause (e.g., design oversight vs. construction defect) and differentiate these from future moisture issues that may arise during building operation. We will present a case study illustrating a comprehensive moisture management program during construction of a large commercial facility.

143**A Community-Based Participatory Approach to Preventing Falls and Silica Exposure Among Latino Construction Workers**

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Latinos, the fastest growing ethnic group in the United States, are overrepresented in both fatal and nonfatal occupational injuries. The construction sector, with a large share of Latino workers (17%), is also one of the most dangerous industries, accounting for 20% of all occupational deaths. Despite extensive research that has addressed fall prevention in construction, the number of fall-related fatalities continues to rise. In the United States, approximately one of five workers who die from falls on the job is Latino. Silica exposure among Latino construction workers is much less well characterized, yet also likely to be a problem. Occupational safety and health interventions shown to be effective in other settings may not be completely appropriate or accessible to the Latino workers and the contractors who employ them. Interdisciplinary, participatory approaches are urgently needed to develop and evaluate measures for protecting the health of immigrant workers. We will describe our Community-Based Participatory Research project, "Protección en Construcción: The Lawrence Latino Safety Partnership," and present results from the assessment phase of this intervention research project. The major hypothesis of our project is that a community-based participatory process involving city agencies, a labor organization, academia, construction safety experts, workers, contractors, family members, and Lawrence residents can develop an effective approach to prevent exposure to fall-related hazards and silica exposure affecting Latino construction workers. This initiative also aims to build a community-wide support system to carry on the program in the future. By involving employers, health care providers, government agencies, insurance companies, and the broader community with workers and their union, this project is offering the potential for sustainable, systemic change at the multiple levels required for intervention effectiveness.

144**Comparison of Quantitative and Qualitative Approaches for Evaluating Health and Safety Hazards in a Pharmaceutical Facility**

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A pharmaceutical facility in Detroit, Mich., recently was evaluated for health and explosion haz-

ards due to release of n-butanol vapors in a protein-filtration process. Quantitative and qualitative approaches were used in the assessment. Quantitative analyses included air sampling, airflow pattern measurements, and temperature measurements. The resulting data were mapped to a 3D representation of the filtration process area as part of quantitative risk assessment. In addition, computational fluid dynamics simulations using STAR-CCM+ 3.02 (CD-adapco, Melville, N.Y.) were used to predict n-butanol distribution patterns. The simulation results were used to extend the understanding of this workplace environment to a wider range of operating conditions beyond what was measured using instruments. Separately, qualitative analyses were conducted using the precautionary principle. The precautionary principle is a widely applied qualitative approach for mitigating hazards that may lead to adverse health effects. It is used to predict undesirable events and focus key corrective actions where perceived risk is highest. The quantitative and qualitative approaches were conducted by different groups of safety and health professionals in order to have unbiased outcomes. Results from the quantitative approach demonstrated likely overexposures to n-butanol and potential for explosion hazards in certain operating conditions of the filtration process. Results from qualitative analyses, while less specific, indicated an urgent need to reduce the n-butanol exposure at its source. In general, these approaches resulted in similar conclusions. However, results from application of the precautionary principle show there is bias based on experience level of safety professionals who would be conducting the assessment. We conclude that both quantitative and qualitative approaches should be used, but at different times in the assessment process. Finally, we propose a complete procedure for application of these approaches for evaluating workplace hazards in pharmaceutical manufacturing.

145**Lithium Battery Safety Program at Woods Hole Oceanographic Institution**

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The Woods Hole Oceanographic Institution (WHOI) uses primary and secondary lithium batteries in a variety of oceanographic research applications. Primary (nonrechargeable) lithium batteries generally contain lithium metal, whereas most secondary (rechargeable) lithium batteries contain an ionic form of lithium (lithium-ion). Because lithium batteries contain more energy per unit weight or a relatively higher energy density than conventional batteries, they have become popular and widely used in a variety of applications. However, the same properties that result in a high-energy density also contribute to potential hazards if the energy is released at a fast, uncontrolled rate. In general, the risks posed by lithium batteries are a function of battery size (the amount of lithium content and corresponding energy density) and the likelihood of short-circuiting or rupture. A lithium battery is susceptible to thermal runaway, a chain reaction leading to self-heating and uncontrolled release of stored energy. Flames produced by lithium batteries are hot enough to cause adjacent cells to vent and ignite. Multiple external and internal events involving primary and secondary lithium batteries (includ-

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