

Collecting Silica and Dust during Concrete Cutting and Drilling

Reducing silica and dust exposures in construction during use of powered concrete-cutting hand tools: Efficacy of local exhaust ventilation on hammer drills

Susan Shepherd, Susan Woskie, Christina Holcroft, and Michael Ellenbecker. Journal of Occupational and Environmental Hygiene, January 2009.

Overview

Concrete cutting in construction is a major source of exposure to respirable crystalline silica. To reduce exposures, local exhaust ventilation (LEV) may be integrated into the hand tools used in order to collect the dust at its source. The research team conducted a field study at the New England Laborers Training Center to establish the efficacy of various LEV systems at this task. The study evaluated two drill bit hoods (a bellows that fits over the drill bit, and a ring hood designed to cover the point where the bit addresses the surface) and two vacuum sources (a smaller HEPA filtered shop-vac (Porter-Cable) and a larger, more powerful device (Dust Control)). Researchers collected samples from personal air monitors (4-stage impactors) while four apprentices drilled holes in a concrete wall employing each of the four possible combinations of hood and vacuum, plus drilling without LEV, resulting in 15 respirable dust and quartz sample for comparison.

Key Findings

- With no LEV, the task generated 308 micrograms of respirable silica dust per cubic meter of air ($308\mu\text{g}/\text{m}^3$), a level widely recognized as hazardous.
- The bellows hood and shop-vac combination reduced airborne silica levels by 98% in the round of trials.
- All of the control combinations reduced respirable airborne silica levels by at least 91% (average 94%).
- All of the control combinations reduced respirable airborne silica levels well below 50 micrograms of silica per cubic meter of air ($50\mu\text{g}/\text{m}^3$), the new Permissible Exposure Limit (PEL) proposed by OSHA ($12\text{-}28\mu\text{g}/\text{m}^3$).

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Read the abstract:

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