

to the surrounding room during nitrogen addition. A throttle valve was designed to regulate the mill air intake and thus increase the effectiveness of the induced draft duct controlling blender headspace. An integrated pressure actuated emergency purge system was also designed. **Lessons learned:** It is critically important for industrial hygienists to understand process systems and operation variables when evaluating the effectiveness of controls. It is also critically important to have SOPs that reflect system operating ranges, design, maintenance, cleaning, and operator training. What looks like a ventilation system under ANSI/AIHA Z-9 may not be a ventilation system at all but rather part of a process control.

253 The Use of Video Exposure Monitoring in a Training Video on the Hazard of Hexavalent Chromium in Welding

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Situation/problem: In 2006, federal OSHA's and Washington State's new hexavalent chromium (CrVI) standards became effective. The exposure limit was reduced from 52 to 5 µg/m³. With the more stringent standard, there was a need for training materials to assist employers and workers comply with the exposure control requirements, particularly as it pertained to stainless steel welders. **Resolution:** Using funds from a Washington State Department of Labor and Industries' grant program, the University of Washington's Field Research and Consultation Group developed a training video using video exposure monitoring (VEM) to visually demonstrate how to effectively use local exhaust ventilation (LEV). The scenarios investigated with the VEM were: MIG welding outdoors, FCAW in a shop, and stick welding in a confined space. All scenarios were monitored with and without LEV. **Results:** Using the VEM technology, we were able to highlight how LEV can be used effectively in various situations. The video and user manual were produced with chapters on the following topics: introduction, the exposure assessment tool, LEV basics, effective use of LEV, other control measures, and the regulation. A poster was also developed that highlights the appropriate exposure controls given the welding

situation. The professionally produced video can be viewed all at once or in modules and has been disseminated to hundreds of viewers and is available on-line. **Lessons learned:** We found that using VEM in a training video can be an effective tool to demonstrate effective exposure control measures while maintaining worker's and manager's attention. To make the VEM effective in a variety of work environments, it must be physically robust, easy to set up, easy to troubleshoot in the field, and have redundant data collection modes. It is also essential to keep a time-coded observation log to assist in synchronizing and interpretation.

254 Experimental Study on the Performance of a Benchtop Enclosing Hood — Effects of Face Velocity and Cross-Draft Velocity

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In the industrial field, benchtop enclosing hoods are critical for protecting workers from airborne contaminants. Face velocity and cross-draft velocity are assumed to be two dominant factors affecting the performance of benchtop enclosing hood. However, there is little published research on the effectiveness of these hoods. Almost all enclosing hood research has been done on laboratory fume hoods. **Objective:** To determine the effects of face velocity and cross-draft velocity on the efficiency of a 36"x30" enclosing hood. **Methods:** This study is a factorial study design with two replications of each treatment combination. The study tested the effects of five levels (111, 140, 170, 200, and 229 *fpm*) of hood face velocity and five levels (14, 26, 36, 46 and 57 *fpm*) of wind tunnel cross-draft velocity on the plain benchtop enclosing hood performance. Freon-134a concentrations were measured on an anthropometrically correct, heated, breathing manikin holding a source between its hands while standing at the enclosing hood face. Samples were taken simultaneously at the nose, mouth, outside the wind tunnel, downstream of the wind tunnel and the exhaust duct. Every location was sampled at 0.15 LPM for 20 minutes. **Results:** Higher values of face velocity were associated with higher hood protection efficiency at each value of cross-draft velocity. Surprisingly, effectiveness was generally greater for

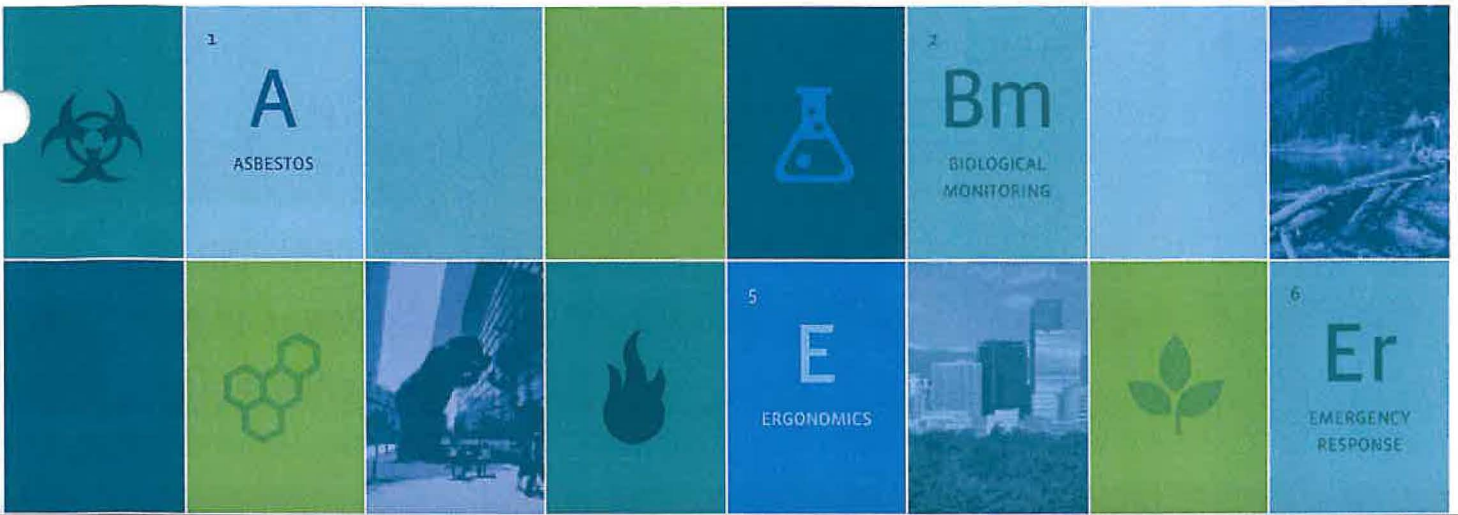
high levels of cross-draft velocity than low ones. The median level of face velocity (170 *fpm*) and the median level of wind tunnel cross-draft (36 *fpm*) produced the best hood protection efficiency. **Conclusion:** is that interaction of cross-draft velocity and face velocity strongly affect the concentrations at the sampling sites.

255 Capture Hood Centerline Velocity Comparison to Dallavalle

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To predict midline velocities in front of a capturing hood, industrial ventilation continues to rely on J. Dallavalle's 1932 model, which assumed no cross drafts or obstruction to flow. Since then, results from published experimental studies have deviated from Dallavalle to one degree or another for the same ideal conditions. The objective of this study was to compare velocities observed using Particle Image Velocimetry (PIV) for both ideal conditions and for the presence of competing airflows, a working surface, and use of an anthropometrically correct, heated and breathing manikin. PIV was used to capture the velocity field in a vertical plane, perpendicular to an unflanged 29.5 x 15.4 cm capture hood that tapered down to a 10 cm circular duct. Airborne particles were generated with a theatrical fog machine and carried past the manikin and toward the hood face by an imposed cross draft. Cross draft flows were randomly set between three levels for each of the four experimental setup block: ideal or freestanding hood, presence of working surface, presence of both working surface and manikin, manikin only. Differences between the observed values and those calculated using Dallavalle's recommended standard was calculated and used for comparison. The factors introduced, affected the measured values very little close to the hood face; however, at distances greater than the height of the hood, each became moderately significant. Current empirical and theoretical knowledge about capturing hoods is lacking detail for use by practitioners in the design process. Environmental conditions vary greatly within modern industries, where processes change rapidly as newer technologies are implemented and products continuously evolve. To best suit the needs of these industries,

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