

all furniture surfaces in each individual room. Sealing the walls above the ceiling with a spray foam and layers of 6-mil plastic as well as sealing all the existing wall openings, i.e., e-outlets and phone jacks prevented further mold spore dissemination. Sections of walls were removed where high levels of wall cavity mold spore contamination were determined. Following remediation efforts, airborne concentrations of culturable and non-culturable mold spores were reduced substantially. This information will help practitioners investigate, evaluate and remediate mold contamination problems. Many innovative sampling techniques were incorporated into this project including non-invasive wall cavity sampling, building tents around air supply ducts with simultaneous sampling in the ambient room environment and simultaneous non-viable and viable mold spore sampling.

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SOIL SAMPLING FOLLOWING A TRAIN DERAILMENT DURING WHICH MULTIPLE CHEMICALS WERE RELEASED. F. DeRosso, University of Utah, Salt Lake City, UT.

On April 11, 1996 eighteen cars of a Montana Rail Link train derailed near the town of Alberton, Montana, releasing approximately 130,000 pounds of gaseous chlorine, 17,000 gallons of potassium cresylate solution and 85 pounds of dry sodium chlorate. Approximately 300 people reported to local hospitals with symptoms related to potential chemical exposures; approximately 40 were treated for chlorine gas exposure. For several weeks after the derailment, various entities and agencies including the U.S. Environmental Protection Agency (EPA), Agency for Toxic Substances and Disease Registry (ATSDR), Montana Department of Environmental Quality, and Montana Rail Link responded in various capacities. The response actions included public evacuation, environmental sampling, medical intervention and contaminated soil excavation and disposal. More than four years after the incident there are still reports of lingering chemical-like odors near the derailment site and reports of continuing adverse health effects from citizens in the surrounding communities. These reports have raised questions as to whether residual chemicals or reaction products are still present in the area surrounding the derailment. The EPA sanctioned a follow-up soil sampling study to address these concerns. This case study describes the development and implementation of the sampling plan. Problems associated with developing a sampling plan included reconstructing the incident from agency files, choosing the appropriate chemicals to be sampled, and addressing the wide variety of public comments and concerns. The first step in the sampling plan development was to schedule a public meeting with concerned citizens to ensure their issues were being addressed. Even with significant up-front public involvement there was a much heated debate by a few individuals before an acceptable sampling plan was developed and implemented. In general, the sampling results eventually satisfied most of the public concerns regarding residual derailment-related chemicals. All safety and health professionals can benefit by the lessons learned in involving the public and multiple government agencies in a response to an environmental disaster.

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LESSONS LEARNED: SAMPLING FOR BIOAEROSOLS IN UNDERGROUND COAL MINES. J. Martin, J. Cocalis, NIOSH, Morgantown, WV; C. Rao, NIOSH, Morgantown, WV.

Situation: Are miners exposed to atypical levels of bioaerosols in the mine environment? To answer this question, the National Institute for Occupational Safety and Health (NIOSH) developed methods to sample face areas of underground coal mines which use untreated surface water in the dust suppression systems. Problems: Traditional bioaerosol sampling methods could not be used due to several constraints imposed by the mine environment. Permissible pumps could not operate at the optimum flow rate for many types of air sampling equipment (e.g., multiple jet impactors, impingers, and spore traps). Conditions downstream from the cutting machine included high dust levels and water sprays that could interfere with sample collection and analysis. In addition, limited background data on microbial species and concentrations in mines made it difficult to determine the proper sampling media and times. Resolution: Air samples for fungi and bacteria were taken with 37 mm open-faced cassettes (0.2 m polyethersulfone filters) and SKC BioSamplers™ using ViaTrap™ mineral oil under non-optimal flow rates. Exposure levels were potentially underestimated with these methods and improvements for future sampling could include modifying sampling times and developing permissible pumps capable of creating optimal air flow for use with a variety of sampling equipment. How will sharing this work experience benefit other practitioners of industrial hygiene and/or occupational and environmental health and safety? This case study provides guidelines to aid industrial hygienists and OEH&S specialists in designing appropriate sampling schemes when faced with non-traditional environments such as an underground coal mine.

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HEAT STRESS MONITORING FOR WORKERS WEARING BOMB GEAR WITH LEVEL B PERSONAL PROTECTIVE EQUIPMENT. E. Meier, PrSM Corporation, Los Alamos, NM.

During a perchlorate salt contamination assessment project, unacclimated workers were required to don multiple layers of PPE and supplied-air respirators along with full-body bomb gear. The entire PPE ensemble weighed approximately 60 pounds and rendered the work "moderate" to "heavy" per ACGIH guidelines. Heat and metabolic stresses were issues that could not be completely mitigated. More common methods of heat stress assessment such as the WBGT index and the pre- and post-monitoring of vital signs were considered and rejected due to the level of PPE and the amount of time required for decontamination and doffing. Real-time telemetric heat stress monitoring was selected as the best way to monitor workers. The devices enabled industrial hygienists and medical staff to communicate instructions to workers, closely monitor vital signs, make decisions regarding worker performance, and remove workers whose vital signs exceeded the specified monitoring criteria. Industrial hygienists confronted with heat stress issues requiring remote monitoring can benefit from the lessons learned on the limitations and advantages of employing such a monitoring system.

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REDUCING EMPLOYEE EXPOSURE TO CONCENTRATIONS OF RESPIRABLE CRYSTALLINE SILICA IN THE FOUNDRY INDUSTRY DURING A GRINDING OPERATION. D. Bentley, BWC Ohio Division of Safety and Hygiene, Pickerington, OH.

Situation: Employee exposures to crystalline silica in grinding operations at foundries are a well-known problem. Exposure has been associated with high incidence of silicosis and lung cancer. Additionally, OSHA is considering a comprehensive crystalline silica regulation that would lower current exposure limits. Problem: Cited by OSHA, employee exposures to crystalline silica at several grinders were found to be 3 to 4 times the OSHA Permissible Exposure Limit (PEL). Additional respirable silica sampling confirmed these high employee exposures. Measurements of air flowing through the existing ventilation system identified low face velocity airflow at each of the grinders. Poor maintenance and expansion planning with respect to dust control and silicosis prevention led to increased worker exposure. Resolution: Modification of the process improved workflow through the finishing department. Dust control innovations resulted in a much higher face velocity at each grinding hood and better capture of the contaminant at the source. To prevent future problems in the operation of the ventilation system, oversight and maintenance of the grinders and the ventilation system was implemented. Air sampling results after the movement of the grinders and changes to the industrial ventilation system in the finishing room confirmed that employee exposure to silica had been reduced. Following changes to the hood design, sampling found no detectable crystalline silica. How will this case study benefit others? This case study provides a practical method for dust control that can minimize employee exposures to crystalline silica in grinding operations. The model shows excellent results can be achieved when a diligent effort is made and team effort is used to accomplish the change.

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CONTROL OF SILICA EXPOSURES IN CONCRETE GRINDING WORK. C. Loewenherz, New York Committee for Occupational Safety and Health, New York, NY; J. Camp, University of Washington, Seattle, WA.

It has long been known that occupational exposure to silica poses a health threat. More recently, construction workers have been identified as being vulnerable to silica exposure. Exposure data by trade is limited but several references do indicate that some of the highest exposures in construction are associated with dry grinding on concrete. While engineering controls are clearly the first choice in capturing dust generated from concrete grinding, there is very little data available on the effectiveness of these methods. The University of Washington Field Research and Consultation Group in cooperation with a major general contractor in the Seattle area characterized exposures to crystalline silica during concrete finishing activities and determined the effectiveness of local exhaust in lowering silica levels. Samples were collected at six sites between October 1999 and April 2000. Activities included grinding on walls, columns, and floors. Results

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ABSTRACTS