sented with an opportunity to assist in the evaluation of cellulose insulation (CI) by conducting an exposure assessment of CI applicators through an interagency agreement with the National Institute of Environmental Health Sciences/NTP. NIOSH completed the study by evaluating 10 contractors in various geographic locations across the United States.

Methods: During each contractor site visit, air samples were collected for total dust, respirable dust, and for scanning electron microscopy (SEM) analysis to characterize any fibers in the dust. The CI installer and hopper operator each had two SEM air samples collected for each day of CI activities. Bulk samples were collected and analyzed for metals, boron, and sulfate content. Real-time and video exposure monitoring were also conducted to further characterize the CI dust and workers' exposures.

Results and Conclusions: Employees in virtually all CI application activities were exposed to total dust levels which exceeded the OSHA PEL, 8-hour TWA of 15 mg/m3. Air sampling results indicated low levels of respirable dust. The SEM analyses identified fibers with an average length of 28 micrometers (μm) and ranging from 5 to 150 μm. Statistical analysis revealed that area and CI installer, total dust air sample concentrations in the attic were significantly higher when applying the CI dry than wet (geometric mean concentration for CI installer, dry was 74.8 mg/m3 versus wet at 18.7 mg/m3; p = <0.01). Exposure concentrations vary significantly between employees when involved with dry CI related activities (p = <0.01). Respirable dust air sample concentrations vary significantly between sampling areas when collected during dry CI related activities (p = 0.03). Based on the air sample data, NIOSH investigators conclude that there is a potential health hazard from exposure to CI and recommends that employees involved with CI activities wear at a minimum NIOSH approved particulate filtering respirators with a N95 designation.

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AN AUTOMOBILE RACING TEAM'S OCCUPATIONAL EXPOSURE TO POTENTIALLY OTOTOXIC CHEMICALS. K. Gwin, K. Wallingford, L. Van Campen, T. Morata, NIOSH, Cincinnati, OH.

BACKGROUND: Because of significant noise exposure during automobile racing, NIOSH partnered with a performance enhancement consulting firm and a stock car racing team to conduct a pilot study evaluating occupational exposure to potentially ototoxic chemicals. The purpose of the study was to evaluate the possibility of noise and chemical interaction that could lead to occupational hearing loss. METHODS: Exposure assessments were conducted at the team's garage and at one daytime and one nighttime race at a short (0.5 mile) oval track during the 2000 racing season. (This track represents a "worst case" exposure scenario due to its small size, steep banking, and high grandstand configuration.) Both area and personal air samples were collected for selected volatile organic compounds (VOCs), metals, and carbon monoxide (CO). Air samples for VOCs were obtained using both thermal desorption and charcoal tubes for qualitative and quantitative determination, respectively; air samples for metals were obtained on mixed cellulose ester membrane filters; and CO concentrations were measured using direct-reading, data-logging dosimeters. RESULTS: Airborne concentrations of VOCs and metals were either not detected or were extremely low, well below any relevant occupational exposure criteria. Mean CO concentrations ranged from <1 to 6 ppm at the team's garage, 12 to 14 ppm during the daytime race, and 3 to 139 ppm during the nighttime race. Peak CO levels ranged from 6 to 117 ppm at the team's garage, 31 to 55 ppm during the daytime race, and 26 to 835 ppm during the nighttime race. CONCLUSIONS: These data suggest that CO concentrations may exceed current 15-minute and 8-hour time-weighted average occupational exposure criteria during automobile racing practice and qualifying events. However, the determination of percent carboxyhemoglobin in exhaled breath after racing events to evaluate the actual CO body burden for the driver and crewmembers of the racing team will be necessary to confirm these environmental data.

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AN EXPOSURE EVALUATION OF LEAD FROM WAVE SOLDERING OPERATIONS DURING THE MANUFACTURE OF CIRCUIT BOARDS. B. King, NIOSH, Cincinnati, OH.

Background: NIOSH conducted a health hazard evaluation (HHE) in response to an employee request concerning potential lead exposure at a circuit board production facility. At this facility, a 60% tin /40% lead solder is used in wave solder machines to secure electronic components to the wafer boards. In particular, two processes of concern were identified. One, a daily process, was the skimming of the surface of the liquid solder in the solder pot with a slotted spoon, removing any surface dross. A second, weekly process was the thorough cleaning of internal wave solder machine components and a deep cleaning of dross from the liquid solder. Methods: Personal breathing zone and area air samples were collected for airborne lead on individuals working at the wave solder machines, at various stations of the production lines, and throughout the facility. Surface wipe sampling for lead was performed on surfaces including equipment, floors, lunchroom tabletops, and ventilation registers. Wipe samples were also performed on the hands of individuals working with the lead solder after their normal hygiene practices. Results: All personal breathing zone and area air samples returned results well below all applicable evaluation criteria. However, surface wipe sampling results ranged from below the analytic limit of detection to a high of 1700 μg lead per wipe sample. Results from hand wipe sampling revealed a high of 52 μg lead per wipe sample, taken from the individual after normal hand-washing who performed the deep cleaning of the solder pot. Conclusion: Although exposure to lead via inhalation appears to be low, its ingestion is still very possible due to the presence of lead found on a variety of work surfaces. NIOSH investigators recommended increased housekeeping procedures for better removal of lead from work surfaces, improved personal hygiene procedures, and vigilance in the use of proper personal protective equipment and engineering controls.

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OCCUPATIONAL EXPOSURES IN SEISMIC RETROFITTING OPERATIONS. J. McKernan, G. Piacitelli, K. Roegner, L. Delaney, NIOSH, Cincinnati, OH; G. Bayne, UC Berkeley/OEHS, Berkeley, CA.

Seismic retrofitting is the process of re-engineering existing structures to limit the extent of damage caused by earthquakes. Workers employed as general and special trade contractors as well as laborers and helpers are engaged in retrofitting operations. This industry is positioned to increase in size due to governmental funding available for natural hazard mitigation in states with frequent seismic activity, such as Alaska and California. This research project quantitatively characterized full-shift personal exposures to diesel exhaust (measured as elemental carbon), lead, respirable dusts, respirable quartz and noise hazards associated with retrofitting operations. Chemical assessments were performed using NIOSH sampling and analytical methods, and noise assessments utilized commercially available noise dosimeters calibrated in accordance with NIOSH REL sampling criteria. A total of 57 personal samples were collected for 11 occupations and 20 tasks observed over three days on a single work site. Participating occupations included: excavators, bricklayers, carpenters, concrete chippers, construction yard workers, core-drillers, demolition laborers, foremen, iron workers, rebar installers, and welders. Personal sampling results indicate that respirable dust (N=23) exposures ranged up to 9.17 mg/m³, with demolition laborers having the highest exposures. Respirable quartz results (N=23) ranged up to 0.53 mg/m³, with demolition laborers and concrete chippers having the greatest exposures. Noise dosimetry results (N=19) ranged from 76-112 dBA, with excessive exposures (>100 dBA) being attributed to tasks performed by concrete chippers, demolition laborers, and iron workers. Lead exposures (N=15) ranged from 0.002 to 0.069 mg/m³, with concrete chippers having the highest exposures. Exposure to diesel exhaust (N=7) ranged up to 0.04 mg/m³, with highest results being attributed to excavation tasks. Fifty-three percent of the results were equivalent to, or exceeded applicable occupational exposure criteria. Sampling results show that particulate and noise abatement controls are necessary for the occupations indicated as having the highest exposures within this unique industry.

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CONTROLLING RESPIRABLE QUARTZ DUST IN SAND-BLASTING: ROLE OF SAND PARTICLE SIZE AND A DUST SUPPRESSION AGENT. J. Nelson, S. Soderholm, M. Greskevitch, CDC/NIOSH, Morgantown, WV.

Abrasive blasting with sand can generate high concentrations of respirable quartz dust to which workers can be exposed. Overexposure to such dust can lead to the development of silicosis, a potentially deadly lung disease. Abrasive blasting is prevalent in construction, automotive, and shipbuilding industries and is often used for cleaning. The process involves using high-pressure air to blast abrasive media against the surface to be cleaned. The impact against a hard surface causes the particles to fracture. If the particles are small enough, they can become airborne dust, easily spread by the air pressure generated by the abrasive blaster. Data from a previously described abrasive blasting laboratory study were analyzed to determine which experimental parameters correlated with lower respirable quartz dust concentrations. The blasting process was performed on 2-foot square steel plates with air samplers placed in locations around the testing area and on the operator. Some of the sands were treated with a commercial dust-suppressing agent. Analysis of the samples indicate that sands with initial larger particle sizes create higher levels of respirable quartz dust than sands with the lowest particle sizes (average particle size by sieve analysis <0.45 mm). The dust suppressant appears more effective in reducing respirable quartz concentrations when used on sands with the lowest initial particle sizes (>50% reduction). Sands with smaller initial particle sizes have similar consumption rates and cleaning rates when compared to those with larger initial particle sizes. According to the

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ABSTRACTS