

conditions for the stationary task, 29 and 27%, respectively, and the SL by 7% ($p < 0.05$) for the reach task. This demonstrates direct glare is a potential risk factor for modifying postural stability during material handling tasks.

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A FURTHER VALIDATION OF RAPID UPPER LIMB ASSESSMENT (RULA). G.A. Davis, T.L. Duncan, R.E. Thomas, Auburn University, Auburn, AL

Repetitive motion injuries are becoming more prevalent in occupational settings. The need to identify problematic workstations to avoid these injuries is crucial. Unfortunately, not all companies have the availability of an ergonomic specialist or the knowledge of ergonomic tools to help identify those areas of concern. Therefore, the task of recognizing the potential for injury may rest on supervisory personnel. RULA is a survey method developed to evaluate workplaces where repetitive motion injuries of the upper extremities may exist. RULA provides a quick and simple assessment of the arms, wrist, neck, trunk, and legs, in the various positions and postures experienced while performing a repetitive task. Because RULA requires a short training time with no special equipment, it is ideally suited for ergonomic evaluations by supervisory personnel. The objective of this study was to determine if supervisors, untrained in ergonomics, could accurately assess tasks that may result in upper limb disorders using the RULA method. The results of these evaluations were compared against those achieved by four trained ergonomists who evaluated the same jobs without using the RULA technique. Based on the results of the study, it was concluded that supervisors, untrained in ergonomics, can accurately assess tasks that may result in upper limb disorders by using the RULA method. The supervisors further reported that RULA was particularly helpful in drawing attention to workstation designs that could lead to injury with extensive use.

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BERYLLIUM CONTAMINATION INSIDE VEHICLES OF MACHINE SHOP WORKERS. W.T. Sanderson, P. Henneberger, J. Martyny, K. Ellis, M. Mroz, L. Newman, NIOSH, Cincinnati, OH

Occupational exposure to airborne beryllium compounds causes a chronic, debilitating lung disease in immunologically sensitized workers. Evidence that very low concentrations of beryllium may initiate this chronic disease is provided by incidences of the illness in family members exposed to beryllium dust from workers' clothes and residents in neighborhoods surrounding beryllium refineries. This report describes the results of a cross-sectional survey to evaluate potential take-home beryllium exposures by measuring surface concentrations on the hands and in vehicles of workers at a precision machine shop manufacturing beryllium products. Wipe samples collected from workers' hands and vehicle surfaces were analyzed for beryllium content by inductively coupled argon plasma-atomic emission spectroscopy. The results ranged widely, from non-detectable to hundreds of mg/ft^2 , but showed that many workers both carried residual beryllium on their hands when leaving work and con-

taminated the inside of their vehicles. The highest beryllium concentration inside the workers' vehicles were found on the drivers' floors ($\text{GM}=19 \text{ mg}/\text{ft}^2$, GSD 4.9), indicating that workers were carrying beryllium contamination on their shoes into their vehicles. A safe level of beryllium contamination on surfaces is not known, but it is prudent to reduce the potential for workers to carry beryllium away from the work site.

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ADDRESSING THE NEED FOR OCCUPATIONAL SAFETY AND HEALTH TRAINING PROGRAMS IN VOCATIONAL & TECHNICAL EDUCATION. J. Palassis, G. Loos, NIOSH, Cincinnati, OH

It is estimated that young workers with less than 1 year of work experience account for about half of all occupational injuries. More than half of the injured adolescent workers received no training in how to prevent the injury they sustained. The National Occupational Research Agenda of NIOSH has identified the adolescents as one of the special populations at risk. It estimates that in any given year, there are 200,000 adolescent workers who suffer work-related injuries, 64,000 of which result in hospital emergency room visits, and 70 of these injuries are fatal. Currently, there are 11 million students in secondary and postsecondary schools who are enrolled in vocational and technical programs. Federal objectives of the Healthy People 2000 Act require more 34% reduction of the injury rate of adolescent workers, from a 1992 baseline. A review of the available National Skill Standards (under a federal act) for workers' competency and certification, revealed inconsistent requirements in the criteria for occupational safety and health (OS&H) knowledge. Workers' certification will commence in 1999. A survey of 50 states departments of voc-tech education indicated that out of 29 states that responded, only 5 had established programs in OS&H. Focus groups conducted with vocational teachers and site visits to vocational schools in three states revealed that there is great need for trade-specific OS&H training materials, and much concern for students' injury liability. Similar concerns were expressed by state and federal agencies in vocational education, by voc-tech associations and labor unions. NIOSH is addressing these needs by developing trade-specific training curricula in OS&H to cover approximately 70 trades where physical, chemical, and biological hazards exist. Each curriculum contains a teaching plan with instructor's outlines and background information with resources; case studies, student learning activities for hazard recognition and control; PPE; safe practices; and assessment methods.

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WORKER EXPOSURES TO ORGANIC SOLVENTS IN KOREA. N.W. Paik, C. Yoon, Seoul National University, Seoul, Korea

Korean workers are most frequently exposed to organic vapors, especially to thinners. This study was performed to evaluate worker exposures to organic solvents in various industries, including manufacturers of automobile parts, elevators, parking facilities, and acoustical instruments. Publishing industries were also included. The results were evaluated by size

and type of industry.

Workers were exposed to mixtures of toluene, xylenes, trichloroethylene, n-hexane, acetone, methanol, n-butanol, n-butyl acetate, and MIBK. Considering additive effects of the compounds, exposures indices were calculated. It was found that worker exposures to organic solvents were highest in small industries and lowest in large industries. During a day shift, the highest exposures were indicated 385 p.m. Workers in small industries had potential exposures exceeding permissible exposure limits for organic solvents. Respiratory protective devices were not supplied to the workers in small industries.

Based on the results of the study, workers of small scale industry should be considered first in industrial health.

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MANAGING WORKER PROXIMITY TO HIGH VOLTAGE LINES THROUGH A STATEWIDE DATABASE SYSTEM. V. Ivensky, T. May, C. Zimmer, Urban Engineers, Inc., Philadelphia, PA; L. Sroka, A. Pellegrino, State of New Jersey, Trenton, NJ

The New Jersey Department of Transportation (NJDOT) is responsible for maintaining thousands of traffic signals, lighted signs, and other electrical devices associated with the state's highway system. An ongoing concern for the Department has been the safety of electrical operations personnel who maintain these electrical devices, particularly while operating in the vicinity of overhead utility lines. Various safety standards and policies regulate clearance distances between maintenance workers and high-voltage utility lines. The study was performed to locate intersections where proximity of high-voltage lines to NJDOT electrical equipment may require maintenance workers to violate clearance rules, and to develop a proactive program to correct violations, including policies, procedures, and design alternatives. A database management system was designed and compiled to collect and analyze data from the state's 3000 highway intersections. Database fields included information on site location, high-voltage lines, and NJDOT electrical equipment. To calculate the distance from equipment such as traffic signal head to the high-voltage line, the system required the following data: electrical equipment height, utility line height, and shortest horizontal distance from the equipment to the utility line. The analytical module of the database allows flexible filtering and sorting of data based on distances between the worker and the high-voltage line. The survey of New Jersey intersections was completed in 1997. The database helps the user to identify and prioritize safety violations and develop recommendations for solving high-voltage proximity problems.

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EVALUATION OF A COMPUTER PROGRAM TO PRODUCE MAXIMUM LIKELIHOOD ESTIMATES OF THE DESCRIPTIVE PARAMETERS FOR HIGHLY CENSORED DATA. J.D. Robertson, G.L. Tietjen, M.L. Tillery, Los Alamos National Laboratory, Los Alamos, NM; W. Galke, National Center for Lead-Safe Housing, Columbia, MD

Air sampling data taken for the purpose of verifying compliance with an occupation stan-

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