127.

A COMPARISON OF THREE LIFTING GUIDELINES: WHOM DO THEY PROTECT? B. Faville, Clayton Group Services Inc., Seattle, WA; C. Shulenberger, Clayton Group Services Inc., Pleasanton, CA.

Many tools exist for evaluating the risks associated with manual lifting tasks. Current methods include the National Institute for Occupational Safety and Health (NIOSH) Lifting Equation, the Washington State Ergonomics Rule, Appendix B, and the proposed American Conference of Governmental Industrial Hygienists (ACGIH) lifting tables.

The NIOSH and ACGIH guidelines are professionally developed to assist practicing safety and health professionals assess lifting tasks. These guidelines are not mandatory or enforceable by Federal or State OSHA. The Washington State equation is part of a regulatory standard and, as such, certain compromises were made in its development. Washington State wanted a method that was easy to use, would identify jobs where the implementation of any necessary controls was both economically and technically feasible, yet would provide protection for workers.

The basis for the development of the guidelines lead to differences in the level of protection afforded to the employee. The purpose of this paper is to compare the three methods, and the applicability and limitations of each method, ... ethods. It is ... ese points in ... ts correctly. ... e the differ- ... impact of ... parameters (e.g. vertical and horizontal hand location) on the outcome is included as part of the presentation.

128.

ERGONOMIC ANALYSIS OF RESIDENTIAL CONSTRUCTION TASKS USING A SUBJECTIVE ASSESSMENT SCALE AND EVALUATION OF THE INFLUENCES OF PERSONAL AND WORKPLACE FACTORS ON PERCEIVED LOW BACK STRAIN. D. Gilkey, T. Keefe, J. Hautaluoma, Colorado State University, Ft. Collins, CO; P. Bigelow, Florida A&M University, Tallahassee, FL; J. Sweere, Northwestern Health Sciences University, Bloomington, MN.

Low back pain among residential construction carpentry workers is at epidemic proportions. Ergonomic evaluation of job-tasks is needed to better understand the actual vs. perceived low back stresses when performing carpentry work. A major aim of this study was to measure and analyze subjective low back strain/effort related to residential framing carpentry job-tasks and personal and workplace factors that might influence perceived exertion. Investigators initially identified the 44 major job-tasks performed by framing carpenters when building a wood-framed residential home followed by the development of a survey instrument. The study survey used a modified 5-point Borg scale consistent with previous investigators to measure low back strain related to each of the 44 job-tasks: (1) no strain, (2) low strain, (3) moderate strain, (4) high strain, (5) very high strain. Zero was recorded if the job-task was not performed. The survey was administered to 94 framing carpenters in the Denver Metro area of Colorado. In this study, each respondent rated all 44 job-tasks for which mean strain scores ranged from 1.05 to 3.08 ($p < 0.001$). The low back strain scores were evaluated to assess the relationships to personal and workplace factors. Personal and workplace factors were found to significantly ($p < 0.05$) influence subjective strain rating in nearly all of the 44 job-tasks. For example, if their level of physical exhaustion was rated "always", this had an impact on ratings in 36 of the 44 job-tasks ($p < 0.05$). The levels of both mental and physical exhaustion were positively correlated to low back strain ratings ($p < 0.05$). This research demonstrates that human factors have a significant influence on how carpenters perceive low back stress and strain related to their daily work and therefore must be considered in ergonomic analyses.

129.

REPORTS OF MUSCULOSKELETAL SYMPTOMS AMONG OPERATORS OF HEAVY CONSTRUCTION EQUIPMENT: A PILOT STUDY. N. Kittusamy, NIOSH, Spokane, WA.

Construction workers are often afflicted with musculoskeletal symptoms that compromise their health and well-being. However, there have been few formal studies of the nature and potentially preventable causes of these symptoms. The purpose of this study is to assess the adequacy of the cab design and to determine the percentage of musculoskeletal symptoms among workers. A questionnaire was designed to assess demographics, work information, job history, and musculoskeletal symptoms in operators of heavy construction equipment. Information concerning equipment included design of the seat/chair, levers, and pedals, bothersome vibration, quality of egress from the equipment, proper preventative maintenance and repairs, and age of equipment. The body regions that were evaluated included the neck, middle/upper back, low back, shoulder/upper arm, elbow/forearm, wrist/hand, hip, knee, and ankle/foot. Sixteen workers out of 17 (94%) completed the questionnaire. All the participants were male. The operators averaged 39 years of age and 11 years of experience. A majority of the operators (>65%) indicated that the cab (i.e., seat/chair, levers, and pedals) was adequately designed for their job. The operators reported that they were not bothered by vibration and that the quality of egress from the equipment was good. Most of the operators (>80%) indicated that proper maintenance and repairs were performed on their equipment. The classification of equipment as being old or new was almost identical. Five body regions that received the highest total percent of symptoms categorized as somewhat severe or higher, in descending order, included the low back, hip, knee, shoulder/upper arm, elbow/forearm, and wrist/hand. These results indicate that these workers are at risk for developing musculoskeletal disorders; the need to perform a larger survey to further substantiate the outcome; and the need to quantify risk factors (i.e., whole-body vibration and static sitting postures).

130.

POSTURAL STABILITY ANALYSIS OF LEAD HAZARD CONTROL PERSONNEL PERFORMING WORK ON LADDERS ON CONTAMINATED POLYETHYLENE SURFACES. J. Gordon, L. Kincl, A. Bhattacharya, P. Succop, University of Cincinnati, Cincinnati, OH.

Lead Hazard Control includes activities such as paint scraping, applying encapsulants, and removing/replacing building components, some of which is performed while working on a ladder. Workers are exposed to environmental conditions such as slippery surfaces and poor lighting while performing work in personal protective equipment on polyethylene surfaces. The purpose of this study was to determine the effect of work surface frictional properties, contamination type, task type, and environmental lighting conditions on workers' ability to maintain "safe" upright balance while working on a ladder. Twenty Lead Hazard Control workers were recruited to determine postural stability while performing simulated static tasks with different contamination (dry, wet, or dusty) and environmental lighting (good or poor) conditions. Postural stability was quantified using a large force platform covered with two layers of polyethylene. During the testing workers wore a respirator and stood on a ladder. Parameters for characterizing postural stability included sway area (SA), sway length (SL), anterior/posterior (AP), and medial/lateral (ML) excursion. An increase in any of these parameters indicates an increase in postural instability. Subjective rating of perceived sense of sway (PSOS) and exertion (PE) during task performance was recorded. The reach task significantly increased the SA, SL, AP, and ML excursions (by 4864%, 453%, 581%, and 1615%, respectively). The subject's PSOS and PE significantly increased when performing the reach task (by 18% and 6%, respectively). The PSOS was marginally significant ($p=0.06$) for the contaminant the ladder was placed on, with subjects perceiving less sway on dusty surfaces than dry, but more sway on wet surfaces than dry. Poor lighting conditions significantly increased the SL (by 7%) and AP excursion (by 8%). Results from this study indicate that performing job tasks while reaching from a ladder may result in postural instability, especially when working on slippery surfaces and/or in low light conditions.

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