CS-110-01
Sit/Stand Workstation Guidelines to Avoid Health Consequences Associated with Prolonged Occupational Sitting or Standing

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Situation/Problem: Researchers suggest the increasing rate of obesity in America is associated with our sedentary lifestyles. Individuals sit, on average, for 14 hours and 39 minutes per day, mostly at work. When not sitting, individuals are also considered physically inactive, as 60% of individuals perform fewer than 2.5 hours of physical activity per week. So, what can industrial hygienists do to address this problem?

Resolution: Researchers recommended performing physical activity while at work to help address the growing obesity problem. This includes using standing office/computer workstations to increase energy expenditure requirements and to promote weight loss. However, it is important to understand the health consequences of prolonged standing prior to proceeding with these recommendations.

Results: The health consequences associated with prolonged sitting are well documented (e.g., higher rates of cardiovascular disease, obesity, body mass index, metabolic syndromes, Type 2 diabetes, deep venous thrombosis, and low-back disorders). Unknown to many, prolonged standing is associated with similar health consequences (e.g., varicose veins, joint damage, foot problems, stroke, heart and circulatory problems, pregnancy difficulties, and work-related musculoskeletal disorders in the legs, knees, and lower back due to long periods of low level tension, ischemia, and muscle tissue that acidifies). Research shows that both prolonged sitting and standing are a concern. A more responsible approach is to recommend a combination of sitting and standing activities throughout the work day, and design for regular movement, to minimize the adverse health consequences.

Lessons Learned: Guidelines for sit/stand workstations include the following:

1. Limit prolonged sitting to ≤ 4 hours per day.
2. Limit continuous (static) standing to ≤ 1 hour per day.
3. Limit cumulative standing to ≤ 4 hours per day.
4. Promote variation between sitting and standing positions throughout the day.
5. Design the workstation for active movement while sitting and standing.

SR-110-02
Whole Body Vibration Exposures among Professional Bus Drivers: A Comparison of Low Floor Bus Designs

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Objective: The goal of this study was to compare whole-body vibration (WBV) exposures among professional drivers between two low floor bus (LFB) designs commonly used in public transit. Research has indicated there is a relationship between working as a transit operator and the development of low back pain.

Methods: Using a repeated measures design and a standardized test route, whole body vibration exposures were compared when sixteen experienced professional bus drivers drove two buses 1) 40' LFB, and 2) 60' articulating LFB. The test route included a segment of driving on city streets, a section of new freeway, a section of old freeway, and a section of roadway that included ten uniform speed humps in King County, Washington, USA. The route was designed with input from the transit agency to simulate a typical day of exposures faced by professional transit operators. A tri-axial seat pad accelerometer was mounted on the driver's seat and a second tri-axial accelerometer was securely mounted on the floor of the bus directly adjacent to the seat. A WBV data acquisition system was used to collect time weighted average (A_w, VDV) and raw (S_{ed}) WBV measurements at the seat and floor.

Results: When comparing LFB designs there were parameter dependant differences in WBV exposures with the 60' articulating LFB resulting in higher WBV exposures relative to the 40' LFB. Additionally, there were

differences in WBV exposures by road segment between bus designs.
Conclusions: When purchasing buses for transit operations it is essential that employers consider the associated WBV exposure differences between bus designs in order to reduce
injury cases. The results of this study indicated that 60' articulating low floor buses produce significantly higher WBV exposures than 40' low floor buses.

SR-110-03
Ergonomic Evaluation of Manually Carried Stair Descent Devices used for the Evacuation of High Rise Buildings

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Objective: The research investigated the physical demands on firefighting personnel when using different types of manually carried stair descent devices designed for the emergency evacuation of high rise buildings as a function of staircase width and evacuation urgency.
Methods: Twelve professional firefighters participated in a study in which three types of evacuation chairs were evaluated under urgent and non-urgent evacuation instructions. The chairs were evaluated under 3 staircase width conditions (36, 44, and 52 inches) which correspond to widths dictated by building codes based on building occupancy. For comparison, an "urgent" manual carry was also performed on the 44 inch wide stairs. Biomechanical demands were assessed via surface electromyographic (EMG) data collected from back, shoulder, and arm muscles. Physiologic demands were assessed via heart rates and Borg Scale ratings. Usability was assessed via interviews.
Results: Analyses of variance indicated that the stair chair with extended front handles, which allow the front person to descend the stairs facing forward, yielded significantly lower time integrated back muscle use and shorter evacuation durations. The narrower stair chair and the fabric seat were not statistically different from the manual carry on the same back muscle measures. As for the arm muscles, the basic stair chair led to the highest Bicep time integrated recruitment levels. Usability data also strongly support the use of the stair chair with the extended front handles. There were no differential biomechanical responses across the sampled evacuation methods across the three staircase widths, however, 6 of the 8 muscles sampled showed significantly increased activation under urgent vs. non urgent conditions.
Conclusions: The time integrated muscle activation data strongly suggests the advantage of using an extended handle stairchair where the front person can descend the stairs facing forward, irrespective of staircase width or the degree of urgency in the evacuation situation.

CS-110-04
A Case Study with the Revised AIHA Ergonomic Toolkit

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Situation/Problem: The AIHA Ergonomics Tool Kit provides a suite of ergonomic assessment tools and information on ergonomic analysis for the general public. Research by novices (several individual students) presented at AIHce 2011 resulted in significant revisions to the toolkit including: A tool selection guide to help novice users determine which tools are most appropriate based on the task characteristics and results interpretation guides for each tool. In this research, 11 teams, consisting of 3 students each (total of 33 students) from an introductory ergonomics graduate class, evaluated the same set of prerecorded (videotaped) tasks used by individual students in the 2011 studies. Their findings have been compared with the results of the previous (2011) studies as well as with the efforts of an experienced ergonomist.
Resolution: The small (3 person) groups of novice users selected the ergonomic assessment tools, which they believed to be most appropriate, from the newly revised Toolkit and analyzed each job using those tools.
Results: The findings of the 11 teams are compared with one another as well as with the

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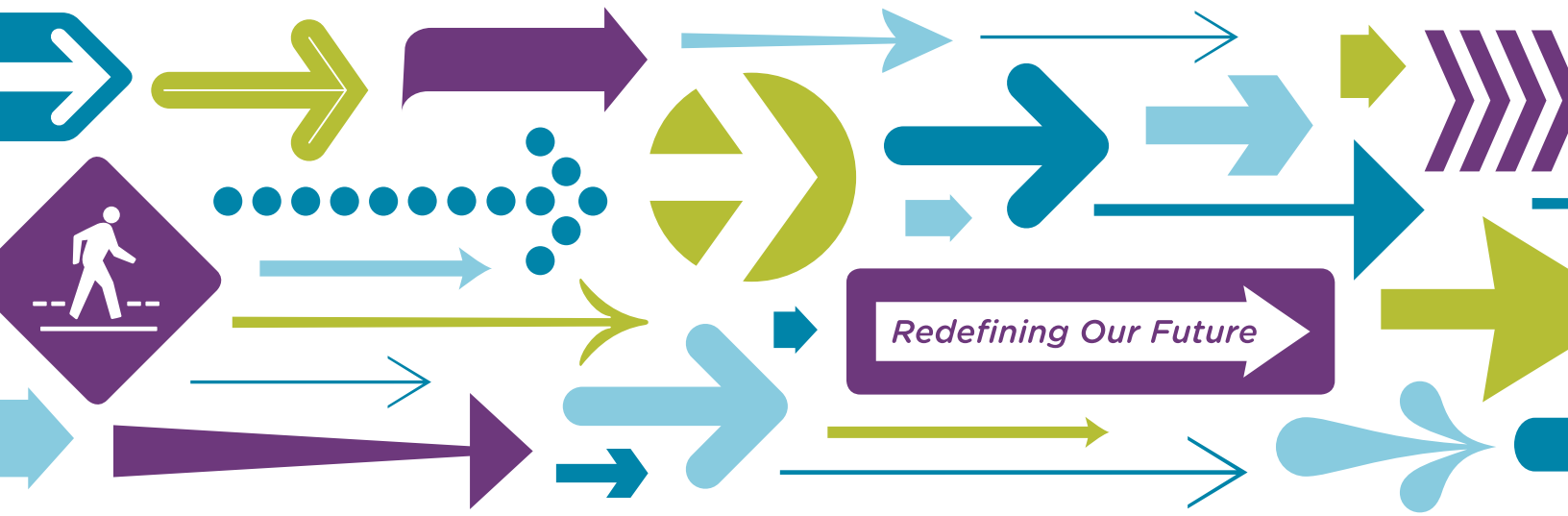

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