

## An Engineering Solution to Stud Welding Hazards

### **Comparison of biomechanical loading during use of conventional stud welding equipment and an alternate system**

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#### **Overview**

Musculoskeletal disorders, especially low back pain, are common among construction workers. Ironworkers who install floor-level studs are among them: their work requires that they remain bent over at the waist for long periods during welding. Using electromyography to measure workers' muscle activity, researchers evaluated an alternative welding system designed to reduce the time workers spent in stooped work postures. The alternative system, consisting of a wheeled cart with an articulating arm, appears to be effective in reducing exposure to extreme trunk flexion among stud welders. However, the system tested increased demands on the shoulder (trapezius) muscles, and rigorous examination of the system's effect on productivity is needed.

#### **Key Findings**

- The alternative system, a cart with an articulated arm supporting the heavy welding gun, allows workers to spend more time upright and less time bent over at the waist, exposed to extreme trunk flexion. Workers using the alternative system spent less than 5% of work time bent at angles greater than 60°, while workers using the conventional approach spent 40% of their time in such extreme trunk postures. The workers' mean trunk inclination angle was less than 10° using the alternative system, but 34.4° using the conventional approach.
- Workers welding floor studs using conventional methods used the welding gun itself to support their body weight, and demonstrated little shoulder muscle activity. With the alternate system, the operator relied heavily on the upper trapezius muscles to manipulate the articulating arm.
- Researchers recommend further development and study of the alternate system. Design enhancements should focus on minimizing the force required to operate the articulating arm and increasing production capability in order to encourage adoption by the trade.

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#### **See abstract:**

<http://www.sciencedirect.com/science/article/pii/S0003687010001948>

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