

Pneumatic Tables Improve Ergonomics in Model Ship Building

Ergonomics is the science of fitting the tools to the worker, instead of requiring the worker to adapt to the tool. When tasks and workstations are not designed for ergonomic comfort, workers are at risk for disabilities. For example, working for long periods of time in awkward positions results in overworking the muscles that are used to accomplish the task, causing those muscles to tire quickly. A person who regularly works at a task in an awkward position may eventually experience a musculoskeletal disorder (MSD) in the overworked muscle group and in the tendons and ligaments that support those muscles. MSDs are one of several terms for discomfort and disability brought about by overuse and misuse of a group of muscles and the soft tissue that supports that muscle group.

The majority of occupational MSDs affect the upper body, especially the hands, arms, shoulders, and neck, but MSDs can also affect the back, legs, or knees. Working on a surface that is too high can cause a worker to lift and hold the shoulders, elbows and arms in an awkward position that forces shoulder muscles to work extra hard to lift and hold the arms. Shoulder muscles tire quickly in such a position, especially when that position must be repeated over and over, or held for more than a few seconds.

When working at a surface that is too low, personnel may have to hunch over the work surface. Extensive leaning forward fatigues the muscles of the back and neck. The muscles of the arms and shoulders may also be overburdened by working in this awkward posture. Where working surfaces are very far below the worker's normal range, the worker may have to squat or kneel to perform the task. Squatting and kneeling puts a lot of pressure on the knees while they work hard to hold the position and balance the weight of the body, creating a risk factor for discomfort and injury.

Ship model builders at the Navy Public Works Center (PWC) in San Diego carry out high precision work on models of Navy ships built to scale. The models are used to test, prove, and refine ship specifications prior to ship construction. The working surfaces for model construction at PWC San Diego, Naval Submarine Base Point Loma were often too high or too low for the worker and the particular work process. This forced model builders to assume awkward positions while working on ship models. In addition, model builders were using weakly structured wheeled carts as



Model makers used unstable carts that were either too low or too high for workstation comfort

model building tables. The wheel locking devices on these carts did not work. This required the worker to use a foot or knee to keep the cart stable and in one place. Model builders who worked on these surfaces were at risk for MSDs of the shoulders, lower back, and knees from maintaining awkward postures for prolonged periods.

The MSD risk factors were discovered during ergonomic discomfort surveys conducted by Safety Coordinators at the Naval Submarine Base Point Loma. The Safety Coordinators and a member of the Employee Driven Cultural Safety Forum reviewed the findings, discussed the issue with the employees at the workshop, and gathered data on recommendations to eliminate the problem. The Safety Coordinators submitted their recommendations to the Ergonomic Program Coordinator who reviewed the recommendations and subsequently authorized the purchase of pneumatic tables to replace the wheeled carts. The overall timeframe from discovery of the problem to its resolution was approximately two months.

Self-leveling heavy-duty pneumatic tables (pictured below left) have been installed in the model workshops at the Naval Submarine Base Point Loma. These adjustable work



surfaces can be automatically raised or lowered to a comfortable height for the individual model builder. Workers no longer need to hunch, twist, bend, squat, or kneel for extended periods while working on a model ship. The new workstations have rotating tops that allow easy access to any part or side of the ship model without requiring the model builder to move. Using pneumatic tables has significantly decreased the frequency and duration that workers must assume awkward postures and the fatigue

associated with such postures. This has reduced the risk of MSDs.

The new pneumatic tables have bellows guards that protect workers from pinching their fingers or wrists and reduce maintenance requirements to periodically scheduled lubrication of the rotating table mechanical gears. Wheels located under the tables allow easy repositioning or relocation of the tables. Table wheels have a locking feature that keeps the pneumatic table from moving or rolling around once the work area is established. A follow up survey has been scheduled to obtain and evaluate data on mishap reduction, cost savings, and other benefits of the new tables.



Pneumatic tables can be repositioned

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