

Machine and Welding Shops

Naval Facilities Engineering Command Ergonomic Risk Assessment

Introduction

An ergonomic risk assessment was conducted for the machine and welding shops in May of 2002. This assessment is based upon interviews with supervisor, safety officer, and employees as well as an evaluation by the Naval Facilities Engineering Command (NAVFACENGCOM) Hazard Abatement Ergonomist. The Job Requirements Physical Demands Survey (JR/PD), an ergonomic survey, was also administered to the employees. The results of the JR/PD indicate that this is an Ergonomic Problem Area (EPRA) with an overall priority score of 7, on a scale of 1-9 where 9 is the maximum value. The JR/PD assesses five distinct body regions the head/eyes, back/torso, feet/legs and hand/arm/wrist. The back/torso region was found to contain significant ergonomic risk. Ergonomic risk is based upon ergonomic stressors associated with the task and employee discomfort. Appendix I contains a summary of the JR/PD results as well as a description of the methodology.

The machine and welding shop was observed in order to determine sources of ergonomics stress and make recommendations to reduce the risk of work-related musculoskeletal disorders (WMSDs) and improve safety, health and productivity. Musculoskeletal Disorders (MSDs) are injuries and illnesses that affect muscles, nerves, tendons, ligaments, joints, spinal discs, skin, subcutaneous tissues, blood vessels, and bones. Work-Related Musculoskeletal Disorders (WMSDs) are:

- Musculoskeletal disorders to which the work environment and the performance of work contribute significantly or
- Musculoskeletal disorders that are aggravated or prolonged by work conditions.

Recommendations to the command to further reduce the probability of injury include new equipmentⁱ and administrative controlsⁱⁱ. Recommendations are included with as much vendor informationⁱⁱⁱ as possible to assist in the evaluation of products and services. Input gathered from the workers, safety specialists, and other personnel to evaluate equipment before purchasing is recommended. This process will increase product acceptance, test product usability and durability, and take advantage of employee experience.

The command may request additional funds from the Chief of Naval Operations (CNO) Hazard Abatement (HA) Program to abate the risk of injury. Naval Facilities Engineering Command (NAVFACENGCOM) manages the CNO Hazard Abatement Program, which is a centrally

managed fund to correct safety and health deficiencies beyond the funding capabilities of the activity. Information about the HA program can be found on the Naval Facilities Engineering Command web site www.navfac.navy.mil/safety and in OPNAVINST 5100.23F. Ch 12 Hazard Abatement.

MACHINE AND WELDING SHOP

Purpose of the Operation

Perform maintenance duties at the activity that require machining and welding metal parts.

Population

9 Civilians - two welders and seven machinists

Injury Data

There are no recorded injuries, but according to the JR/PD results 3 employees reported having been to a health care provider in the last 12 months for pain or discomfort that he thinks is related to his job.

Description of the Operation

The welding and machine shops are connected and employees often assist with tasks in both shops. Raw materials and items for repair arrive at the shops by truck and forklift and are unloaded at the dock. There is not enough room in the workshop for a forklift to maneuver so the materials are unloaded by hand and carried to the work or storage areas, as shown in figures 1 and 2. Employees stated that the most difficult part of the task is unloading incoming materials. Steel stock can weigh from 200 to 1000 lbs. in the form of sheets or "I" beams.

Employees are also responsible for moving parts being fabricated and repaired, as shown in figure 3. Employees often hold sheets of metal during machining, as shown in figure 4 where an employee is loading a break press.



Figure 1: Unloading truck



Figure 2: Unloading truck



Figure 3: Moving parts during processing (Photo from US Naval Observatory)



Ergonomic Issue Description

Heavy Lifting: The major ergonomic risk factor associated with welding and machine shop tasks is heavy lifting. Employees routinely carry heavy parts into the workshops and between operations. Repeated heavy lifting and carrying places stress on the back and can lead to Work-Related Musculoskeletal Disorders. Heavy lifting may have caused or contributed to the high JR/PD score for the back/torso region.

Awkward Postures (Sustained and Repetitive) : Employees also use sustained and often awkward back postures while supporting the weight of the materials during machine loading, as shown in figure 4. The weight of the metal contributes to the strain placed upon the back. Sustained awkward postures restrict blood flow and can cause muscle fatigue as well as place the employee at risk of developing Work-Related Musculoskeletal Disorders.

Employees using welding masks have a tendency to flip them down with a quick neck motion rather than using a hand motion. This motion when

performed repetitively and combined with the weight of the mask can place strain on the neck.

Recommendations

- An outdoor free standing jib crane is recommended for loading and unloading the incoming materials. An estimate of \$5725 has been submitted.
- The current welding table can be outfitted with locking casters to facilitate transportation of work during fabrication and repair. This upgrade can be performed in house.
- Height Adjustable mobile lift tables are recommended for transporting materials into the workshop in order to reduce heavy lifting and carrying. Mobile lift tables can also be used to support metal material while loading machines. A smaller table can be used for smaller sheets of metal or machines such as the punch press while the larger table can be used for the break and bending presses as well as incoming materials.



Height Adjustable Cart Recommendations*		
Vendor	Product	Price
Lab Safety 1-800-356-0783	Bishamon Mobile Scissor Lift Tables 330 lb. Capacity #18771	\$560
Grainger 757-855-3153	Manual Hydraulic Elevating Scissor Cart 400 lb. Capacity #3KR46	\$377.50
Global Equipment 1-800-645-1232	Scissor Lift Table 660 lb. Capacity #GK954850	\$367

C&H 1-800-558-9966	Mobile Scissor Lift Truck 330 lb. Capacity 71-525A	\$568
Peak Logix	Mobile Hydraulic Lift 2000 lb. capacity 10" to 58" lift range 36"x78" platform size	\$3470

*prices vary with platform size

- Auto-darkening helmets darken as soon as the welding torch is activated. The helmets eliminate the need for the worker to snap their helmet closed and promote neutral neck postures.

Lab safety	9A 32046	Helmet w/ quickshade 1.6X 3.75	\$308
	9A 32047	Helmet w/ quickshade 2.4 x 308	\$396

- Encourage workers to take stretching breaks during the day to relieve discomfort and encourage muscle movement². The following web sites include exercises that can be printed and posted. Sources should be cited when reproducing information. Web site links updated Jan 2002.

http://www.steelcase.com/servlet/ToolsInsightsServlet?ACTION=5&CONTENT_ID=202

www.shelterpub.com/fitness/office_fitness_clinic/OFC_online_stretches.html

<http://www.ucsc.edu/opers/wellness/pages/officestretches.html>

www.safety.duke.edu/Ergonomics/90_seconds.htm

*Some information has been removed from this report that is specific to the activity.

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¹ Equipment purchase without proper and repeated training will not mitigate risk and may in fact increase hazards.

ⁱⁱ Administrative controls are management-controlled work practices and policies designed to reduce exposures to work-related musculoskeletal disorders (WMSDs) hazards by changing the way work is assigned or scheduled. Administrative controls reduce the exposure to ergonomic stressors and thus reduce the cumulative dose to any one worker. Examples of administrative controls that are used in the ergonomics context are employee rotation, employer-authorized changes in the pace of work, and team lifting.

ⁱⁱⁱ This report does not constitute an endorsement of any particular product. Rather, it is a recitation of how Navy personnel have addressed a particular work place safety issue. Neither the Navy nor its employees and agents warrant any product described in this report for any use, either general or particular.