

## **Naval Facilities Engineering Command Ergonomic Risk Assessment**

### **Introduction**

This report summarizes the ergonomic risk assessment conducted July of 2003. The Mail Room and Shipping and Receiving Area were observed in order to determine sources of ergonomic stress and recommend improvements. This assessment is based upon interviews with supervisor, safety specialist, 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 in the Shipping and Receiving Area and the Mail Room. The results of the JR/PD indicate the Shipping and Receiving Area is not an ergonomic problem area. The Shipping and Receiving area scored a 4 on a scale of 1 to 9 where 9 is a maximum value. The tasks performed in the Shipping and Receiving area present ergonomic risk factors, as shown by the JR/PD results and noted by the ergonomist. At this time, the employees are not reporting any discomfort; therefore the recommendations presented in this report are intended to reduce ergonomic risk factors. Should the employees start to experience discomfort, greater efforts should be taken to address the ergonomic issues. The Mail Room scored a value of 5 which indicates an Ergonomic Problem Area. A value of 5 and higher is an Ergonomic Problem Area. The JR/PD results in both areas are limited by the small sample size of respondents.

The JR/PD assesses five distinct body regions: shoulder/neck, hand/wrist/arm, back/torso, leg/feet, and head/eye based upon identified ergonomic risk factors and employee reported discomfort. For the Shipping and Receiving Area the back/torso and leg/feet were found to have the greatest level of ergonomic risk. Ergonomic risk is based upon ergonomic stressors associated with the task and employee discomfort. The employees perceive this job as physically demanding. Organizational factors, which relate to morale and job satisfaction, indicate additional job stressors. A significant number of employees reported experiencing work-related pain or discomfort that does not go away outside of work. A significant number of employees also reported pre-existing MSDs as well as conditions recognized as contributing factors for MSDs, which places them at a higher risk of additional or more severe WMSDs. Appendix I contains a summary of the JR/PD results as well as a description of the methodology.

According to the JR/PD results, the Mail Room was identified as an Ergonomic Problem area. The leg/feet region was found to be the greatest source of ergonomic stress. Appendix II contains a summary of the JR/PD results as well as a description of the methodology.

The Shipping and Receiving Area and Mail Room were 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 equipment<sup>i</sup> and administrative controls<sup>ii</sup>. Recommendations are included with as much vendor information<sup>iii</sup> 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](http://www.navfac.navy.mil/safety) and in OPNAVINST 5100.23F, Ch 12 Hazard Abatement. The deadline for submission is the end of February.

## Shipping and Receiving

Purpose of the Operation: Responsible for packing and crating non-hazardous material shipped from the activity to worldwide destinations.

Population: Up to 10 civilian warehouse personnel, 3 specifically assigned to this task

Injury Data: No recorded injuries

### Description of the Operation:

Employees receive and temporarily stage materials for shipment. Employees are responsible for processing shipments and construction of containers as necessary. If an appropriate container is not available the employee will construct one from wood and/or metal.

### Ergonomic issue description:

**Heavy and Repetitive Lifting combined:** The boxes on the conveyor system weigh up to 20 lbs. Workers repeatedly reach for and pull the boxes to their work area. Repetitive lifting combined with awkward postures can place the worker at risk of back strain or injury. Workers also process heavier items weighing up to 70 lbs which is considered heavy lifting. According to the National Institute of Occupational Safety and Health Revised Lifting Equation, nearly all healthy workers can lift up to 51 lbs. in ideal lifting conditions over a substantial period of time without increased risk of lower back injury. The employees regularly perform lifting tasks greater than 51 lbs. in less than ideal conditions while removing items from pallet racking, figure 1. Employees also carry items for packaging and items to be weighed. Reaching above shoulder height and carrying heavy items increases the ergonomic stressors and thus the risk of back injury for the workers.



Figure 1: Lifting carton from pallet racking

**Awkward Postures:** The new packing conveyors were designed for incoming items to be placed on the middle roller conveyor. The employees stand on either side of the conveyor system and reach forward to pull the incoming items from the middle conveyor on to the conveyor closest to them, refer to figure 2. The employees have to reach at least 28" to pull the incoming boxes down, as shown in figure 3. Extended reaches can cause stress on the upper extremities and place a worker at risk of developing WMSDs. Extended reaching above shoulder height combined with heavy lifting, such as to retrieve items from the pallet rack increases the risk of developing an injury.

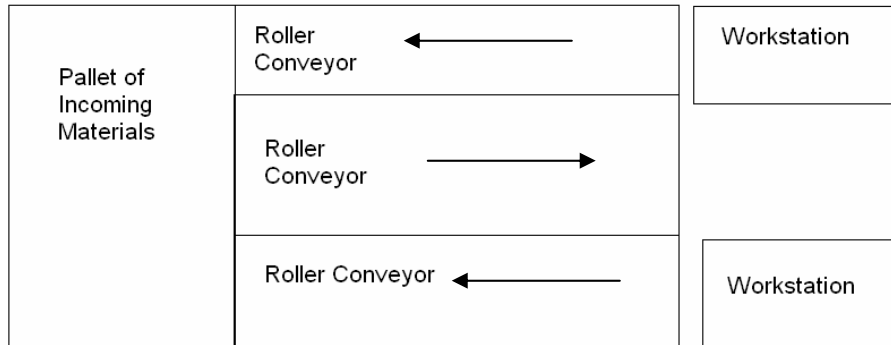


Figure 2: Workstation setup



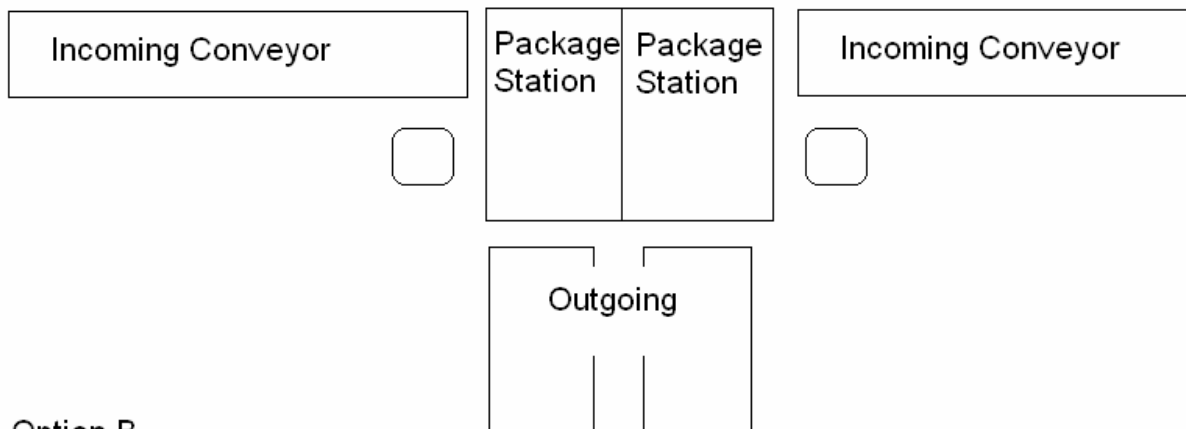
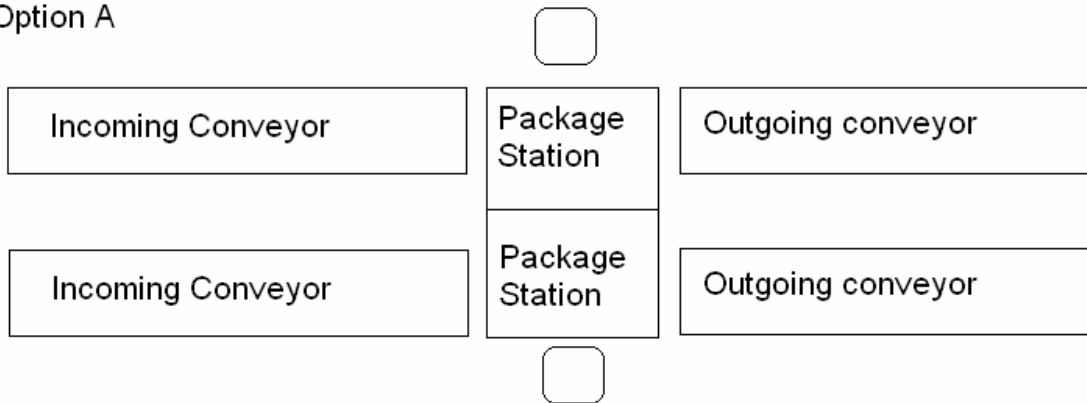
Figure 3: Reaching to incoming conveyor

### Recommendations

- Redesign the workstation design so the tasks are performed inline to reduce material handling. There are a number of feasible layout designs, two examples of possible layouts are shown below. Facilities engineering should be involved in the layout redesign. The incoming conveyor should lead to a packaging workstation which should then lead to an outgoing conveyor. The employee should be able to access both incoming and outgoing packages on the conveyor easily with minimal movement, reaching or twisting of the torso. With the

installation of an additional conveyor, two separate package processing systems could be set up. The conveyors can be retrofitted with adjustable height legs to allow the conveyor to be set to the working height of the employee in order to encourage neutral working postures. The packaging workstation should contain all necessary equipment, including a scale to avoid unnecessary material handling. Adding a scale may require an additional power supply. Refer to Table 1 for pricing of workstation equipment.

Option A



Option B

- Obtain material handling equipment to reduce manual lifting of items from the pallet racks such as an order picker or person lift. The pallet shelves will have to be relocated to allow for access with material handling equipment. Refer to table 2 for additional vendor information.
- The employees should be trained in proper lifting techniques as well as the importance of storing the heaviest and most frequently used items in the power zone, between the shoulders and the knees, or on shelves that require material handling equipment to access.



Table 1: Workstation Equipment				
Description	Vendor	Product	Estimated Cost	Figure
Workstation Equipment	Ernie Taylor at Peaklogix 703-819-6061	2 Dehnco full function packaging stations with adjustable height legs	\$12111	
		4 gravity flow conveyor lines with adjustable height conveyor legs for gravity fed conveyor 10 Ergomat Smooth ESD Anti-fatigue matting	\$4480	

Table 2: Material Handling Equipment				
Description	Vendor	Product	Estimated Cost	Figure
Material Handling Equipment	Lab Safety 1-800-356-0783	Order Picker Item #35623  Platform Ht. 10'6"	\$4289.00	

	<p>Ballymore (610] 696- 3250</p>	<p>Orderpicker  Model OP-11 Capacity 300 lbs. Platform Ht. 10'6"</p>	<p>\$3354</p>	
	<p>Grainger</p>	<p>Aerial Work Personnel Lift,  ELI Series Capacity 350 lbs Work Height 21' Platform Height 15'</p>	<p>\$4650</p>	
	<p>Cotterman 1-800-552- 3337</p>	<p>Pusharound Lift  Platform Ht- 25' Capacity- 300lbs.</p>	<p>\$4471.6</p>	
	<p>Cotterman 1-800-552- 3337</p>	<p>Outriggerless Pusharound Lift  Platform Ht. 17' Capacity 400lbs.</p>	<p>\$3738</p>	

## Mail Room

Purpose of the Operation: Processing mail

Population: 2 employees, 1 civilian and 1 active duty

Injury Data: No recorded injuries

### Description of the Operation:

Incoming mail arrives by truck where it is sorted for pick-up. The mail room receives about 4900 pieces of flat mail, 4300 letters and 70 packages each week. Each command picks up its mail after it has been sorted. The mail room processes about 200 pieces of outgoing mail each week. Employees spend up to 2 hours a day processing mail. The employees complained of leg and back pain from standing for long periods.

### Ergonomic issue description:

**Heavy and Repetitive Lifting:** Heavy awkward lifting can strain the back and place the worker at risk of injury. Incoming mail arrives at the dock by truck in hampers which can weigh up to 500 lbs. The truck height is not equal to the dock height so the employees have to pull the heavy hampers up onto the building dock across a 6" gap. This action was not photographed but a similar photo is shown in figure 4 with parcel delivery. Pulling a 500 lb. hamper onto the dock is extremely hazardous and places the workers at risk of injury.

Emptying parcels from the hampers also creates a hazard as workers bend over into the hamper to retrieve items, as demonstrated in figure 5. Employees currently move heavy packages to one side of the hamper and force the hamper to tilt which requires a high force exertion and places the worker at risk of injury if the cart moves. Lifting in an awkward posture increases the stress on the spine and can lead to increased risk of injury. Employees also repeatedly lift heavy mail bins during the sort process and when the command representative comes to the customer window to pick up their mail.





Figure 4: Delivering parcels

Figure 5: Emptying hampers

Norfolk Dental Clinic

**Repetitive Motions and Awkward Postures:** Sorting mail requires the worker to stand for long periods performing repetitive hand/arm/wrist motions combined with extended reaches and bending of the torso. Mail is sorted into mail sorters which have compartments for different commands. The top row of slots for the various mail sorters is 70 to 79" above the floor which is well above shoulder height for the worker shown in figure 6. Repeated extended reaches, particularly above shoulder height, can place stress on the upper extremities and place a worker at risk of developing WMSDs. Employees sort from mail bins and when the mail is completely sorted, they return batched mail to the mail bins for pick-up. Mail bins are left on the floor which causes the worker to continually bend to floor level to retrieve mail. Lifting from floor height increases the load to the spine and the chance of injury.



Figure 6: Sorting mail



Figure 7: Lifting mail bin of sorted mail

Employees also work at two computer workstations for up to an hour each day. One computer is linked to Federal Express and one to the internet for other mail carriers. The employee shown in figure 8 wears bifocals and has to extend her neck in order to view the computer monitors. The work surface is not height adjustable and the worker has to reach above elbow height to access the keyboard and mouse. The printer is located above the computers and requires an extended reach above shoulder height to reach.



Figure 8: Computer Workstation

#### Recommendations:

- A loading dock scissor lift would allow the height of the dock to be adjusted to the height of the delivery van in order to reduce heavy lifting. Refer to table 3.
- A mobile tote stand would allow the employees to place the mail bin next to the mail sorters and eliminate the need to bend to the floor to pick up mail. The tote stand could then be wheeled to the customer window to further reduce bending and lifting. Refer to table 4.
- A mobile tote cart could replace the larger bulk sorters shown in figure 6. Sorting the mail directly into mail bins would eliminate the need to transfer mail from the sorter to the bins. Refer to table 5.
- A hamper dumper would allow the workers to tilt the hampers in order to reach the items at the bottom with less bending of the back. Refer to table 6.

- Anti-fatigue matting at all sorting workstations would alleviate some of the worker’s pain and discomfort throughout the day. Anti-fatigue matting pricing depends on type and quantity. It is recommended that samples be obtained for employees to test before purchasing. A smooth mat with a beveled edge is recommended if equipment with castors is to travel across it. Anti-fatigue vendors include:  
 Vendors: Global Industrial 1-800-645-1232  
 Lab Safety 1-800-356-0783  
 C&H 1-800-336-1331  
 Matting World 1-800-257-8557  
 Alimed 1-800-225-2610 (Anti-Fatigue Matting and Shoe Inserts)
- Height adjustable computer workstations would allow the workers to utilize the computers in a more neutral position. Information regarding office ergonomics can be found at <http://www.navfac.navy.mil/safety/> under Ergonomics – Tools as well as Training and Awareness.
- Encourage workers to take stretching breaks during the day to relieve discomfort and encourage muscle movement. A physical therapist can instruct the workers in stretching exercises appropriate for their job or refer to the following websites. The following web sites include exercises that can be printed and posted. Sources should be cited when reproducing information. Web site links updated Dec 2002.

[http://www.steelcase.com/servlet/ToolsInsightsServlet?ACTION=5&CONTENT\\_ID=202](http://www.steelcase.com/servlet/ToolsInsightsServlet?ACTION=5&CONTENT_ID=202)

[www.shelterpub.com/ fitness/ office fitness clinic/OFC online stretches.html](http://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/90seconds.asp](http://www.safety.duke.edu/Ergonomics/90seconds.asp)

Table 3: Loading Dock Scissor Lift				
Description	Vendor	Product	Estimated Cost	Figure
Loading Dock Scissor Lift	Peaklogix 703-819-6061	Loading dock scissor Lift Smooth deck with textured surface Recess lift into concrete 6”-8” concrete slab provided	\$14960	

Table 4: Mobile Tote Stand				
Description	Vendor	Product	Estimated Cost	Figure







Mobile Stand	Tote	C&H 1-800-558-9966	Eurokraft Parts Stand Adjustable	\$212	
		Lab Safety 1-800-356-0783	Adjustable Tilting Work Stand	\$190	
		Grainger	Tilting work stand	\$208.5	

Table 5: Mobile Tote Sorters					
Description	Vendor	Product	Estimated Cost	Figure	
Mobile Sorters	Tote	Postal Products Unlimited 1-800-229-4500 X1071	Tote Cart	\$487.50*	
		Postal Products Unlimited 1-800-229-4500 X1071	Mobile Sort Rack	\$320.00*	
		Postal Products Unlimited 1-800-229-4500 X1071	Distribution Racks	\$549.98*	

Prices depend on quantity

Table 6: Hamper Dumper				
Description	Vendor	Product	Estimated Cost	Figure
Hamper Dumper	C&H 1-800-558-9966	Hydraulic Akro-Lift	\$3557	
	Lab Safety 1-800-356-0783	Hydraulic Akro-Lift	\$3795	
	Grainger	Easy mobile tilter	\$2764	

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

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<sup>i</sup> Equipment purchase without proper and repeated training will not mitigate risk and may in fact increase hazards.

<sup>ii</sup> 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.

<sup>iii</sup> 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.