

## Naval Facilities Engineering Command Ergonomic Risk Assessment for Drug Screening Laboratory Accessioning

### INTRODUCTION

This report summarizes the ergonomic risk assessment conducted at a Drug Screening Laboratory, on 15 November 2001. The Accessioning Department was observed in order to determine sources of ergonomic stress and recommend improvements. This assessment is based upon interviews with workers supervisors, industrial hygienists and safety personnel and on an evaluation by the Naval Facilities Engineering Command Ergonomist.

The risk assessment was conducted in conjunction with the Job Requirements and Physical Demands Survey (JR/PD) distributed to the Accessioning and Screening departments. The JR/PD is an ergonomic survey designed to assess ergonomic risk in the workplace. Appendix A and B contain summaries of the JR/PD results for each department as well as a description of the methodology.

The JR/PD Overall Job Priority score is determined by selection the human body region with the highest risk value based upon ergonomic risk factors and worker discomfort. An Overall Job Priority score of five or greater, on a scale of one to nine, establishes a task/job as an Ergonomic Problem Area (ERPA). The JR/PD assesses risk in five distinct body regions: Head/Eyes; Shoulder/Neck; Back/Torso, Hand/Wrist/Arm, and Leg/Foot.

The results of the JR/PD indication the Screening Department, with an Overall Job Priority score of two is not an ergonomic problem area. Therefore, the Screening Department is not address in this risk assessment report. For additional information, refer to appendix II.

The results of the JR/PD indicate the Accessioning Department, with an Overall Job Priority score of nine, is an ergonomic problem area. Therefore, this report concentrates on the Accessioning Department.

The Accessioning Department's operation introduces the risk of work-related musculoskeletal disorders (WMSDs), with discomfort particularly in the Shoulder/Neck, Back/Torso, and Hand/Wrist/Arm body regions.

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 reduce the probability of injury include considering equipment purchase<sup>1</sup>, process redesign, and implementation of administrative controls<sup>2</sup>. Providing equipment such as improved batch trays and

seating, and a new urine transferring method should alleviate some of the ergonomic stressors associated with this job.

Representative vendor information is included in the recommendations to assist in the evaluation of products and services<sup>3</sup>. Recommendations to the command include gathering input from affected workers, safety specialists, and other personnel to evaluate equipment before purchasing. This process will increase product acceptance, test product usability, and durability, and takes 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 5100.25E. Ch 12 Hazard Abatement.



Photo 1: Receiving area storage with various size boxes



Photo 2: Processing specimens and paperwork

## ACCESSIONING DEPARTMENT

Purpose of the Operation: Catalogue and prepare urine samples for drug screening

Population: Nine civilians working 40 hours per week

Injury Data: None available. For additional information refer to JR/PD Recovery Time and Activity Interruption results in appendix I

Description of the Operation: Urine samples are sent to the laboratory by mail. Boxes of samples may be directly delivered to the Accessioning Department, or workers may pick up deliveries at the hospital post office. Boxes vary in size and weight, containing between twelve and thirty-six samples. Photo 1 shows the receiving area storage with various sized boxes.

One worker processes between 300 and 400 samples a day, one box at a time. Workers retrieve the boxes from the staging area and begin the processing at individual workstations. The worker opens the box and inner plastic wrapping with a box cutter and then removes the urine sample bottles and chain of custody paper work, as shown in Photo 2. Some shipments require further cutting because of individually wrapped sample bottles.

After unpacking the samples, workers label both the chain of custody paperwork and the sample bottles with bar-coded stickers to ensure accurate tracking. Photo 3 shows



Photo 3: Labeling samples in batch trays

the labeling of samples. Some employees use a pinch grip to pull the label off while others use a pen as a tool. Checking the chain of custody form and labeling the sample bottles requires repetitive neck and hand motions.

The workers transfer the labeled sample bottles into large trays measuring 21" x 15" x 3.5" for batching as shown in photos 3 and 5. The batch trays hold 50 bottles and weigh approximately 20 pounds.

After filling the batching trays, the workers prepare the samples for screening. First, they breach the seal on the sample by unscrewing the top. Then they hand transfer a portion of the urine from the sample bottles into test tubes, as seen in photo 4. Next, the workers affix to the test tube a third label matching the chain of custody form and sample bottle and place the test tube into a holding tray. Workers



Photo 4: Transferring urine from specimen bottle to test tube

may unscrew as many as 400 samples bottles a day, a task that introduces stress in the hand/wrist/arm area. Workers experience additional stress in pouring urine from a large bottle into a small test tube, a difficult, tedious task, made more so by the need to avoid or minimize spillage.

After pouring the urine into test tubes, the worker places the full batching tray into a cart for storage until the screening process is complete. If a screening finds positive results, the workers are required to locate the original sample bottle from the holding cart.



Photo 5: Full batch tray

Workers process samples at individual workstations consisting of a large flat table, task lighting, overhead storage, a protective screen for pouring, and a chair as show in photo 2. The oversized chair or lab stool contributes to awkward torso postures by preventing the employees from resting against the back support. When pouring urine samples, the employees' hands and arms remain unsupported further contributing to awkward body postures of the shoulder and neck.

After completion of the screening process, the worker pushes a heavy cart of batch trays to the disposal station, as seen in photo 6. The worker lifts the batching trays (weighing approximately 20 pounds each) to fill the hopper of the Vyleater machine, which disposes of both urine and sample bottle. The worker then pushes the hopper door (full of spent samples) overhead to secure it closed shown in photo 7. This operation introduces body stress, especially to the back and shoulders. The worker is responsible for washing the batching trays and removing the waste. The disposal task often results in an unpleasant backup of spent urine samples.

The command instituted administrative controls to allow the employees time to rest from fatiguing postures. A bell signals 5-minute rest periods at the top of every hour. The commander personally encourages stretching and rest breaks and conducts training. The commander also distributes reminder postures for stretching. Overall, the commander is a proponent of ergonomic awareness and preventive measures.



Photo 6: Batch tray storage carts left. Vyleater hopper door open - right

Ergonomic Issue Description: The major ergonomic risk factors for the Accessioning Department are repetitive hand and arm motions performed in awkward postures.

*Repetitive Motions & Awkward Postures:* Nearly all tasks executed by the Accessioning Department workers are repetitive in nature due to the sheer high volume of samples (nearly 400 a day) and similarity between the tasks. Workers perform thousands of repetitive motions each day from un-packaging samples, to applying labels, transferring urine into test tubes and moving bath trays into storage. In addition, the workers perform a majority of the tasks in awkward or unsupported postures. Motions repeated with little variation may cause fatigue and overuse of the muscles, tendons, and joints that are involved. Overuse leads to muscle strain, inflammation of joints and tendons, and increased pressure on nerves, which eventually leads to pain, discomfort, and WMSDs.



Photo 7: Securing hopper door overhead

Performing repetitive motions in awkward postures (e.g., arms unsupported, not resting against the back support) adds significantly to the muscular effort required to perform each motion. The added force hastens the onset of fatigue and increases the likelihood of injury from overuse. The joints are most susceptible to repetitive motion injuries, especially the wrists, fingers, shoulders, and elbows. The combination of these risk factors and the similarity of all tasks carried out by the accessioning department may contribute to the back/torso, shoulder/neck and hand/wrist/arm discomfort, found in the JR/PD results.

Recommendations:*Work-rest breaks*

- Enforce structured rest breaks. Some employees work through the rest breaks to process more samples due to understaffing.

*Batching and Batching Trays*

- New batch trays designed for 24 bottles of urine would provide lighter and easier handling. A smaller tray would decrease reaching while pulling samples and shorten the cycle time of filling a batch tray. With only 24 bottles, the weight would be reduced. The new trays could be obtained from the current manufacturer or created by cutting the current trays.
- Workers should be encouraged to rest muscles groups or use different muscles between each batch. For example, workers could alternate between sitting and standing.
- A slight angling on the platform that holds the batch trays would reduce reaching when accessing the farthest samples. An adjustable incline that does not cause the samples to fall could be made in-house. Alternatively, an office document holder could be used.

Table 1: Representative Products for *Batching and Batching Tray*

Description	Vendor	Product	Estimated Cost	Figure
Document Holder	See Read / Write stands below.			

*Sample Bottles and Transferring Urine*

- Natural posture box cutters are recommended for opening packages.
- The screw top on the urine sample bottle exposes the workers to a repetitive wringing motion. A specimen bottle with a flip top would alleviate this problem.
- Pouring urine samples from the bottles into the test tubes is time consuming and creates spillage. One alternative is a lip in the specimen container to facilitate pouring.
- Some testing sites wrap the sample bottles individually, thereby creating more labor for the accessioning department employees. Suggest working with the testing sites to establish uniform shipping processes that minimize worker labor and exposure.
- In the absence of differently designed bottles as described above, workers can be provided with an assistive device to open the bottles.

- Pouring urine samples from bottles into test tubes is a tedious, exceedingly stressful, and time-consuming task. A custom-designed pouring device could be engineering. The worker would manually load the device, actuate it and manually / unload it. The device would position the sample bottle over the test tube and perform the transfer. This would eliminate spillage and the stress and awkward postures associated with hand transfer of urine. NAVFACENGC.COM is available to consult on a custom design-pouring machine.
- Automating the urine sample extraction process was not accepted in the past because of space limitations and low volume of samples being processed at the time. Automation should be reconsidered given the quantity of samples processed.
- Personal air purifiers will improve environmental factors and personal comfort.

Table 2: Representative Products for *Sample Bottles and Transferring Urine*

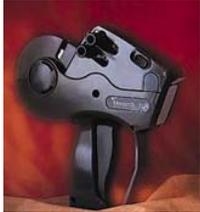
Description	Vendor	Product	Estimated Cost	Figure
Bottle Opener – manual assist	Life Products	Oxo Good Grips Opener		
Electric Bottle Opener	Independent Living Products	Open-Up	42.00	
Bottle Opener – manual assist	Freedom Living Devices	Rubber Lid Gripper	3	
Bottle Opener – manual assist	Freedom Living Devices	Deluxe Jar Opener (Zim Jar Opener)	16.00	

Description	Vendor	Product	Estimated Cost	Figure
Bottle Opener – manual assist	Freedom Living Devices	Multi Purpose Jar Wrench	9.00	
Box Cutter	Alimed	Carton Cutter	\$18.	
Box Cutter	Ship-It 1-800-525-6001	Box Opener Box of 100 Extra Blades	\$19.95 \$22.00	
Air Purifier	Comfort Living 1-800-327-4382	Bionaire Personal Space Air Purifier	\$29.	
	Wal-Mart	Bionaire Personal Space Air Purifier	\$19.	
	Sharper Image	Ionic Breeze Person Purifier	\$60.	

### *Labeling, Writing and Reading*

- Workers currently peel and apply labels with their fingers or use a pen as a tool to grab the label. An improved label dispenser would eliminate the risk associated with repetitive pinch grips. Worker input could be used to decide between a labeling gun and an automatic dispenser.
- Workers are strongly encouraged not to peel labels with their fingers. The preferred method is with a tool such as a pen with a wide gripping surface. Pen and pencil grippers (bulbs/cushions), available from the local office supply store, would increase the gripping surface and reduce the force required to hold the implement. Given the amount of writing required for record keeping the employees would benefit from grippers or wide body pens during all their activities.
- Using read/write stands to hold written records would reduce neck strain.

Table 3: Representative Products for *Labeling, Writing, and Reading*

Description	Vendor	Product	Estimated Cost	Figure
				
Read / Wright Stand	Alimed 1-800-225-2610	Read/Write Stand RA73746	\$40	
Read / Wright Stand	US Office Products 1-877-402-5655	Read/Write Stand RNG 94280)	\$34	
Label Dispenser	Label-Depot 305-861-6636	Label Dispenser SLE-U45		
Label Dispenser	Label-Depot 305-861-6636	Trigger Action Applicator (label gun) THA-300		
Label Dispenser	Staples 800-333-3330	Pricing Labeler	\$68-\$78	
Label Dispenser	Mark-Rite 800-848-7279	Label Dispenser		
Pen Grips	Alimed 1-800-225-2610	Bulb Grips	\$1.	
Wide Body Pens	Staples 800-333-3330	Dr Grip Pen	\$7.	

*Workstation Design*

- Provide a new sitting support for each employee. Chairs are like shoes, in that one size does not fit all. Worker input should be used in the selection process.

- Workers could reduce fatigue and improve blood flow by using a sit/stand chair. A sit/stand chair provides the support of a chair while giving the user the mobility and reach associated with standing.
- If the worker prefers a lab stool to a sit/stand chair, they could reduce fatigue by alternating between sitting and standing. The stool must have an adjustable backrest, be height adjustable, and have lumbar support. Because laboratory work of this nature is best performed at about elbow height, footrests may be needed for workers whose feet do not rest firmly on the floor. Footrests should be height adjustable and wide enough to accommodate both feet without having bending the knees..

Table 4: Representative Products for *Workstation Design*

Description	Vendor	Product	Estimated Cost	Figure
Sit/Stand Chairs				
	Alimed 1-800-225-2610	Portable Sit/Stand	\$300	
	Alimed 1-800-225-2610	Stand Stool RA75195	\$300	
	Global Industrial 1-800-645-1233	Lyon Sit- Stand Stool XF244849	\$223	
	C&H 1-800-336-1331	Lyon Sit- Stand Stool 41-186D	\$219	
	C&H 1-800-336-1331	Workspace Sit/Stand Stool 41-340A	\$190	
	Lab Safety and Supply 1-800-356-0783	Lyon Sit- Stand Stool OM-27282	\$221	
	Lab Safety and Supply 1-800-356-0783	Large Prowork Chair OM-4729	\$177	

Description	Vendor	Product	Estimated Cost	Figure
Laboratory Stools				
	Global Industrial 1-800-645-1232	Effortless Stool- completely adjustable XF252374 Casters optional	\$252	
	C&H 1-800-558-9966	Workspace, Bevco, and Krueger Stools	\$226-\$243	
	Lab Safety and Supply 1-800-356-0783	Biofit and Bevco	\$206-322	

### *Sample Storage and Disposal*

- New carts to store the batched samples are recommended to reduce the push / pull forces and strength required to move the present carts. Smaller carts with less material are easier to push than the large carts.
- An automatic feeder / conveyer accessory will be added to the Vyleater urine disposal machine scheduled for a December 2001 install. The conveyer eliminates the sanitary considerations and the strength required to push the hopper door (full or urine samples) to its overhead secure position. The conveyer will decrease the time and effort required to dispose of spent urine samples thus greatly increasing productivity.

Table 5: Representative Products for *Sample Storage and Disposal*

Description	Vendor	Product	Estimated Cost	Figure
Automatic feeder / conveyor	S & G Enterprises  888-RAM-FLAT	Vyleater automatic conveyor	Contact vendor with specific Vyleater model	
Carts	Lab Safety  800 356 0783	Stock Trucks with optional security  1A 65285	\$450.	

**END NOTES**

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

**2** 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.

**3** 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.