

Southwest Regional Maintenance Center (SWRMC) Eliminates Ergonomic Risks in Sail Shop



Sailor works with webbing at SWRMC Sail Shop

The Southwest Regional Maintenance Center (SWRMC) Sail Shop employs seven full time active duty technicians to create patterns and cut, join, and repair fabric pieces for various Navy vessels. The Sail Shop has three types of workstations - sewing, webbing, and storage.

At the sewing stations, workers sew fabric while seated at sewing machines for up to three hours a day. At the webbing stations, Sailors stand at work tables to lay out webbing patterns and inter-weave one layer of webbing material over another. Sailors also

manage heavy rolls of fabric, storing and removing them, as needed, from a rack for use in the Sail Shop.

The seats or benches at Sail Shop sewing stations were not adjustable for height or seat position and did not provide back support. Workers would lean forward or slouch while sewing. Sitting for long periods without back support flattens the natural curvature of the lower back. Holding such postures for long periods may lead to muscle fatigue and leg and back aches.



Contact pressure on wrists and elbows can lead to tendon, ligament, or muscle inflammation/irritation.

In addition, the Sailors' palms and forearms were in contact with the sharp edge of the workstation counter, resulting in contact stress. Sustained contact stress can compress the tendons, ligaments or muscles that are close to the surface of the skin resulting in irritation and inflammation. Over time or with repeated exposure, the inflammation can cause pain and discomfort and lead to injury.



Leaning forward and standing on hard surfaces for long periods can lead to muscle pain and fatigue.

At the webbing stations, the height and depth of the work tables forced workers to lean forward in order to reach webbing projects. The webbing patterns can be up to eight feet wide, the width of the table, requiring constant reaching and stretching instead of standing upright in a more comfortable, neutral posture. Additionally, Sailors assigned to the webbing station had to stand on the hard concrete floor for extended periods when working with webbing. Standing in one place for a long time, especially on a hard, cold surface, can become uncomfortable and tiring due to reduced circulation and pooling of blood in the legs and feet.

The material rack in the Sail Shop storage area is ten feet high and supports bolts of fabric, each weighing 60 pounds or more. The bolts used to be stacked on top of each other, which made them difficult to retrieve. In order to remove the rolls from the rack, two technicians working together had to stretch to reach the fabric bolts. The combination of awkward postures to reach overhead and heavy lifting created a significant risk of low back injury when there was not adequate time for rest or recovery between tasks.



Fabric bolts were hard to access.

Sail Shop operations involving awkward postures, reaching, heavy lifting, forceful exertions, and prolonged standing on hard surfaces increased the risk of work-related musculoskeletal disorders, or WMSDs. WMSDs are injuries and illnesses that affect muscles, nerves, tendons, ligaments, joints, spinal discs, skin, and bones. Symptoms of WMSDs usually involve weakness and discomfort. The discomfort due to a WMSD often improves following medical



Cramped workstations and non-adjusting seats led to leaning forward or slouching.

treatment and changing work habits.

Sailors in the SWRMC Sail Shop complained of neck and back pain. One webbing station worker also experienced numbness in her legs. These symptoms all were consistent with the Sail Shop ergonomic risk factors identified above.

Ergonomics is the science of fitting the work to the worker, instead of requiring the worker to adapt to existing working conditions. Tasks, equipment, and tools that are designed with the user and task in mind help to reduce the risk of WMSDs and other work-related injuries by allowing the worker to avoid harmful repetitive motions, awkward or unnatural postures, excessive immobility, and repeated forceful pressure on susceptible parts of the body. Applying ergonomic principles in the workplace also increases productivity and efficiency, reduces errors and waste, increases worker satisfaction and workplace morale, and ultimately improves overall quality of work and products.

The goal of the Navy's *Ergonomics Program* is to reduce the frequency and severity of WMSDs by redesigning work tasks or workstations through the introduction of procedures and tools that minimize ergonomic risk factors. SWRMC participated in an Ergonomics Risk Assessment Project funded by the Navy *Hazard Abatement and Mishap Prevention Program* to improve occupational health and safety conditions by identifying ergonomic risk factors in the workplace and resolving them by implementing suitable ergonomic solutions. At the request of SWRMC, a Certified Professional Ergonomist (CPE) provided technical support to the project.

Prior to the onset of the SWRMC Ergonomics Project, the CPE and SWRMC safety staff observed Sail Shop staff members carry out their usual work tasks. They also interviewed Sail Shop technicians, supervisors, and SWRMC industrial hygienists to pinpoint possible ergonomic risk factors. The CPE distributed *Job Requirements and Physical Demand Surveys* (JR/PD) to the Sail Shop staff. The JR/PD is an occupational health survey that the military utilizes to identify risk factors in various work environments and to identify and prioritize solutions.



Enlarged sewing workstation design includes improved lighting.

The results of the overall ergonomic assessment and JR/PD indicated the presence of ergonomic risk factors for Sailors working at the Sail Shop sewing and webbing stations and in the storage area. The Sail Shop staff, CPE, safety office and industrial hygienist analyzed the data and results of the site survey and brainstormed ideas to reduce the risk exposure level. A number of changes were decided upon and approved by the SWRMC safety staff and Sail Shop chief.

Navy *Hazard Abatement and Mishap Prevention Program* funding provided adjustable seats for the Sail Shop sewing workstations. The adjustable chairs minimize the need to bend forward or slouch over while working. The chairs have stable five-point swivel bases with firm cushioning on the backrests and seat pans. The seat pans are height adjustable and tilt forward as needed. The front edge of each chair seat is rounded to prevent cutting into the backs of workers' legs, and the chairs' backrests are adjustable for height and depth.

Improved sewing workstations were designed by the CPE. They have been enlarged to accommodate the new adjustable chairs and to include task lighting. The enlarged space also means that Sailors no longer need to twist their bodies to reach their work when sewing.



Webbing is attached to adjustable frames, reducing need for awkward postures.

An additional improvement at webbing workstations is a frame to which the webbing can be attached. The frame is placed in a low position at the start of a webbing task and can be raised as the work

task progresses. The frame also rotates to move the work piece as rows of webbing are added.



Vertical storage system delivers bolts of fabric at neutral waist height.

A vertical storage device for bolts of fabric was installed in the Sail Shop. The heavy bolts are now delivered at waist height, eliminating the need for overhead lifts and deep knee bends to store or retrieve fabric bolts.



Anti-fatigue matting reduces fatigue.

Anti-fatigue matting was installed in front of webbing stations and special, anti-fatigue sole inserts were provided

for the shoes of technicians who stand for long periods. Anti-fatigue matting is a durable and efficient way to reduce discomfort and fatigue in people who stand for long periods. The specially designed sole inserts serve the same purpose as the anti-fatigue matting for Sail Shop technicians who are routinely away from their primary workstations or spend much of their time in transit.



Special sole inserts in shoes help diminish fatigue.

Since the ergonomic improvements were made in the SWRMC Sail Shop, there have been no complaints by Sailors of pain or numbness. Sail Shop technicians have expressed satisfaction with the ergonomic improvements in their workstations. The workstation and storage improvements have also resulted in fabrication, storage, and retrieval task time savings. The yearly potential injury aversion and productivity cost savings are estimated to be \$306,500.00.
