DEPARTMENT OF HEALTH AND HUMAN SERVICES Public Health Service

National Institute for Occupational Safety and Health
Robert A. Taft Laboratories
4676 Columbia Parkway
Cincinnati OH 45226-1998

March 16, 2006
HETA 2003-0179
HETA 2004-0103

David Smith
Safety Department
USPS Main Office
951 20th Street
Denver, Colorado 80202-9998

Dear Mr. Smith:

This report pertains to the health hazard evaluation (HHE) requests submitted by employees to the National Institute for Occupational Safety and Health (NIOSH) regarding the incidence of musculoskeletal disorders of the back, shoulder, and hands among workers operating Delivery Bar Code Sorter (DBCS) machines at the Denver General Mail Facility (GMF). The first HHE request, received by NIOSH on February 28, 2003, requested that NIOSH review injury prevention procedures contained in a new release of the On-The-Job Safety Review/Analysis (JSA) for the DBCS machine, which included revised sweeping methods and use of a lifting technique known as PowerLift.® The second HHE request, which was also submitted by employees, was received by NIOSH on January 23, 2004. This HHE requested that NIOSH review the merits of a new United States Postal Service (USPS) injury reduction program called the Ergonomics Risk Reduction Process (ERRP). This program, a collaborative effort with the Occupational Safety and Health Administration (OSHA) and USPS unions, was aimed at identifying new approaches to working safely in USPS facilities. I agreed to evaluate specific injury reduction strategies resulting from the ERRP process pertaining to the DBCS machines. I received this information from the requestors and from USPS safety personnel. No onsite evaluation was conducted during the course of the second HHE investigation.

Background

In 1991 and 1992, NIOSH investigators evaluated the potential for ergonomic hazards on three types of automated mail processing machines, one of which was the first generation DBCS. These types of DBCS machines have 102 stackers arranged in three tiers at heights of 22 inches, 36.5 inches and 50.25 inches above the floor, respectively. The latest generation DBCS machines currently used by the USPS have more than 200 stackers, arranged in four rows, ranging in height from 21.5 inches to 56 inches.

In the final report (attached), NIOSH investigators concluded that the automated equipment used by the USPS "put employees at potential risk for low back and upper extremity musculoskeletal

disorders" due to the awkward postures and repetitive tasks to which workers were exposed. The report noted in particular the design flaws at the DBCS sweeper position.[1]

The main flaw cited in the report was the height of the three rows of stackers, the first row being too low to avoid excessive trunk flexion (bending over) while sweeping mail, and the third row being too high for most workers to avoid reaching above shoulder height to sweep mail. The report cautioned against bending the knees as an acceptable method of sweeping the bottom row of stackers due to the excessive ligament forces at the knee during deep knee flexion. Another risk factor noted in the report was the potential of highly repetitive upper extremity motions from sweeping 102 stacking locations from a machine capable of sorting 35,000 pieces of mail per hour.

The recommendations pertaining to the DBCS contained in the July 1993 NIOSH report were as follows:

1. Assign additional workers to the machines to help with sweeping.
2. Limit the time that workers spend on the DBCS machines.
3. Provide additional rest breaks for workers on the DBCS machines.
4. In the long term, automate the sweeping position of the DBCS.

Discussion of Current Concerns

JSA and PowerLift

The JSA is a form used by the USPS to describe the basic steps of a job task, list the potential hazards, and prescribe a recommended action to prevent injury from the listed hazards. For the feed and sweep positions of the DBCS, the JSA recommends using the PowerLift technique. For the sweep position only, the JSA recommends using two hands for sweeping, bending knees while lifting, turning the body instead of twisting when lifting, and rotating with the feeder every hour to prevent repetitive injuries.

In January 2004, I met with Dr. Michael Schaefer, developer of the PowerLift technique and related training programs, at the GMF in Las Vegas, Nevada. He was conducting a train-the-trainer refresher course to lead workers at the facility and he invited me to participate in the training. The key element of the PowerLift is the establishment of a wide base when lifting, coupled with methods to move a box, tray, or other load close to the body while simultaneously lifting with the legs. I considered the methods to be biomechanically sound and a good approach to injury prevention when lifting. I also considered the methods to be complicated and difficult to learn in a single training session.

[1] NIOSH HETA 92-0073-2337, United States Postal Service General Mail Facility, Denver, Colorado, July 1993.

Dr. Schaefer emphasized that the PowerLift techniques need to be reinforced through periodic audits of worker lifting practices and repeat of PowerLift training sessions. He felt that his lifting techniques were most applicable to the feeding part of the DBCS job where bulk mail is lifted into the machine for sorting. Even though the sweeping portion of the job is not actually a lifting task, but rather a repetitive motion task, he felt that the bent knee/wide base posture put the worker in the best position to sweep the bottom two rows of the DBCS. He added that this bent knee/wide base posture cannot be used by most workers to sweep the top two rows because these rows are often above the shoulders of the sweepers. Finally, Dr. Schaefer added that a good lifting technique is only effective if there are no other factors which negate its positive aspects, such as too heavy a load, slippery load, lifting barriers, or poor ergonomic design.

As noted in the attached HHE report, NIOSH investigators consider the sweep portion of the DBCS to be poor ergonomic design and caution against deep knee bending to sweep the bottom rows of the machine, work practices inherent in the JSA and PowerLift method. The recommendation in the JSA for the workers on the DBCS to rotate every hour is sound because the differences between these two tasks (feeding and sweeping) provide a break from the stereotyped motions comprising each of the tasks. Sweeping with two hands and turning the body instead of twisting is also a good injury prevention practice, provided the receiving mail carts are far enough from the stackers of the DBCS machines.

Conversations with safety personnel at the Denver GMF indicated that new workers are given training on operation of the DBCS machine and use of the PowerLift techniques, but follow up and reinforcement is limited to making the training materials available to workers who want to practice what they were taught during work orientation.

Ergonomics Risk Reduction Process

Recognizing the effect of musculoskeletal disorders on the workforce, the USPS, the American Postal Workers Union, the National Postal Mail Handlers Union, and the Occupational Safety and Health Administration (OSHA) entered into a strategic partnership to identify and control ergonomic risk factors. This partnership, known as the Ergonomic Risk Reduction Process (ERRP) was formed so that the members could work together to reduce the number of injuries and ergonomic related hazards at USPS facilities.

The ERRP was started in the summer of 2003 at select sites, with implementation at the Denver GMF beginning in the Spring of 2004. The program establishes a subgroup of the Local Safety & Health Committee called a Core Team, which has the responsibility to develop and administer the local program. Each participating facility has a “site coordinator” and, for the initial 30-60 days, a certified ergonomist on site.

Training is provided to all craft employees as well as supervisors and managers. Each task in the plant is evaluated and a job hazard analysis is conducted to identify ergonomic risk factors. The core team recommends and implements changes to work practices, work area design and overall work procedures to reduce ergonomic related injuries. The core team also has the responsibility to document and report fixes (best practices) that have been successful in reducing injuries.

The second HHE request stated that the ERRP was charged with establishing new work practices for many postal work job tasks, including those used on the DBCS machines. I reviewed these new work practices as requested. The ERRP is an important program because it acknowledges the work-relatedness of musculoskeletal disorders associated with the tasks performed by USPS workers, and the need for new approaches to reducing the incidence of these disorders.

In July 2005, I received from the HHE requestors the DVDs and written documentation outlining the train-the-trainer sessions that took place at the Denver GMF as part of the ERRP training segment. Upon inspection, I realized that these were the same materials that NIOSH investigators evaluated during the time the DBCS was initially deployed. The "DBCS/DPS Methods & Support Equipment Guide" dated November 1995 was already in my possession and the DVD outlining the proper method for feeding and sweeping the DBCS machine has the same content as the videotape I received from your office in June 2003.

I contacted the Safety Department at the Denver GMF and they reminded me that the ERRP program addresses ergonomic problems in all areas of the facility, not just the DBCS, and that as a result of ERRP, musculoskeletal disorders have decreased by as much as 40%, including decreases among workers on the DBCS machines. Examples they gave me included numbering the bottom two rows of the DBCS stackers to correspond with the numbered carts across the aisle from the DBCS machines to which the swept mail is placed, and eliminating the practice of "flipping" trays of mail to load it into the sorter. Labeling the stackers and mail carts is intended to reduce the amount of bending needed to sweep the lower two stackers. Removing mail from a tray using a neutral wrist posture instead of rotating the hands and wrists to dump ("flip") mail onto the sorting platform is an effective way to reduce deviated wrist postures. There is no doubt that flipping should be avoided. However, bending less to sweep the mail from the bottom rows seems to conflict with the employee's need to leave two inches of mail in the stacker after each sweep, as prescribed in the DBCS instructional DVD, to avoid getting their hands caught in the machine.

Despite the reported reductions in musculoskeletal disorders, it is important to emphasize that for progress to be sustained administrative remedies must be periodically reinforced through training review sessions and monitoring of employee work practices. For proper control of physical hazards on repetitive tasks requiring deviated postures and hand intensive activities, NIOSH recommends a more permanent solution, known as engineering controls, in which the physical hazard is eliminated. While such changes may have been effective in other areas of the Denver GMF, such as elimination of physical lifting tasks through installation of conveyors to transport mail, the physical demands of the DBCS machines, particularly on the sweeper side, have been essentially unchanged.

Designing engineering controls for the DBCS machine is a challenge. In such instances NIOSH recommends that job factors be modified to prevent injuries. In the case of the DBCS, controlling mail throughput per hour or the number of pieces of mail sorted each hour, presents an opportunity for effective intervention. To my knowledge, no study has ever been performed to determine how many pieces of mail a pair of DBCS workers can safely process in an hour or a day with little risk of injury. This may be due to the variety of mail types sorted on the DBCS machines. The Union's policy emphasizes minimizing the amount of time a worker spends on the DBCS machines to the extent possible. Another alternative a worker has is to bid to another type of job, but this option is becoming increasingly limited as new generations of DBCS machines, such as the DIOSS and DIOSS-EC, are scheduled for deployment, eliminating older, single tier machines such as the Input Subsystem (ISS) Optical Character Reader (OCR).

Conclusions and Recommendations

Based on meetings and conversations with USPS consultants, safety personnel, managers, and workers the following conclusions can be made:

1. The DBCS machines presently in use by the USPS (four tiers, 201 stackers) present the same or greater risk of injury to workers as the three-tiered DBCS machines evaluated by NIOSH in 1991-92.
2. The USPS recognizes the need to reduce the incidence of musculoskeletal disorders at its facilities by identifying new and better methods for workers who perform mail processing tasks.
3. The ERRP and other engineering/administrative strategies are sound and logical approaches to achieving the goal of lower incidences of musculoskeletal disorders.
4. The engineering controls developed under the ERRP initiative are more likely to result in long term reductions in injuries and musculoskeletal disorders than the administrative methods which do not eliminate the hazards or design shortcomings that resulted in high incidences of musculoskeletal disorders. Most of the controls developed for the DBCS machine have been administrative in nature.

In addition to the conclusions listed above and the recommendations contained in the attached HHE report, the following is recommended for the DBCS machines:

1. Conduct periodic training and monitoring of worker activities to reinforce safe work practices that have been taught and developed at the USPS.
2. Rotate workers frequently between the feeder and sweeping positions. Rotation should take place at least once per hour, but more frequent rotation such as every 30 or 45 minutes may be more beneficial to workers.
3. The feeder should occasionally stop loading new mail into the DBCS and help the sweeper to ensure that the amount of mail accumulated in the stackers does not exceed desired levels.

4. Encourage workers to use sound work practices like the PowerLift while working on the DBCS machines, particularly at the feeder position where the wide stance and lift with the legs techniques are most applicable.
5. Determine and implement a mail processing rate of work which will prevent workers from sustaining injury. This can be established either through time and motion studies or by manipulating numbers of pieces of mail processed per hour or per day until injury rates are under control. As noted in the Discussion section above, reducing the rate of work is the most effective administrative means of injury control when engineering controls are not implemented, such as in the case of the DBCS.

This letter closes our file on these health hazard evaluation requests. NIOSH recommends that employers post a copy of this letter for 30 days at or near work areas of affected employees.

Thank you for your cooperation with this evaluation. If you have any questions, please do not hesitate to contact me at (513) 841-4438.

Sincerely yours,

Daniel J. Habes, MSE, CPE
Industrial Engineer
Hazard Evaluations and Technical
Assistance Branch
Division of Surveillance, Hazard
Evaluations and Field Studies

enclosure
cc: R. Romero
T. Valenzuela
D. Enderson
L. Reeder (requestor)