

OSHA Strategic Partnership Program - Ergonomic Strategic Partnership
Verification Report Items

DENVER PROCESSING & DISTRIBUTION CENTER

7500 E. 53rd Place
Denver, CO 80266-9997

October 22 - 25, 2007

Verification Team

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Section I – EXECUTIVE SUMMARY

1. Date of Onsite Verification: October 22 – 25, 2007
2. Date of Launch: September 25, 2003
3. Number of Employees: 2,100
4. Type of Facility: Processing & Distribution Center
5. Quantitative Key Results:

Injury & Illness Rate Summary:

2004 – 2006 MSD Rate Comparisons

	MSDs	% Change	Handling /Lifting	% Change
2004	4.67 (94 cases)		3.43 (69 cases)	
2005	2.32 (40 cases)	50% decrease	1.62 (28 cases)	53% decrease
2006	2.39 (36 cases)	3% increase	0.53 (6 cases)	67% decrease

MSD Cumulative Injury Compensation Costs:

Year	Workers Comp Cost	% Yearly Change
2004	\$ 703,636	
2005	\$ 339,944	52% decrease
2006	\$ 261,301	23% decrease
2007	\$ 102,159	61% decrease

This represents an overall reduction of \$ 601,477 in workers' compensation costs.

6. Process Improvements – Ergonomic Hazards Addressed:

The Denver Site Core Team was very successful in implementing ergonomic improvements:

Task Analyses Conducted:	153
Task Analyses Resolved:	108
Task Analyses Recommendations Implemented:	87

Below is a sample of ergonomic fixes implemented in a variety of plant settings:

Location/Operation	Concern	Corrective Action
DBCS Maintenance	Hand procedures used to vacuum the DBCS resulted in prolonged awkward posture	Used a flexible hose that can be cut to length
AFSM 100 –feeding	While feeding the AFSM, employees bump their shins on the tub holder	Moved tub holder 3” to improve clearance
Mail Prep – sorting mail	A tall employee sorting mail at a low table had neck pain	Provided an additional (on the sort table) tub to raise and angle the tub with mail
Letters automated – sweeping manual cases	Ropes on the back of the case were hard to pull resulting in forceful pulls with pinch grasp	Replaced ropes with bungee cords that are more flexible

7. How did the Partnership function after the Ergonomist left and how is the facility maintaining ERRP?

The Denver Processing & Distribution Center (P & DC) has consistently staffed the position of a Site Coordinator and appears to be operating under the principles established during the roll out. Since the initial launch, the facility has had two Site Coordinators. The original Site Coordinator was on-site for over a year and then was reassigned to a district safety position. The current Site Coordinator has been in this position since 2005 and is extremely effective in managing the Core Team. She is well respected by her peers and upper management. The Site Coordinator keeps the team on task and fully supports their work. The Site Coordinator and Core Team are continuously working on ergonomic related projects and implementing the goals of the partnership.

The facility has an excellent Core Team:

- o Knowledgeable of ergonomic hazards and developing corrective actions
- o Does excellent job of tracking ergonomic related data e.g. injury and illness charts and graphs
- o Good mix of crafts, each craft well represented
- o Maintenance representative on team is beneficial
- o Very supportive Field Coordinator
- o Site Core Team Leader very passionate, has respect of peers and upper management. Excellent “champion” for ERRP.

8. Relationship between the Site Core Team and the Joint Labor Safety and Health Committee:

There is a good working relationship between the site core team and the Joint Labor Safety and Health Committee (JLSHC). The site coordinator attends the JLSHC meetings and briefs the committee on ergonomic related activities.

9. Management Perspective of the OSHA Strategic Partnership (OSP):

Top management at the facility is committed to ERRP:

- Top management was extremely cooperative during the site visit
- Local funding has been provided to supplement ERRP start up funding
- Two full-time ERRP positions are being funded
- Effective corrective actions are shared with other local sites

While top management was very supportive of the ERRP Site Core Team, supervisors rarely attended “Monthly All Core Team” meetings.

Recommendation:

Increase the level of supervisory participation in the ERRP process. This could be accomplished by rotating the starting times for the monthly meetings to accommodate the supervisors’ production schedules.

10. Employees Perspective of the OSHA Strategic Partnership (OSP):

Employees are aware of ERPP at the facility. Employees expressed that the program has been a useful tool. Involvement by employees in ERRP occurs through their membership on the ERRP team, use of the ergonomic suggestion box, and participation in abating ergonomic hazards. Employees with a hearing impairment have been included in ERRP-sponsored training.

11. Hearing Impaired Services:

The Denver P & DC employs over 30 hearing-impaired employees working on all three Tours (shifts). It was clear that the programs implemented at the site provided these employees a safe work environment.

The Plant Manager assigned a Postal employee as a Coordinator (Deaf Liaison) to work with management and the unions.

The plant uses a variety of communication methods. For meetings and training events of 45 minutes or more, the USPS Deaf Liaison uses a contract service which is available 24/7.

For meetings and training events of undetermined length, Video Remote Interpreting (VRI) equipment is used (3 units). VRI is a web-based video conferencing service used for meetings and group sessions to provide real-time interpreting services between supervisors and deaf or hard-of-hearing employees. VRI equipment includes a special camera and a large-screen TV connected via a high-speed Internet connection. The interpreter uses the camera to view the deaf or hard-of-hearing employees and then interprets what they are signing and verbally communicates this to the supervisor and hearing employees.

The Deaf Liaison meets monthly with hearing-impaired workers to discuss potential problems, suggestions, and concerns on USPS issues.

For communications of a short duration (less than 45 minutes), workers communicate using hand-written notes and “sign” language.

All of the hearing-impaired workers interviewed believed the USPS was doing a good job of providing communication services for planned “events” (safety training, safety meetings) and for questions that arose on the plant floor.

12. Operation of the Data Bar Code Sorter (DBCS) Machines:

The DBCS machines continue to be an area of significant concern because musculoskeletal disorder (MSD) - related injuries/illnesses continue to occur. As part of the verification review, an ergonomic evaluation of the Delivery Bar Code Sorter (DBCS) machine Feeder and Sweeper tasks was performed. This evaluation was performed using industry-accepted evaluation methods to assess the potential risk for injury. This ergonomic assessment should not be considered an in-depth ergonomic evaluation of these tasks. The evaluation determined that both the Feeder and Sweeper tasks may create some degree of musculoskeletal hazard to the clerks performing the task. Principle risks appear to be to the shoulder, back, and wrist. Recommendations to assist in reducing the potential for injury to the clerk performing this task include:

1. Feeder methods for removing mail from the mail trays:
 - a. Consider using the “rolling” method to transfer mail from the trays onto the jogging table.
 - b. If a neutral wrist posture can be consistently used, “Flipping” may be appropriate for some employees. In determining if this method would be effective, it would be necessary to determine if the jogging equipment could withstand repeated jarring. (See the DBCS Standardization Mail Processing Training: Facilitator Guide, revised 5/26/2006)
 - c. Use the current jogging shelf for storage only.
 - d. Present mail to the feeder station on a height adjustable false bottom in a GPMC, ERM, cart or container to minimize the need for low level lifting. If the Feeder position is to be used to effectively provide rest and recovery time within the rotation pattern, precautions should be taken to reduce the frequency of low level lifting or extended reaching.
2. Rotation:
 - a. To reduce the risk present to the lower back and to the shoulders, adhere to the established 30 minute rotation schedule between the Sweeper and the Feeder as recommended in the DBCS/DPS Methods and Support Equipment Guide. Additional ergonomic studies and cooperative investigations with workers may reveal other appropriate rotation schedules.
 - b. Studies should be conducted to determine the duration of time that the clerks could spend on higher volume machines.

- c. The final sweep appears to be the critical period from a frequency standpoint. If other workers in the area are at a point where they can assist, this could reduce the frequency of lifting.
 - d. Alternate body postures when sweeping the mail:
 - Change the sweeping pattern
 - Consider sweeping alternating right hand sweep versus left hand sweep
3. Stacking mail trays on the 1226 Pie Carts:
 - a. Enlist the ERRP committee to conduct an ergonomic assessment to determine why the practice of stacking the loaded trays on top of the pie carts over two high occurs. Develop administrative control methods to avoid this practice and provide viable alternatives to avoid stacking loaded mail trays over two high on top of the 1226 pie cart.
4. General Suggestions:
 - a. Solicit input from the nationwide ERRP committees for suggestions and implementation options for administrative, work method, or engineering controls. Suggestions should be sent to the appropriate engineering, design, or safety and health staff for consideration in future designs, modifications, or decision making activities.
 - b. To determine the full extent of the musculoskeletal injuries occurring at the Sweeper and Feeder tasks on the DBCS machines, an evaluation of the Feeder and Sweeper tasks should be considered. This evaluation should assess these tasks on different DBCS machines and different tours to determine potential physical hazards due to static and dynamic postures, force, frequency, and duration risks present during various rotation schedules, sweeping patterns, mail volume, mail categories, run time, machine through-put and performance expectations. This evaluation should include employee anthropometrics, employee work methods and operation methodology.

Section II – OVERALL INJURY AND ILLNESS RATES

Year	Total Injuries	TCIR Rate	DART Rate
FY 2004	103	5.12	4.33
FY 2005	100	5.84	5.32
FY 2006	104	6.9	5.84
FY 2007	93	4.95	4.10

TCIR = Total Case Incidence Rate

DART = Days Away, Restricted Work Day Rate

Section III - GOALS, STRATEGIES, AND MEASURES:

Goal A. Improving the Safety and Health Environment: Did the worksite demonstrate improvements in the safety and health environment so that OSHA, USPS, NPMHU, and APWU could work together to reduce musculoskeletal disorders (MSDs)?

- The ERRP process at the P&DC has been effective in reducing the number of MSDs incurred since the inception of this partnership.
- In FY 2003, this facility recorded 135 MSDs and has experienced a 72% decrease over the past five years.
- The DBCS-related injuries, particularly on Tour 1, continue to be an area of concern.

Goal B. Worksite Analysis: Did the worksite demonstrate improvements in identifying tasks and conditions where MSD incidents occur and develop and implement ergonomic control processes to reduce or eliminate MSD incidents?

The ERRP Site Core Team has been successful in conducting Task Analyses (See the table of examples of ergonomic fixes in the Executive Summary.).

Goal C. Training: Did the worksite demonstrate improvements in training USPS local managers, supervisors, NPMHU and APWU representatives, and the local Joint Labor-Management Safety and Health Committees to ensure comprehension of ergonomic risks and control processes?

Training Hours:

Craft	Intro to Ergo '03 to date	DBCS (5/06&10/07)
Manager/Supervisor	211	10
Clerk	1,596	410
Mail Handler	749	0
Maintenance	226	0
Total	2,782	419

The site has trained a significant number of workers and managers at the site; however, the site has not completed the required ergo training courses. The site also has not adhered to an annual refresher training schedule.

Recommendation:

Complete required ergonomics training. Also, establish a schedule for annual refresher training.

Goal D. Reduction in Illness and Injuries Rates: Did the worksite demonstrate improvements in reducing the number of MSD related incidents thereby reducing the number of days away from work for both lost workday and restricted duty cases associated with MSD incidents?

Since the inception of the ERRP process, the facility has experienced a 67% decrease in the MSD injury and illness rate. Despite this overall success, the site needs to continue to explore ways to reduce MSD-related injuries on the DBCS machines.

Goal E. Best Practices: Did the worksite demonstrate improvements in developing and evaluating best proven practices to be implemented in other postal facilities with similar ergonomic issues, and to share best proven practices with applicable USPS operations with similar ergonomic issues?

- The site demonstrated an effective Hearing-Impaired Support program

Section IV - SUCCESSES AND AREAS FOR IMPROVEMENT

I. Management Leadership	
• Demonstrates support and prompt response • Clear program responsibilities • Open lines of communication • Attends ERRP meetings and other s/h functions • Appropriate resources	<i>Needs improvement.</i>
Comments: The plant manager and senior MDO provide financial and human resources in support of the ERRP process. The Site Core Team Leader meets on a weekly basis with the senior MDO. One of the lead MDOs occasionally attends the All Core team meetings. However, supervisors rarely participate in the Site Core Team meetings.	
II. Ergonomic Training	
• Training of crafts and supervisors is incomplete and overdue.	<i>Needs Improvement</i>
Comments: Need to get back on schedule	
III. Employee Participation Process	
• Meaningful involvement • Employees active in the ERRP process • Provide survey results if applicable	<i>In place</i>
Comments: Site core members are fully involved in the Partnership. The individual tours meet weekly and the entire core team meets monthly. Core members have performed task analysis, performed job observations, interviewed concerned employees, designed ergo related fixes, conducted employee training and organized the ergo health fair. Non-Core team craft employees are involved in the ERRP process through ergonomic suggestions and some employees have been involved in the abatement of the hazard.	
IV. Job Hazard Analysis and Control	
• Task analysis conducted • Task analysis resolved • Fixes implemented • Quick fixes implemented	<i>In place</i>
Comments: As a result of the partnership, the ERRP Core Team has conducted over 108 ergonomic tasks analyses and 87 “fixes” have been implemented.	

V. MSD Management		
- Implement an ongoing process to identify MSD's and control the risk factors. - Worksite builds a self sustaining ergonomic skill set and competencies within the workforce using a combination of management, labor union, and craft resources.		<i>Needs improvement</i>
Comments: The Site Core Team has been successful in implementing some ergonomic improvements; however MSD-related injuries continue to be an issue for Tour 1 workers (when the highest volume of mail occurs).		
VI. Process Evaluation		
Effective evaluation of goals, strategies, and measures		<i>Needs improvement</i>
Comments: Site coordinator, ERRP assistant and core team analyze the number of MSD-related injuries monthly and develop easy-to-read charts and graphs. The Site Core Team need to continue to focus on MSD-related injuries that occur on Tour 1.		
VII. Communications		
Effective lines of communication between OSHA, USPS, APWU, NPMHU, JLMSHC, and the Site Core team.		<i>In place</i>
Comments: Site coordinator invites OSHA to all monthly core team meetings and provides meeting minutes to the OSHA ERRP representative. JLMSHC quarterly meetings are attended by the site coordinator. When an ergonomic/safety related issue develops, the site coordinator will address the issue immediately with JLMSHC rather than waiting for the quarterly meeting. ERRP maintains 3 bulletin boards throughout facility that contain ERRP information, stretches, MSDs injuries, fixes and success articles. Site coordinator shares monthly core meeting activities with APWU and NPMHU representatives. In addition, the Site Core Team has access the USPS ERRP Website which contains over 700 "good ideas" for improving ergonomic conditions. Site Core Teams have access to the national database of website "ergo fixes" and have a HQ ergonomist assigned to assist them.		

APPENDIX A

Ergonomic Evaluation of the Delivery Bar Code Sorter Machines

A team of US Department of Labor Occupational Safety and Health Administration (OSHA) professionals performed a monitoring inspection of the U.S. Postal Service Processing and Distribution Center (USPS P&DC) in Denver Colorado as part of the partnership between OSHA and the USPS P&DC. As part of the monitoring inspection an ergonomic evaluation of the Delivery Bar Code Sorter (DBCS) machine Feeder and Sweeper tasks was performed. Interviews with management and employees were conducted to determine the various parameters of the DBCS machine operation. Measurements and video tape of selected runs were taken. An ergonomic analysis was performed using industry accepted evaluation methods to assess the potential risk for injury. Preliminary recommendations to reduce the potential for injury to the clerks performing this task are included. This ergonomic assessment should not be considered an in-depth ergonomic evaluation of these tasks.

A. Interviews with workers on the Delivery Bar Code Sorter machines (DBCS), October 22 – 24, 2007

1. Work schedule:
 - a. Tour 1: 10: 00 or 10:30 pm to 6:30 or 7:00 am
Tour 2: 6:00 or 7:00 am to 2:30 or 3:30 pm
Tour 3 1:00 or 3:30 pm to 9:30 or 12:00 am
 - b. Breaks: two 15 minute breaks and 30 minute lunch break
 - c. Overtime: Employees may volunteer for time specific overtime based on peak volume (tax time, Mother's Day and Christmas rush) for four 10 hour days followed by an eight hour day. If a sixth day is needed an additional 8 hours may be worked. If there are no volunteers for overtime, then management mandates 4 hours per week of overtime.
 - d. Turnover: There is minimal employee turnover on the DBCS machines
2. DBCS Machine:
 - a. Number of employees:
Tour 1: 160 operators
Tour 2: 32 operators
Tour 3: 149 operators
 - b. Machines come with three and four tier alignments and extra modules can be added to increase the number of stack pockets (sort designations) on each machine. The number of stack pockets range from 190, 198, 220 up to 288.
 - c. There are 55 four tier machines and three of the three tier machines at the Denver P & DC.
3. DBCS Process:
 - a. Mail comes in from the collector > mail is cancelled > receives the bar code > goes to the DBCS by mailhandlers in trays via General Purpose Mail Container (GPMC - cage) or the Eastern Region Mail Container (ERMC - webbing).
 - b. Tour 1 has double pass:
 - The double pass mail comes from within the area.

- First Pass: Sorts to the zone and the mail is placed into trays on the 1226 pie carts, then the pie carts are pushed to the Feeder station in preparation for the second pass.
 - Second pass: Each zone is sorted to the stops in each individual route into the Delivery Point Sequencing (DPS)
 - The mail is “clean” mail
 - This pass may require up to 288 stacker pockets.
- c. Tour 2 and Tour 3 has a single pass:
- A single pass is performed when the mail comes in from outside the area. This pass requires 60 to 85 stacker pockets.
 - This mail is “not clean” with rubber bands that need to be removed
- d. DBCS Productivity standards:
- The target is 25,000 pieces of mail per hour however; the actual Base Production Index is 18,000 to 20,000 pieces of mail per hour.
4. Work Methods:
- a. A team consisting of one Feeder and one Sweeper run the DBCS machine
- Feeder:
The Feeder lifts and empties full mail trays from GPMCs, ERMCS or other containers and emptied onto the jogger table. The mail is culled and “tapped down,” so that the stamped ends of the envelopes create an even edge along the base of the jogger. There are three methods to remove the mail from the tray, “flipping,” “rolling,” and manually transferring from the mail tray on the jogging shelf.
Flipping the mail out of the tray onto the jogging table involves tossing the mail out of the mail tray and removing the tray so that the mail lands onto the jogging table. Flipping the mail is not recommended by the Postal Service since this may damage the jogging equipment as documented in the revised “DBCS Standardization Mail Processing Training: Facilitator Guide.”

Rolling the mail out of the mail tray involves tipping the mail tray up against the back of the jogger, removing the tray leaving the mail vertically on the jogging table. The clerk “rolls” the mail into proper feeding alignment.
The third method involves placing the tray of mail on the jogger shelf. The mail is **manually lifted** from the tray onto the jogging table using both hands. The Feeder slides the mail from the jogger onto the feed table. Empty mail trays are replaced in the GPMC for storage until the next shift. The tray stand next to the jogging table is used as storage of slugs, rejects or sequence errors.
 - Sweeper:
A pie cart (1226), a wheeled metal rack which holds mail trays, is placed parallel to the DBCS machine stack pockets. The sweeper pulls out the drawer containing a mail tray that corresponds to the pocket to be swept. Both hands are used to remove the accumulated mail in the pockets and place it into the pie cart tray. Two inches of mail is left in the pocket to

prevent finger injury from the moving parts until the final sweep at the end of the run. When trays in the drawer are full, they are removed and stacked on the top of the pie cart no more than two trays high. However, with heavy through-put, employees report that trays may be stored up to seven trays high on top of the pie cart or two to three high on the floor. There are fold down steps in front of the tiers which are only used to clear jams and not during sweeping.

- Rotation:
Each DBCS team decides when and how often to rotate between sweeper and feeder positions. The clerks indicate that they may rotate every two hours after every break. The DBCS/DPS Method & Support Equipment Guide indicates that operators should rotate positions on a regular basis, preferably every half hour when the machine is running. Both the USPS Headquarters and Denver Plant Manager recently mandated clerks rotate every 30 minutes.
- Density analysis:
Each sort location has a different volume of mail that comes to the stack pockets. The sort location can be more easily changed in the first pass than the second pass because the density is determined by the number of stops within the zone. This provides options to sort heavier mail volume into the middle two tiers in the stack pocket location. However, changing the stack pocket location during the second pass is reportedly not feasible since the Delivery Point Sequence must be maintained. If the clerk wants to change the density layout, they go to their supervisor who will pass this information onto the Operation Support Specialists (OSS). The density distribution does not change seasonally.

5. Training:
 - a. DBCS mail process requires yearly training using six videos
6. Pie cart maintenance:
 - a. There is no regularly scheduled maintenance for the 1226 pie cart wheels or shelf rollers. If there is a maintenance issue the 1226 pie cart is to be removed from use and “red tagged.”
 - b. Some of the 1226 pie cart drawers are difficult to slide open.
7. The Implemented Fixes Log list the following fixes on the DBCS machines since the inception of the Ergonomic Risk Reduction Process (ERRP). The ERRP committee has no authority to make engineering changes on the machine. The fixes are:
 - a. Sweeping 4th tier: brighter labels for the stacker pockets, instructed DBCS operator to treat the cart like the DBCS machine
 - b. Removing trays from the cart: request maintenance when the drawers stick
 - c. Vacuuming DBCS wimpy panels: found a flexible hose that can be used
 - d. 1226 Cart alignment: realign the 1226 carts so employees do not need to twist
 - e. Feeding the DBCS: replace the joggers with newer model with a plastic flap to cover the gap
 - f. Sweeping DBCS: replace the anti-fatigue mats

B. Policy and Procedures (Duties and Responsibilities)

The “DBCS Standardization Mail Processing Training: Facilitator Guide,” revised 05/26/2006 indicates that:

1. The standardized work instructions and training are a combination of demonstrated proven “best practices” from the NY Metro Area and Pacific Area.
2. Optimum operational performance requires:
 - a. Maintaining continuous feed,
 - b. Good jogging, edging and culling and mail presentation at the feeder,
 - c. Continuous sweeping of pockets and avoiding pocket full occurrences which will stop the machine.
 - Operation set-up procedures – position 1226F tray carts 36 inches from the stacker modules. Ensure that the tray racks are in working order and designated for specific machines (if not submit a repair order). Set up should be achieved within ten minutes.
 - Jogging – place tray of mail on jogger shelf, do not flip trays. Transfer mail from shelf to jogger, gently slide mail onto feed table.
 - Feeding procedures – keep the feed table full while working primarily in front of the jogger
 - Sweeping procedures – always leave at least 2 inches of mail in the pocket being swept; push the mail forward in the trays.
3. Supervisors are accountable for:
 - a. Employees being trained and using proper work methods
 - b. Reporting machine problems to maintenance and indicate resolution of the problems
4. Operators are accountable for:
 - a. The Feeder is to correctly move the mail from tray to jogger by placing the mail tray on the shelf and using two hands to move the mail.
 - b. The mail is not to be flipped on to the jogging table or the feeder belt area. This can cause damage to the jogging equipment. Flipping trays on the feeder belt damages the transport belt. Both are very costly to repair.
 - c. The Sweeper should always leave two inches of mail in the stacker pocket when sweeping a machine that is running. This prevents exposure to and potential injury from moving parts.
 - d. The Sweeper is to rotate assignments during the tour with the Feeder
 - e. Ensure that the trays are not overstuffing which can cause delays at the sleever straper.
5. Performance indicators:
 - a. These indicators are determined based on demonstrated performance by the top quartile facilities in the respective group size. Displayed metrics on or near each machine helps drive performance with performance expectations.
 - b. Machine Target Operational Throughput
 - The actual number of mail pieces that are being run per hour from the time the machine was started until the time the run was ended (includes idle and down time). The target is:
 - o Category 1: 24,000 pieces per hour
 - o Category 2: 26,000 pieces per hour

- o Category 3: 28,000 pieces per hour

C. Measurements and Observations

1. Equipment:
 - a. GPMC and ERM
 - b. Pockets: top is tier #1, bottom is tier #4
 - c. 1226 pie cart
 - d. Step stools
 - e. Tray stand
2. DBCS machine measurements:
 - a. The jogger table is 37 inches high.
 - b. There are up to 288 stack pockets in 4 tiers.
 - c. The aisle is 27 inches wide and 935 inches long for 288 pocket machine. A step can be folded down from the machine. When the step is down, the aisle is 19 inches wide. The step is 13 inches wide and 13 inches high.
 - d. Weights:
 - o Tray Tare: 0.8 pounds
 - o Tray of First Class mail: 15 pounds to 17 pounds
 - o Tray of Standard Third Class mail: up to 25 pounds
3. DBCS machine mail volume:
 - a. The type of mail influences the volume. The size of the letters and the volume of mail directly influence the sort plan. The mail is “cleaner” on the Tour 1.
 - b. The typical volume is 80,000 to 100,000 pieces of mail per shift on Tour 1 and Tour 3.
 - c. Heaviest volume days occur on Wednesday, Thursday, Friday and Sunday on Tour 1 during the first pass with 140,000 to 160,000 pieces of mail per shift.
 - d. The heaviest mail volume may reach 200,000 pieces of mail per shift during holidays (Christmas and Mother’s Day).
4. Musculoskeletal Disorders DART Rates:
MSD Days Away and Restricted Time Rates on the DBCS machines from the OSHA 300 Logs:

Tour/ Year	2005	2006	2007*
Tour 1	4.3	4.2	5.2
Tour 2	0.7	0	0.3
Tour 3	1.0	1.0	0

DART and Severity Rates by Body Part from the OSHA 300 Logs:

DBCS (all tours)	Work Hours	Body Part	MSD DART	MSD Severity Rate
2005	606,681	Low back	2.5	156.3
		Shoulder/neck	1.6	152.0
		Distal Upper Extremity	0.3	1.0
2006	618,602	Low back	1.3	68.5
		Shoulder/neck	1.9	145.5
		Distal Upper Extremity	1.0	9.7
2007	616,764	Low back	2.6	100.2
		Shoulder/neck	2.3	25.3
		Distal Upper Extremity	1.3	96.6

5. Stature:

Feeder:

Some short stature clerks rise up on their tiptoes to lift the tray onto the jogging table. They struggle with the weight of the loaded tray to place onto the jogging table or the jogger shelf.

Sweeper:

Short stature clerks rise up onto their tiptoes to reach the top stacker tier pockets and to place mail into top pie cart drawers.

6. Frequent trunk flexion

Feeder:

The GPMC bottom shelf is about 13 inches high with loaded mail trays stacked on top of each other at approximately 5 inch increments up to 48 inches high.

The 1226 pie cart lower drawers are 37 inches and 27 inches high. The lifts from the lower drawers and from the lower stack of mail trays in the GPMC are made with at least 30° of trunk flexion. Frequent bending also occurs when placing empty trays from the floor into the GPMC. When the jogging shelf is used the shorter stature clerks must reach forward with up to 30° of trunk flexion to place the loaded mail tray onto the shelf or to remove the mail from the tray.

Sweeper:

The third level DBCS tier is 39 inches high, the bottom tier is 27 inches high and the bottom drawers on the 1226 pie cart drawers are 37 inches and 27 inches high. The bottom tier pocket is 20 inches deep. All of the lifts from the pockets and placement into the drawers are made with at least 45° and up to 90° of trunk flexion. Frequent bending occurs while moving mail from the bottom two tiers to the bottom level drawers. All Sweepers stoop to visually verify that two inches of mail is left in the pocket and reach into the lower tier pockets. In addition to the repetitive bending there is prolonged static exertion of the trunk muscles.

7. Shoulder reaching

Feeder:

When the jogging shelf is used the shorter stature clerks must reach forward with up to 90° of shoulder flexion to place the loaded mail tray onto the shelf.

Sweeper:

The top DBCS tier pocket is 63 inches high and the second tier pocket is 51 inches high. The top pie cart drawer is 58.5 inches high and the second drawer is

48 inches high. The top of the 1226 pie cart is 61 inches high with storage of one loaded tray on top of the cart is 66 inches high. The observed sweep method is with the clerk standing with their right side towards the pockets. The clerks work primarily with their dominant right hand to perform the sweeping activities. The duration of exposure to the shoulders postures is dictated by the design of the stack pockets and the drawers of the 1226 pie cart. Whether reaching overhead or away from the body, the shoulders have to support the arm weight and the load in the hand against gravity. This occurs whether the trunk is erect or in a flexed posture. Using this sweep method the right shoulder is held away from the body in a flexed and/or abducted posture:

0° to 45°	16% of the cycle time
46° to 90°	52% of the cycle time
91° to above	30% of the cycle time

The left shoulder is held away from the body in a flexed and/or abducted posture:

0° to 45°	66% of the cycle time
46° to 90°	14% of the cycle time
91° to above	18% of the cycle time

The static loading component from the prolonged contraction of the shoulder muscles vary between the left and right shoulder use. The shoulder postures vary depending on the clerk's stature.

8. Wrist Deviation

Feeder:

The clerk places the mail tray either on the jogging table or on the jogging shelf. There are three techniques to empty the mail tray onto the jogging table. The preferred method by many of the employees is to "flip" the tray. This method requires mid to end range bilateral wrist deviation and requires less manual handling of the mail because the mail is already in proper alignment on the table. This method reportedly can damage the jogging equipment. In the second method, the loaded mail tray is vertically placed on the jogging table emptied leaving the mail vertically standing on the jogging platform. The mail is "rolled" into the feeding position. This method requires wrist flexion to roll the mail into position. The last method requires the clerk to place the mail tray onto the jogging shelf. To remove the mail from the tray, the mail is held between the left and right hands with both wrists hyperextended and deviated. All three of these methods require force to grip the mail and awkward wrist postures to maneuver the mail from the tray to the jogging position.

D. 3-D Biomechanical Analysis – Static Strength Prediction Program

The program estimates the biomechanical static strength capabilities of the clerk in relation to the physical work demands and provides estimates of the compressive force on the low back and the static localized muscle strength. Four different lifting tasks were analyzed. They are:

- lifting the loaded mail tray onto the jogging shelf,
- flipping tray onto jogging table,
- lifting mail from the top tier pocket, and

- lifting mail from the bottom tier pocket.

The analyses are shown in Appendix B.

The following were the estimated compressive forces on the low back:

Object	Estimated Low Back Compressive Force (lbs)
25 pound mail tray onto the jogging shelf	459 lbs
Flipping 25 pounds mail tray	471 lbs
10 pounds of mail from the top tier	254 lbs
10 pounds of mail from the bottom tier	692 lbs

Lifting 10 pounds of mail from the bottom tier pocket is potentially a greater risk for injury to the low back than the other tasks noted.

The National Institute for Occupational Safety and Health (NIOSH) recommends that most workers can tolerate a compressive force of 770 pounds (Waters et al. 1993). A force above 770 pounds is considered unsafe for some workers. The muscle strength model determines the most limiting joint strength which determines the person's whole body strength capability for performing a given task. The following was the percent capable with the shoulder strength necessary to perform the task:

Object	Estimated Shoulder Strength Capable
25 pound mail tray onto the jogging shelf	61%
Flipping 25 pounds mail tray	99%
10 pounds of mail from the top tier	65%
10 pounds of mail from the bottom tier	92%

Lifting a 25 pound loaded mail tray on the jogging shelf is potentially a greater physical strength risk to the shoulders than the other tasks noted.

E. Revised NIOSH Lifting Equation Analysis

A preliminary lifting analysis, using the Revised NIOSH Lifting Equation (Waters et al. 1993, NIOSH 1994), was performed for the sweeping task. Several field studies have shown that the Revised NIOSH Lifting Equation (RNLE) is able to identify jobs associated with a high risk for occupationally related low back pain. A Lifting Index of 1 implies that the job is hazardous to some healthy workers. At a Lifting Index of 3.00 only about 25% of healthy male workers and less than 1% of healthy female workers can perform the job safely. Back injury rates have been shown to increase significantly in populations when the work is performed at LI greater than 1.0 and will continue to increase as the lifting index becomes larger. See Appendix B.

The RNLE is used to evaluate the stress created by performing a single lifting task. This methodology evaluates lifts performed by the sweeper from the DBCS pockets to the pie cart trays. The results for this type of analysis resulted in a Frequency Independent Lifting Index of about 0.2 for all levels, well below the level that should raise concern about back injury for most workers. It must be realized that this result does not factor in the repetitive nature of these tasks and is an indicator only for back stress.

However, the frequency of lifting for sweepers can be significant and as such should be considered. The problem is that the frequency varies depending on a number of factors such as the rotation pattern, the sweeping patterns, the volume of mail, the quality of the mail, time of the run, and mechanical breakdown. Based on the limited video footage that was obtained during the evaluation, it appears that it can range from a low of a few lifts per minute early in the shift up to 13 to 14 lifts per minute when performing final sweep duties at the end of the run. Most workers should be able to perform these lifting tasks safely at the lower levels of 2 to 3 lifts per minute. But, according to the lifting equation few if any workers could safely perform this task at the faster rates observed during the final sweep.

Additionally, only the sweeper task was evaluated even though there is some lifting associated with the feeder task. This portion of the work pattern should also be considered since it is part of the DBCS rotation.

F. The Strain Index

The Strain Index (SI) is a semi-quantitative job analysis tool used to determine the magnitude of risk for developing distal upper extremity musculoskeletal disorders primarily those associated with the muscle-tendon unit and carpal tunnel syndrome (Moore et al, 1995). The analyses are shown in Appendix B.

The three different methods for removing the mail from the trays were analyzed. These included “flipping” the letters out of the tray onto the jogging table, “rolling” the letters out of the mail tray, and manually lifting the letters from the mail tray on the jogging shelf. The analysis used estimates of the exertion required to move the letters and considered wrist postures. The results are:

Flipping mail	SI = 3.3 to 4.5 depending on posture used
Rolling mail	SI = 1.1
From jogging shelf	SI = 4.5

A SI of 5 distinguishes between safe and hazardous jobs. SI = 3 is almost surely safe, and SI = 7 is almost surely hazardous. The index is especially sensitive to intensity of exertion.

This suggests that the force required to grasp the letters, the wrist postures and the rest and recovery time potentially reduce the risk for injury to the hand and wrist .

G. Recommendations:

Both the Feeder and Sweeper tasks may create some degree of musculoskeletal hazard to the clerks performing the task. Physical risks appear to be to the shoulder, back, and wrist. The following are some recommendations to mitigate the hazards.

1. Feeder methods for removing mail from the mail trays:
 - a. Consider using the “rolling” method to transfer mail from the trays onto the jogging table.
 - b. If a neutral wrist posture can be consistently used, “Flipping” may be appropriate for some employees. In determining if this method would be effective, it would be necessary to determine if the jogging equipment could withstand repeated jarring.
 - c. Use the current jogging shelf for storage only.
 - d. Present mail to the feeder station on a height adjustable false bottom in a GPMC, ERMC, cart or container to minimize the need for low level lifting. If the Feeder position is to be used to effectively provide rest and recovery time within the rotation pattern, it is critical to ensure that all precautions are taken to reduce the frequency of low level lifting or extended reaching.
2. Sweeper methods for removing mail from the stack pockets:
 - a. Alternate body postures when sweeping the mail:
 1. Change the sweeping pattern
 2. Consider sweeping alternating right hand sweep versus left hand sweep
 3. Consider taller stature workers to sweep the top level tiers and the shorter stature workers to sweep the bottom level tiers.
3. Rotation:
 - a. To reduce the risk present to the lower back and to the shoulders, adhere to the established 30 minute rotation schedule between the Sweeper and the Feeder as recommended in the DBCS/DPS Methods and Support Equipment Guide. Additional ergonomic studies may reveal other appropriate rotation schedules and sweeping methods.
 - b. Studies should be conducted to determine the duration that the clerk can spend on higher volume machines.
 - c. The final sweep appears to be the critical period from a frequency standpoint. If other workers in the area are at a point where they can assist, this could reduce the frequency of lifting.
 - d. Alternate body postures when sweeping the mail:
 - Change the sweeping pattern
 - Consider sweeping alternating right hand sweep versus left hand sweep
 - Consider taller stature workers to sweep the top level tiers and the shorter stature workers to sweep the bottom level tiers
4. Stacking mail trays on the 1226 Pie Carts:
 - a. Enlist the ERRP committee to conduct an ergonomic assessment to determine why the practice of stacking the loaded trays on top of the pie carts over two high

occurs. Develop administrative control methods to avoid this practice and provide viable alternatives to avoid stacking loaded mail trays over two high on top of the 1226 pie cart.

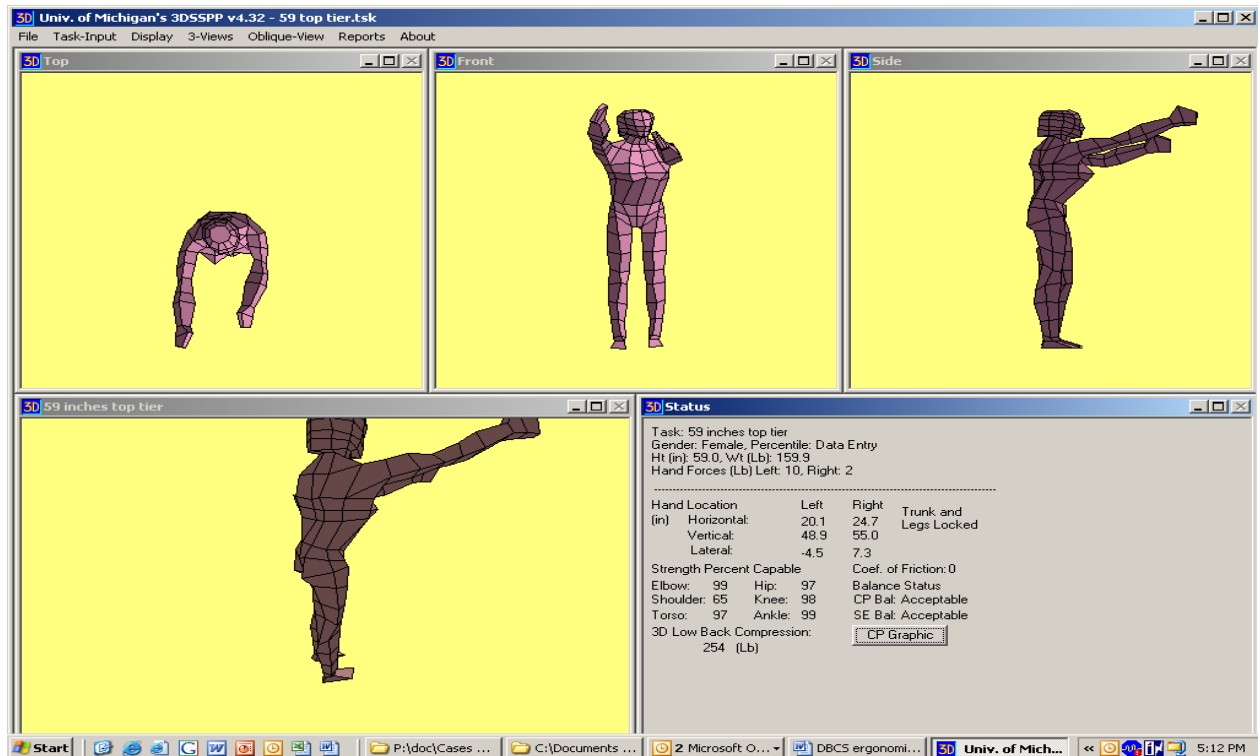
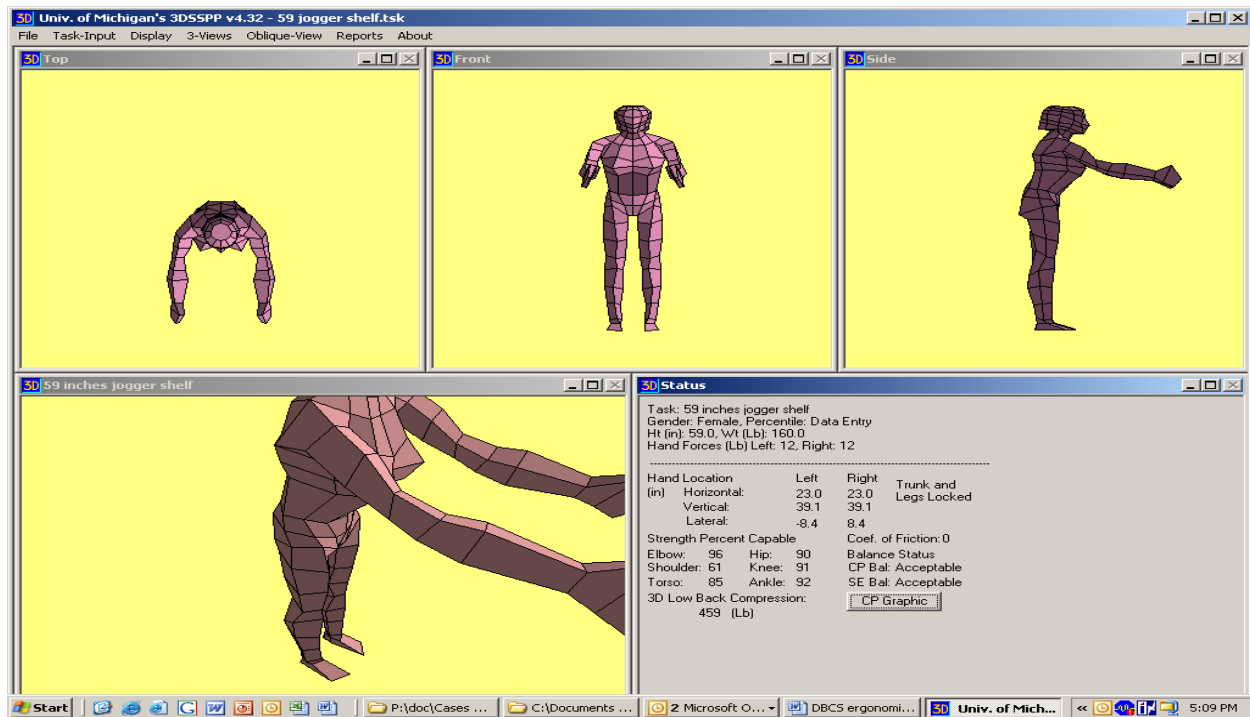
5. General Suggestions:

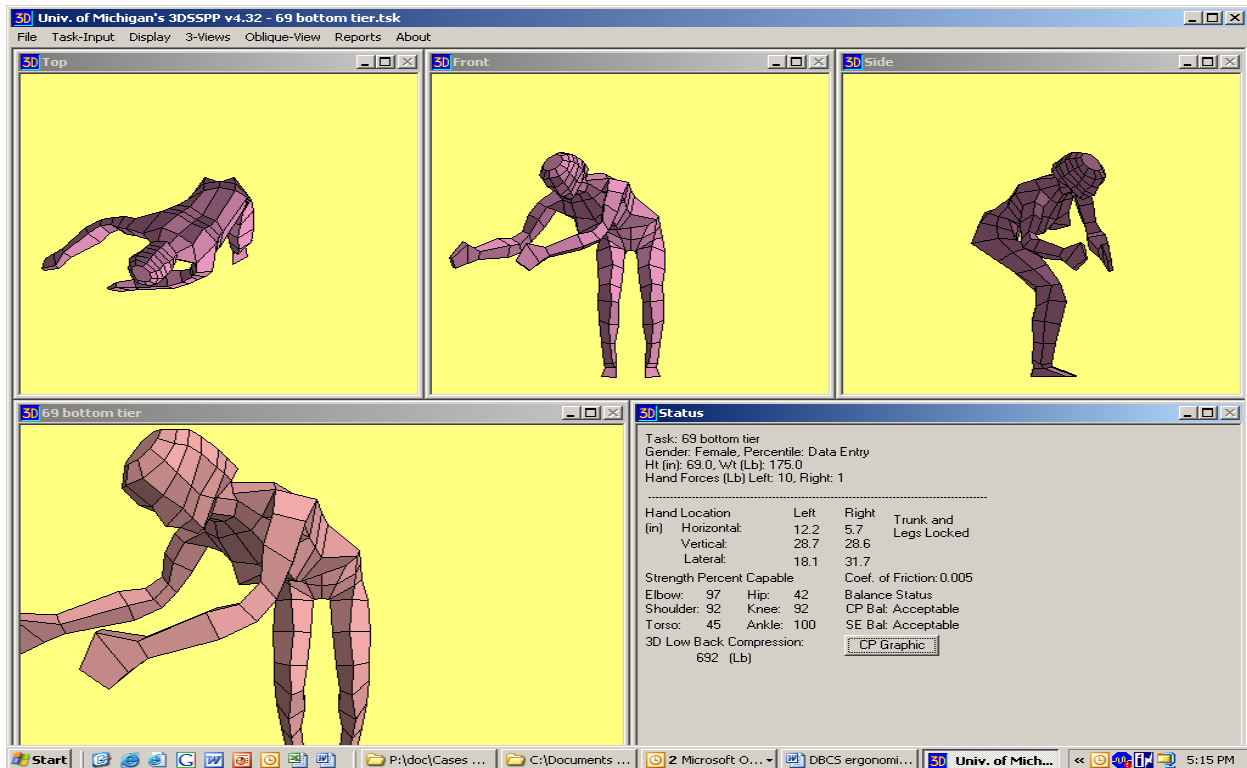
a. Share lessons learned and seek input from other ERRP committees for suggestions and implementation options for engineering controls, administrative, work method controls. Continue to send suggestions to the appropriate engineering, design, or safety and health staff for consideration in future designs, modifications, or decision making activities.

b. To determine the full extent of the musculoskeletal injuries occurring at the Sweeper and Feeder tasks on the DBCS machines, an evaluation of the Feeder and Sweeper tasks should be considered. This evaluation should assess these tasks on different DBCS machines and different tours to determine potential physical hazards due to static and dynamic postures, force, frequency, and duration risks present during various rotation schedules, sweeping patterns, mail volume, mail categories, run time, machine through-put and performance expectations. This evaluation should include employee anthropometrics, employee work methods and operation methodology:

- Explore a method that would allow mail to be moved from the mail tray to the jogger without manually lifting it.
- Continue to assess the method for visual verification and reaching into the rear of the pockets.
- Continue to refine cost analysis data of DBCS musculoskeletal injuries.

Appendix B





RNGP -- Job Analysis

Revised NIOSH Guide Program for Manual Lifting

Analysis of Entire Job

Analyst: Dana Root
JOB: Sweeping
Duration: 3 Hours 0 Minutes

Composite Recommended Weight Limit (CRWL) 0.0 lbs
Composite Lifting Index (CLI) 100.00
Recommended Rest Allowances 0 min

Estimated percent capable population:
 Female = 1% Capable
 Male = 1% Capable

Help
Print
Edit Job

Task		Frequency Independent (Origin)	Single Task (Origin)	Frequency Independent (Destination)	Single Task (Destination)
Top Tier	LI	0.22	0.21	0.22	0.21
Second Tier	RWL	40.7	19.5	41.6	19.9
	LI	0.20	0.21	0.19	0.20
Third Tier	RWL	45.1	22.5	46.0	23.0
	LI	0.18	0.18	0.17	0.17
Bottom Tier	RWL	37.4	16.8	46.1	20.7
	LI	0.21	0.24	0.17	0.19

Employee Name: Sweeper

Dept./Position/Location: USPS Denver P & DC

Analyst Name: DR

Date: 11/01/2007

Shift/Hours: 10:00 to 06:30am

Exposed: 160

Strain Index (SI) Internal Job Hazard Analysis (JHA)

Task	Task Description	Exertions								Hours per Day	T S I	IM	EM	DM	PM	SM	HM
		Intensity of Exertion		Per minute	%Duration of Exertion	Posture		Speed									
1	Flipping mail out of tray onto jogger platform	Moderate	▼	2	20	Bad	▼	Fair	▼	3	4.5	6	.5	1	2	1	.75
2	Flipping mail out of tray onto jogger platform	Moderate	▼	2	20	Fair	▼	Fair	▼	3	3.38	6	.5	1	1.5	1	.75
3	Rolling mail out of tray onto jogger platform	Light	▼	4	20	Fair	▼	Fair	▼	3	1.13	1	1	1	1.5	1	.75
4	Placing tray of letters onto jogging shelf	Moderate	▼	3	20	Bad	▼	Fair	▼	3	4.5	6	.5	1	2	1	.75

file: USPS Denver Apr 15, 2008