Safety and Health Investment Projects (SHiP) Grant
for
The Timberland Regional Library (TRL) Courier Department

Final Report:

Date: February 6, 2014

Background:

Until recently, the concept of ergonomics has been not been a large part of any planning process for the TRL Courier Department. The TRL Courier Department is the department responsible for delivery and return of materials to a centralized sorting area. TRL's service area is over 7,000 square miles, with 27 libraries and 1.3 million items. The value of one shared collection by 27 different community libraries is dependent on the courier and central sorting functions. Those functions require force, prolonged sitting, awkward postures, gripping as well as a combination of all the above.

The physical processes and the environment that the Courier Department and sorting functions exist in had not been examined for decades. The limits were due mostly to incorrect assumptions similar to "ergonomic improvements require a lot of money" or that "they would slow down the delivery of materials to patrons" or even possibly "cost jobs" or being unaware of the developing technology or the overwhelming thought of where to start.

In January 2010, TRL Training Specialist, Nancy Schutz requested an Ergonomics Evaluation by the Department of Labor and Industries (L&I) for the Courier Department and sorting functions. We were uncertain as to what to expect from an Ergonomics Evaluation but found afterwards that the report was extremely helpful for developing a strategy to improvement. The Ergonomics Evaluation was conducted by Claudia Kelley, Ergonomist, Keld235@lni.wa.gov. She annotated in her report:

- "The Courier pick-up area is inaccessible to hand truck in some locations. Couriers must bend, reach, slide and lift the boxes to get them out of the cubbies or from under shelves, off shelving unit bases and onto the hand truck. Extra handling and awkward postures increase the risk of injury."

Another risk factor was identified specifically with the couriers:

- "Lifting 30 to 35 lb. boxes of books from below mid-shim height into the van. This awkward lift places stress on the low back due to bending or squatting. Boxes are handled 400 to 700 times and although not all are lifted from the floor or ground level, the numbers of lifts is high."

Risk factors were also identified affecting our sorters:

- "Bending over a stack of boxes or cart to sort can stress the lower back. Bending and squatting to lifting a 35 lb. box of books from the floor to a cart or the table. This awkward lift can stress the low back, hand, wrists and arm."

Other minor risk factors were identified and quickly corrected by incorporating the use of a cart, proper lifting techniques, and the use of both hands instead of one, etc.

The evaluation also noted that many risk factors in library systems are inherent to the job and can't be eliminated or even significantly reduced. It helps to start by looking at the worst incidences of the risk factors, and then decide how best to modify them. It's also important to identify system wide contributors that make the tasks more difficult and therefore, more risky.

The report was an extremely helpful first step. It provided an approach for identifying risk factors and for evaluating what opportunities are available to reduce those risk factors. It also gave us the focus for looking at those factors in a global sense, or for discovering system wide contributors. Most important it started us thinking, talking, and sharing ideas as a group. We were excited and eager but we still needed guidance to maintain effective progress.

The SHiP Grant was identified as an opportunity to work towards accomplishing the objective of reducing risk factors noted in the Ergonomics Evaluation. We submitted a project description and work plan that centered on the major milestones for constructing new shelving, implementing new boxes, and utilizing lifting equipment. In addition, we wished to review the feasibility of vans with liftgates. Initially, the SHiP Grant was thought to be a source of funding for ergonomic improvements for a pre-determined project. The result was an opportunity to learn more about ergonomic tools, resources, and theories, and the need to include ergonomic elements into our daily discussions.

SHiP Grant Project Major Milestones:

Shelving:

The old shelving was constructed over 30 years ago and assembled with a mis-matched combination of wood and metal materials. The nature of the configuration required couriers to bend, twist, pull, and drop the stack of boxes on the floor from the raised base of the shelving; a movement that was identified as a serious risk factor for injury.

New Shelving was identified and (Global Equipment Company, www.globalindustrial.com) provided by the SHiP grant to eliminate the awkward bending/twisting/pulling movements noted in the original Ergonomics Evaluation. The bottom base of the shelf was removed, allowing the boxes to be stacked directly on the floor. This allowed the boxes to be placed 90 degrees from the previous configuration so the couriers could tip the boxes to slide the hand truck under the boxes, then tip back to remove them from the shelving all without bending or pulling.

The mid shelf used for storage on the old shelving was too low: it posed potential for head injury to staff members when bending and lifting to and from the boxes. The mid-level shelf was raised to a height above the head on the new shelving. This eliminated the risk of head injury to sorters and couriers.

An old, unsecured metal cabinet was used in conjunction with the old shelving for the storage of vehicle maintenance records and courier clipboards, which entailed another unnecessary bending motion. The old cabinet was declared surplus. Now, attached to the side of the new shelving is a double door (secured with a combination lock) wooden cabinet with access to the clipboards at waist-to-shoulder height. The maintenance records are now placed in a clear plastic holder at shoulder height, also attached to the side of the new shelving. Besides the benefit of minimizing bending risk factors, the new configuration also freed up some valuable floor space that was originally wasted by the old metal file cabinet.

During the construction phase, structural supports were necessary for attaching the shelving to the wall; insulation and paneling were also part of the preparation. Overall, the new shelving is a success.

One undesirable bending motion still exists with the new shelving; since boxes with hand truck access on bottom are not available, a bend is still required on low stacks to tip the boxes back towards the hand truck. Rick Goggins, WA LNI Ergonomist, suggested placing risers on the floor, lifting the boxes off the floor which to allow a hand truck room to slide under the box, thus preventing the courier from bending to tip small stacks. However, the amount of space from the base of the hand truck to the edge of the box is too narrow for risers to support the stack of boxes.

Lift Carts:

The former method for sorting required either sorting from the stack of boxes on the floor, which required a bending motion each time the material was below waist level, or by bending over to lift the entire box and place it on the table for sorting (up to 100 times within a 4 hour period). Inevitably, both methods required the sorters to bend over to the floor. Two new lift carts (Beacon Industries Inc., www.beacontechnology.com) identified in the grant eliminated the need for sorters to bend to the floor and sort from each box

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The HYDRA-2 model enables the sorters to consistently sort from the boxes at waist height, their “power zone” or at any desirable height.

This is accomplished by pumping the hydraulic cylinder with one's foot.

One drawback of the lift cart is that the cart is too cumbersome to slide under a stack of boxes, so a stack of boxes must be transported with a hand truck and placed onto the lift cart. The sorters created three methods of sorting books from the lift cart: 1.) from the lift cart to stacks on the tables, then carried to the outbound boxes; 2.) from the lift carts to boxes on the tables, then the box is carried to the outbound section when full; or 3.) from the lift cart directly to the outbound boxes. The methods of building stacks on the table or sorting to boxes on the table is limited due to the limited space of the tables and work area. The sorters are given the flexibility to use the sorting method that works fastest for them.

Lift Gates:

A one piece lift gate, which did not require physical handling, was not available in the size of vehicle we desired, so a two piece fold out type of lift gate on a larger vehicle was tested. The obvious disadvantage of this type was the need to bend and unfold the lift gate before loading and bending again to fold the lift gate when finished. Our busiest route has 13 service points; thus requiring 26 bending and folding motions with the two piece lift gate.

Even with the two piece lift gate, the advantage was evident; bending to lift boxes in and out of the vehicles was no longer required. Stacks of boxes were easily moved in and out of the vehicle with a hand truck. Up to 400 bends and lifts on the busiest route for just one day are eliminated with a lift gate, and up to 1300 per week for each of the six couriers.

The use of a lift gate would have the most positive impact on reducing the risk factors of potential back injury. Considering the cost of equipping the TRL fleet, a smaller box van with a ramp would provide the same benefit as the vehicle rented for the test; this would be more practical for parking in narrow stalls and under covered parking areas.

Boxes:

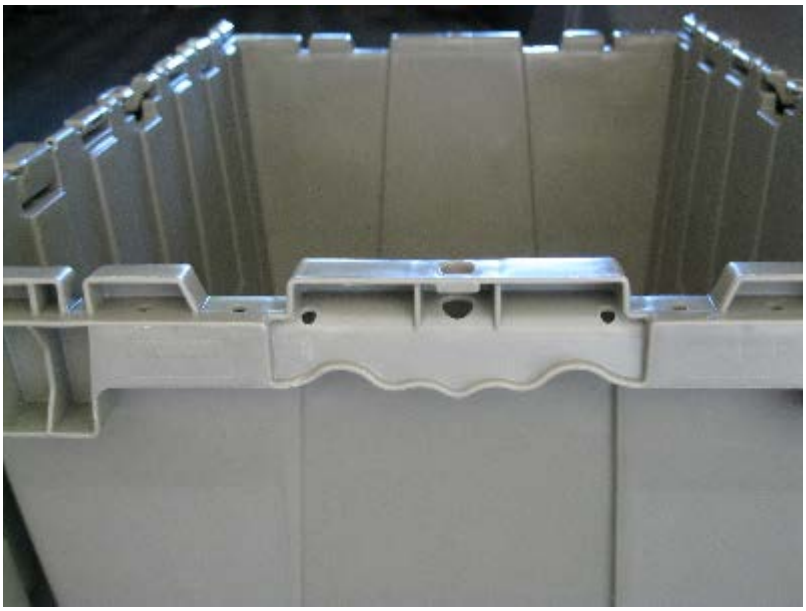
Two basic methods for loading transport vehicles were considered while testing new boxes: 1.) TRL continues with the current method of loading vans by bending and lifting, or 2.) TRL changes to a vehicle equipped with a lift gate or ramp. An additional consideration was the ergonomic benefit and practicability of the boxes themselves. The global requirement for consideration that at some point the boxes will be handled by staff at the libraries and the Service Center.

Several types of boxes were tested. All of the boxes with lids had low nubs molded into the top of the lid to help interlock the boxes when they were stacked. This feature was helpful for tilting and moving

the stacks with a hand truck and also reduced the height which the couriers needed to lift the boxes when lifting and sliding a box over other boxes. The lids were hinged, so stacking empty boxes for storage could be accomplished with the lids opened.

However, the handles were a major drawback with each of the lid type of boxes. Some of the handles were straight and caused notable strain on the fingers.

Others were apparently formed to fit the hands ergonomically with curves.

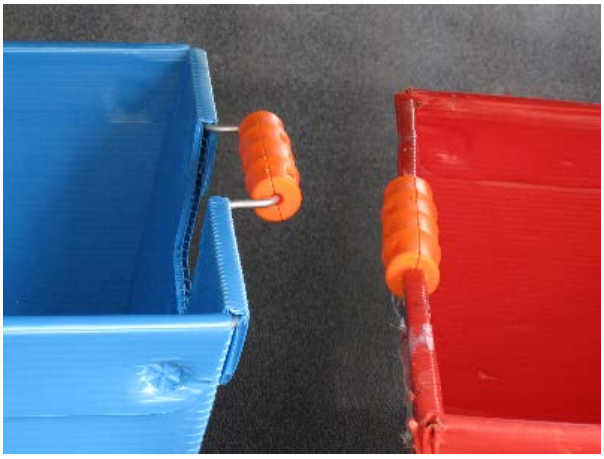


None of the boxes with lids were actually usable for daily lifting. All of the handles were more narrow and edgy than our current boxes; a potential for stress and injury to the wrist and fingers.

A few boxes without lids were also tested. They provided a better handle than the lid type boxes and were easily slid over other boxes while moving them in the vehicle. However, they had some drawbacks as well. These types of boxes could not be nested into each other; they require mating of the tops to the bottoms in order to stack. This created a storage problem when the boxes were empty and actually limited the amount of material that could be loaded in the vans due to the fact that boxes are not always fully loaded when picked-up at the branches. Both of the boxes tested had open, corrugated sides that could potentially damage the corners of books. One particular box was collapsible; good for storage and stacking when empty, but it created a potential for pinching the hands when folding them closed.

With the exception of the handles, the current boxes utilized by TRL worked fine for loading with a lift gate/ramp and with our current configuration of lifting them into the vans. With this in mind, we tested the current boxes with larger handles that were considered to be a better model for addressing our more pressing ergonomic issue.

The handles themselves were well received by most everyone. The handles were placed in-line with the frames, but proved to be difficult to grasp when lifting small stacks of boxes that were partially full. Extending the handles outward corrected the issue of grabbing the larger handles; however, they were extended too far for placing the boxes in the outbound stalls at the Service Center. The vendor could not create a smaller bend in the frame to bring the handles closer to the sides of the box, but they created a solution to raise the handle slightly, which brought them in closer to the box. The raised handle type of box does have a drawback: it increases the height in which the box must be lifted over top of another by approximately an inch. But, it balances the ergonomics, grabbing, placement, and storage issues.



Project Assessment:

1. Who was your target audience? Who did you intend to serve and who did you end up serving as a result of your project?

After review of the original project outline, our target audience was a very specific sub-group of employees at Timberland Regional Library; we meant to improve the working conditions for the Couriers and Sorters at the central administrative center by concentrating on reducing awkward lifts and pulls, and repetitive motions. Included in the original project for objectives were improved shelving, lift equipment, mini-pallets and a sampling of new boxes to test.

We were focused on the most obvious physical indicators for improvement: the shelving and getting the boxes into the employee power zone, the area of a person's body between mid-thigh and a few inches below shoulder height, and close to the body.

As discussion and evaluation of those specific improvements evolved, more information was gathered and additional products were reviewed but we became overwhelmed. The intent of the project's original design seemed to fall off target and some aspects seemed wasteful. Re-evaluating the purpose of the project with Grant Manager, Anar Imin, and WA LNI Ergonomist, Rick Goggins, who were extremely valuable for support and feedback, provided re-renewed focus. Eventually, we kept to the project's overall purpose and achieved outcomes in alignment with those purposes.

The results of the project had tremendous impacts on the daily routines of our target audience but we were also able to incorporate global impacts throughout our service district. The shelving was designed for specific needs of the Couriers but is more useful for the Sorters as well. In addition, we were able to install insulation so that the work area is warmer in the winter and cooler in the summer. The new boxes were designed to eliminate the bladed handle with a rounded handle that has impacted all staff. We are now reviewing the individual libraries and modifying their holds/pick-up areas with pull-out shelving that is closer to being within a standard power zone by utilizing glides. Here is a recent example:

2. What outcomes were you trying to achieve for your target population?

As we approached the project, the original idea was to achieve specific physical outcomes by reducing the number of awkward lifts and pulls for our target population. We feel like we achieved those physical results but we also gained a knowledge base and appreciation for the impacts ergonomic improvements make to our daily routines. Ergonomic gains are an important topic to include in our work daily work conversations.

With the new shelving, a great number of the awkward reach and pull movements have been eliminated for our Couriers. Those awkward movements numbered in the 100's each day. With the lift equipment, the Sorters are now sorting from their power zone and not having to do the multiple bends to reach a box on the floor in order to sort on a table. We also increased the work space for sorting allowing them to sort directly into boxes. And, with the new box handles, we have eliminated the blades that were causing repetitive stress injuries with use. The rounded handles displace the impact force with use instead or throughout the hand.

The unexpected impact has been the knowledge gained and the open discussions that have evolved and recognition for the need to include these types of conversations in ongoing conversations. The SHiP Grant was special for us because it involved better staff cohesion with really good conversations about the workplace and teamwork. It will also help us into the future in order to evaluate processes for simple changes that are healthier for our staff.

3. How did you measure whether you'd achieved these outcomes?

We utilized multiple tools to determine the effectiveness of the project and ways to measure the changes the project is supposed to effect.

The effectiveness of the project was enhanced by incorporating recommendations in a 2010 Ergonomics Report produced by Claudia Kelley, WA LNI Ergonomist, after an audit at our central facility. Also, Rick Goggins, WA LNI Ergonomist, accompanied us on a best practices visit to other library districts which included: Sno-Isle, King County, Seattle Public, and Pierce County. The outbound and inbound sections were evaluated for shelving, totes, vehicles, and lift equipment. We also had the opportunity to talk with the managers for each district. Advantages, disadvantages, and financial feasibility for TRL were noted at each location. This visit also enabled to discuss the project with Rick Goggins in more depth, which was key for the project's success.

Once the project was outlined, we focused on the specific movements that we were trying to reduce. We did a sampling count of those movements before environmental changes were instituted and then after the changes. In addition, we shared observations and opinions regarding techniques from each Courier and Sorter. We also went as far as to measure the specific distance for each individual's power zone to match up with the new equipment.

Counting the amount of lifts was an important feature to this project. It provided the empirical input to determine success of the project. It also helped our Couriers understand specifically what we were

trying to accomplish and why we were trying to eliminate those awkward movements. It gained understanding and buy-in for the project from those it was intended to affect most.

4. What data did you collect and how did you collect it?

Frank Flores, the Project Manager, defined the specific lifts and movements that each Courier was to compile. The measurement period before the project implementation was performed over a standard workday. The workdays do not often vary, so it was felt that a standard day would be an adequate sample to extrapolate data.

There was also a qualitative aspect to the evaluation. We wanted to know how the drivers felt before and after the project implementation. Interviews were conducted before and after.

We eliminated 126 daily bends coupled with pulling and pushing movements by making the shelving area more accessible to a hand truck. We eliminated 378 daily gripping by the Couriers using bladed handles on boxes, in addition throughout the service district. We were able to include insulation to the work room as an added element to the shelving. We eliminated 280 daily bends and lifts by the sorters.

Our focus was directly on eliminating those movements described above, but the qualitative aspects were interesting. It wasn't until the project become tangible that the target audience became active agents. And, after the project's implementation, they felt physically better after a week of working. This physical affect has impacted conversation in a more positive direction and made the target members more active participants with additional improvements that we are examining currently.

5. How did you use the results?

The empirical results were somewhat anticipated. It was obvious that the design for the work space was creating issues as pointed out in the Ergonomics Report and the impact of a thoughtful re-design would benefit those results. However, the results helped to quantify the overall purpose for the project and provided the Target Audience the information to process the intended impact on them.

The Target Audience were concerned after the best practices tour of other districts that this was a project looking for efficiencies and job elimination. And, change is always difficult. But, after reviewing the results and talking with each member it was more apparent that efficient body movement was more the purpose.

Once that conclusion was reached, each member of the Target Audience felt free to broaden the conversation and examine other elements of their position. The results have led to the interjection of ergonomics into our primary focus and conversation.

6. What were you performance targets?

The elimination of those direct physical movements was our primary focus. We feel like the specific level of reduced forced movements was attained. Those changes also impacted 100% of our Target Audience and included more beneficiaries throughout our service area.

Entering the project we hoped to achieve even more gains with our performance targets but some ideas created side effects that could not be avoided. For instance, the mini-pallets would have avoided the need for our Couriers to reach and bend the boxes in order to slip a hand truck under. However, the mini-pallets would have required another bend, lift and carry action. The ergonomic cost/benefit evaluation was discussed and it was decided not to use that tool.

A progress indicator that was unexpected was the level of staff satisfaction with participating in the project. The buy-in was not immediately attained but after the results and intentions were understood it became easier for the Target Audience to become an active participant.

Summary:

The Shelving section of the grant was very successful; the new shelving eliminated the bending/twisting/pulling risk factor created by the old shelving and file cabinet. The placement of boxes to allow access for hand trucks at the individual branches would further reduce the risk of injury. The implementation of Lift Carts was very beneficial; they eliminated bending down to each incoming box. If space permitted, we would purchase another cart and establish one cart per work area. We are currently sharing the two carts for three work areas. The Lift Gate portion of the grant proved to offer the greatest potential benefit to the couriers, hundreds of bending motions could be eliminated for couriers on a daily basis. Further research and testing of vehicles configured with a lift gate or ramp should be conducted to ensure the rig is conducive to TRL's needs before committing to a purchase. The search for the perfect Box was not as successful as the other portions of the grant. Completely satisfying the storage, bending, lifting, ergonomics, and placement issues with one type of box were not achieved. Designing and manufacturing a box tailored to our exact requirements would be very expensive; however, the box we purchased meets our basic needs.

Overall, the grant project was successful, not only within the parameters of the grant, but it also created a learning process, reinforced team building, and in the end, established a more professional and pleasant work atmosphere.

Finally, we could not have achieved any level of success if it had not been for the guidance received from WA LNI Ergonomists Rick Goggins and Claudia Kelley and WA LNI Grant Manager, Anar Imin. Safety and health improvement projects come with caveats and without expert help and guidance, the most well intentioned projects can cause the worst un-intended consequences. The patience displayed and direction provided by each was enormous and we owe everything to them for the project's success.

Additional acknowledgements:

Several people provided valuable input during the SHIP grant process; a grant project would not have been possible without the following people: Ted Nash considered the operational needs of the Courier Department during the shelving phase; Flo Phelps and Monica Dalton conducted careful research to purchase lift carts; Linda Castas diligently researched vendors for boxes and file holders; and Frank Flores served as the Project Manager, completing reports, ensuring the financial side was in order, and coordinating the project.