ERGONOMICS DEMONSTRATION PROJECT

Spilker Masonry

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Department of LABOR AND INDUSTRIES

SPILKER MASONRY DEMONSTRATION PROJECT

Masonry workers in Washington State have had a high rate of Work-Related Musculoskeletal Disorders (WMSDs). An ergonomic demonstration project was initiated by Spilker Masonry located in Spokane, WA during the fall of 2001, with the goal of identifying technically feasible controls for the industry to help address WMSD hazards.

Not all jobs in the company were evaluated. The business focused on identifying controls for two tasks where they were aware of a high rate of injury. The first task was scaffold building by hodcarriers and the second was laying 12-inch block by bricklayers. The two specific potential controls were:

1) Using hydraulic powered tower scaffolding vs. the manual crank tower scaffolding or the standard welded tubular frame scaffolding.
2) Evaluating two employees laying l2-inch blocks together rather than one employee performing the job alone.

In addition to looking at risk factors related to the ergonomics rule, the production levels and injuries incurred were tracked. The project team included Spokane Labor And Industries staff and representatives from Spilker Masonry. The team's focus was to develop examples that could be used to meet the requirements of the proposed rule. Three employees were involved in evaluating the tasks and the injuries that were incurred among the workers.

Specifically the goals were:

- *Demonstrate that the company can identify specific risk factors and hazards related to the ergonomics rule.*
- *Evaluate injuries and production issues when working with the different types of scaffolding being used in the masonry business.*
- *Evaluate production issues with employees using two-handed (two-person) block laying for l2 inch-wide concrete blocks vs. one-handed (one-person) block laying.*
- *Identify ways to reduce or eliminate typical hazards related to scaffolding erection and laying 12-inch block.*

SCAFFOLDING:

Three types of scaffolding were evaluated with the purpose of determining the change in productivity and incidence of injury incurred with the different methods. The scaffolding was evaluated after it was installed. Initial installation of the scaffolding required that workers lift heavy frames, planks, ladder frames, etc. when off loading and when disassembling them. Since each of the three types of scaffolding required lifting of frames and walking planks or platforms during unloading and assembly, the evaluation focused primarily on differences in scaffold use once erected. Injuries that were tracked were related to the raising and lowering of the different types of scaffolding.

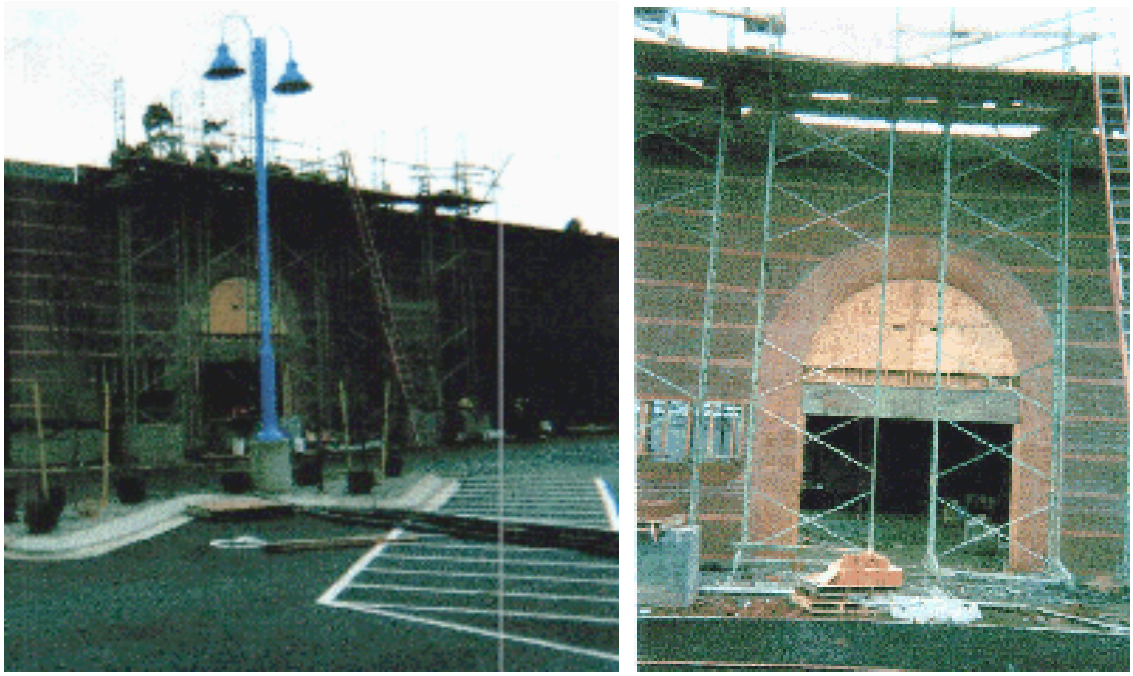
Comparison of scaffold erection and height adjustment

Type of scaffolding	**Tasks during erection**	**Tasks when changing height**
Welded tubular frame (standard)	1. Unloaded from truck 2. Built level by level as the job progresses 3. Planks are raised to intermediate levels on each frame, or possibly only to the top of each frame level	Hodcarriers raise planks manually and build additional levels manually
Manual Crank Tower Scaffolding (Non-Stop)	1. Unloaded from trucks 2. Assembled on ground 3. Raised with crane	Hodcarrier hand cranks (at each of several vertical trusses) raising the single wooden plank walkway (moves between cranks to move each a little at a time when raising the overall plank walkway)
Hydraulic powered tower scaffolding	1. Unloaded from trucks 2. Assembled on ground 3. Raised with crane	Hodcarrier operates powered mechanism to raise walkway

- Welded tubular frame scaffolding: This type of scaffolding is still the norm in most construction work, and can be used in tight places where tower scaffolding will not fit. Standard frames are carried to location and safety rails, foot planks cross braces are added as the work continues. This type of scaffolding requires constant building and employees need to lift the walking foot planks as the wall gains in height.

Welded tubular frame scaffolding

- Manual Crank Tower Scaffolding (*Non-Stop*): This scaffolding keeps the employee at optimum laying height, avoiding low back injury caused by continuously bending, and it avoids head injury caused from falling objects (standard scaffolding requires constant building and stocking above the bricklayers to keep ahead). The scaffolding is self-contained once it is assembled, since guardrails are installed at ground level. An additional risk factor introduced when using the manual crank tower scaffolding is the repetitive motion when cranking.



Two examples of the manual crank tower scaffolding (Non-Stop)

- Hydraulic powered tower scaffolding (*Hydro-Mobile*): This scaffolding is similar to the manual crank tower scaffolding, with the difference being that the manual cranking is eliminated. Scaffolding is raised hydraulically. There were no risk factors observed during use.

Hydraulic powered tower scaffolding (Hydro mobile)

This project compared hydraulic powered tower scaffolding to standard steel tube frame scaffolding to see if it reduces risk factors. Manual crank tower scaffolding was not considered after the initial evaluation, since its operation was very similar to the powered tower scaffolding, but it had the additional risk factor of repetitive motions when using the hand crank. In addition to risk factors, the project tracked differences in injuries and productivity.

Four jobs in 2002 were tracked using the hydraulic powered tower (*Hydro-Mobile)* scaffolding. Spilker evaluated risk factors related to the ergonomics rule, and tracked near-miss incidents while building and working on scaffolding, injuries, scaffold safety violations, and production when working on both powered tower and standard scaffolding.

Evaluation results for powered tower scaffolding

Ergonomics rule-related benefits:

- Hydraulic powered tower scaffolding eliminates manual cranking and it keeps the bricklayer at optimum laying height. For example, most of the work is at waist height, which results in minimal bending or reaching above the shoulders.
- Hydraulic powered tower scaffolding is gas powered. Therefore, there is no manual cranking or building of scaffold above the ground. This results in fewer problems with awkward body postures, high hand force and repetitive motion required when using the non-powered scaffolding.
- The stocked material is elevated so that the bricklayer does not have to bend down to pick it up. This reduces awkward body postures, such as working with the back bent greater than 30 degrees.

Safety and health benefits:

- Hydraulic powered tower scaffolding is assembled on the ground, which reduces fall hazards.
- There were no injuries related to the use of hydraulic powered tower scaffolding in the year 200l and for the first 6 months of 2002 and during the comparison-tracking period. However, there were also no injuries related to standard steel tube frame scaffolding during the same time period.

Productivity benefits:

- There was an increased production rate of 20% while using the hydraulic powered tower scaffolding.

LAYING 12-INCH CONCRETE MASONRY UNITS (CMU)

The standard way to lay l2-inch Concrete Masonry Units (CMUs), which weigh 65 pounds, is when one employee lifts the unit from the scaffolding, mortars the head joints and then places the block on the wall with one hand. In the years 2000 and 2001 there were also three low back injuries related to laying 12-inch block, but none of these injuries occurred on the two jobs where the employees "doubled up." Spilker Masonry tracked risk factors, low back injuries, muscle strains and sprains along with production on two jobs that used 12-inch units from January through May 2002.

Eight masonry projects were tracked in 2002, two of which involved employees laying the l2-inch block. On both of these projects, two employees "doubled up" on the l2-inch block.

Evaluation results for two-employee lifting of 12-inch block

Ergonomics rule-related benefits:

- With two employees lifting the block, the weight lifted per employee was cut in half.
- The employees did prefer to "double up" because of less stress on their backs and arms.

Safety and health benefits:

- There were no injuries in 2002 from laying l2-inch masonry units using the two-employee method.

Productivity effects:

- The production rate was lower by approximately 30% when using the 2 employees vs. 1 employee laying 12-inch blocks.
- Spilker Masonry felt that keeping the employees safe and healthy would be the #1 priority over production.

OVERALL PROJECT CONCLUSIONS

Spilker Masonry determined that the use of the hydraulic powered scaffolding resulted in reduced exposure to risk factors (potential WMSD hazards) such as awkward postures, high hand force and repetitive motion. Other potential risk factors that would also be reduced include lifting (heavy, frequent and awkward), which would be required when building the standard steel tube frame scaffolding. The hydraulic powered scaffolding was also safer to use and resulted in 20% higher production.

When using two employee ("doubling-up") block laying methods, the potential risks to employees, which included lifting and high hand force, were reduced. However, production was also reduced by 30%. It is hoped that once employees become accustomed to working with the "doubling-up" method that production would increase.

For more details on WMSD hazards and potential solutions in masonry work, please see the Masonry Industry Ergonomics Demonstration Report: http://www.lni.wa.gov/wisha/ergo/demofnl/masonry_update.pdf.