



Ergonomics Best Practices for the Construction Industry

Many of the injuries in the construction sector are musculoskeletal disorders caused by cumulative trauma. We call these injuries that result from cumulative wear and tear cumulative trauma disorders (CTDs). Back injuries, tendinitis and carpal tunnel syndrome are examples of common CTDs. Workplace risk factors for CTDs include repetitive motions, high forces, awkward postures and vibration exposure. CTDs in the construction industry can be associated with such activities as manual material handling, hand tool usage, awkward postures and prolonged equipment operation.

The ergonomics process

One effective way to reduce the risk of CTDs such as carpal tunnel syndrome and back injuries is to establish an ergonomics process. You should not regard ergonomics processes as separate from those intended to address other workplace hazards. Use the same approaches to address workplace ergonomic hazard identification, case documentation, assessment of control options and health-care management techniques that you use to address other workplace safety issues. It is important to realize that you cannot combat cumulative disorders effectively with a quick-fix program. Rather, a long-term process, which relies on continuous improvement, is the preferred approach to reducing CTDs. Successful programs not only result in reduction of injuries, but they also realize quality and productivity gains.

For an ergonomics process to be successful, it is imperative that management is committed to the process, participates in the process and provides the necessary resources to ensure its success.

Include the following elements as part of effective management commitment:

1. Issue policy statements that;
 - Treat ergonomic efforts as furthering the organization's goal of maintaining and preserving a safe and healthy work environment for all employees;
 - Expect full cooperation of the total work force in working together toward realizing ergonomic improvements;
 - Assign lead roles to designated persons who are known to make things happen;
 - Give ergonomic efforts priority with other cost reduction, productivity and quality assurance activities;
 - Have the support of the local union, if applicable;

-
2. Hold meetings between employees and supervisors that allow full discussion of the policy and the plans for implementation;
 3. Set concrete goals that address specific operations. Goals give priority to the jobs posing the greatest risk;
 4. Commit resources to;
 - Train the work force to be more aware of ergonomic risk factors for work-related CTDs;
 - Provide detailed instruction to those expected to assume lead roles or serve on special groups to handle various tasks;
 - Bring in outside experts for consultations on start-up activities and difficult issues until you develop in-house expertise;
 - Implement ergonomic improvements as they are required;
 - Provide release time or other compensatory arrangements during the workday for employees expected to handle assigned tasks dealing with ergonomic concerns;
 - Furnish information to all those involved in or affected by the ergonomic activities to be undertaken;
 - Provide evaluative measures to track the results of the ergonomic process to indicate that progress has been made and if plans need to be revised. Reporting results of the process and publicizing notable accomplishments also emphasize the importance of the process and maintain the interest of those involved.

Employee involvement

Promoting worker involvement in efforts to improve workplace conditions is a critical element to an ergonomics process. It also has several benefits, including:

- Enhanced worker motivation/job satisfaction;
- Added problem-solving capabilities;
- Greater acceptance of change;
- Greater knowledge of the work and organization.

Task force development

Ergonomic issues typically require a response that cuts across a number of organizational units. An ergonomics task force provides an excellent forum to secure input and cooperation from these units. In addition to management and the work force, participation should be secured from:

- Safety personnel;
- Health-care providers;
- Human resources personnel;

-
- Maintenance;
 - Purchasing;
 - Ergonomics specialists.

Clearly define the roles and responsibilities of each team member, including determining who will document problems and monitor project progress.

Training

Training is an essential element for any effective safety and health program. Train all staff members to:

- Recognize workplace risk factors for CTDs and understand general methods for controlling them;
- Identify the signs and symptoms of CTDs that may result from exposure to such risk factors and be familiar with the organization's health-care procedures;
- Understand the process the employer uses to address and control risk factors, the employee's role in the process and ways employees can actively participate.

All ergonomic task force members should receive advanced training in job analysis and control measures, problem identification, and should develop skills in team building and problem solving.

Best practices from BWC's SafetyGRANT\$ Program

The preferred approach to the prevention and control of CTDs is to design the job taking into account the capabilities and limitations of the work force. Design jobs that minimize CTD risk factors such as high forces, awkward postures and repetitive motions.

BWC's SafetyGRANT\$ program has provided assistance to construction companies to help them reduce their risk of CTDs in the workplace. As part of the program, BWC has collected job designs that construction companies have used to reduce the risk of CTDs.

Participating companies report the effectiveness of the interventions by measuring CTD incidence rates, lost days due to CTDs, restricted days due to CTDs and employee turnover. They also measure the relative risk of injury by completing risk factor assessments for affected tasks. These assessments provide a measure of the relative risk of injury for a specific task.

BWC calculated a return-on investment (ROI). Assumptions include:

- \$29,000 per incident (www.backsafe.com);
- Every dollar saved in injury reduction is available purchasing power to the employer;
- BWC normalized data to calculate the injuries and costs that would occur in an equivalent one-year follow-up period. In this way, direct comparisons could be made between the baseline and follow-up periods;
- BWC did not consider the time value of money in the calculations.

Construction industry ergonomic best practices

The following are situations frequently encountered in the construction industry that can lead to CTDs and some demonstrated solutions (best practices) to alleviate those problems.

Situation — manual materials handling

The construction environment is often labor intensive and involves the manual handling of materials. These materials can include bricks, block, lumber, bags of cement, etc. Often the items are bulky, and employees must carry them over rough terrain. Not only are slips and falls prevalent, but manual materials handling can place large forces on the spine and is associated with back and shoulder injuries.

Best practice — material handling aids

The forces on the spine and, hence, the risk of injury can be greatly reduced by mechanizing the manual material handling tasks. Machinery is commercially available that can aid in material handling in the construction environment. Rough terrain forklifts can move pallets of material from trucks to the area where the items are needed. Some have the capability to reach material up several stories. This type of machinery can also reduce slip and fall injuries by reducing or eliminating carrying distances, and carrying over rough or slippery terrain.

Results

After an average follow-up period of 231 days, seven construction companies that received lift assists, aids and/or transport devices, achieved the following results:

- The CTD incident rate (incidents per 200,000 hours) changed from 2.1 to 0 — a 100-percent improvement;
- The ROI for material handling aids is 2.4 years;
- The days lost due to CTDs decreased from 329 days per 200,000 hours worked to 0 – a 100-percent improvement;

-
- The restricted days due to CTDs improved from 32.7 days per 200,000 hours worked to 0 — a 100-percent improvement;
 - The turnover rate (per 200,000 hours worked) changed from 21.6 to 11.7 — a 46-percent improvement;
 - The average risk factor score for 10 affected tasks in the four companies was 41.8 before the devices were put into place, and was 28.3 afterwards — a 32-percent improvement.

Situation — moving appliances/HVAC Units

In new home construction, appliances, heating/air conditioning units, plumbing and other items must be moved to the house. Often, workers must move these items up and down steps and stairways. Even with a traditional dolly, these tasks create heavy loads on the spine and awkward trunk postures. These risk factors combine to create a high risk of back injury.

Best practice — powered dolly

Powered dollies, which are commercially available, can eliminate much of the force required and the awkward postures associated with traditional dollies. The powered dollies often have adjustable handles and stair climbing devices.

Results

After an average follow-up period of 398 days, three construction companies that implemented powered dollies achieved the following results:

- The CTD incident rate (incidents per 200,000 hours) changed from 14.9 to 0 — a 100-percent improvement;
- The ROI for powered dollies is .18 years, or 2.2 months;
- The days lost due to CTDs dropped from 29.8 days per 200,000 hours worked to 0 — a 100-percent improvement;
- The restricted days due to CTDs improved from 19.8 days per 200,000 hours worked to 0 — a 100-percent improvement;
- The turnover rate (per 200,000 hours worked) changed from 79.3 to 31.6 — a 60-percent improvement;
- The average risk factor score for four affected tasks in the three companies was 30.2 before the devices were put into place, and was 29.7 afterward — a 2-percent improvement.

Situation — scaffolding in masonry

When laying brick or block, scaffolding is used to provide access to the face of the structure. When laying block toward the bottom of the scaffolding, the mason must flex the trunk to reach. Frequent and prolonged trunk flexion is associated with low back pain. When laying block above shoulder level, raising the arms is prevalent. This posture is associated with shoulder disorders. Also, when adjusting the scaffolding level, lifting heavy planks is required. This task requires bending and twisting, coupled with heavy, awkward loads — all risk factors for low back pain.

Best practice — adjustable scaffolding

You can use adjustable scaffolding that provides for a continuous height adjustment. This adjustment allows the masons to lay block at about waist level, thus minimizing the awkward trunk postures associated with back pain. Furthermore, after the initial setup, the planks do not have to be moved, so the task of manually moving planks to adjust the scaffolding levels has been eliminated, as have the associated risk factors.

Results

After an average follow-up period of 399 days, one construction company that implemented adjustable scaffolding achieved the following results:

- The CTD incidence rate remained at zero;
- The ROI for adjustable scaffolding is undeterminable at this time due to lack of measurable data;
- The turnover rate (per 200,000 hours worked) changed from 47.5 to 27.9 — a 41-percent improvement;
- The average risk factor score for three affected tasks in the company was 31.3 before the scaffolding was put into place, and was 30.3 afterward — a 3-percent improvement.

Situation — manual landscaping tasks (digging, lifting, carrying)

In construction, tasks requiring digging, lifting, grading and carrying earth materials are prevalent. These tasks often involve heavy manual labor, including using hand tools (e.g. shovels, rakes, and picks), hauling wheelbarrows full of dirt and rock, and digging post holes. These activities can place relatively large forces on the hands, shoulders and back. These forces, especially when experienced repetitively, contribute to CTDs.

Best practice — skid steerer and attachments

Skid steerers can eliminate the need to manually perform many landscaping and earth working tasks. You can purchase attachments that can be used for grading, digging holes and ditches, hauling dirt, and transferring pallets of materials. These machines eliminate many of the accompanying risk factors, such as repetitive loading on the hands, shoulders and back. The risk of injury also is reduced.

Results

After an average follow-up period of 298 days, three construction companies that used the SafetyGRANT\$ program to use skid steerers at their construction sites achieved the following results:

- The CTD incident rate changed from 17.4 CTDs per 200,000 hours worked to 12.2 CTDs per 200,000 hours worked — a 30-percent improvement;

-
- The ROI for skid steerers is 4.4 years;
 - The restricted days rate due to CTDs changed from 17.4 days per 200,000 hours worked to 16.2 days per 200,000 hours worked — a 7-percent improvement;
 - The average risk factor score for 12 affected tasks in the three companies was 32.5 before they used the skid steerers and 20.1 afterward — a 38-percent improvement.

Also, one construction company that began using a skid steerer with a gravel leveling attachment reported that productivity has increased by an estimated 65 percent.

Situation – screeding

Concrete work requires that the concrete surface be smoothed, a process called screeding, a task often performed manually. Manual screeding requires a worker to pull a flat screed board across the wet concrete. The worker must firmly grip the board, which places stresses on the fingers and hand. The worker must also bend the trunk to reach the board. This extreme trunk flexion can contribute to low back pain.

Best practice — laser-guided screeding equipment

A laser-guided screed mechanizes the manual screeding. The operator sits on the machine, and a laser guides the screed. Thus, the stresses on the hands and the extreme trunk flexion are virtually eliminated, and the risk of injury is decreased.

Results

After an average follow-up period of 225 days, one construction company that implemented a laser screed achieved the following results:

- The CTD incidence, lost days and restricted days rates all remained at zero;
- The ROI for a laser screed is undeterminable at this time due to lack of data to accurately measure;
- The turnover rate (per 200,000 hours worked) changed from 202 to 138 — 32-percent improvement;
- The risk factor score for the affected task was 45 before the laser screed was used, and was 1 afterward — a 98-percent improvement;
- The company found that it could use the laser screed on 63 percent of the square footage it poured. Productivity, measured in square footage per man hour, increased 40 percent to 45 percent as a result of using the laser screed.

Case studies from SafetyGRANT\$

Can construction companies reduce injuries in their workplaces? The answer is unequivocally, yes! Through the SafetyGRANT\$ program, BWC has collected data on the effectiveness of installing ergonomic interventions in construction companies' workplaces. The following case studies demonstrate that by incorporating ergonomic best practices into the design of tasks and by using good safety management processes, you can reduce the risk of injuries, including CTDs. Ergonomic best practices worked for them, and they can work for you, too.

BWC has analyzed data on injuries from construction companies that have received SafetyGRANT\$ to install ergonomic interventions like those mentioned in the best practices described on previous pages. These construction areas have reported their baseline (before ergonomic intervention) and follow-up (after ergonomic intervention) data with an average follow-up period of 291 days. Here's what we have found to date:

- The CTD incidence rate has gone from 4.1 CTDs per 200,000 hours to 2.8 CTDs per 200,000 hours worked — a 32-percent improvement;
- The lost days due to CTDs changed from 169 per 200,000 hours worked to 30.8 per 200,000 hours worked — an 82-percent improvement;
- The average risk factor score (a relative measure of the risk of cumulative trauma disorder) for 58 tasks in the 30 areas changed from 35.9 (before the ergonomic intervention) to 22.3 (after the intervention) — a 38-percent improvement.

These best practices are just a few of the ergonomic interventions that you can incorporate into construction areas. For more information about safety in the workplace or for assistance with your operation, please contact BWC's Division of Safety and Hygiene at 1-800-OHIOBWC, and listen to the options, or visit our Web site at ohiobwc.com.

K.E. Dittmar Co. Inc. Zanesville

Situation

Tasks performed at K.E. Dittmar, a family-owned construction company, include:

- Digging and leveling footers, digging post holes, and moving stone and fill for grading. These tasks involve carrying loads and operating tools, which create forces on the hands, shoulders and spine;
- Framing — This task involves lifting and carrying lumber, weighing 50 to 100 pounds. These bulky loads create large forces on the spine;

-
- Finish work — Tasks involve placing siding, soffit, gutter, downspouts, and trenching, along with grading and leveling the concrete work around the structure. Trenching entails swinging a pick and manually digging with a shovel. These tasks have been associated with increased risk of back injury.

Solution

K.E. Dittmar purchased a skid steerer with backhoe, buckets, forks, trencher and auger attachments. The skid steerer and attachments eliminated much of the manual labor required to perform these tasks and the associated risk factors.

Results (after 10 months)

- K.E. Dittmar was awarded \$33,501.50 for the purchase of a skid steerer and attachments.
- Ten months after putting the skid steerer into place, CTD incidence rates had decreased from 29 to 5.9 CTDs per 200,000 hours worked — an 80-percent improvement.
- Restricted days due to CTDs declined from 29.1 to 23.6 days per 200,000 hours worked — a 22-percent improvement.
- Average risk factor scores for the affected tasks dropped from 34.2 to 21.0 — a 39-percent reduction.

Hawley Landscape, Vienna

Situation

Many of the tasks that Hawley Landscape performs require heavy lifting. For example, after pruning, employees manually load brush, branches and trimmings into a truck. They use a tarp or wheelbarrow to drag or push the material over to the truck, and then they lift the tarp up into the truck or push the wheelbarrow up a ramp. These activities can create large loads on the shoulders and back, thus increasing the risk of shoulder injury and back pain.

Solution

Hawley Landscape purchased four hydraulic lift gates for dump trucks. The lift gates eliminate the loading and unloading of other equipment, as well as plant materials. They also help prevent workers from slipping off while climbing into or off of the truck. These lift gates eliminate the repetitive bending and twisting of the trunk associated with the lifting tasks.

Results (after seven months)

Hawley Landscape was awarded \$16,216 for its equipment that was estimated to cost \$20,270.

- Productivity went from loading one wheelbarrow at a time to three.

-
- The CTD incidence rate has declined from 15.5 CTDs per 200,000 hours to 0 — a 100-percent improvement.
 - The CTD lost day rate dropped from 124 days per 200,000 hours to 0 — a 100-percent improvement.
 - The restricted days rate and turnover rate remained at 0.
 - Average risk factor scores for the affected tasks changed from 35 to 28 – a 20-percent reduction.

Martin Masonry, Loveland

Situation

Martin Masonry is a construction company specializing in high-end residential masonry veneer applications of brick, block and stone. This includes the building of chimneys, fireplaces and structural masonry. Risk factors include lifting, carrying, bending, shoulder deviations, static stress and fatigue, etc. The greatest risk factors stem from the repetitive overhead heavy lifting of brick, block and mortar up multiple levels of scaffold. Lifting scaffolding plank, assembling and disassembling scaffold, as well as the continual bending required of masonry helpers to transport materials on the scaffold also create additional risk factors.

Solution

Martin Masonry purchased a Skytrack 6036 telescope material lift and walk-through scaffolding. The Skytrack material lift allows the employees to lift pallets of bricks or block up onto the scaffolding without manually handling the material. Previously, employees would lift and carry small amounts of brick/block onto scaffolding. This new equipment reduces, and in some cases eliminates, the manual lifting of materials, thereby reducing the employee's exposure to risk factors, such as lifting, carrying, bending, shoulder deviations, static loads and fatigue. The walk-through scaffolding allows employees to move materials from one end of the scaffolding to another without having to climb over cross bars or support bars.

Results

- Martin Masonry was awarded \$40,000 for its equipment that was estimated at \$64,735.80.
- At 13 months after putting the material lift and the scaffolding into place, CTD incidence rates, lost days due to CTDs and restricted days due to CTDs remained at zero.
- Turnover rate decreased from 317 to 129 per 200,000 hours worked — a 59-percent improvement.
- Average risk factor scores for the affected tasks changed from 35.3 to 19.0 — a 46-percent reduction.
- Average number of bricks per mason increased from 575 to 625 — an 8.7 percent productivity gain.