Ergonomics in Material Handling

Introduction: The Importance of Ergonomics in a Safe and Productive Workplace

Ergonomics refers to the science of optimizing physical movement to improve efficiency while limiting stress, and poor ergonomic practices can create serious safety hazards. By following best practices and by utilizing appropriate equipment, operations can reduce lost productivity while providing a better working environment for equipment operators and other staff.

Workplace injuries are a significant concern; the leading cause of disabling injury on the job in 2012 was overexertion from pushing, pulling, carrying and other basic movements that form the daily tasks of the warehousing industry. Injuries involving overexertion accounted for 25.3 percent of all disabling workplace injuries and $15.1 billion in expenses in 2012, the latest year for which data has been released.

According to numbers from the Bureau of Labor Statistics as reported by EHS Today, the warehousing and storage industry encounters higher-than-average risks of:

- **Musculoskeletal Injuries** - Workers in the storage and material handling subset of the economy suffered musculoskeletal injuries at over twice the rate of workers in other industries. There were 78.1 injuries of this type for every 10,000 workers in warehousing, compared to 35.5 in the general category.
- **Strains, Tears and Sprains** - For every 10,000 workers in the warehouse industry, 80 suffered injuries of the sort that result from poor ergonomic practices, such as damage to muscles, tendons and ligaments.
- **Work-limiting Injuries** - The Bureau of Labor Statistics tracks injuries that were severe enough to result in restricted duties and missed days of work. Warehouse employees showed a significant incidence of injuries that impacted productivity in 2012, with 3.9 serious injuries per 100 workers.

Figure 1. BHS Scissor Lift Table (LT), designed to position materials at comfortable heights for improved ergonomics.

Most of these injuries are completely avoidable, and an operation can implement ergonomic improvements to reduce instances of injury and maximize operating efficiency. This paper will provide a basic introduction to ergonomics in material handling equipment (MHE) along with suggestions for risk analysis and prevention.

Employing Ergonomics for Warehousing and Storage Applications

The science of ergonomics matches the working environment to the capabilities of the worker -- the goal is to achieve optimal efficiency with minimal stress. Ergonomists recommend the following practices for working in warehouses and distribution centers.

1. Identify Risks in Material Handling Equipment

Before implementing changes to improve ergonomic practices in a facility, managers must evaluate areas of risk. The Occupational Safety and Health Administration (OSHA) has identified four specific factors that can lead to increased risk for musculoskeletal injuries on the job:

- Force required to lift, move or otherwise manipulate objects.
- Motions that are repeated over long periods of time.
- Unnatural postures or body movements.
- Bodily contact with hard or sharp edges.

It is important to note that safe limits can shift with repetition and frequency. In order to evaluate the safety of a given lifting task, the National Institute for Occupational Safety and Health (NIOSH) developed a model called the NIOSH lifting equation, which evaluates six metrics on a given lifting or lowering

job: weight of the object, measurements of horizontal and vertical space, grip, degree of necessary twist (if any), duration and frequency of the task.

The combination of these measurements produces a comprehensive recommended weight limit, defined as “the amount of weight that can safely be lifted by an employee given a specific job geometry, frequency, and duration.” **For tasks with greater recommended weight limits, from moderate to hazardous weights, lifting devices should always be used to prevent injury.**

BHS lift tables, roller stations and transfer carts with appropriately sized rolling castors can help to offset the risk of injury associated with heavy lifting and lowering maneuvers. Even when mechanical tasks are partially or completely offset by equipment, however, proper ergonomics remain extremely important.

2. Design Workstations and Infrastructure to Support Ergonomics

It is easiest to promote ergonomic best practices with workstations that are built to allow for safer movements and outfitted with adequate safety equipment and signage. Often, choosing proper equipment is the most effective way to ensure safety and efficiency.

In warehouses and distribution centers, this means appropriate roller stands, transfer carts, material handling equipment and forklift battery changers, arranged in such a way that workers find it easy to move naturally. BHS equipment is designed for ergonomic use in various settings, with lifting devices that reduce physical strain substantially.

Creating a more ergonomic workplace starts with well-designed workstations. In order to allow workers to practice optimal posture and body positioning, workstations need to be set at a height that it appropriate for each worker’s body. Adjustable and custom-built tables provide this flexibility.

The goal is to allow the operator to maintain a “neutral posture.” Neutral posture involves a straight, relaxed back and elbows set at a right angle, with wrists held naturally. The neck and shoulders are also held straight. Holding neutral posture helps to prevent stress on particularly vulnerable areas and keeps workers more comfortable over time.

Most warehouse employees don’t stand still at a single workstation. For these workers, using appropriate equipment is an important element of safe and comfortable operation. When using order picking carts to transfer materials, the equipment should be reliable, appropriate to the task, and well maintained. It is also helpful to use carts equipped with fork pockets, which allow heavier loads to be moved with lift trucks.

Workers should not use lift tables that require excessive measures for standard maintenance; components should be easy to access and replace. This allows for safer maintenance and prevents workers from using excessive force to operate poorly maintained equipment.

Maintenance staff should pay particular attention to the wheels of carts and, ensuring that they move smoothly and safely. Workers should regularly monitor weight levels on equipment and avoid overloading carts.

Figure 2. BHS Powered Mobile Lift Table (PMLT). A push-button control allows for simple functionality, and the maximum height of 79 inches allows for reduced fatigue and improved mobility.

Forklift operators will benefit from machinery that is designed to protect their safety. The best lift trucks today are designed with ergonomic principles imported from the automotive industry, including vibration reduction, operator posture, and skin-friendly surfaces.

3. Train Employees to Use Ergonomic Movements During Work Tasks

Once risk areas have been identified, specific ergonomic considerations can be implemented. It is important to consult with all team members -- workers, ergonomists, and management -- throughout the process. Workers have the most first-hand knowledge of their tasks, and can help arrive at realistic solutions for complex ergonomic challenges. From the management perspective, training in ergonomic bodily movements is an important responsibility.

The types of soft-tissue injuries that plague warehouse workers can be avoided by keeping movements within a natural range of biomechanical comfort. Professional ergonomists sometimes call this the “handshake zone,” which refers to the heights from 37 to 47 inches, extending 16 inches outward from the worker’s body. Having ergonomically designed equipment to keep lift loads optimally

placed for worker safety is essential, and traveling transporters, carts and rollers can be deployed to bring a facility into full compliance with ergonomic best practices.

There are several bodily motions common to work in all warehouses and distribution centers that can lead to risk of injury. Fortunately, there are also recommended ergonomic improvements designed to limit these risks.

Bending at the waist can create a hazard, especially when lifting objects or using repetitive motion. Ergonomists recommend storing products and frequently accessed equipment at a height that does not require twisting or bending. Lift tables provide an efficient way to access objects at varying heights without risking worker safety. The adjustable height of a stationary lift table creates a workstation that can be tailored to any worker's height, minimizing chances of repetitive muscle injury.

Figure 3. Bin Tipper. Designed for safe and easy lifting, bin tippers are perfect for light industrial use to empty bins at schools, factories, recycling centers and more.

During lifting tasks, workers should line their bodies up with the materials such that no twisting of the back is required. It is also best to position the object being moved between the worker's knees and shoulders; the "handshake zone" is preferable when dealing with larger, heavier materials.

NIOSH also recommends avoiding the following actions, which can increase the risk of soft tissue injury:

- Lifting heavy and/or awkward objects and holding them far from the body.
- Using quick, stuttering movements when lifting or carrying objects.
- Twisting or bending while lifting materials.
- Repetitive movement of heavy objects.
- Holding materials away from the body or high overhead.

Preventing repetitive motion injuries is a challenge in the warehouse industry. OSHA recommends enforcing frequent, mandatory breaks for all employees involved in repetitive tasks. Giving employees the chance to stretch and change postures can be helpful. Some managers also find that cycling workers through several jobs in a shift is an effective intervention to prevent muscle injuries.

Conclusion:

In 2004, warehouse workers were in the top three professions at risk for back injuries. Almost a decade later, the musculoskeletal injuries for warehouse employees remained twice as common as in general private industry; it is clear that further interventions are required. The science of ergonomics is the industry's best option for reducing injury rates without incurring excessive costs.

Because of the particular risks involved in the material handling industry -- and because ergonomics can help to mitigate those risks -- maintaining best practices in the field is a key responsibility for facility managers. While the importance of training cannot be overstated, appropriate equipment choices are an essential component of an ergonomics plan for any warehouse or distribution center.

Well-designed equipment is required for transporting and accessing materials safely. BHS order picking carts can prevent overexertion, and mobile lift tables support transportation of materials while also offering the adjustability that can keep materials within a worker's natural reach, allowing for safe loading and unloading.

Figure 4. BHS Order Picking Cart (OPC). Ideal for processing orders and moving merchandise, the OPC is equipped with fork pockets for lifting and transporting via lift truck.

Appropriately sized racks and storage shelving can make it easier to maintain neutral posture during work, and custom equipment from BHS can further reduce strain in certain applications.

With appropriate infrastructure, excellent staff training and a commitment to best practices for worker safety, ergonomics can be used to keep any warehouse or distribution center safer and more productive.

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P.O. Box 28990 • St. Louis, MO 63132 USA • 1.800.BHS.9500 • Fax: 314.423.6444 • Email: sales@bhs1.com • Web: BHS1.com