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Manual Material Lifting:

a pain in the neck, back ...

Workers are repeatedly lectured on how to lift safely. But there are growing indications that few loads are, in fact, safe to lift. Furthermore, so called safe lifting techniques, for the majority of workers, cannot be applied without significant change in the design of the lifting environment and the load to be lifted. Regardless, manual lifting should be viewed as the last possible option for moving a load. For it is now well known that lifting — the moving of an object from a lower level to a higher level or vice versa — places the back at increased risk for pain and/or injury.

What's the problem?

Low back pain and injury associated with manual lifting was one of the main concerns expressed by Bernardino Ramazzini "the founder of occupational medicine" when he first published his observations in the 1600s. Not much has changed since then. The National Institute for Occupational Safety and Health (NIOSH) has estimated at least 30 per cent of workers are exposed to lifting hazards daily. Approximately one in every four Canadians whose jobs involved manual material handling experience pain due to a back injury. In Ontario, injuries related to musculoskeletal disorders (MSDs) account for over 40 per cent of Workplace Safety & Insurance Board claims. Many of these injuries are caused by overexertion related to manual material handling.

How does the back work?

The human spine is comprised of 33 bones called vertebrae stacked on top of each other to form the spinal column. Twenty-four of the 33 are moveable. Between each vertebra is a disc that helps absorb pressure and prevents the bones from rubbing against each other. Ligaments hold the vertebrae together.

The spine itself is comprised of three regions: the cervical or neck region, thoracic or middle back region and the lumbar or lower back region. The cervical region includes seven vertebrae at the top of the spine. The thoracic region is located in the middle of the spine and consists of 12 vertebrae. The lower portion of the spine is called the lumbar region and is comprised of five or six vertebrae, depending on the individual. The normal human spine is curved like an "S"; the cervical region curves inward while the thoracic region curves outward and the lumbar region curves inward. This S configuration is critical to ensuring an even distribution of body weight and the ability to respond to different physical forces. And while the spine supports most of the body's weight and movement, each segment relies upon the strength and flexibility of the others in order to function properly.

What are the risk factors?

While most postures produce a change in the alignment of the spine, certain postures place the spine and associated muscles at greater risk of injury. Moving from a position of standing up to bending down and then from bending to standing, during which the spine changes shape increases the risks of an injury to the back. When this movement is combined with lifting or lowering a load, there is an even greater risk for low back pain and/or injury. Bending at the waist and extending the upper body changes the spine's alignment and shifts the abdominal centre of balance forcing the spine to support both the weight of the upper body and the weight of the load being lifted or lowered.

In rare instances a worker can sustain a back injury from a single incident such as lifting too heavy a load, slipping and falling. In most cases however, it takes years of repeated manual lifting and carrying to compromise the back to such a point where a single event results in severe pain and/or serious injury. Performing lifting tasks continually, even at a moderate intensity, can place mechanical strain on the back, increasing the likelihood of injury. Eventually, even a mild effort can result in disabling back pain and/or injury. Recovery from back injuries can take a long time and further injury may occur, making the problem worse.

Manual material lifting is a component of many jobs in many sectors including recreation, retail, wholesale, construction, manufacturing, and assembly. Occupations most likely to experience back pain and injury because of manual lifting include labourers, assemblers, cashiers, carpenters, painters and plumbers.

What guidelines are in place?

There are several internationally recognized formulas that provide guidance in assessing the safety of lifting tasks. All recommend the following variables be considered when assessing a task for lifting:

Task variables

- location of the object to be lifted;
- size/shape of the object to be lifted;
- height from and/or to which the object will be lifted;
- weight distribution of object;
- whether the object has handles;
- frequency and duration of lifting.

Human variables

- age and sex of individual(s) lifting;
- body dimensions (stature, arm/leg length);
- physical fitness;
- experience and training.

Environmental variables

- thermal (temperature, humidity and ventilation);
- dynamic (platform motion and vibration).

One of the most commonly employed lifting guidelines is the *Revised Work Practices Guide for Manual Lifting*, published by the National Institute for Occupational Safety and Health (NIOSH). The lifting equation proposed by NIOSH provides a method for computing a maximum weight limit for manual lifting. Regardless, the recommended maximum weight to be lifted, under perfect lifting conditions, is 51 pounds or 23 kilograms.

Other guides currently in use include the Australian Occupational Health and Safety Commission's *Standard for Manual Handling*. This guide is built on the premise that the risk of back injury increases as the weight of the load increases. The code states that the back is most vulnerable to injury when loads over 4.5 kg are handled from a seated position or when loads over 16 kg are handled from positions other than seated. Fifty-five kilograms is the maximum weight a single individual may be required to lift under certain conditions.

What are the limitations?

While safe lifting guidelines are in wide spread use, all acknowledge there is no absolute safe weight to lift. In fact, given the range of variables that contribute to a lifting task, it is not possible to establish a definitive weight.

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The NIOSH lifting guideline, in particular, is limited in its application. This lifting equation is based on the assumption that other manual material handling activities (holding, pushing, pulling, carrying and climbing) constitute less than 10 per cent of a worker's activity, which is generally not the case. Equally important, this guideline does not include factors to account for unusual heavy loads, unexpected slips and/or trips and unfavourable environmental conditions. Further, these guidelines were not designed to assess one-handed lifts, lifting while seated or kneeling or lifting in a constrained or restricted workspace. Neither does it apply to high-speed lifting or the lifting of unstable or wide loads.

In short, most "safe lifting guidelines" do not necessarily account for other workplace task or environmental factors that may increase the risk or injuries.

What legislation is available?

California, Sweden, Australia, Japan and the European Union are just some of the jurisdictions worldwide that have recognized the need for regulatory action to protect workers from musculoskeletal injuries. In varying degrees these legislative initiatives address a host of MSDs, including those related to the back as well as other injuries caused by repetitive, awkward and forceful work.

Federal legislation

Here in Canada regulatory action has progressed. Amendments in 2007 to Part XIX of the *Canada Occupational Health and Safety Regulations* (COHS) call on employers to incorporate ergonomic-related hazards responsible for the development of MSDs into their legally mandated Workplace Hazard Prevention Program (Section 125(1)z.03, Part II, *Canada Labour Code*). These amendments outline the details employers must incorporate in the prevention program including a hazard identification and assessment process, development of preventive measures along with ergonomics training. Employers are also required to develop, implement and monitor such a program in consultation with and with the participation of the policy committee, or, if there is no policy committee, the workplace committee or health and safety representative. As well employers are required to submit, at least every three years, an evaluation report of effectiveness to the Ministry of Labour.

Provincial legislation

Among provincial jurisdictions British Columbia has the most comprehensive ergonomic regulation. It requires employers to consult joint health and safety committee members and affected workers in identifying, assessing and controlling the risks associated with the development of musculoskeletal injuries. Saskatchewan and Manitoba have also enacted ergonomic regulation.

In Ontario, ergonomic interventions are legislated only for those in the health care sector and are especially limited in scope. Section 45 of the *Industrial Establishment Regulations* (O. Reg. 851/90) address aspects of lifting in the workplace, but only as they apply to safety hazards involved in the transportation and storage of items. These include the prevention of tipping and falling hazards. They do not take into account injuries caused by repetitive, awkward or forceful work. Still concrete steps have been taken to address ergonomic related injuries in Ontario workplaces. In 2007 the Ministry of Labour (MOL) released two musculoskeletal disorders (MSDs) prevention resource documents developed by the Occupational Health and Safety Council of Ontario (OHSCO). The *MSD Prevention Guideline* and *Resource Manua*l provide workplaces with a framework for addressing MSDs in the workplace. This was followed by the 2008 release of an accompanying *MSD Prevention Toolbox* which as the name suggests contains different tools designed to aid workplaces in assessing, implementing and monitoring their MSD prevention programs.

The guideline, resource and toolbox also speak specifically to the importance of providing MSD prevention training to all workers ensuring their participation in the MSD prevention process.

Without specific ergonomics legislation Ontario workers and their representatives must rely on the employer's general duty clause in the *Occupational Health and Safety Act* (OHSA). This clause requires employers to take every precaution reasonable for the protection of workers. The MOL indicates its inspectors will consider the OHSCO MSD Guideline and accompanying materials as a determinant of what is reasonable to protect workers from MSDs.

Does ergonomics work?

For those workplaces that have assessed lifting hazards and implemented ergonomic changes to protect workers, the results have been significant.

When an Ontario automotive manufacturer moved its production to larger vehicles they also introduced larger, heavier and more awkward parts weighing 14 kilograms or more. These parts were originally installed, at a rate of approximately 26 an hour, with an air gun weighing 32 kilograms. Today ergonomically designed articulating arms which the worker controls, hold the necessary parts while an electric nut runner installs them, thereby eliminating the need for manual material handling.

Ergonomic interventions have also been important in reducing the incidence of back injury at an appliance manufacturer based in Hamilton, Ontario. Hydraulic tables and lifts are employed throughout the facility to raise, lower and turn stoves and refrigerators, allowing operators to perform work at waist height thereby eliminating the need to shift these heavy appliances into proper position.

An ergonomic assessment of clothing manufacturers in Ontario resulted in many tasks being designed according to ergonomic principles. Some plants used mobile hoists to load bolts of fabric onto a spreader. Still others employed gravity instead, rolling the fabric bolt up a ramp onto the spreader. Regardless, both measures either minimized or eliminated the need for manual lifting of a heavy and awkward load.

Without a doubt, ergonomic changes, implemented in consultation with workplace parties, can reduce worker injury and enhance productivity. Ideally, the ergonomic design of work environments and tasks should be considered in the initial design stages, rather than in response to rising injury rates and/or declining workplace productivity. Ergonomic interventions aimed at minimizing the hazards of manual lifting, however, do not occur in isolation. To be effective, worker training must accompany changes.

The Workers Health & Safety Centre offers several programs in this area. The general program on Manual Material Handling is of particular use. Other WHSC training programs addressing MSDs include: *Applying Ergonomics to Prevent Musculoskeletal Injuries; Ergonomics: Injuries, Risk Factors and Design Principles;* and *Ergonomic Toolbox.* For more information about WHSC training programs, please contact the WHSC office near you or visit **www.whsc.on.ca**.

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Published by the
Workers Health & Safety Centre
15 Gervais Drive, Suite 802
Toronto, Ontario M3C 1Y8
Tel: 416-441-1939
Fax: 416-441-1043
Toll free (Toronto): 1-888-869-7950
Web site: www.whsc.on.ca

Executive Director:
Dave Killham

Director, Information Services:
Loretta Michaud

Editor:
Yvonne Laurent

Regional Offices:
Central Ontario (Toronto)
Tel: 416-441-1939
Eastern Ontario (Ottawa)
Tel: 613-232-7866
South Central Ontario (Hamilton)
Tel: 905-545-5433
South Western Ontario (Sarnia)
Tel: 519-541-9333
North Eastern Ontario (Sudbury)
Tel: 705-522-8200
North Western Ontario (Thunder Bay)
Tel: 855-281-3634

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