

Prolonged Standing: taking the load off

We've all felt it — sore feet, stiff legs and low back pain, all resulting from long hours of standing at work. While they may not be considered major workplace injuries they do have adverse health and safety consequences for workers. Workers who are tired and suffering are less alert increasing the risk of incidents.

European studies report one third to one half of all workers spend more than four hours a day on their feet, standing and/or walking. The largest portion of these workers work in the manufacturing and service industries, which include, retail sales associates, industrial workers (machine operators and assembly-line workers), supermarket workers (especially cashiers), and food services staff. Others such as casino dealers, mail carriers, large scale laundering workers, teachers and health care workers also spend a large percentage of time on their feet.

A U.S. study confirms that prolonged standing is especially risky for pregnant workers and their unborn children. Working in a standing position for six or more hours per day while pregnant has been linked to pre-term births, low birth weights and high blood pressure for the mother.

Generally, the effects of prolonged standing can be eliminated or reduced through work organization and workstation design. A well-designed workstation with a well-designed job, make it possible to work in a balanced position without unnecessary strain on the body.

What working conditions aggravate prolonged standing?

In an ideal workplace, everyone would have the choice of standing or sitting in a properly adjusted ergonomically designed chair and resting when necessary. All the tools required to complete their tasks would be within easy reach.

Standing for long periods of time can cause the posture to become progressively worse. Typically, workers will begin to slouch and shift their weight from one foot to another to alleviate strain. Slouching promotes a posture, which is static and causes the worker to become less alert and active. If this uncomfortable position is maintained for long periods, it can lead to circulation problems such as swollen feet and legs.

The physical layout of the workstation, tools, placing of keys, controls and displays determine the body positions workers will assume when performing their tasks. If the workspace is inadequate for the task, workers will have less freedom to move around and refresh tired muscles. They may also be forced to assume awkward positions. This lack of flexibility in choosing body positions contributes to health problems.

Workplace flooring also has an impact on health, especially on the feet. Hard unyielding floors such as those made of concrete or metal are the least comfortable surfaces to work on. Working on a hard floor has the impact of a hammer, pounding the heel at every step.

These conditions commonly occur when the job is designed without considering characteristics of the body. When the job design ignores the basic needs of individual workers, work can cause discomfort in the short term and can eventually lead to severe and chronic health problems.

How does the body respond to prolonged standing?

Joint Compression

Each body part is compressed by all of the sections of the body above it. For example, the head, arms and torso compress the hips, but the feet are compressed by the weight of the entire body. Compressing a joint is like squeezing a sponge — body fluids are squeezed out of the space in the joint. Without body fluids and circulation, joints become malnourished, and cannot continue to support the weight of the body. Wear and tear of body parts occurs.

Insufficient blood return in the legs

Gravity pulls blood down into the feet. One way that blood returns to the heart is through cyclic muscle contractions. When muscles are engaged in one long contraction to keep a person standing, it hinders proper circulation of body fluids. This can result in blood pooling in the legs, which can eventually lead to varicose veins.

Postural muscle fatigue

Postural joints and muscles keep the body from falling over while a person is standing or walking. These joints and muscles need nourishment, which they get from circulation. Muscles also need rest breaks to recoup from bouts of work. Standing or walking for a long time, forces muscles and joints to work nonstop without nourishment. Without rest muscles become exhausted, resulting in pain.

What are the health consequences?

Standing is a natural human posture and by itself poses no particular health hazard. In fact, when standing for short periods of time, the body is in one of its most comfortable positions. The lumbar curvature is naturally maintained, the spinal column is properly supported and the body's internal organs are in a relaxed, natural position. However, working in a standing position on a regular basis can cause the following:

- Sore feet;
- Swelling of the legs;
- Varicose veins;
- General muscular fatigue;
- Low back pain; and
- Stiffness in the neck and shoulders.

Keeping the body in an upright position over time requires considerable muscular effort that is particularly unhealthy even while standing motionless. When muscles are constricted, blood flow to the load-bearing muscles is reduced. These are the muscles used to maintain an upright position. This causes muscular strain in the legs, back and neck.

Insufficient blood flow accelerates the onset of fatigue and causes pain and even permanent damage to body tissue. This results in injuries such as varicose veins, arthritis in the knees and hips, plantar fasciitis (inflammation of a tough band of tissue on bottom of the foot), heel spurs, flat feet, high blood pressure and low back pain.

Prolonged and frequent standing, without some relief by walking, causes blood to pool in the legs and feet. When standing occurs over prolonged periods without some relief by walking, it can result in inflammation of the veins. This inflammation may progress to chronic and painful varicose veins. Excessive standing also causes the joints in the spine, hips, knees and feet to become temporarily immobilized or locked. This immobility can later lead to rheumatic diseases related to degenerative damage to the tendons and ligaments.

How are feet specially affected?

The foot has dozens of bones, joints, muscles, nerves, blood vessels, tendons and layers of fascia (connective tissue). When the body tissues are sufficiently stressed, they become swollen and/or inflamed. Chronic inflammation may create scar tissue and changes to bony structures. The bones of the foot form arches that are supported by ligaments and muscles. These arches contribute



Information Bulletins for health, safety and environmental representatives

RESOURCE LINES

to the strength, stability, mobility, and resilience of the foot. During standing, walking, running or jumping, the arches serve as shock absorbers, spreading energy before it is transferred higher up the leg.

If arches are lost (for example through conditions of flat feet, overpronation [flattening of the arch and inward tilting of the ankle]), the shock-absorbing quality of the arches disappears. This affects the feet, knees, hips and spine. Losing the arch in the foot also changes the position of the knee and hip, which makes them more vulnerable to injury from working while standing for long period.

What legislation is available?

Britain, Sweden, Australia, Japan and the European Union are among the many jurisdictions with ergonomic regulations addressing musculoskeletal disorders (MSDs) such as those resulting from prolonged standing.

Of these, Sweden's is perhaps the most comprehensive. Legislated in January 1998 the regulation sets an ambitious target: "The purpose of the Provisions is for workstations, jobs and work environment conditions to be designed and arranged in such a way that risks of physical loads both static and dynamic which are dangerous to health or unnecessarily fatiguing or stressful are averted." Employer duties include among other things a responsibility to ensure that "work which is physically monotonous, repetitive, closely controlled or restricted does not normally occur." Also spelled out are models for assessing the work and a checklist for identifying potentially dangerous load factors.

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. Still concrete steps have been taken to address ergonomic related injuries in Ontario workplaces. In 2007 the Ministry of Labour (MOL) released two MSDs prevention resource documents developed by the Occupational Health and Safety Council of Ontario (OHSCO). The *MSD Prevention Guideline* and *Resource Manual* 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* (OHS). 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.

What can be done?

In the absence of specific legislation, workers and workplace representatives can minimize the risks associated with prolonged standing through workstation design, job design, flooring, anti-fatigue mats and personal protective equipment (PPE).

Workstation design

Proper design of the workplace will alleviate the hazards associated with prolonged standing. This includes a well-designed workstation, which has the following:

- Adjustable-height work surface (if work surface is not adjustable, install a platform to raise a shorter worker and a pedestal to raise the work piece for a taller worker);
- Room for workers to change body positions;
- A foot-rail or footrest enabling workers to shift weight from one leg to the other;
- Elbow supports for precision work;
- Padded kneeler in front of workers allowing them to kneel slightly forward while performing tasks in front of them
- Choice to work sitting or standing at will (sit/stand stool);
- A seat for resting if standing is unavoidable.

Job design

Basic principles of good job design for standing work include the following:

- Provision for worker training (on proper work practices and use of rest breaks);
- Job rotation among group of workers (moves workers from one job to another to shorten time standing);
- Job enlargement gives workers more and varied tasks to increase body positions and motions;

- Avoidance of extreme bending, stretching and twisting;
- Work paced appropriately; and
- Allowance for frequent rest breaks.

Flooring

Materials that provide flexibility such as wood, cork, carpeting, or rubber are gentler on workers' feet. Concrete or metal floors can be covered with mats. Mats should have slanted edges to help prevent tripping. However, thick foam-rubber mats should be avoided. Too much cushioning can cause fatigue and increase the risk of tripping.

Anti-fatigue matting

Anti-fatigue matting may also alleviate foot discomfort and fatigue. It encourages subtle movement of the leg and calf muscles, which in turn promotes an easier flow of blood back to the heart reducing foot fatigue.

PPE

The health effects of prolonged standing can also be minimized with the use of adequate footwear. Footwear should not change the shape of the foot, have enough space to move toes, have shock absorbing cushioned insoles and heels no higher than 5 cm (2 inches).

NOTE: The Workers Health & Safety Centre offers several training programs addressing MSDs including: *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.



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

Submissions are encouraged.
Reproduction is permitted, provided the source is acknowledged and a copy sent to the Director, Information Services.

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	

cope:343