OFFICE ERGONOMICS

A Critical Factor in Workplace Safety

The fastest growing category of workplace injury is a group of conditions called Musculoskeletal Disorders (MSDs). The increase in number of repetitive motion and stress injuries has resulted in ergonomics becoming a critical factor in workplace safety. Mobile and virtual offices, aging workforces, and our dependence on laptops and smartphones have all contributed to this growing trend.

The use of computers and related technology may require only small amounts of physical activity, but we bring our whole bodies to work. And in order for us to work as efficiently as possible, we must accommodate our bodies by providing a safe, and comfortable workplace.

In the past, the workplace was designed to move products and operate machines efficiently. Since people always seemed so adaptable, how they fit into the workplace received less attention. Ergonomics is the science that seeks to adapt tasks and tools to fit the person. It’s a way of looking at the designs of tasks, tools, equipment and workplace layouts to fit the job to the person, rather than the person to the job.

By understanding ergonomics—and how to analyze and adapt work to avoid ergonomic health hazards—everyone can work in ways that reduce the risks for MSDs, control the costs associated with these injuries and increase everyone’s safety.

Developing an office ergonomics program can help you maintain a safe workplace and help employees avoid MSDs. Creating an Ergonomics Hazards Assessment and Control Program will help you examine the activities in your office, reduce the ergonomic health hazards that may exist and make sure that everyone understands how to keep themselves healthy.

Understand Musculoskeletal Disorders

Musculoskeletal Disorders are characterized by wear and tear on tendons, muscles, joints and sensitive nerve tissue and are caused by repetitive use over an extended period of time. What these conditions have in common is that they are usually cumulative and occur gradually over time. Fatigue and discomfort can result whenever force or pressure is placed on the body or the same movement is performed repeatedly over a long period of time.

Types of MSDs

MSDs may include muscle strains and tears, ligament sprains, joint and tendon inflammation, pinched nerves and spinal disc degeneration. Two of the most common MSDs among office workers are carpal tunnel syndrome and tendinitis.

Causes of MSDs

These are the major risk factors that can lead to MSDs:

- Awkward postures and positions: working in ways that place increased demands on the body.
- Force: requiring the muscles and joints to work harder or to exert more effort.
- Repetition: making the same movement repeatedly or frequently.
- Contact stress: pressing part of the body against a hard surface or sharp edge or resting it on such a surface for an extended time.
Signs and Symptoms of MSDs
Common signs and symptoms of MSDs include the following:
• Burning
• Cramping
• Decreased grip strength
• Decreased range of motion
• Deformity
• Loss of muscle function
• Numbness
• Pain
• Stiffness
• Tingling

In general, these signs and symptoms may be worse at night or even first noticed at night.

Discomfort by itself is not considered a sign or symptom of MSDs. Even so, you may choose to address reports of discomfort, given that the purposes of your ergonomics program are to reduce the potential for injuries and to provide a comfortable and productive workplace.

Early Reporting of MSDs
Encourage employees to pay attention to their bodies. When they are experiencing the signs or symptoms of MSDs—for instance, pain, tingling or muscle fatigue—they should report it immediately, rather than wait until the problem becomes severe. The importance of early reporting of MSDs cannot be overstated.

Emphasize that MSDs develop gradually over time. This means that the signs and symptoms will only become worse the longer an individual continues the activity that has caused them. The sooner the problem is reported, the sooner the source will be discovered and treatment will get under way. By reporting the problem promptly, the employee will recover sooner and with less pain and stress.

Prevent Musculoskeletal Disorders
How an employee moves and uses his or her body while performing work and non-work related activities will determine how healthy and comfortable he or she feels on the job. To ensure that everyone feels as healthy and comfortable as possible, workplaces, machines and tasks should be reviewed according to the principles of ergonomics. Doing so is the most effective way to eliminate MSDs.

One of the basic principles of ergonomics is using good body positions that keep the employee working in neutral. This means keeping the joints in their strongest, most stable and least stressful positions while working. For example, if you’re standing, your wrists are in neutral when your arms are relaxed at your sides. In this position, the wrists are straight, not bent or flexed. Your forearms, wrists and hands should also be relaxed and aligned when you’re sitting at a desk using a keyboard or mouse.

Ergonomic Design
Ergonomic design is the practice of designing workplaces, machines and tasks to match the capabilities and limitations of the human body. The goal is to create a workplace in which employees can work in neutral, minimizing wear and tear on their bodies.

Stretching, Warm-Up and Relaxation Activities
As noted earlier, muscles that are used in one position for an extended period of time will become fatigued. This affects circulation to the working muscles and makes any job more difficult and more uncomfortable. By taking regular breaks and completing stretching, warm-up and relaxation activities, employees can help avoid fatigue and prevent MSDs.

Stretching improves the blood flow and keeps the working muscles fresh and loose. Doing stretching exercises can relieve the muscle strain and tightness caused by work involving awkward postures and positions, force, repetition and contact stress.

Administrative Practices
Several administrative practices can be used to reduce MSD hazards in the workplace:
• Look for simple adaptations that can make jobs safer:
  – Layout changes to improve heights and reaches
  – Improvements in work methods
  – Use of equipment such as keyboard holders or lighting
• Involve employees in the work planning process, since they are often in the best position to find solutions to work process problems.
• Enlarge jobs to include more parts of the body and avoid jobs that involve repeating one specific task over and over.
• Rotate jobs using different muscle groups among employees. Doing so not only helps provide relief from performing repetitive motions but also provides cross-training, increased job stimulus and better understanding of operations.
Medical Management
It's important to have a program in place to identify and treat employees with MSDs. That program should address the following areas:

- **Early recognition**: The sooner symptoms are identified and reported, the better the chance for providing effective and inexpensive treatment. Early recognition can be achieved through training sessions and employee surveys that ask employees to report problems.

- **Systematic evaluation and referral**: When employees report symptoms, standardized diagnostic steps must be performed, and standardized procedures must be followed for treatment and referral.

- **Conservative treatment and follow-up**: The primary goal is to treat any health problem at an early stage and thus avoid surgery or other more involved treatments. A plan should be put in place to ensure that employees return to work only when ready, that they are assigned jobs that are compatible with their restrictions and that they are evaluated periodically to see that problems are not recurring.

Provide Office Ergonomics Training
An important way to make sure all employees understand office ergonomics and how to prevent the occurrence of MSDs is to conduct training on this topic. That training should cover these points:

- Basic principles of ergonomics.
- MSDs and their causes.
- How to work in neutral to reduce stress and injury.
- How to adjust workstations to meet individual needs.
- How to do stretching, warm-up and relaxation activities.

Evaluate the Program
After your ergonomics program has been put in place, it's important to evaluate it on a regular basis. When you evaluate your program, be sure that you cover these points:

- Ask employees in the program or a sample of those employees (and their representatives) about the effectiveness of the program and any problems they have found.
- Review all of the elements of the program to make sure they are working effectively.
- Determine whether MSD hazards are being identified and addressed.

- Determine whether the program is achieving positive results, as demonstrated by indicators such as these:
  - Fewer MSDs in the workplace (and especially fewer serious MSDs).
  - More jobs in which MSD hazards have been controlled.
  - Fewer jobs posing MSD hazards to employees.
  - Any other measure that shows positive change.

You should also evaluate your program (or a relevant part of it) when you have reason to believe that it's not working properly. And if your evaluation finds problems, you should promptly correct them.

Keep Accurate Records
The final step in managing your ergonomics program is to keep accurate records. You should keep written or electronic records of the following information:

- Employee reports of MSDs, MSD signs and symptoms, and MSD hazards.
- Ergonomic improvements made.
- Ergonomics program evaluations.
- Employee training provided.

Developing an office ergonomics program can help you maintain a safe workplace and help employees avoid Musculoskeletal Disorders.

Resources:

- **Association of Canadian Ergonomists**
  http://www.ace-ergocanada.ca/

- **Canadian Centre for Occupational Health and Safety**
  http://www.ccohs.ca/keytopics/ergonomics.html

- **Chubb Loss Control Services Ergonomics Tool Kit**
  Contact your Chubb Loss Control Services professional

- **Cornell University Ergonomics Web**
  http://www.ergo.human.cornell.edu/cuergoguide.html

- **National Institute for Occupational Safety and Health (NIOSH)**
  http://www.cdc.gov/niosh/topics/ergonomics/

- **Occupational Safety and Health Administration (OSHA)**
  http://www.osha.gov/SLTC/ergonomics/

- **The Ergonomics Center of North Carolina**
  http://www.theergonomicscenter.com/

- **Treasury Board of Canada Secretariat: The Fundamentals - Ergonomics**
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Introduction

Congratulations! You have taken the first step toward improving the way you work at your desktop computer.

Have you ever thought of the many things you do while you are at your computer work station? What is your body posture while you are performing general computer functions, such as keying, mousing, or writing? How long do you work at your computer without taking breaks?

By changing the way you interact with your computer equipment and furniture, you may be able to reduce your risk of injury.

Protect your ability to work! If you are already feeling some discomfort or pain or if you would like to learn how to work safely and reduce your risk of injury, read on. This guide was written for you.
**Using this booklet**

This booklet is intended for use by desktop computer users. The purpose of this booklet is to help you reduce your chances of being injured. You will learn to identify common desktop computer work station problems and explore some improvement goals. By understanding how you perform your job tasks, and how you use your equipment and furniture, you can work more safely, efficiently and comfortably.

Each section of this booklet begins with an action goal which tells you what you need to do to work more safely and more comfortably. The action goals are summarized on pages 5 and 6, and covered in more detail in the sections on pages 8-33.

Suggestions in this booklet are made to improve your work station first by utilizing your existing furniture and equipment. Try to do the best you can with what you’ve got. After that, suggestions are made to improve your work station by purchasing new or replacing existing furniture and equipment. If you are unable to improve your work station without purchasing new or replacing existing furniture or equipment, talk to your immediate supervisor. If you are already feeling discomfort, the table on page 4 will direct you to the sections in the booklet that address possible causes for your discomfort.

The Checklist on page 7 serves as a way to identify computer tasks that may expose you to the risk of injury. If you answer YES to all the questions on the Checklist, you may not need to go any further. The pages that follow the Checklist offer suggestions for improving your work station and your work practices.

You can also use this booklet as a training tool. Talk about these guidelines in your safety meetings and discuss ways to make necessary improvements.

No one is required to use the information in this booklet. This booklet is not intended to provide employers or employees with information on how to comply with Cal/OSHA regulations.
Take a Look
As you read this booklet, sit at your computer and take a good look at what you do there. You may be surprised to learn that some things you do every day may cause you pain or discomfort over time. Learn how to change your work habits! You can ease your symptoms and learn how to work pain free.

Job Tasks
Before you begin to look for risk factors, it is important to understand how your job tasks may contribute to your exposure to these risk factors. Ask yourself which tasks you perform simultaneously (at the same time). For computer users, simultaneous tasks are those tasks that are performed while keying, and include:

A. keying / mousing (generic term for using an external pointing device)
B. keying / mousing / writing
C. keying / mousing / writing / using the telephone
D. keying / mousing / writing / using the telephone / reading

When simultaneous and nonsimultaneous tasks are performed in awkward postures or with extended reaches, you increase your chances of developing an injury. If you perform simultaneous tasks, go to pages 19-25.

Workstation “Handedness”
Look at the direction of the work flow when performing simultaneous tasks. Generally, people are most comfortable when they work toward their dominant side. For example, if you are right-handed, your right hand is your dominant hand, and your right side is your dominant side. Does the “handedness” of your work station fit your hand dominance? In other words, does the design of the work station promote your work to flow toward your dominant hand? The “handedness” of the work station is determined by the location of the keyboard relative to the work area where other tasks are performed simultaneously with keying. When this work area (often the writing surface) is to the left of the keyboard, it is said to be a left-handed work station, and vice versa. A right-handed employee who sits at a left-handed work station will twist, turn, and reach to get to the work area to his/her left. The “handedness” of the work station is not always a concern, as in the case when only one task is performed there (e.g. keying only). To learn more ways to make the work station fit your handedness, go to pages 22-25.
Risk Factors
In computer tasks there are certain conditions or risk factors that can contribute to the development of musculoskeletal disorders (MSDs) when computer users are exposed frequently to these risk factors, or for long periods of time. The conditions for exposing a user to the risk of MSDs associated with computer use are as follows:

- Keying for long periods of time without breaks or rest
- Using force when striking the keyboard or when gripping the pointing device (e.g. mouse, trackball)
- Working with awkward neck, shoulder, elbow, wrist, or back postures
- Remaining in the same position for a long time with little or no movement (e.g. sitting, holding the mouse)
- Continuous pressure against (leaning on) the wrist rest, work surface edge, or armrest with the wrists, forearms, or elbows; or against the front edge of the chair with the back of the legs.

Do not wait until you feel pain or discomfort. Learn to change the way you work. If you understand your body posture in relationship to your computer equipment and furniture, you may, in fact, be able to prevent this kind of injury.

If you are exposed to any of these risk factors repeatedly or for long periods, you might experience pain or discomfort. If you do, refer to the pages below for improvement options. If you continue to have pain or discomfort, let your immediate supervisor know.

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<th>It may be related to this...</th>
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Action Goals

Now that you are aware of the job tasks you perform and the risk factors leading to MSDs, you are ready to look at the setup and organization of the furniture and equipment in your work space. The action goals that follow will help you reduce or eliminate some of these risks. They are written to help you work safely.

The following action goals describe the best way to work at your work station. This section will help you to know where to start looking for problems at your work station. After reading these goals, complete the Checklist on page 7. If you are unable to answer questions on the Checklist because you need additional information about an action goal, or if you answer “NO” to any item on the checklist, go to the page indicated where the action goal is covered in greater detail.

Goals

WHEN SITTING

1a-b. Your feet are resting comfortably on the floor or on a footrest, and your knees are slightly lower than your hips.

2. There is a 2- to 4-inch gap between the back of your knees and the front edge of the chair when your back is against the chair.

3. The curve of the chair back fits into the deepest part of the curve in your lower back.

4. The back of the chair is upright or tilted back for comfort, and provides upper back support.

5. Armrests are adjusted so that they are just slightly below your elbows when your shoulders are relaxed.

6. Armrests do not interfere with access to the keying, mousing or writing surfaces.

WHEN KEYING

7a. Your shoulders are relaxed, and your elbows are close to your body.

7b. Your elbows are bent to 90 degrees or slightly greater (inner angle).

7c. The tops of the “home row” keys are at the same height as your elbows, or slightly lower than your elbows.

7d. Your wrists are straight (not bent).

WHEN POSITIONING THE CURSOR WITH A POINTING DEVICE
(using a mouse, trackball, touch pad, etc.)

8. The pointing device is close to the keyboard.
Goals

WHEN ORGANIZING THE WORK SPACE
9a. Reaches performed frequently are within the “near” work space (your elbows remain at your sides).
9b. Reaches performed occasionally are within the “near” or “mid” work space (no more than an arm’s length away).
9c. You are not reaching across your body to work.

WHEN VIEWING THE MONITOR
10a. It is in front of you and the top line of print is at or just below your eye level or even lower if you wear bifocal, trifocal, or progressive lenses; AND You are able to scan the screen from top to bottom by using only eye movements, not head movements.
10b. You can sit against the back of the chair and read the monitor screen from a comfortable distance, without experiencing eye fatigue, blurred vision or headaches.
10c. The monitor screen is free of glare.

WHEN READING THE DOCUMENT
11a. The document is off the flat work surface and in your line of vision.
11b. The document is directly next to the monitor or between the monitor and the keyboard.
11c. The document is at the same distance as, or closer than, the monitor.
11d. You can look at the document and the monitor by moving only your eyes, not your head.

WHEN USING A NEW SOFTWARE PROGRAM OR OPERATING SYSTEM (OS)
12a. You are efficient in the most common tasks you perform.
12b. You reduce the stress and frustration you experience when you cannot complete a task.
Instructions:
Answer the questions below to determine problems that might cause MSDs. If you answer “NO,” turn to the page indicated for improvement options. If you run out of improvement options and you still have problems, contact your immediate supervisor.

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<thead>
<tr>
<th>GOAL</th>
<th>YES / NO</th>
<th>If NO, see page:</th>
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<td><strong>WHEN SITTING</strong></td>
<td></td>
<td></td>
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<tr>
<td>1a-b</td>
<td>Is the chair height adjusted so that your feet rest comfortably flat on the floor or footrest, with your knees just slightly lower than the hips?</td>
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<tr>
<td>2</td>
<td>Look at the depth of the seat pan. Is there a small gap (2 to 4 inches) between the back of your legs and the front edge of the seat pan?</td>
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<tr>
<td>3</td>
<td>Does the curve of the back of the chair fit into your low back?</td>
<td>11</td>
</tr>
<tr>
<td>4</td>
<td>Does the back of the chair tilt back?</td>
<td>12</td>
</tr>
<tr>
<td>5</td>
<td>With your shoulders relaxed, are the armrests slightly below your elbows, and do your arms hang comfortably at your sides?</td>
<td>13</td>
</tr>
<tr>
<td>6</td>
<td>Can you get your chair close enough to your keying, mousing, or writing surfaces without reaching?</td>
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<tr>
<td><strong>WHEN KEYING</strong></td>
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<tr>
<td>7a-d</td>
<td>With your shoulders relaxed and your fingers curved, is the home row of keys at the same height as your elbows or slightly below your elbows?</td>
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<td>Is the pointing device positioned close to the keyboard?</td>
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<td>9a-c</td>
<td>Are you able to use your work surface and equipment without over-reaching or using awkward postures?</td>
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<td>Is it in front of you and the top line of print is at or just below eye level or even lower if you wear bifocal, trifocal, or progressive lenses; AND are you able to scan the screen from top to bottom using only eye movements, not head movements?</td>
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<td>10b</td>
<td>Can you sit against the back and read the monitor screen from a comfortable distance, without experiencing eye fatigue, blurred vision, or headaches?</td>
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<td>10c</td>
<td>Is the monitor screen free of glare?</td>
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<td><strong>WHEN READING THE DOCUMENT</strong></td>
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<tr>
<td>11a-d</td>
<td>Is the document off the flat work surface and at the same distance as the monitor screen?</td>
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<td><strong>WHEN USING NEW SOFTWARE PROGRAMS AND OPERATING SYSTEMS</strong></td>
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<td></td>
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<tr>
<td>12</td>
<td>Have you been trained on the software programs and operating system you are using?</td>
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Awkward seated postures and lengthy periods of sitting may increase your risk of injury. It is important that you are comfortable while sitting, as remaining in an awkward seated posture can increase your fatigue level, tighten muscles, or irritate nerves. When your body is fatigued or in discomfort, the risk of injury increases, and productivity and accuracy decrease. An awkward seated posture is especially risky if it is combined with lengthy periods of sitting, or other awkward body postures, and eventually you may have trouble doing even simple tasks, such as reaching for the telephone.

When you remain in the same seated posture for a long time, your blood flow slows down and you may begin to feel tired. The muscles in your neck, shoulders, and back become fatigued. Recognize opportunities to get out of your chair and move around. Instead of reaching up to the overhead bin, stand up. Instead of reaching to the printer, place the printer farther away so you must get up and walk to it. Stand up to take a phone call. Moving around keeps the blood flowing and prevents muscle fatigue and cramping.

**When your chair is properly adjusted**

1a-b. Your feet are resting comfortably on the floor or on a footrest, and your knees are slightly lower than your hips.

2. There is a 2-4-inch gap between the back of your knees and the front edge of the chair when your back is against the chair.

3. The curve of the chair back fits into the deepest part of the curve in your lower back.

4. The back of the chair is upright or tilted back for comfort.

5. Armrests are adjusted so that they are just slightly below your elbows when your shoulders are relaxed.

6. Armrests do not interfere with access to keying, mousing, or writing surfaces.

You may need to adjust the height of your chair every day, depending upon the job task, and the shoes you are wearing (the higher the heels, the higher the chair will be raised). If the seat pan height is changed, the keyboard and monitor will need to be adjusted, as well.
ACTION GOAL #1: Adjust the seat pan height so that

a. Your feet rest comfortably flat on the floor, or on a footrest.
b. Your knees are slightly lower than your hips.

IF YOU SEE THIS . . . TRY THIS . . .

Your feet do not rest comfortably flat on the floor. Lower the chair until your feet rest comfortably flat on the floor. Use a footrest.

Your feet rest on the floor, but your knees are higher than your hips. Raise the chair until your hips are slightly higher than your knees.
ACTION GOAL #2: Adjust the seat pan depth so that there is a 2–4-inch gap between the back of your knees and the front edge of the chair when your back is against the chair.

If you see this . . .

There is more than 4 inches between the front edge of the seat pan and the back of your knees.

Try this . . .

Slide the seat out (forward) to make it deeper and provide more support.

Or

Use a chair with a seat pan that has a 2- to 4-inch gap between the back of your knees and the front edge of the chair when your back is against the chair.*

* Select a chair that fits and is comfortable. Be sure that the chair provides upper and lower back support. Ask for a demonstration of the adjustment features of the chair.
ACTION GOAL #3: Adjust the height of the back of the chair so that the curve of the back of the chair fits into the deepest part of the curve in your lower back.

IF YOU SEE THIS . . .

Chair back too low

The curve in the chair back does not fit into your lower back.

TRY THIS . . .

Chair back too high

Reach back to feel the curve in your lower back. Then raise or lower the chair back until it fits into the curve of your lower back;

OR

Use another chair that can be adjusted to fit your lower back.*

* Select a chair that fits and is comfortable. Be sure that the chair provides upper and lower back support. Ask for a demonstration of the adjustment features of the chair.
ACTION GOAL #4: Adjust the tilt of the back of the chair so that the back of the chair is upright or tilted back for comfort.

IF YOU SEE THIS . . .

The chair back does not tilt back slightly and rock or lock into position.

TRY THIS . . .

Use another chair that tilts back slightly and rocks or locks into position.*

* Select a chair that fits and is comfortable. Be sure that the chair provides upper and lower back support. Ask for a demonstration of the adjustment features of the chair.
ACTION GOAL #5: Adjust the armrests so that

a: They are slightly below your elbows when your shoulders are relaxed.
b. Your arms hang comfortably at your sides.

IF YOU SEE THIS . . . TRY THIS . . .

Armrests too high
Your shoulders are raised when resting on the armrests. With shoulders relaxed, lower the armrests to just slightly below your elbows.

Armrests too low
You reach down to rest on the armrests. Raise the armrests to just slightly below your elbows when your shoulders are relaxed.
The armrests cannot be adjusted to slightly below your elbows when your shoulders are relaxed.

TRY THIS . . .

Remove the armrests.

OR

Use another chair with adjustable armrests.*

* Select a chair that fits and is comfortable. Be sure that the chair provides upper and lower back support. Ask for a demonstration of the adjustment features of the chair.
ACTION GOAL #6: Adjust the armrests so that they do not interfere with access to keying, mousing or writing surfaces.

IF YOU SEE THIS . . .
Armrests interfere with access to keying, mousing, or writing surfaces.

TRY THIS . . .
Adjust the armrests to their lowest position. In this position they cannot be used for resting.

OR

Remove the armrests.
**WHEN KEYING**

**When the keyboard is at the right height**

7a. Your shoulders are relaxed, and your elbows are close to your body.
7b. Your elbows are bent to 90 degrees, or slightly greater (inner angle).
7c. The tops of the “home row” keys are at the same height as your elbows, or slightly below your elbows.
7d. Your wrists are straight (not bent).

![Home row](image1)

![Keys at elbow height](image2)

![Keys slightly below elbows](image3)

When you center your fingers on “home row”, your fingers must reach the top, bottom, and sides of the keyboard. The fingers and wrists do all the work and they quickly tire.

**Try this keying technique**

Instead, transfer the workload from your hands to the larger muscles of your arms, elbows, and shoulders by using arm movements rather than just finger and wrist movements while keying. You will work more comfortably and you won’t tire as quickly.

*Source:*

“Computing Without Pain With the MouseKeyDo System,” Norman J. Kahan, MD.

In this section, reference is made to the keyboard platform. The keyboard platform is mounted beneath the work surface, and allows you to raise, lower, and tilt the keyboard. For computer operators, it is recommended that the keyboard platform is either flat (not tilted) or tilted downwards (negative tilt). It is not recommended that the keyboard is tilted upwards (positive tilt), as this forces you to bend your wrists back.

![Negative tilt](image4)

![Flat or neutral (not tilted)](image5)

![Positive tilt](image6)

Many desktop computer users still use the standard, or traditional, keyboard. For a description of alternative keyboards, go to http://www.healthycomputing.com/office/accessories/keyboard/#Keyboards.
ACTION GOAL #7: Adjust the keyboard height so that

a. Your shoulders are relaxed, and your elbows are close to your body.
b. Your elbows are bent to 90 degrees, slightly greater (inner angle).
c. The tops of the home row keys are the same height as your elbows or slightly below your elbows (negative tilt).
d. Your wrists are straight (not bent).

IF YOU SEE THIS . . .

Keyboard too high
The keyboard is above elbow height.

Keyboard too low
The keyboard is too low and your wrists are bent.

TRY THIS . . .

Raise or lower the keyboard platform or your chair until the tops of the home row keys are at the same height as your elbows or slightly below your elbows when your shoulders are relaxed. Use a footrest if necessary.

Tilt the back edge of your keyboard platform slightly downward (“negative” tilt). You arms will tilt downward, and your elbows will open to slightly more than 90°. Don’t use the legs beneath the keyboard.
The keyboard is at your elbow height, but you lean on your wrists while keying.

Use the wrist rest only for short periods between keying. For longer periods, remove your hands from the keyboard and rest them in your lap.
Pointing devices, such as the mouse and trackball, can cause computer-related injuries to the shoulders, neck, elbows, wrists, and hands. Common actions associated with such devices include reaching, gripping, pivoting at the wrist, finger clicking, and holding the button when “dragging” the mouse. Those actions and static arm posture (“mouse arm”) may cause problems eventually.

When a pointing device is used while keying, it is important that it is accessed without overreaching or using awkward postures. To accomplish this place the pointing device as close to the keyboard as possible.

When the pointing device is in the right position
8. The pointing device is close to the keyboard.

There are many improvement options for positioning the pointing device that are not covered in this section. Other comfortable positions for the pointing device that promote a flat (neutral) wrist can be used.

When using a mouse, try this technique:*

- Drop your arm and hand as one onto the mouse, with your upper arm hanging freely from your shoulder.
- Drape your hand over the mouse, with your palm on the center of the mouse and all your fingertips hanging over the front and sides (avoid the temptation to grip the mouse with your fingers).
- Make small circular motions with the mouse by making arm movements from the shoulder.
- Click the mouse button with the mid-section of your finger rather than your fingertip.

*“Computing Without Pain With the MouseKeyDo System,” Norman J. Kahan, MD.

Tips for mouse or trackball:
- Take your hand off the mouse or trackball when you are not using it, and rest your hand in your lap.
- Make sure you have enough space on the work surface to move the cursor with the mouse in one sweeping movement, rather than having to pick up and reposition the mouse.
**ACTION GOAL #8:** Place the pointing device so that it is close to the keyboard.

**IF YOU SEE THIS . . .**

The pointing device is a trackball that does not fit on the keyboard platform.

**TRY THIS . . .**

Use a keyboard that does not have a 10-key pad and place the trackball next to the keyboard.

**OR**

Replace the keyboard platform with an adjustable keyboard platform wide enough to fit the keyboard and the trackball. Adjust the height and tilt of the platform so that the tops of the home row keys are at your elbow height, or slightly below your elbows (negative tilt), when your shoulders are relaxed.

There are many improvement options for positioning the pointing device that are not covered in this section. Other comfortable positions for the pointing device that promote a flat (neutral) wrist can be used.
ACTION GOAL #8  Continued

IF YOU SEE THIS . . .

The pointing device is a mouse that does not fit on the keyboard platform.

OR

IF YOU SEE THIS . . .

The pointing device is either a mouse or a trackball that does not fit on the keyboard platform.

TRY THIS . . .

Place a mouse platform over the numbers pad and use it as a mousing surface.

OR

TRY THIS . . .

Follow these steps:
1. Remove the keyboard platform;
2. Then place the keyboard and pointing device directly on the work surface, with the mouse or trackball next to the keyboard.
3. Raise the chair until the tops of the home row keys are at the same height as your elbows, or slightly below your elbows, when your shoulders are relaxed. Use a footrest, if necessary.
4. Adjust the height and distance of the monitor, if necessary.

There are many improvement options for positioning the pointing device that are not covered in this section. Other comfortable positions for the pointing device that promote a flat (neutral) wrist can be used.

OR

Use a keyboard with a built-in pointing device (touch pad).
Organizing the Work Space

Overreaching is defined as reaching to such a distance that you lean forward or to the sides while fully extending your arm. Overreaching in any direction causes fatigue, reducing productivity and accuracy and increasing the risk of injury. Reduce or eliminate overreaching by rearranging the work station.

“Near” Work space Activities
For activities performed frequently or repetitively, the work should be performed within the “near” work space, with your elbows at your sides. Within this space, you can work comfortably without stretching or leaning. Working outside this space requires you to reach, bend, twist, and so forth. These activities lead to discomfort and fatigue and can cause injuries. By working within the “near” work space, you can maximize efficiency and comfort.

“Mid” Work space Activities
Activities performed occasionally can be performed in the “mid” work space (an arm’s length away); however, this requires extension of your arm. Activities performed beyond this mid-range involve leaning and reaching and should be performed rarely.

If your work space is properly organized
9a. Reaches performed frequently are within the “near” work space (your elbows remain at your sides).
9b. Reaches performed occasionally are within the “near” or “mid” work space (no more than an arm’s length away).
9c. You are not reaching across your body to work.
ACTION GOAL #9: Organize the work space so that

a. Reaches performed frequently are within the near work space (your elbows are at your sides).
b. Reaches performed occasionally are within the near or mid work space (no more than an arm’s length away).
c. You are not reaching across your body to work.

IF YOU SEE THIS . . .

You frequently lean to make reaches more than an arm’s length away.

TRY THIS . . .

Remove unnecessary equipment and supplies from the work station;

AND

Re-organize your work space by moving all necessary equipment and supplies close, to no more than an arm’s length away, or to a location where you must get up and walk to it.
ACTION GOAL #9  Continued

IF YOU SEE THIS . . .

You are using a keyboard platform and you are keying, mousing, and writing simultaneously, and you reach above and behind your keyboard to get to the pointing device or the writing surface.

TRY THIS . . .

Follow these steps:
1. Remove the keyboard platform;
2. Then place the keyboard, pointing device and writing material directly on the work surface;
3. Raise the chair until the tops of the home row keys are at the same height as your elbows, or slightly below your elbows when your shoulders are relaxed. Use a footrest, if necessary.
4. Adjust the height and distance of the monitor, if necessary.

OR

Follow these steps:
1. Replace the keyboard platform with a height- and tilt-adjustable platform that is wide enough for the keyboard and pointing device.
2. Adjust the height and tilt of the keyboard platform until the tops of the home row keys are the same height as your elbows, or slightly below your elbows (negative tilt) when your shoulders are relaxed.
IF YOU SEE THIS . . .

Your work station does not match your dominant hand (handedness).

TRY THIS . . .

Reverse the placement of the computer equipment so that non-keying tasks are performed on your dominant side when you are sitting at your keyboard.

IF YOU SEE THIS . . .

File drawers prevent you from having knee clearance beneath the work surface on your dominant side.

TRY THIS . . .

Reverse the placement of the file drawers so that they are beneath the work surface on your non-dominant side.
Monitor height

The maximum height of your viewing range is established by your horizontal line of sight when you are comfortably and properly seated at your work station.

A monitor that is set too high will cause you to tip or tilt your head back to look up at the monitor. Over time, neck, shoulder, and upper back pain may result. You may also notice dry eyes because there is a tendency to blink less when looking up.

Monitor distance

Placing the monitor at a comfortable distance varies with each person. In general, the closer you are to the monitor, the harder your eyes work to keep the image in focus. You may experience eye fatigue, blurred vision, or headaches if your monitor is placed too close. On the other hand, if you lean forward to see the monitor, pull it closer to you.

If your monitor is properly adjusted

10a. It is in front of you and the top line of print is at or below your horizontal line of sight or even lower if you wear bifocal, trifocal or progressive lenses.

10b. You can sit against the back of the chair and read the monitor screen from a comfortable distance, without experiencing eye fatigue, blurred vision, or headaches.

10c. The monitor screen is free of glare.

Try these techniques

1. Periodically shift your view to something in the background (behind the monitor). Give your eyes a chance to relax.
2. Periodically rest your eyes by closing them for five seconds.
3. Adjust the monitor’s contrast and/or brightness (light background, dark font).
4. Zoom in to increase the display percentage.
5. Blink!
ACTION GOAL #10a: Adjust the height of the monitor so that

- It is directly in front of you and the top line of print is at or just below eye level, or lower if you wear bifocal, trifocal, or progressive lenses AND

- You are able to scan the screen from top to bottom using only eye movements, not head movements.

IF YOU SEE THIS . . .

Monitor too high
The top line of print is above eye level.

TRY THIS . . .
Lower the monitor
Lower the monitor (remove the computer or monitor riser[s] from beneath the monitor) until the top line of print is at or slightly below eye level, or lower if you wear bifocal, trifocal, or progressive lenses.

OR

Raise the chair
Raise your chair until your eyes are at or just slightly above the top line of print, or even higher if you wear bifocal, trifocal or progressive lenses. Use a footrest, if necessary.

IF YOU SEE THIS . . .

Monitor too low
You use head movements to scan from top to bottom of the screen.

TRY THIS . . .
With bifocal, trifocal, or progressive lenses
Raise the monitor until the top line of print is at or slightly below your eye level, or even lower if you wear bifocal, trifocal, or progressive lenses.

OR

Without bifocal, trifocal, or progressive lenses
ACTION GOAL #10b: Start with the monitor an arm’s length away. Then adjust the distance of the monitor so that you can sit against the back of the chair and read the monitor screen from a comfortable distance, without experiencing eye fatigue, blurred vision, or headaches.

IF YOU SEE THIS . . .
Monitor too close
You have symptoms (eye fatigue, blurred vision, or headaches).

TRY THIS . . .
Move the monitor back until you can comfortably read the screen without experiencing symptoms.

IF YOU SEE THIS . . .
Monitor too far
You have difficulty reading the screen, and lean forward to get a closer look.

TRY THIS . . .
Move the monitor closer until you can sit back and comfortably read the screen without symptoms.

A small change can make a big difference
ACTION GOAL #10c: Adjust the tilt of the monitor so that the screen is free of glare.

IF YOU SEE THIS . . .

Glare on your monitor from task or overhead lighting.

TRY THIS . . .

Tilt the monitor down slightly;

OR

Dim task or overhead lights; draw blinds or curtains.

_____________________________

IF YOU SEE THIS . . .

Glare on your monitor from windows.

TRY THIS . . .

Reposition the monitor so that it is at a right angle to the light source;

OR

Use a glare screen.

OR

Use file folders or a screen hood.

Other sources of glare include light colored clothing and white papers.
Focusing on a document requires the muscles in your eyes to contract to keep the image sharp. Each time your eyes shift from the document to the monitor they must refocus. Eventually they become fatigued. Ultimately, the result is eye fatigue, eyestrain, or headaches which can affect productivity and accuracy.

When the document is placed flat on the work surface, you will use head and neck movements to shift your view between the document and the monitor. These movements can cause neck strain if performed repeatedly, or day after day.

**When the document holder is properly placed**

11a. The document is off the flat work surface and in your line of vision.

11b. The document is directly next to the monitor, or between the monitor and the keyboard.

11c. The document is at the same distance as, or closer than, the monitor.

11d. You can look at the document and the monitor by moving only your eyes, not your head.
ACTION GOAL #11: Position the document so that

a. It is off the flat worksurface and in your line of sight.
b. It is directly next to the monitor or between the monitor and the keyboard.
c. It is at the same distance as the monitor or closer.
d. You can shift your view between the document and the monitor by moving only your eyes, not your head.

IF YOU SEE THIS . . .

The document is not directly next to the monitor.

TRY THIS . . .

Place the document at the same height and distance as the monitor unless the print is too small to read. If the print is hard to read, place the document closer to and at the same height as the monitor.

OR

Position the document between the monitor and the keyboard.
ACTION GOAL #11 Continued

IF YOU SEE THIS . . .

The document is farther away than the monitor.

TRY THIS . . .

Use a document holder that mounts to the monitor or is positioned to either the left or right side of the monitor;

OR

Position the document between the monitor and the keyboard.
KNOW YOUR SOFTWARE PROGRAMS AND OPERATING SYSTEM...

**ACTION GOAL #12: Ask your manager for instructions or training before you begin so that**

a. You are efficient in the most common tasks you perform.
b. You reduce the stress and frustration you experience when you cannot complete a task.

Protect your ability to work! Ask your manager for help if you have not been trained on the software programs or operating system you are using.

If you need to work with a particular program or operating system, be sure to familiarize yourself with it ahead of time. Training can be as simple as a short demonstration or taking a class for a day or two. The time spent in training can pay off in big dividends in (1) preventing injuries; (2) being able to work without discomfort or pain; (3) reducing unnecessary movements; (4) saving time and getting the work done more efficiently.

Many software programs have shortcuts that allow you to quickly accomplish tasks without using a pointing device (mouse, trackball, etc.). By pressing one or more keys on the keyboard you can complete your task quickly and without the awkward postures associated with the pointing device. Learn to use the shortcuts as an alternative to the pointing device.
The Benefits of Software Training

By Anthony Andre, PhD.

Interface Analysis

In a recent usability study conducted by Interface Analysis Associates, 24 intermediate to highly experienced computer users were observed while they were attempting to perform basic tasks in common software applications. Their interactions with the software were analyzed in terms of length of time, number of mouse clicks, and successful completion of the tasks and when compared to optimal performance standards. The results showed that, on average, participants either took longer and used more mouse clicks than necessary to successfully perform common computer tasks, or they couldn’t figure out how to complete a task. In the end, the study suggests that for every 8 hours of computer work, the same work could have been performed in only 40 minutes if the software training had been provided!

**Impacts on You**

During these periods of inefficiency, participants were observed for body postures and other behaviors, such as facial expressions (indicators of frustration or stress) and verbal utterances. These observations revealed the impact of software inefficiency in four main areas:

**Time:** The more inefficient we are as computer users, the more time we spend sitting in front of the computer. The negative effects of prolonged sitting include poor circulation; muscle fatigue; back, shoulder, and neck pain; eye strain; and more.

**Repetitions:** Inefficiency results in more mouse clicks and keystrokes, that is, higher repetitions.

**Posture:** Our postures change when we can’t easily accomplish our goals with our computer software. For example, we lean forward, we hold the mouse with our arm outstretched and shoulder raised, and ultimately we lose the basis for the support of good body posture.

**Stress:** With each failed attempt to carry out a specific action or command with our computer software, we experience higher levels of stress, frustration, and time pressure.

**Conclusions and Guidelines**

Computer users are encouraged to explore ways to improve their computer interaction efficiency and seek training in the software programs and operating systems they use in their workplaces. Indeed, most of the participants indicated that their interactions with software would be more efficient with formal training.
TIPS TO IMPROVE THE WAY YOU WORK

• **Take micro-breaks** from repetitious activities or static postures every 30 minutes for one or two minutes before resuming that activity or posture. Find opportunities to get out of your chair and move around.

• **Place the telephone** on your non-dominant hand side. Your dominant hand will be free for writing, and cradling the telephone between your ear and shoulder while writing will not be necessary.

• **Use a telephone headset or the speaker** when performing tasks simultaneously with the telephone. This practice will prevent awkward neck and shoulder postures associated with cradling the telephone between your ear and shoulder.

• **Type with the tips of the fingers.** Less force is needed to depress the keys with the tips of the fingers. Use a light touch when keying.

• **Change postures frequently** throughout the day. Alternate working from a sitting to a standing position whenever possible. Change the tilt of the back of the chair frequently.

• **Use shortcut keys** whenever possible, instead of a pointing device (mouse, trackball, etc.).

• **Alternate hands** when using the pointing device, OR alternate between pointing devices (e.g. alternate between mouse and trackball). Use larger muscles by moving from the elbow and shoulder, rather than from the wrist, when operating the pointing device.

• **Stand up** to reach into overhead bins rather than reaching up from a sitting position, OR, lower the overhead storage bins if possible.
**List of Websites**

The Web sites listed below contain ergonomic information for office and industrial work settings and work techniques.

<table>
<thead>
<tr>
<th>Website</th>
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<tr>
<td>Canadian OSHA</td>
<td><a href="http://www.ccohs.ca/oshanswers/ergonomics/">http://www.ccohs.ca/oshanswers/ergonomics/</a></td>
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<td>Cornell University</td>
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<td>Healthy Computing</td>
<td><a href="http://www.healthycomputing.com">http://www.healthycomputing.com</a></td>
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<td>Human Factors/Ergonomics Society (HFES)</td>
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<td>Interface Analysis</td>
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<td>International Ergonomics Association (IEA)</td>
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<td>MouseKeyDo</td>
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<td>National Institute for Occupational Safety &amp; Health (NIOSH)</td>
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<td>Oregon OSHA</td>
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<td>UC Davis Ag-Ergo</td>
<td><a href="http://ag-ergo.ucdavis.edu">http://ag-ergo.ucdavis.edu</a></td>
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Toll-free number: 1-800-963-9424  
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Central Valley  
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San Bernardino, CA 92401  
(909) 383-4567

San Diego  
7575 Metropolitan Dr., Suite 204  
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Your call will in no way trigger an inspection by Cal/OSHA Enforcement

• Voluntary Protection Program  
  Oakland, CA 94612  
  (510) 622-1081

• Research and Education Unit  
  Sacramento, CA 95825  
  (916) 574-2528
Connected
We have become an e-mobile society. Many people are constantly connected to work and family via smartphones, tablets, laptops, Webcams, virtual meetings and the Cloud. Unfortunately, the advances in all this connectivity have not necessarily translated into advances in most workers’ personal ergonomics. The typical road warrior may spend countless hours in awkward unchanging positions that often occur in tight or cramped spaces and doesn’t have height-adjustable keyboard trays or even peripherals. Costly checked bag fees mean that many road warriors have had to limit what they bring along to what will fit in the overhead compartment and under the seat in front of them. That typically means stripping down the office workstation to just a laptop computer or tablet and lugging everything through the airport to get to their final destination. Since ergonomics is about fitting the task to the person, it’s important to provide frequent travelers with information on how to handle working in challenging situations. With knowledge about ergonomics principles and some creativity, the savvy worker can make impromptu adjustments to reduce stress and discomfort while working on the go.

Traveling Offices and Impromptu Ergonomics
Because prolonged holding or carrying a 2- to 8-pound laptop has a direct effect on posture, workers should eliminate the carry by using a wheeled bag or backpack. Lighter-weight bag options are preferred since travelers frequently lift them into a vehicle trunk or into overhead airline storage compartments. The bag should have high-quality wheels and a long-enough handle for easy maneuvering. If the bag doesn’t have wheels, the carried laptop load should be balanced on both sides of the body. Travelers should avoid carrying laptops by the bag handle. At the very minimum, a bag with a padded shoulder strap should be used, and the load should be shifted between right and left shoulders frequently to provide mini-rest breaks to each side of the body. Two padded shoulder straps, as on a backpack, are preferred to distribute the load across both shoulders more evenly. Backpacks should be worn high on the torso.

Whether at the airport, in the car, in a hotel, or in a remote office setting, travelers frequently find that the equipment provided at the temporary work location is not ideal. Knowing a few tricks of the trade can minimize potential musculoskeletal risks they encountered.

Sitting Posture
A pillow, cushion or even folded towels can be used to raise the worker high enough in the chair so that the elbows are...
level or slightly higher than the keyboard. A rolled-up bath towel or pillow can be used to support the lower back. If the feet cannot be placed flat on the floor with the altered sitting height, consider placing them on a book, briefcase or other solid object in order to keep them supported with the thighs parallel to the floor. If there isn’t a surface low enough or a chair high enough to work comfortably, then the lap is always an option. Sit so the knees and hips are level to allow the laptop to rest comfortably in the lap. Laptops can produce significant amounts of heat, so it is a good idea to place a heat-dissipating barrier, like a towel or large thin book, between the laptop and the user's lap. It is not advisable to use the laptop in bed, but, if it can’t be helped, pay close attention to the body’s posture and ensure that the lumbar region of the back is properly supported. Try to sit up straight so as to avoid neck, shoulder and back discomfort. Pillows can be used to support the lower back and head. And remember to use a heat-dissipating barrier.

Breaks
Frequent work breaks are especially important in a mobile computing environment—even brief ones. Listen to the body and take a short break when the first signs or symptoms of discomfort arise. Short stretching exercises, a trip to the bathroom, or a walk to the water fountain are purposeful ways of incorporating breaks into the worker’s routine. Taking a break to change working positions is perhaps the best reason to take a break. Alternating between working with the laptop on the desk for better screen position and with the laptop in the lap for better arm position is a common position toggle. Remember, the best position is the next position!

Airplane
Few people would describe current airplane coach seating as comfortable, let alone expansive. If travelers need to use a laptop on the airplane, a bulkhead seat or exit row, as a second choice, may be the best compromise between cost and space. Bulkhead seats are not limited by a reclined seatback in the row ahead. Exit rows provide more seat-to-seat spacing and will allow travelers to keep their arms in more-neutral positions. A small pillow or folded in-flight magazines can be used to provide support to the neck or lower back, and the tray table can serve as a great heat-dissipating barrier between the lap and laptop.

Technology
With new technologies emerging every day, it's good to take a step back and ask how the technologies are used and if there are any inherent risks. Smartphones can keep travelers connected while on the move, but their size also introduces some risk of injury with overuse. Frequent text messaging can lead to tendonitis of the thumb, also known as De Quervain’s disease or “Blackberry Thumb.” Keyboard use can be minimized with the use of the “dictation” mode supplied on many of the newer phones.

Tablet computers are larger than smartphones yet lighter weight than laptop computers. Because of their built-in touch-screen keyboards, tablets also induce poor neck posture (flexion) like smartphones and laptops. Tablets may be an alternative to a heavy laptop, but, if using a tablet for an extended period of time, a tablet stand (oftentimes built into the tablet’s case), an external keyboard, and an external pointing device are recommended. Travel keyboards and travel mice can be handy space-saving devices since they are usually smaller than their standard full-size counterparts. However, because they are smaller, they can create smaller
pinch-like grips and additional awkward postures in the hands and wrists which lead to a more-rapid increase in fatigue and a greater potential for musculoskeletal disorders (MSDs). If travelers will be spending large amounts of time using these external devices, make sure that the devices fit their hands comfortably. The one-size-fits-all approach definitely does not apply here.

Technology advancements have many upsides, but they also present some new challenges especially for the telecommuter and frequent traveler. These workers can easily slip into an “always-on” lifestyle with extended working hours in awkward postures. Using ergonomics principles to fit the task to the person can prevent pain at home and on the road.

**Chubb Loss Control Services Assistance**

To learn more about Impromptu Ergonomics, or for further reference materials on this topic, please contact your local Chubb Loss Control Services Risk Engineer. You can also visit us at www.chubb.com.
# IMPROMPTU ERGONOMICS Checklist

## Transport

<table>
<thead>
<tr>
<th></th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>Potential Fixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is a wheeled bag or a backpack used to transport the computer and its peripheral equipment?</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Use a wheeled bag or backpack</td>
</tr>
<tr>
<td>Does the wheeled bag have a long-enough handle to prevent awkward back postures while using it?</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Use a wheeled bag with a longer handle</td>
</tr>
<tr>
<td>Does the nonwheeled bag have at least one padded shoulder strap? (Two straps are preferred.)</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Use a bag with at least one padded shoulder strap (two straps preferred)</td>
</tr>
<tr>
<td>Is the nonwheeled bag strap shifted from one shoulder to the other frequently to provide mini-rest breaks to the other shoulder?</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Switch shoulders frequently when using a bag with only one strap</td>
</tr>
<tr>
<td>Are both straps of the backpack used (one on each shoulder) to distribute the weight of the computer and its peripheral equipment?</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Use both straps of the backpack</td>
</tr>
<tr>
<td>Is the backpack worn high on the torso?</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Wear the backpack high on the torso</td>
</tr>
</tbody>
</table>

## Sitting

<table>
<thead>
<tr>
<th></th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>Potential Fixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can the chair be raised high enough so the elbows are level with or slightly higher than the keyboard?</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Sit on a pillow, cushions or folded towels to raise the worker</td>
</tr>
<tr>
<td>Has the laptop screen been raised, assisted by the use of an external keyboard and pointing device in an effort to keep the elbows level with or slightly higher than the keyboard?</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Use an external keyboard and external pointing device</td>
</tr>
<tr>
<td>Is the lower back supported?</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Support the lower back with a rolled-up towel or pillow</td>
</tr>
<tr>
<td>Can the feet be placed firmly on the floor with the thighs parallel to the floor?</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Support the feet with a book, briefcase or other solid object</td>
</tr>
<tr>
<td>Is the laptop used at a workstation instead of on the lap? (Lap use is recommended only if the chair/user cannot be adjusted high enough or the work surface cannot be lowered enough.)</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Adjust the chair higher or the work surface lower if possible</td>
</tr>
<tr>
<td>Are the knees and hips level to allow the laptop to rest comfortably in the lap?</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Position the knees and hips level</td>
</tr>
<tr>
<td>Is a heat-dissipating barrier used between the laptop and the lap?</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Use a large thin book or folded towel as a barrier</td>
</tr>
<tr>
<td>Is the laptop used at a workstation instead of in bed? (Bed use is recommended only as a last resort if the chair/user cannot be adjusted high enough or the work surface cannot be lowered enough.)</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Use a chair and workstation if possible</td>
</tr>
<tr>
<td>Is the user able to sit up straight with the lower back and neck supported?</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Sit up straight and use a pillow or rolled-up towel to support the lower back and neck</td>
</tr>
<tr>
<td>Are short breaks taken before signs and symptoms of discomfort arise?</td>
<td>![ ]</td>
<td>![ ]</td>
<td>N/A</td>
<td>Take a break to change to another working position, use the bathroom or walk to the water fountain</td>
</tr>
<tr>
<td>Airplanes</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
<td>Potential Fixes</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
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<td>-----------------------------------------------------</td>
</tr>
<tr>
<td>Does the seat ahead provide ample space to use the laptop?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Consider sitting in a bulkhead or exit row seat or utilizing a laptop with a smaller footprint</td>
</tr>
<tr>
<td>Are the lower back and neck supported?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Provide support with a pillow or rolled-up blanket</td>
</tr>
<tr>
<td>Is a heat-dissipating barrier used between the laptop and the lap?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Use a magazine or tray table as the barrier</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tablets &amp; Smartphones</th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>Potential Fixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is an external keyboard employed when using the tablet or smartphone for extended periods of time?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Use an external keyboard for long periods of use</td>
</tr>
<tr>
<td>Is an external pointing device employed when using the tablet or smartphone for extended periods of time?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Use an external pointing device for long periods of use</td>
</tr>
<tr>
<td>Is a stand or prop employed when using the tablet or smartphone for extended periods of time?</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>Use a stand for long periods of use</td>
</tr>
</tbody>
</table>
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Introduction

Ergonomics, or fitting the task to the person, has been applied in industrial settings for decades. Besides the incentive of maintaining the health and well-being of workers, promoting sound ergonomic principles in industrial environments has also proven to improve other business metrics such as productivity, efficiency and quality, thereby maximizing company profits. Ultimately, since ergonomics is all about optimizing the performance of the workers, the tasks they perform and the machines they use, many companies have integrated ergonomics into their Lean Manufacturing and 5S (work organization and housekeeping) efforts and vice versa. Essentially, the goal of Lean and 5S is to remove wastes and unnecessary steps from processes to optimize efficiency. Such wastes may include an unnecessary lift, an awkward reach or reworking poor quality parts, which may also introduce additional ergonomic risks and concerns that otherwise would not be present. Thus, linking ergonomics to your Lean and 5S initiatives is certainly encouraged.

Although “industry” is a very broad term with a variety of work processes and tasks, there are common task characteristics that drive the majority of ergonomic concerns in industries of all types:

- Repetitive, Upper-Extremity Intensive Tasks
- Awkward Postures

According to the Bureau of Labor Statistics (BLS, 2012), approximately 60 million U.S. workers spend more than half their time in their job performing repetitive movements, and over 25% perform such tasks continually or almost continually. Likewise, awkward postures are another major cause of occupational injury. Of the strain, sprain and tear cases involving days away from work reported annually, 36% involve injuries to the back; 21% involve injuries to the shoulder, arm, wrist, or hand; and 12% involve injuries to the knees. The majority of such cases are associated with performing work tasks that do not incorporate positive ergonomic principles that directly result in lost time, lost productivity and lost company profits. To avoid such problems, consider using this Industrial Ergonomics Tool Kit: Manual Material Handling and Awkward Postures to improve the fit between the work demands and the capabilities of your workers.

Repetitive, Upper-Extremity Intensive Tasks

Besides manual material handling (covered in a separate Industrial Ergonomics Tool Kit), another large percentage of industrial work involves the repetitive use of the upper extremities. Upper-extremity intensive tasks are defined as any task performed by the shoulders, arms/elbows, hands/wrists and fingers that involve significant ergonomic stressors (i.e. high force, awkward posture and repetitive or static motion). The criteria listed below and in the attached checklist that follows help users identify and solve ergonomic issues associated with upper-extremity intensive tasks.
High Hand Force and Wrist Posture, Highly Repetitive Motion/Repeated Impact

Potential Ergonomic Risks

High Hand Force and Wrist Posture

- Pinching an unsupported object(s) weighing more than 2 lb per hand, more than 2 hours total per day
- Pinching with a force of greater than 4 lb per hand (comparable to pinching a half ream of paper or the force required to open two wooden clothespins), more than 2 hours total per day
- Gripping an unsupported object(s) weighing more than 10 lb per hand, more than 2 hours total per day
- Pinching or gripping with significant wrist deviation (greater than 30° flexion, greater than 45° extension or greater than 30° ulnar deviation)

Greater than 30° flexion
Greater than 45° extension
Greater than 30° ulnar deviation

Highly Repetitive Motion/Repeated Impact

- Repeating the same motion with the shoulders, elbows, wrists or hands (excluding keying activities) with little to no variation every few seconds, more than 2 hours total per day
- Using the hand (heel/base of palm) or other body part as a hammer, more than 10 times per hour, and more than 2 hours total per day

Ergonomic controls and solutions that eliminate or mitigate such ergonomic risks typically fall into three main categories:

1. Engineering Controls—changes made to workstations, products, tools, machinery, etc. that alter the physical composition of the work area or work process
2. Administrative Controls—changes made to the work process or manner in which the work is performed without physically changing the workspace (e.g., job rotation, work methods training, breaks and stretching)
3. Personal Protective Equipment (PPE)—equipment worn to minimize exposure to certain risks (e.g., gloves, padding, foot and eye protection, protective hearing devices, hard hats, respirators)

The control types above are listed in the order in which they should be considered. For instance, always consider engineering controls that eliminate or mitigate the ergonomic risks prior to administrative controls and PPE that may only regulate exposure to the risks.

Recommended Controls for Repetitive, Upper-Extremity Intensive Tasks

Engineering Control Examples

- Design equipment and select tools that minimize hand grip force and promote use of a power grip vs. pinch grip whenever possible
- Mechanize tasks (e.g., pneumatic press, hydraulic piston) that require one-hand forces greater than 10 lb
- Provide tool balancers for heavy (greater than 10 lb) or bulky one-handed tools
- Provide torque arms for high-torque tools
- Provide adequate clearance for the shoulders, arms/elbows and hands/fingers to reduce awkward postures and excessive forces
- Consider automating highly repetitive manual tasks (repeated every few seconds)
- Use clamps, jigs and fixtures to reduce manual part positioning and minimize static hand grip forces
- Provide a tool to eliminate repeated impact forces on the hand and/or knee
- Conduct routine preventative maintenance on equipment and tooling to minimize forces on the body
• Investigate process or product improvements to eliminate repeated impact forces on the hand or knee

• Consider using automated equipment such as automated storage & retrieval systems (ASRS), vertical lift modules (VLM), robotic palletizers and automated guide vehicles (AGVs)

Administrative Control Examples
• Consider adding an employee to highly repetitive tasks to reduce task frequency per person

• Rotate tasks and take frequent short breaks to reduce exposure

• Train and promote proper body mechanics and the importance of working in neutral posture and encourage employees to take measures or make suggestions for solutions to accomplish such principles

Awkward Postures
Awkward posture is defined as any task occurring significantly outside the body's neutral posture—located around the joint's midrange of motion for most body parts.

More specifically, neutral posture occurs when:

• Standing upright and maintaining the natural S-shape curve of the spine

• Keeping the head, neck, back, hips and legs in line such that the ears, shoulders, hips and legs are aligned in the same plane

• Shoulders are relaxed and upper arms are close to the side

• Elbows are close to 90° angle

• Wrists are straight, with hands in handshake position

• Legs are straight and feet are firmly supported on the floor

An exertion significantly outside this neutral range, termed an awkward or extreme posture, is inefficient and requires muscles to work closer to their maximum capacity, resulting in increased risk of fatigue and possible injury. Examples of awkward postures include overhead work, excessive back bending, squatting and kneeling. Thus, the section below and attached checklist helps users identify and solve ergonomic issues associated with awkward postures.

Overhead Work, Awkward Neck and Back Posture, Squatting and Kneeling

Potential Ergonomic Risks

• Working with the hand(s) above the head or the elbow(s) above the shoulders more than 2 hours total per day

• Working with the neck bent (without support and without the ability to vary posture) more than 30° for more than 2 hours total per day

• Working with the back bent forward (without support and without the ability to vary posture) more than 30° for more than 2 hours total per day

• Squatting more than 2 hours total per day

• Kneeling more than 2 hours total per day
Recommended Controls for Awkward Postures

Engineering Control Examples

- Automate or mechanize the task to eliminate the awkward postures for the employee
- Raise or lower the work (lift tables, container tilters, fixtures, jigs, height-adjustable arms, tool balancers) to improve posture
- Raise or lower the worker (step stools, work platforms, scaffolding, personnel scissor lifts, creepers) to improve posture
- Provide stools and/or creepers to minimize squatting and kneeling

Administrative Control Examples

- Rotate tasks and take frequent short breaks to reduce exposure
- Train and promote proper body mechanics and the importance of working in neutral posture and encourage employees to take measures or make suggestions for solutions to minimize awkward postures

Personal Protective Equipment (PPE) Example

- Provide padding (padded mats or knee pads) to minimize contact stress while kneeling

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INDUSTRIAL ERGONOMICS: Repetitive, Upper-Extremity Intensive Tasks and Awkward Posture Checklist

<table>
<thead>
<tr>
<th>Task Description</th>
<th>Y</th>
<th>N</th>
<th>Task Notes</th>
<th>Potential Fixes</th>
</tr>
</thead>
</table>
| Pinching an unsupported object(s) weighing more than 2 lb per hand, more than 2 hours total per day | | | | A. Automate or mechanize the work  
B. Modify tooling to promote a power grip  
C. Use clamps, jigs & fixtures vs. gripping  
D. Job rotation to minimize exposure  
E. Other:__________________________ |
| Pinching with a force greater than 4 lb per hand (comparable to pinching a half ream of paper or the force required to open two wooden clothespins), more than 2 hours total per day | | | | A. Automate or mechanize the work  
B. Modify tooling to promote a power grip  
C. Use clamps, jigs & fixtures vs. gripping  
D. Job rotation to minimize exposure  
E. Other:__________________________ |
| Gripping an unsupported object(s) weighing more than 10 lb per hand, more than 2 hours total per day | | | | A. Provide tool balancer or torque arm  
B. Reduce object weight  
C. Use clamps, jigs & fixtures vs. gripping  
D. Methods: Promote two-handed gripping  
E. Other:__________________________ |
| Gripping with a force greater than 10 lb per hand (comparable to clamping light-duty jumper cables onto a battery), more than 2 hours total per day | | | | A. Provide tool balancer or torque arm  
B. Reduce object weight  
C. Use clamps, jigs & fixtures vs. gripping  
D. Methods: Promote two-handed gripping  
E. Other:__________________________ |
| Pinching or gripping with significant wrist deviation (greater than 30° of flexion, greater than 45° of extension, or greater than 30° of ulnar deviation) more than 2 hours total per day | | | | A. Automate or mechanize the work  
B. Modify tooling to improve grip & posture  
C. Use clamps, jigs & fixtures vs. gripping  
D. Job rotation to minimize exposure  
E. Other:__________________________ |
### Highly Repetitive Motion/Repeated Impact

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<tr>
<td><strong>6. Repeating the same motion with the shoulders, elbows, wrists or hands (excluding keying activities) with little to no variation every few seconds more than 2 hours total per day</strong></td>
<td>Y</td>
<td>N</td>
<td>Task Notes</td>
<td>Potential Fixes</td>
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</table>

- A. Automate or mechanize the work
- B. Reduce task frequency and/or duration
- C. Minimize forces for repetitive motions
- D. Optimize posture for repetitive motions
- E. Other: __________________________

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<tbody>
<tr>
<td><strong>7. Using the hand (heel/base of palm) or other body part as a hammer more than 10 times per hour, more than 2 hours total per day</strong></td>
<td>Y</td>
<td>N</td>
<td>Task Notes</td>
<td>Potential Fixes</td>
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</table>

- A. Automate or mechanize the work
- B. Minimize forces for repetitive motions
- C. Use hand tool for impact vs. body part
- D. Reduce task frequency and/or duration
- E. Other: __________________________

### Awkward Postures

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<tbody>
<tr>
<td><strong>8. Working with the hand(s) above the head or the elbow(s) above the shoulders more than 2 hours total per day</strong></td>
<td>Y</td>
<td>N</td>
<td>Task Notes</td>
<td>Potential Fixes</td>
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</tbody>
</table>

- A. Automate or mechanize the work
- B. Lower the work (e.g., ht. adjust. fixture)
- C. Raise the worker (e.g., work platforms)
- D. Job rotation to minimize exposure
- E. Other: __________________________

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<tbody>
<tr>
<td><strong>9. Working with the neck bent (without support and without the ability to vary posture) more than 30° for more than 2 hours total per day</strong></td>
<td>Y</td>
<td>N</td>
<td>Task Notes</td>
<td>Potential Fixes</td>
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<tr>
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</table>

- A. Automate or mechanize the work
- B. Raise/tilt the work (ht./tilt adjust. arm)
- C. Lower the worker (ht. adjust. platform)
- D. Job rotation to minimize exposure
- E. Other: __________________________

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</thead>
<tbody>
<tr>
<td><strong>10. Working with the back bent forward (without support and without the ability to vary posture) more than 30° for more than 2 hours total per day</strong></td>
<td>Y</td>
<td>N</td>
<td>Task Notes</td>
<td>Potential Fixes</td>
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- A. Automate or mechanize the work
- B. Raise/tilt the work (e.g., container tilter)
- C. Lower the worker (ht. adjust. platform)
- D. Job rotation to minimize exposure
- E. Other: __________________________

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</thead>
<tbody>
<tr>
<td><strong>11. Squatting more than 2 hours total per day</strong></td>
<td>Y</td>
<td>N</td>
<td>Task Notes</td>
<td>Potential Fixes</td>
</tr>
<tr>
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</tbody>
</table>

- A. Automate or mechanize the work
- B. Raise the work (e.g., lift table, fixtures)
- C. Lower the worker (ht. adjust. platform)
- D. Provide padding & encourage kneeling
- E. Other: __________________________

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</thead>
<tbody>
<tr>
<td><strong>12. Kneeling more than 2 hours total per day</strong></td>
<td>Y</td>
<td>N</td>
<td>Task Notes</td>
<td>Potential Fixes</td>
</tr>
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</table>

- A. Automate or mechanize the work
- B. Raise the work (e.g., lift table, fixtures)
- C. Lower the worker (ht. adjust. platform)
- D. Provide padding, job rotation
- E. Other: __________________________

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This form was developed in conjunction with The Ergonomics Center of North Carolina and Chubb Loss Control Services and adapted and modified from Washington State Department of Labor and Industries Caution/Hazard Zone Checklists.
Introduction

Ergonomics, or fitting the task to the person, has been applied in industrial settings for decades. Besides the incentive of maintaining the health and well-being of workers, promoting sound ergonomic principles in industrial environments has also proven to improve other business metrics such as productivity, efficiency and quality, thereby maximizing company profits. Ultimately, since ergonomics is all about optimizing the performance of the workers, the tasks they perform and the machines they use, many companies have integrated ergonomics into their Lean Manufacturing and 5S (work organization and housekeeping) efforts and vice versa. Essentially, the goal of Lean and 5S is to remove wastes and unnecessary steps from processes to optimize efficiency. Such wastes may include an unnecessary lift, an awkward reach or reworking poor quality parts, which may also introduce additional ergonomic risks and concerns that otherwise would not be present. Thus, linking ergonomics to your Lean and 5S initiatives is certainly encouraged.

Although “industry” is a very broad term with a variety of work processes and tasks, there are common task characteristics that drive the majority of ergonomic concerns in industries of all types:

- Manual Material Handling
- Awkward Postures

Manual material handling (MMH) has long been and continues to be the leading cause of occupational injury in the United States, comprising 27% of all injuries and 60% of all injury costs in industry (Konz and Johnson, 2008).

 Likewise, awkward postures are another major cause of occupational injury. Musculoskeletal disorders associated with MMH and awkward postures often include strains and sprains to the lower back, shoulders, arms/elbows, hands and knees. Of the strain and sprain cases involving days away from work, 36% involve injuries to the back; 21% involve injuries to the shoulder, arm, wrist or hand; and 12% involve injuries to the knees. The majority of such cases are associated with performing work tasks that do not incorporate positive ergonomic principles that directly result in lost time, lost productivity and lost company profits. To avoid such problems, consider using this Industrial Ergonomics Tool Kit: Manual Material Handling and Awkward Postures to improve the fit between the work demands and the capabilities of your workers.
Manual Material Handling

Manual material handling (MMH) is defined as any handling task involving the human body as the main “power source.” MMH tasks include lifting, lowering, carrying, pushing and pulling objects or containers of any kind. Thus, the primary intent of this ergonomics tool kit and attached checklist is to help users identify and solve ergonomic issues associated with MMH tasks.

Lifting, Lowering, Carrying, Pushing and Pulling

Potential Ergonomic Risks

- Lifting heavy object(s) weighing more than 25 to 30 pounds
- Lifting objects frequently weighing more than 10 pounds, more than twice per minute and more than 2 hours total each day
- Lifting objects weighing more than 10 to 15 pounds above the shoulders, below the knees or at arm’s length away from the body
- Lifting or carrying bulky, difficult-to-grasp or unstable/unbalanced objects
- Carrying heavy object(s) weighing more than 25 to 30 pounds
- Pushing/pulling objects using high force (greater than 50 pounds of initial force to start an object in motion OR greater than 25 pounds of sustained force to keep an object in motion)

Ergonomic controls and solutions that eliminate or mitigate such ergonomic risks typically fall into three main categories:

1. **Engineering Controls**—changes made to workstations, products, tools, machinery, etc. that alter the physical composition of the work area or work process

2. **Administrative Controls**—changes made to the work process or manner in which the work is performed without physically changing the workspace (e.g., job rotation, work methods training, breaks and stretching)

3. **Personal Protective Equipment (PPE)**—equipment worn to minimize exposure to certain risks (e.g., gloves, padding, foot and eye protection, protective hearing devices, hard hats and respirators)

These control types are listed in the order in which they should be considered. For instance, always consider engineering controls that eliminate or mitigate the ergonomic risks prior to administrative controls and PPE that may only regulate exposure to the risks with effectiveness dependent on the policy being followed or PPE being properly used.

Recommended Manual Material Handling Controls

Engineering Control Examples

- Use lift-assist equipment that eliminates manual lifting (e.g., vacuum lifts, hoists, cranes)
- Use conveyors and/or carts for material transfers to eliminate manual carries
- Keep lifts between knee and shoulder height (waist height is optimal) via lift tables, pallet stacking, work platforms, portable ladders and storage strategies
- Reduce object/container weight
- Reduce the carry distance
- Make the object easier to handle (e.g., handles, handhold cutouts)
- Use power tuggers for moving heavy carts
- Increase wheel diameter, caster size and/or number of wheels on carts to decrease push/pull force
- Consider alternative wheel materials (lower-friction materials) or floor surfaces to decrease push/pull force
• Perform routine preventative maintenance on cart wheels/casters and/or floor surfaces

• Consider using automated equipment such as automated storage & retrieval systems (ASRS), vertical lift modules (VLM), robotic palletizers and automated guide vehicles (AGVs)

Administrative Control Examples
• Mandate a two-person lift and carry policy for heavy and/or bulky objects

• Rotate tasks and take frequent short breaks to reduce exposure

• Train and encourage proper lift, carry and push/pull techniques (i.e., keep object close to the body; bend knees; maintain neutral back posture; avoid twisting the back; keep motions smooth and controlled; lift, carry and push/pull with two hands; push instead of pull; etc.)

Personal Protective Equipment (PPE) Example
• Wear well-fitted gloves to minimize contact stress on the hands while lifting or pushing/pulling objects

For additional information and resources on material handling guidelines and equipment solutions, please reference the NIOSH Ergonomic Guidelines for Manual Material Handling and Material Handling Institute.

Awkward Postures
Awkward posture is defined as any task occurring significantly outside the body’s neutral posture—located around the joint’s midrange of motion for most body parts. More specifically, neutral posture occurs when:

• Standing upright and maintaining the natural S-shape curve of the spine

• Keeping the head, neck, back, hips and legs in line such that the ears, shoulders, hips and legs are aligned in the same plane

• Shoulders are relaxed and upper arms are close to the side

• Elbows are close to 90° angle

• Wrist are straight, with hands in handshake position

• Legs are straight and feet are firmly supported on the floor

An exertion significantly outside this neutral range, termed an awkward or extreme posture, is inefficient and requires muscles to work closer to their maximum capacity, resulting in increased risk of fatigue and possible injury. Examples of awkward postures include overhead work, excessive back bending, squatting and kneeling. Thus, the section below and the attached checklist that follows help users identify and solve ergonomic issues associated with awkward postures.

Overhead Work, Awkward Neck and Back Posture, Squatting and Kneeling

Potential Ergonomic Risks
• Working with the hand(s) above the head or the elbow(s) above the shoulders more than 2 hours total per day

• Working with the neck bent (without support and without the ability to vary posture) more than 30° for more than 2 hours total per day

• Working with the back bent forward (without support and without the ability to vary posture) more than 30° for more than 2 hours total per day

• Squatting more than 2 hours total per day

• Kneeling more than 2 hours total per day

For additional information and resources on material handling guidelines and equipment solutions, please reference the NIOSH Ergonomic Guidelines for Manual Material Handling and Material Handling Institute.
Recommended Controls for Awkward Postures

Engineering Control Examples

• Automate or mechanize the task to eliminate the awkward postures for the employee

• Raise or lower the work (lift tables, container tilters, fixtures, jigs, height-adjustable arms, tool balancers) to improve posture

• Raise or lower the worker (step stools, work platforms, scaffolding, personnel scissor lifts, creepers) to improve posture

• Provide stools and/or creepers to minimize squatting and kneeling

Administrative Control Examples

• Rotate tasks and take frequent short breaks to reduce exposure

• Train and promote proper body mechanics and the importance of working in neutral posture and encourage employees to take measures or make suggestions for solutions to minimize awkward postures

Personal Protective Equipment (PPE) Example

• Provide padding (padded mats or knee pads) to minimize contact stress while kneeling

Chubb Loss Control Services Assistance

To learn more about Industrial Ergonomics, or for further reference materials on this topic, please contact your local Chubb Loss Control Services Risk Engineer. You can also visit us at www.chubb.com.
# INDUSTRIAL ERGONOMICS: Manual Material Handling and Awkward Postures Checklist

**Evaluator:** ___________________________  
**Evaluation Date:** ___________________________

**Department:** ___________________________  
**Location:** ___________________________

**Job Description:** ____________________________________________________________

**Instructions:** Assess tasks that are a regular and foreseeable part of the job. For each question, determine whether the potential ergonomic risk factor is present by placing a check in the appropriate box. If checked, make notes of the task causing the concern in the Task Notes column and make notes of potential solutions in the Potential Fixes column (see Recommended Controls in the Tool Kit for additional ideas to help mitigate the risk).

<table>
<thead>
<tr>
<th>Manual Material Handling</th>
<th>Y</th>
<th>N</th>
<th>Task Notes</th>
<th>Potential Fixes</th>
</tr>
</thead>
</table>
| ![Image](image1.png) 1. Lifting heavy object(s) weighing more than 25 to 30 lb | ✓ | | | A. Eliminate lift via conveyor or slide to cart  
B. Lift assist (e.g., vacuum lift, lift table)  
C. Reduce object weight  
D. Mandate a two-person lift  
E. Other: ___________________________ |
| ![Image](image2.png) 2. Lifting objects weighing more than 10 lb, AND more than twice per minute, AND more than 2 hours total per day. | | ✓ | | A. Eliminate lift via conveyor or slide to cart  
B. Lift assist (e.g., vacuum lift, lift table)  
C. Reduce object weight  
D. Reduce lift frequency and/or duration  
E. Other: ___________________________ |
| ![Image](image3.png) 3. Lifting objects weighing more than 10 to 15 lb above the shoulders, below the knees, or at arm’s length | | ✓ | | A. Eliminate lift via conveyor or slide to cart  
B. Lift assist (e.g., vacuum lift, lift table)  
C. Reduce object weight  
D. Keep lifts close & b/n knees & shoulders  
E. Other: ___________________________ |
| ![Image](image4.png) 4. Lifting or carrying objects that are too bulky, difficult to grasp or unstable/unbalanced | | ✓ | | A. Eliminate lift via conveyor or slide to cart  
B. Lift assist (e.g., vacuum lift, lift table)  
C. Alternative container (smaller, handles)  
D. Mandate a two-person lift  
E. Other: ___________________________ |
| ![Image](image5.png) 5. Carrying objects weighing more than 25 to 30 lb | | ✓ | | A. Eliminate carry via conveyor or cart  
B. Lift assist (e.g., vacuum lift, hoist)  
C. Reduce object weight  
D. Mandate a two-person carry  
E. Other: ___________________________ |
| ![Image](image6.png) 6. Pushing/pulling objects using high force (> 50 lb initial force to start an object in motion OR > 25 lb sustained force to keep object in motion) | | ✓ | | A. Conveyance or power tugger for cart  
B. Alt. wheels (larger diameter, material)  
C. Preventative maintenance  
D. Job rotation to minimize exposure  
E. Other: ___________________________ |
<table>
<thead>
<tr>
<th>Awkward Postures</th>
<th>Y</th>
<th>N</th>
<th>Task Notes</th>
<th>Potential Fixes</th>
</tr>
</thead>
</table>
| 7. Working with the hand(s) above the head or the elbow(s) above the shoulders more than 2 hours total per day |   |   |            | A. Automate or mechanize the work  
B. Lower the work (e.g., ht. adjust. fixture)  
C. Raise the worker (e.g., work platforms)  
D. Job rotation to minimize exposure  
E. Other:__________________________ |
| 8. Working with the neck bent (without support and without the ability to vary posture) more than 30° for more than 2 hours total per day |   |   |            | A. Automate or mechanize the work  
B. Raise/tilt the work (ht./tilt adjust. arm)  
C. Lower the worker (ht. adjust. platform)  
D. Job rotation to minimize exposure  
E. Other:__________________________ |
| 9. Working with the back bent forward (without support and without the ability to vary posture) more than 30° for more than 2 hours total per day |   |   |            | A. Automate or mechanize the work  
B. Raise/tilt the work (e.g., container tilter)  
C. Lower the worker (ht. adjust. platform)  
D. Job rotation to minimize exposure  
E. Other:__________________________ |
| 10. Squatting more than 2 hours total per day                                   |   |   |            | A. Automate or mechanize the work  
B. Raise the work (e.g., lift table, fixtures)  
C. Lower the worker (ht. adjust. platform)  
D. Provide padding & encourage kneeling  
E. Other:__________________________ |
| 11. Kneeling more than 2 hours total per day                                     |   |   |            | A. Automate or mechanize the work  
B. Raise the work (e.g., lift table, fixtures)  
C. Lower the worker (ht. adjust. platform)  
D. Provide padding, job rotation  
E. Other:__________________________ |

This form was developed in conjunction with The Ergonomics Center of North Carolina and Chubb Loss Control Services and adapted and modified from Washington State Department of Labor and Industries Caution/Hazard Zone Checklists.
Laboratory operations can be found in a wide range of industries, including hospitals, universities, research facilities, pharmaceutical production, etc. It is an important operation that should not be forgotten when addressing ergonomics due to the risk of repetitive motion injuries associated with the tasks performed and the equipment used. Laboratory workers can develop repetitive motion injuries while performing tasks such as pipetting, working with microscopes and microtomes, and using their computers. Working in awkward postures or prolonged static positions also contributes to fatigue and repetitive stress that leads to injury. Another major ergonomic risk factor is the generation of high physical forces by lab workers performing material handling tasks.

In order to address these issues, it is important to apply some basic workstation design principles to eliminate or reduce these common ergonomic risk factors.

**Be Aware of Your Posture**

- **Keep a neutral posture** in your back by maintaining the three natural curves (S-shape) of the spine. This is accomplished when the ears, shoulders and hips are aligned in the same plane.

- **When seated, keep your feet firmly supported** by lowering the chair so that the feet are flat on the floor or by using a footrest.

- **Use a chair with adequate lumbar support** and sit against the back of the chair.

- **Tilt the seat forward** or use a seat wedge when working in a forward posture. Adjust the position of the work, work surface or chair so that an upright position is attained.

- **Try to work at a cutout** in the lab bench. This will allow you to work as close to the bench as possible while sitting against the back of the chair.

- **When standing for long periods of time, use shoes with good support** and cushioning or shoe inserts to reduce discomfort. Using cushioned or antifatigue mats can help redistribute the pressure on your legs.

- **Keep trays and other frequently used supplies within easy reach.**

**Keep Arms and Hands Relaxed**

- **Keep your shoulders relaxed** and your elbows close to the sides of your body when working and avoid reaching to use instruments and work materials. This can be achieved by sitting close to your work area, holding objects close to the body, and adjusting the chair to match the proper height of the bench.

- **Maintain neutral wrist and arm postures** as much as possible. Remember, a neutral hand and arm posture looks as if you are shaking hands with someone.

- **Avoid repetitive or forceful twisting** and turning motions, like the ones performed when opening test tubes or adjusting knobs on a microscope.

- **Select tools and equipment that fit the size of your hands.**
• Use padding to soften sharp edges and tubing to increase the diameter of a tool when using a pinch grip; this will reduce the force and pressure.

• Use gloves that fit properly. Gloves that are too big or small cause undue stress by increasing pinch and grip forces.

Avoid Static Positions
• Vary postures throughout the day by changing activities and taking short breaks every 20 minutes. This will rest your muscles and increase blood circulation.

• When standing for long periods, make sure you shift your weight often. Use a stool or foot rail to raise one foot off of the floor to relieve pressure on your back.

• Alternate the position of objects held in your hand, such as forceps. Alternating between your thumb and index finger and your index and middle fingers will vary the task. Even when alternating, don’t forget to take breaks to allow muscles to rest and the blood to flow back into your fingers.

• Incorporate simple stretching motions prior to starting your tasks and intermittently during the day to improve blood flow and maintain flexibility.

Use Good Material-Handling Techniques
• Store materials as close to you as possible or use rotating carousels or turntables to reduce excessive reaching for objects.

• Store heavy and frequently used objects on shelves located below shoulder height whenever possible.

• Use a footstool or stepladder to reach objects that are stored on higher shelves.

• Avoid asymmetrical lifting or twisting while lifting. The object to be lifted should be directly in front of you.

• Use a team approach to remove heavy centrifuge rotors. If possible, use a second person to assist with lifting and removing the rotors.

• Use a cart to transport rotors or any heavy object.

• Consider purchasing equipment from vendors that manufacture lighter-weight rotors.

Risk Factors and Recommended Controls for Specific Types of Lab Work
Pipetting
Potential Ergonomic Risks
• Repetitive motion of the hands, forearm and thumb, or fingers

• Pinch grips when handling pipette tips or opening vials

• Bending and twisting of the wrist

• Working with elbows elevated and abducted (away from the body)

• Neck bent forward or sideways

• Awkward and static postures

• Excessive force of the thumb

• Overreaching

Recommended Controls
• Automate pipetting tasks when possible, especially for continuous and repetitive tasks.

• Work with wrists in neutral (straight) positions; do not twist or rotate your wrists.

• Make sure head and shoulders are kept in neutral position.
• Avoid elevating arms and elbows above shoulders for long periods of time to prevent static work of arm and shoulder strain.

• Raise your chair instead of reaching up to pipette and work only at appropriate heights.

• Alternate hands or use both hands to pipette.

• Hold the pipette with a relaxed grip.

• Use minimal pressure whenever possible.

• When changing tips, use a light amount of force or both hands.

• Use electronic, latch-mode or light-touch pipettes for highly repetitive pipetting tasks to reduce/eliminate contact pressure on your thumb.

• Use low-profile tubes, solution containers and waste receptacles or adjust their height and position to prevent twisting and bending of the wrist and neck.

• Use lightweight pipettors that properly fit the size of your hand.

• Use pipettors with finger aspirators and thumb dispensers to reduce thumb strain.

• Alter continuous repetitive pipetting by performing other tasks or take a 1- to 2-minute break every 20 minutes.

• Use short pipettes and shorter waste receptacles for used tips in order to reduce reaching.

• Consider task sharing as another way to reduce the impact of risk factors associated with pipetting.

Microscopy

Potential Ergonomic Risks
• Awkward and static posture of the neck and head
• Awkward and static posture of the lower back
• Lack of adequate leg and knee clearance under work table
• Working with elbows abducted (away from the body)
• Pinch grips when adjusting binocular eyepiece and when moving the stage
• Contact stress in the areas of the wrist and palm of your hand
• High repetition
• Eyestrain and fatigue

Recommended Controls
• Sit close to the work surface.
• Elevate, tilt or move the microscope close to the edge of the bench to avoid bending the neck or raising the shoulders.
• Adjust your chair, workbench or microscope eyepiece's height to maintain an upright head and neck posture.

• Use adjustable eyepieces or mount the microscope on a 30° angle stand for easier viewing.

• Consider use of camera systems with monitors instead of an eyepiece microscope.

• Keep elbows close to your sides.

• Make sure to work with wrists in neutral (straight) position.

• Avoid forearm and wrist contact stress by not leaning on hard edges. Pad sharp edges with foam or pad wrists and forearms to reduce pressure.

• Make sure leg and knee clearance under workbench is adequate.

• Always assume proper sitting position, ensuring proper lower back support and that feet are supported.

• Prevent repetition and alter prolonged awkward postures.

• Take adequate small breaks or perform other job tasks that require less repetition. Rest your eyes, neck and shoulders. Every 15 minutes, close your eyes or focus on something in the distance. Every 30-60 minutes, get up to stretch and move.

• Make sure microscopes remain clean all the time and lighting is adequate.

Fume Hoods, Laminar Flow and Biosafety Cabinets

Potential Ergonomic Risks
• Repetitive motions of the hands, wrist and forearms, especially when pipetting is involved

• Constrained knee and leg space, especially in fume hoods and older biosafety cabinets

• Contact stress on the forearms, wrists and knees, or legs

• Awkward and static posture of the neck, torso, legs, arms and wrists

• Constrained body position

• Working with elbows abducted (away from the body)

• Overreaching

• Prolonged standing in unnatural positions or in restricted postures

Recommended Controls
• Remove unnecessary supplies from the work area.

• Perform your work at least 6 inches back into the hood or cabinet to maintain optimal airflow containment for material and personal protection.

• Place most frequently used work supplies near the front of the hood (but not closer than 6 inches from the face of the hood) to minimize twisting when disposing of wastes.

• When possible, keep waste containers inside the hood/cabinet to minimize twisting when disposing of wastes.

• Use approved elevated turntables to place equipment and make retrieval easier.

• Always assume a proper posture. Use an adjustable chair or stool with built-in foot- and armrests.

• Avoid contact stress (forearm and wrist contact with sharp edges).
• If standing for prolonged periods of time, use an antifatigue mat and footrest to reduce muscle fatigue.

• Avoid static loads when possible.

• Raise cabinets a few inches upwards to create a more comfortable leg and thigh clearance. Use diffused lighting to limit glare.

• Reduce eyestrain and awkward posture by keeping viewing window clean and line of sight unobstructed. Make sure the window sash operates smoothly and locks into position to prevent injury.

Microtomy

Potential Ergonomic Risks
• Highly repetitive motions of the hands and arms

• Excessive force of the hands

• Awkward postures of the neck, torso, arms and wrists

• Working with elbows abducted (away from the body)

• Overreaching

Recommended Controls
• Keep elbows close to your sides.

• Replace manual microtome with an automatic unit if possible.

• Reduce force when operating the handwheel.

• Adjust the feed wheel position to reduce stress.

• Use motorized cutting.

• Use an external control unit like a pedal instead of the hand operated wheel.

• Apply padding to the work surface and the edge of the work surface to eliminate sharp edges and increase the amount of blood flow to the hands.

• Use an adjustable task chair or stool with built-in foot rest.

• Place microtome at the appropriate height in your workbench.

• If working in a seated position, make sure the workbench allows enough clearance for legs and thighs.

• Rotate tasks and take frequent short breaks.

Chubb Loss Control Services Assistance
To learn more about Laboratory Ergonomics, or for further reference materials on this topic, please contact your local Chubb Loss Control Services Risk Engineer. You can also visit us at www.chubb.com.
# LABORATORY ERGONOMICS Checklist

## Workstations

<table>
<thead>
<tr>
<th></th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>Potential Fixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the user stands for prolonged periods of time, is antifatigue matting provided?</td>
<td></td>
<td></td>
<td></td>
<td>Provide antifatigue mats</td>
</tr>
<tr>
<td>Is the height of the workstation appropriate for the user and for the work performed (above elbow height for precision work, just below elbow height for light work, and 4-6 inches below elbow height for heavy work?)</td>
<td></td>
<td></td>
<td></td>
<td>Adjust workstation height</td>
</tr>
<tr>
<td>Is there sufficient leg and foot clearance at all seated work areas?</td>
<td></td>
<td></td>
<td></td>
<td>Provide leg room</td>
</tr>
<tr>
<td>Are frequently used items located within easy reach?</td>
<td></td>
<td></td>
<td></td>
<td>Relocate items within forearm's length</td>
</tr>
<tr>
<td>Can all laboratory chairs be adjusted to accommodate the user working in seated workstations?</td>
<td></td>
<td></td>
<td></td>
<td>Provide adjustable chairs</td>
</tr>
<tr>
<td>Can users rest their feet flat on the floor or footrest?</td>
<td></td>
<td></td>
<td></td>
<td>Provide footrest</td>
</tr>
<tr>
<td>Do chairs provide good lower back support?</td>
<td></td>
<td></td>
<td></td>
<td>Provide lumbar support</td>
</tr>
<tr>
<td>Is the monitor at about an arm’s length distance away from the employee?</td>
<td></td>
<td></td>
<td></td>
<td>Relocate monitor</td>
</tr>
<tr>
<td>Can the monitor be adjusted so that the top of the screen is located at users’ eye level?</td>
<td></td>
<td></td>
<td></td>
<td>Relocate monitor</td>
</tr>
<tr>
<td>Can the keyboard and mouse be located so users can rest their arms at their side with forearms parallel to the floor?</td>
<td></td>
<td></td>
<td></td>
<td>Relocate keyboard and mouse</td>
</tr>
<tr>
<td>If documents are frequently used, is a document holder provided?</td>
<td></td>
<td></td>
<td></td>
<td>Provide document holder</td>
</tr>
</tbody>
</table>

## Pipettors

<table>
<thead>
<tr>
<th></th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>Potential Fixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the user work in neutral wrist positions?</td>
<td></td>
<td></td>
<td></td>
<td>Provide training</td>
</tr>
<tr>
<td>Is manual pipette use minimized?</td>
<td></td>
<td></td>
<td></td>
<td>Provide training</td>
</tr>
<tr>
<td>Are electronic pipettors provided?</td>
<td></td>
<td></td>
<td></td>
<td>Pipettors</td>
</tr>
<tr>
<td>Are latch-mode pipettors provided?</td>
<td></td>
<td></td>
<td></td>
<td>Pipettors</td>
</tr>
<tr>
<td>Is the pipettor designed to reduce contact with sharp edges?</td>
<td></td>
<td></td>
<td></td>
<td>Pad sharp edges</td>
</tr>
<tr>
<td>Have users been trained how to properly operate the pipettor (e.g., pick up tips, eject tips, program electronic pipettors, etc.)?</td>
<td></td>
<td></td>
<td></td>
<td>Provide training</td>
</tr>
<tr>
<td>Pipettors</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
<td>Potential Fixes</td>
</tr>
<tr>
<td>-----------</td>
<td>---</td>
<td>---</td>
<td>-----</td>
<td>-----------------</td>
</tr>
<tr>
<td>Does the user pipette less than 2 hours per day?</td>
<td></td>
<td></td>
<td></td>
<td>Limit total pipetting time</td>
</tr>
<tr>
<td>Are frequent breaks provided?</td>
<td></td>
<td></td>
<td></td>
<td>Provide proper breaks</td>
</tr>
<tr>
<td>Is the pipettor electric or multichanneled to allow for computer-activated multiple dispensing instead of finger-activated dispensing?</td>
<td></td>
<td></td>
<td></td>
<td>Provide adequate pipettor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Microscopes</th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>Potential Fixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does the user work in neutral shoulder postures (not hunched over)?</td>
<td></td>
<td></td>
<td></td>
<td>Provide training</td>
</tr>
<tr>
<td>Does the user work in neutral neck postures (flexion &lt; 25°)?</td>
<td></td>
<td></td>
<td></td>
<td>Provide ocular extensions Provide training</td>
</tr>
<tr>
<td>Is the work area free of contact stresses between sharp edges and the forearms?</td>
<td></td>
<td></td>
<td></td>
<td>Pad edges and forearms</td>
</tr>
<tr>
<td>Is the microscope pulled out to the edge of the workbench and located at an optimum viewing height?</td>
<td></td>
<td></td>
<td></td>
<td>Relocate microscope</td>
</tr>
<tr>
<td>Are armrests or padding provided?</td>
<td></td>
<td></td>
<td></td>
<td>Provide armrest</td>
</tr>
<tr>
<td>Is there sufficient leg room?</td>
<td></td>
<td></td>
<td></td>
<td>Provide leg room</td>
</tr>
<tr>
<td>Is a footrest provided?</td>
<td></td>
<td></td>
<td></td>
<td>Provide footrest</td>
</tr>
<tr>
<td>Have users been trained how to properly sit at a microscope workstation?</td>
<td></td>
<td></td>
<td></td>
<td>Provide training</td>
</tr>
<tr>
<td>Are microscope work breaks provided every 30-60 minutes?</td>
<td></td>
<td></td>
<td></td>
<td>Provide proper breaks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fume Hoods and Biosafety Cabinets</th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>Potential Fixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are antifatigue mats used if users experience prolonged standing?</td>
<td></td>
<td></td>
<td></td>
<td>Provide antifatigue mats</td>
</tr>
<tr>
<td>Are materials inside the hoods/biosafety cabinets close to the users to avoid extended reaches?</td>
<td></td>
<td></td>
<td></td>
<td>Relocate items within forearm’s length</td>
</tr>
<tr>
<td>Is there sufficient leg room?</td>
<td></td>
<td></td>
<td></td>
<td>Provide leg room</td>
</tr>
<tr>
<td>Do users work with neutral neck and back postures?</td>
<td></td>
<td></td>
<td></td>
<td>Provide training</td>
</tr>
<tr>
<td>Are frequent breaks provided for prolonged work periods?</td>
<td></td>
<td></td>
<td></td>
<td>Provide proper breaks</td>
</tr>
<tr>
<td>Are lighting levels inside the hoods/biosafety cabinets appropriate?</td>
<td></td>
<td></td>
<td></td>
<td>Modify lighting sources</td>
</tr>
<tr>
<td>Microtomy</td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
<td>Potential Fixes</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>-----</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Do users maintain neutral postures (without excessive wrist flexion and</td>
<td></td>
<td></td>
<td></td>
<td>Provide training</td>
</tr>
<tr>
<td>extension) when operating the microtome?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the workstation at a height that reduces arm abduction (away from</td>
<td></td>
<td></td>
<td></td>
<td>Adjust workstation height</td>
</tr>
<tr>
<td>body) as much as possible?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do users have access to an automatic microtome?</td>
<td></td>
<td></td>
<td></td>
<td>Provide automatic microtome</td>
</tr>
<tr>
<td>Are frequent breaks provided?</td>
<td></td>
<td></td>
<td></td>
<td>Provide proper breaks</td>
</tr>
</tbody>
</table>
Connected
We have become an e-mobile society. Many people are constantly connected to work and family via smartphones, tablets, laptops, Webcams, virtual meetings and the Cloud. According to the Bureau of Labor Statistics, this instant connectivity has enabled approximately 24% of the American workforce to work at least some hours at home, outside the realm of what is considered a traditional office environment. Telecommuting has many benefits such as increased worker productivity, reduced commuting time and expenses, increased work schedule flexibility (also a potential drawback), improved job satisfaction and retention, and reduced sick leave. Drawbacks to telecommuting include loss of face-to-face collaboration, extended working hours due to schedule flexibility, the expectation of always being connected, feelings of isolation, and making do with whatever workstation is available.

Unfortunately, the advances in all this connectivity have not necessarily translated into advances in most workers’ personal ergonomics. The typical telecommuter may spend countless hours in awkward unchanging positions that often occur in tight or cramped spaces. Since ergonomics is about fitting the task to the person, it’s important to provide telecommuters with information on how to handle working in challenging situations.

Telecommuting: The Home Office
It’s rare to find a home without a computer in today’s society, even if the computer is used just for personal activities. The same ergonomics principles that are applied to a traditional office, shown in the Office Ergonomics Workstation Model on the next page, should be applied at home in a designated workspace. Unfortunately, since some employers view the opportunity to work from home as a benefit, they do not see the need to provide adjustable equipment. The responsibility for this usually falls to the employees, who more often than not simply make do with the furniture they have at hand—from the kitchen table and chair to a makeshift desk or card table in a bedroom. The result is often pain and discomfort that may impact the company’s health insurance or worker’s compensation costs. It works to everyone’s advantage if the company takes measures up front to make sure the employee is set up correctly and has the resources to address any problems that may arise. For additional details on fitting the workstation to the worker, please refer to Chubb’s Office Ergonomics Workstation Model.

The body functions best when it is in a neutral posture—located around the joint’s midrange of motion for most body parts. A posture significantly outside this neutral range, termed an awkward or extreme posture, is inefficient
and requires muscles to work near their maximum capacity which may result in increased fatigue rates and musculoskeletal disorders (MSDs). Unfortunately, awkward postures are inherently designed into laptops—a common tool for many telecommuters. If the laptop is positioned so the upper extremities are in neutral postures, then the screen is too low and the neck will be bent forward (flexed) in an awkward posture. If the laptop’s screen is positioned higher to keep the neck neutral, then the upper extremities are placed in awkward postures with shoulders shrugged and forearms slanted upwards.

If employees primarily use a laptop for telecommuting, a docking station should be supplied. A docking station with external monitor, external keyboard and external mouse will permit independent positioning and make ergonomic-neutral postures more achievable. A document holder is an essential add-on to also keep the neck in neutral postures when transcribing or referring to source material. Another advantage of a docking station is that the laptop can be undocked easily for use when travelling.

Technology advancements have many upsides, but they also present some new challenges for the telecommuter. These workers can easily slip into an “always-on” lifestyle with extended working hours in awkward postures. Using ergonomics principles to fit the task to the person can prevent pain at the office and when telecommuting.

**Chubb’s Office Ergonomics Workstation Model**

- Elbows at 90 degrees with wrists straight
- Upper arms located by the worker's side
- Mouse located next to the keyboard and at the same height
- Keyboard at the same height as the elbows
- Seat height adjusted so the thighs are parallel to the floor
- Lumbar support adjacent to the small of the back
- Top of screen at eye level
- Monitor located approximately arm’s length away from worker
- Feet firmly supported by the floor or by the footrest
- Leg room should be free of obstructions

**Chubb Loss Control Services Assistance**

To learn more about Telecommuting Ergonomics, or for further reference materials on this topic, please contact your local Chubb Loss Control Services Risk Engineer. You can also visit us at www.chubb.com.
### TELECOMMUTING ERGONOMICS Checklist

**Chair**

<table>
<thead>
<tr>
<th>Question</th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>Potential Fixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the chair height adjusted so the user's thighs are parallel to the floor?</td>
<td></td>
<td></td>
<td></td>
<td>Adjust chair height</td>
</tr>
<tr>
<td>Is the lumbar support adjusted so that it fits into the lumbar region of the user's back?</td>
<td></td>
<td></td>
<td></td>
<td>Adjust lumbar support</td>
</tr>
<tr>
<td>Does the backrest recline have a lockout to support the user in an upright posture?</td>
<td></td>
<td></td>
<td></td>
<td>Provide new chair</td>
</tr>
<tr>
<td>Is the seat pan depth adjusted to allow three fingers, width between the back of the user's knee and the front of the seat pan?</td>
<td></td>
<td></td>
<td></td>
<td>Adjust seat pan depth</td>
</tr>
<tr>
<td>Are the armrests adjusted to just below the elbow of the user?</td>
<td></td>
<td></td>
<td></td>
<td>Adjust armrests</td>
</tr>
<tr>
<td>Do the armrests allow the user to get close enough to the workstation?</td>
<td></td>
<td></td>
<td></td>
<td>Remove armrests</td>
</tr>
</tbody>
</table>

**Keyboard Tray, Keyboard & Pointing Device**

<table>
<thead>
<tr>
<th>Question</th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>Potential Fixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the chair needs to be raised to position the user better with respect to the keyboard and pointing device, is there a footrest available to keep the user's thighs parallel to the floor?</td>
<td></td>
<td></td>
<td></td>
<td>Provide footrest</td>
</tr>
<tr>
<td>Would an articulating keyboard tray provide the user with a better approach to the keyboard?</td>
<td></td>
<td></td>
<td></td>
<td>Install keyboard tray</td>
</tr>
<tr>
<td>Is the keyboard tray large enough for both keyboard and pointing device?</td>
<td></td>
<td></td>
<td></td>
<td>Provide an extended keyboard tray</td>
</tr>
<tr>
<td>Is the keyboard tray stable?</td>
<td></td>
<td></td>
<td></td>
<td>Change or repair keyboard tray</td>
</tr>
<tr>
<td>Does the angle of the keyboard allow the wrists to be straight?</td>
<td></td>
<td></td>
<td></td>
<td>Change keyboard tray angle</td>
</tr>
<tr>
<td>Does the pointing device (e.g., mouse, trackball, etc.) fit the hand?</td>
<td></td>
<td></td>
<td></td>
<td>Provide different pointing device</td>
</tr>
<tr>
<td>Is the pointing device located next to the keyboard in a place where it can be operated without extended reaching?</td>
<td></td>
<td></td>
<td></td>
<td>Adjust pointing device location</td>
</tr>
<tr>
<td>Is a wrist rest or padding available to protect against hand or forearm contact with sharp or hard edges?</td>
<td></td>
<td></td>
<td></td>
<td>Add wrist rest for keyboard and/or pointing device</td>
</tr>
<tr>
<td>Is the user required to lean against the wrist rest to perform tasks?</td>
<td></td>
<td></td>
<td></td>
<td>Change wrist rest</td>
</tr>
<tr>
<td>If a laptop computer is used, are an external keyboard and pointing device provided?</td>
<td></td>
<td></td>
<td></td>
<td>Provide external devices</td>
</tr>
<tr>
<td><strong>Monitor &amp; Source Document</strong></td>
<td>Y</td>
<td>N</td>
<td>N/A</td>
<td>Potential Fixes</td>
</tr>
<tr>
<td>------------------------------</td>
<td>---</td>
<td>---</td>
<td>-----</td>
<td>-----------------</td>
</tr>
<tr>
<td>If a laptop computer is used, is an external monitor provided?</td>
<td></td>
<td></td>
<td></td>
<td>Provide monitor</td>
</tr>
<tr>
<td>Is the monitor located in front of the user?</td>
<td></td>
<td></td>
<td></td>
<td>Reposition monitor</td>
</tr>
<tr>
<td>Is the monitor approximately an arm’s length (with fingers extended) away from the user?</td>
<td></td>
<td></td>
<td></td>
<td>Reposition monitor</td>
</tr>
<tr>
<td>Is the monitor set at a height so that the top row of characters on the screen is even with the seated eye height of the user?</td>
<td></td>
<td></td>
<td></td>
<td>Lower or raise monitor</td>
</tr>
<tr>
<td>If a document holder is used, is it located adjacent to the computer screen?</td>
<td></td>
<td></td>
<td></td>
<td>Move document holder</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Phone &amp; Printer</strong></th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>Potential Fixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the phone located on the same side as the hand that is used to answer it?</td>
<td></td>
<td></td>
<td></td>
<td>Move phone to opposite side</td>
</tr>
<tr>
<td>Can the phone be answered without extended reaching?</td>
<td></td>
<td></td>
<td></td>
<td>Move phone closer</td>
</tr>
<tr>
<td>Does the user talk on the phone while cradling it?</td>
<td></td>
<td></td>
<td></td>
<td>Add headset or speaker phone</td>
</tr>
<tr>
<td>Does the user utilize speakerphone or a headset while participating in conference calls?</td>
<td></td>
<td></td>
<td></td>
<td>Add headset or speaker phone</td>
</tr>
<tr>
<td>Can the printer be easily accessed?</td>
<td></td>
<td></td>
<td></td>
<td>Relocate printer</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Work Surface</strong></th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>Potential Fixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is there sufficient space for all equipment and accessories?</td>
<td></td>
<td></td>
<td></td>
<td>Reorganize furniture</td>
</tr>
<tr>
<td>Are frequently used equipment and supplies within arm’s reach?</td>
<td></td>
<td></td>
<td></td>
<td>Reorganize equipment</td>
</tr>
<tr>
<td>Is there a need for the work surface to be height adjustable?</td>
<td></td>
<td></td>
<td></td>
<td>Provide height-adjustable workstation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Work Space</strong></th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>Potential Fixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can the user move about the work space easily, without equipment, the CPU and/or supplies?</td>
<td></td>
<td></td>
<td></td>
<td>Organize work space</td>
</tr>
<tr>
<td>Is there adequate leg clearance (height, width, depth)?</td>
<td></td>
<td></td>
<td></td>
<td>Provide leg room</td>
</tr>
<tr>
<td>Is there sufficient storage and filing room to keep the work area free from clutter?</td>
<td></td>
<td></td>
<td></td>
<td>Provide more storage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Environment</strong></th>
<th>Y</th>
<th>N</th>
<th>N/A</th>
<th>Potential Fixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is lighting adequate for all tasks?</td>
<td></td>
<td></td>
<td></td>
<td>Provide task lighting</td>
</tr>
<tr>
<td>Is the monitor screen free of glare from overhead lighting?</td>
<td></td>
<td></td>
<td></td>
<td>Reduce overhead lighting</td>
</tr>
<tr>
<td>Is the monitor located perpendicular to windows or are windows heavily tinted?</td>
<td></td>
<td></td>
<td></td>
<td>Use blinds</td>
</tr>
<tr>
<td>Is equipment noise minimized at the source?</td>
<td></td>
<td></td>
<td></td>
<td>Reduce noise</td>
</tr>
</tbody>
</table>
OFFICE ERGONOMICS

REMEMBER THE BASICS

PLACE THE MONITOR DIRECTLY IN FRONT OF YOU WHILE AT THE KEYBOARD

POSITION THE TOP OF MONITOR SCREEN AT OR BELOW EYE LEVEL AND ABOUT AN ARM’S LENGTH AWAY

TILT OR SWIVEL THE MONITOR SCREEN TO ELIMINATE REFLECTIONS ON THE SCREEN OR ADD AN ANTI-GLARE FILTER

REDUCE GLARE ON WORK SURFACES BY DECREASING OVERHEAD LIGHTING AND USING WINDOW SHADES EFFECTIVELY

ADD A TASK LIGHT TO ILLUMINATE DOCUMENTS PROPERLY

USE A DOCUMENT HOLDER TO PLACE SOURCE DOCUMENTS AS CLOSE TO THE COMPUTER SCREEN AS POSSIBLE AND AT THE SAME HEIGHT AND DISTANCE

PLACE MOUSE AND OTHER INPUT DEVICES NEXT TO THE KEYBOARD

ALLOW AMPLE CLEARANCE TO MOVE KNEES AND LEGS UNDER THE KEYBOARD SUPPORT

MAINTAIN A PROPER POSTURE HAVING A 90 DEGREE OR GREATER ANGLE AT THE HIPS AND KNEES WHILE THE FEET ARE SUPPORTED BY THE FLOOR OR FOOTREST

SIT WITH HEAD AND NECK IN UPRIGHT POSITION, EVEN WHILE ON THE TELEPHONE

KEEP SHOULDERS RELAXED AND ELBOWS CLOSE TO THE BODY

SELECT A CHAIR THAT ALLOWS CLEARANCE BEHIND KNEES WHEN SEATED AGAINST THE BACKREST

USE THE BACKREST OF THE CHAIR TO PROVIDE FULL SUPPORT PARTICULARLY FOR THE LOWER BACK

ADJUST THE HEIGHT OF THE CHAIR TO ACHIEVE A PROPER POSTURE

ADJUST THE KEYBOARD OR CHAIR HEIGHT TO KEEP FOREARMS, WRISTS AND HANDS IN A STRAIGHT LINE WHILE USING THE KEYBOARD

BLOCK NOISE WITH FABRIC PARTITIONS OR USE EARPLUGS, MUSIC OR A SMALL FAN TO MASK NOISE
Office Workstation Considerations

- Have you adjusted your office chair height (up) so your forearms/hands are at or slightly above your desk table height? Do you understand all of your chair adjustments? Is the area under your desk clear?
- Are your feet flat on the floor? Do you need a footrest?
- Are you close enough to the desk so you can sit in your chair, with your back fully supported by the chair? Do your chair’s armrests get in the way?
- Is your keyboard close to your body? Do you need a wrist pad?
- Is the top of your monitor level with your eye level? Is your monitor far enough away (arms length or more)?
- Is the office equipment (phone, calculator, etc.) you regularly use located within arms reach from your sitting position?
- Do you frequently transfer information/data from paper to your computer? Do you need a paper holder?
- Do you answer the phone a lot? Do you need a phone rest or headset?
- Is the room lighting creating glare on your monitor screen?
15 Ways to Improve Your Computer Work Station

The following 15 steps are a brief summary of what most ergonomists agree are most important in helping you to perform your job safely and comfortably.

1. Sit back in your chair, not leaning forward.
2. Position the top of your monitor 2-3 inches above seated eye level.*
3. Reduce glare on the screen by strategic monitor placement and/or an optical glass filter.
4. Sit at arm’s length from the monitor screen.
5. Keep both feet flat on the floor or footrest with your knee angle greater than 90°.
6. Position your documents at the same height as the monitor. A document holder may be helpful.
7. Keep your wrists flat and straight, not bent.
8. Keep your elbows at greater than 90° angle, and your arms close to your body even when using the mouse. Avoid overreaching.
9. Center the monitor and keyboard in front of you.
10. Adjust the keyboard tray and mouse platform to accommodate numbers 7 & 8 above.
11. Use a stable work surface.
12. Remember to blink (to moisten your eyes). Look away from the computer screen every 15 to 30 minutes and focus on something at least 20 feet away.
13. Take a moment to stand and stretch periodically.
14. If you need glasses, wear them!
15. Hold your phone in your hand or use a headset; avoid grasping the phone between your head and shoulder.

These ergonomic tips are intended to be helpful hints, not as a rigid standard for all colleagues in all situations. Your personal choices will depend on many factors.

* If you wear bifocal or progressive lenses, the monitor may need to be lower so that you do not have to lean your head back to look at it. The monitor’s position should allow your head to be level when you look at the screen.