Your health and safety at work

ERGONOMICS

III. Basic ergonomic principles

It is generally most effective to examine work conditions on a case-by-case basis when applying ergonomic principles to solve or prevent problems. Sometimes even minor ergonomic changes in the design of equipment, workstations (see section A, Workstation for more details about this topic) or job tasks can make significant improvements in worker comfort, health, safety and productivity. The following are a few examples of ergonomic changes which, if implemented, can result in significant improvements:

- For assembly jobs, material should be placed in a position such that the worker's strongest muscles do most of the work.
- For detailed work which involves close inspection of the materials, the workbench should be lower than for work which is heavy.
- Hand tools that cause discomfort or injury should be modified or replaced. Workers are often the best source of ideas on ways to improve a tool to make using it more comfortable. For example, pliers can be either straight or bent, depending on the need.
- A task should not require workers to stay in awkward positions, such as reaching, bending, or hunching over for long periods of time.
- Workers need to be trained in proper lifting techniques. A well designed job should minimize how far and how often workers have to lift.
- Standing work should be minimized, since it is often less tiring to do a job sitting than standing.
- Job assignments should be rotated to minimize the amount of time a worker spends doing a highly repetitive task, since repetitive work requires using the same muscles again and again and is usually very boring.
- Workers and equipment should be positioned so that workers can perform their jobs with their upper arms at their sides and with their wrists straight.

No matter what small or major ergonomic changes are discussed or implemented in the workplace, it is vital for the workers who will be affected by the changes to be involved in the discussions. Their input can be very helpful in determining what changes are necessary and appropriate. They know their job better than anyone else does.

Points to remember about basic ergonomic principles
1. It is generally most effective to examine work conditions on a case-by-case basis when applying ergonomic principles to solve or prevent problems.

2. Sometimes minor ergonomic changes in the design of equipment, workstations or job tasks can make significant improvements.

3. Workers who may be affected by any ergonomic changes in the workplace should be involved in the discussions before changes are made. Their input can be very helpful in determining necessary and appropriate changes.

A. Workstation

A workstation is the place a worker occupies when performing a job. The workstation may be occupied all the time or it may be one of several places where work is done. Some examples of workstations are work stands or work tables for machine operation, assembly or inspection; a work table where a computer is operated; a control console; etc.

A well designed workstation is important for preventing diseases related to poor working conditions, as well as for ensuring that work is productive. Every workstation should be designed with both the worker and the task in mind so that work can be performed comfortably, smoothly and efficiently.

If the workstation is properly designed, the worker should be able to maintain a correct and comfortable body posture. This is important because an uncomfortable work posture can cause a variety of problems, such as:

- back injury;
- development or aggravation of RSIs;
- circulatory problems in the legs.

The main causes of these problems are:

- poorly designed seating;
- standing for long periods;
- reaching too far;
- inadequate lighting forcing the worker to get too close to the work.

- The following are some basic ergonomic principles for workstation design. A general rule of thumb is to consider body size information, such as height, when choosing and adjusting workstations. Above all, workstations must be adjusted so that the worker is comfortable.

Workstation
Head height

- Allow adequate space for the tallest possible worker.
- Position displays at or below eye level because people naturally look slightly downward.

Shoulder height

- Control panels should be placed between shoulder and waist height.
- Avoid placing above shoulder height objects or controls that are used often.

Arm reach

- Place items within the shortest arm reach to avoid over-stretching while reaching up or outward.
- Position items needed for work so that the tallest worker does not need to bend while reaching down.
- Keep frequently used materials and tools close to and in front of the body.

Elbow height

- Adjust work surface height so that it is at or below elbow height for most job tasks.

Hand height

- Make sure that items that have to be lifted are kept between hand and shoulder height.

Leg length

- Adjust chair height according to leg length and the height of the work surface.
- Allow space so that legs can be outstretched, with enough space for long legs.
- Provide an adjustable footrest so that legs are not dangling and to help the worker change body position.

Hand size

- Hand grips should fit the hands. Small hand grips are needed for small hands, larger grips for bigger hands.
- Allow enough work space for the largest hands.

Body size
• Allow enough space at the workstation for the largest worker.

Two examples of good workstations

Here are some general suggestions for an ergonomic workstation:

• Accommodate both right- and left-handed workers by providing a good work layout and tools which suit their needs.
• Provide each workstation with a chair even if the work is done standing up. Periodic rests and changes in body position reduce the problems of standing for too long.
• Eliminate glare and shadows. Good lighting is essential.

When you think about how to improve a workstation, remember this rule: If it feels right, it probably is right. If it feels uncomfortable, there is probably something wrong with the design, not the worker.

Points to remember about workstation design

1. The workstation is the place a worker occupies when performing a job.

2. A well designed workstation is important for preventing diseases related to poor working conditions, as well as for ensuring work is productive.

3. Every workstation should be designed with both the worker and the task in mind.

4. A properly designed workstation should allow the worker to maintain a correct and comfortable body posture.

5. There are a number of ergonomic factors to consider when designing a workstation, including head height, shoulder height, arm reach, elbow height, hand height, leg length, and
hand and body size.

6. When you think about how to improve a workstation, remember this rule: If it feels right, it probably is right. If it feels uncomfortable, there is probably something wrong with the design, not the worker.

B. Sitting and chair design

Sitting

If a job does not require a great deal of physical strength and can be done in a limited space, then the work should be done in a sitting position.

Note: sitting all day is not good for the body, especially for the back. Therefore, there should be some variety in the job tasks performed so a worker is not required to do sitting work only. A good chair is essential for sitting work. The chair should allow the worker to change the leg and general working positions easily.

The following are some ergonomic guidelines for sitting work:

- The worker needs to be able to reach the entire work area without stretching or twisting unnecessarily.
- A good sitting position means that the individual is sitting straight in front of and close to the work.
- The work table and the chair should be designed so that the work surface is approximately at the same level as the elbows.
- The back should be straight and the shoulders relaxed.
- If possible, there should be some form of adjustable support for the elbows, forearms or hands.

The working position should be as comfortable as possible. The arrows indicate areas that need to be improved to prevent potential injuries from developing. To improve the sitting position for the worker on the right, the chair height should be lowered, tilted slightly forward and the worker should be provided with a footrest.
The work chair

A proper work chair needs to satisfy certain ergonomic requirements. Use the following guidelines when choosing a chair:

- The work chair should be appropriate for the job being performed and for the height of the work table or workbench.
- Ideally the seat height and the backrest height should be adjustable separately. The backrest tilt should also be adjustable.
- The chair should allow the worker to lean forward or backward easily.
- The worker should have adequate leg room under the work table and should be able to change the position of the legs easily.
- The feet should be flat on the floor. When this is not possible, the worker should be provided with a footrest. A footrest will also help to eliminate pressure from the back of the thighs and knees.
- The chair should have a backrest which supports the lower back.
- The seat should curve slightly downward at the front edge.
- Ideally, the chair should have five legs for stability.
- It is preferable if arm rests are removable since some workers do not find them comfortable. In any case, arm rests should not prevent the worker from getting close enough to the work table.
- The chair should be covered with a breathable fabric to prevent slipping off the chair.

On some jobs arm supports and rests may reduce arm fatigue.
Much of the above information may be somewhat idealistic for most workers, particularly workers in developing countries. However, it is essential that workers and their representatives understand that many health and safety problems are related to the non-application of ergonomic principles in the workplace. By understanding the importance of ergonomics, workers can start to improve their work situation, especially if management understands the relationship between productivity and good ergonomic conditions.

Points to remember about sitting/chair design

1. If a job does not require a great deal of physical strength and can be done in a limited space, then the work should be done in a sitting position.

2. Sitting all day, however, is not good for the body. Therefore, there should be some variety in the job tasks performed.

3. A good chair is essential for sitting work.

4. A sitting job should be designed so that the worker does not have to stretch or twist unnecessarily to reach the work area.

5. There are a number of ergonomic factors to consider when designing sitting work and when selecting a chair for the worker who will perform the tasks.

C. Standing workstation

Standing for long periods of time to perform a job should be avoided whenever possible. Long periods of standing work can cause back pain, leg swelling, problems with blood circulation, sore feet and tired
muscles. Here are some guidelines to follow when standing work cannot be avoided:

- If a job must be done in a standing position, a chair or stool should be provided for the worker and he or she should be able to sit down at regular intervals.

- Workers should be able to work with their upper arms at their sides and without excessive bending or twisting of the back.
- The work surface should be adjustable for workers of different heights and for different job tasks.
- If the work surface is not adjustable, then provide a pedestal to raise the work surface for taller workers. For shorter workers, provide a platform to raise their working height.
- A footrest should be provided to help reduce the strain on the back and to allow the worker to change positions. Shifting weight from time to time reduces the strain on the legs and back.
- There should be a mat on the floor so the worker does not have to stand on a hard surface. A concrete or metal floor can be covered to absorb shock. The floor should be clean, level and not slippery.
- Workers should wear shoes with arch support and low heels when performing standing work.
- There should be adequate space and knee room to allow the worker to change body position while working.
- The worker should not have to reach to do the job tasks. Therefore the work should be performed 8 to 12 inches (20 to 30 centimetres) in front of the body.

A chair, footrest, a mat to stand on, and an adjustable work surface are essential components for a standing workstation.

The job should be designed to allow the worker to keep the arms low and the elbows close to
the body.

When determining the appropriate height of the work surface, it is important to consider the following factors:

- the elbow height of the worker;
- the type of work being performed;
- the size of the product being worked on;
- the tools and equipment being used.

Follow these guidelines to ensure a good body position for standing work:

- Face the work.
- Keep the body close to the work.
- Move the feet to face in a new direction instead of twisting your back or shoulders.

<table>
<thead>
<tr>
<th>Points to remember about standing workstations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Standing for long periods of time to perform a job should be avoided whenever possible.</td>
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<tr>
<td>2. Long periods of standing work can cause health problems.</td>
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<tr>
<td>3. There are a number of ergonomic factors to consider when designing or redesigning a standing workstation.</td>
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<tr>
<td>4. There are also important factors for the worker to consider to ensure a good body position for standing work.</td>
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D. Hand tools and controls
Hand tools

Hand tools should be designed according to ergonomic requirements. Poorly designed hand tools, or tools that do not fit the individual worker or the task can cause negative health effects and decrease a worker's productivity. In order to prevent health problems, as well as to maintain the worker's productivity, hand tools should be designed so that they fit both the individual and the task. Well designed tools can contribute to good body positions and movements and can increase productivity. Use the following guidelines when selecting hand tools:

- Avoid poor quality hand tools.
- Choose tools that allow the worker to use the larger muscles in the shoulders, arms and legs, rather than the smaller muscles in the wrists and fingers.
- Avoid holding a tool continuously in a raised position or gripping a heavy tool. Properly designed tools allow the worker to keep the elbows next to the body to prevent damage to the shoulder or arm. Additionally, properly designed tools do not require the worker to bend the wrists, stoop or twist.
- Choose handles that are long enough to fit the whole hand. This will help to reduce uncomfortable pressure on the palm of the hand or on the joints of the fingers and hand.
- Do not use tools with spaces where fingers and skin can get caught.
- Choose double-handled tools, such as scissors, pliers or clippers. These should have a span that does not overstretch the hand.
- Do not select tools with contoured handles; they fit only one size of hand and put pressure on hands they do not fit.
- Make tool handles easy to grip. Handles should also have good electrical insulation and they should not have any sharp edges or sharp corners. Put soft plastic covers on handgrips to reduce slipperiness.
- Avoid using tools that force the wrist to bend or to be in an awkward position. Redesign tools so that the tool bends and not the wrist.
- Choose tools with an evenly balanced weight and make sure they are used in the proper position.
- Make sure tools are properly maintained.
- Tools should be appropriate for right- or left-handed workers.

These pictures illustrate how tool design can prevent you having to work with a bent wrist.
In a poultry processing plant a variety of special knife handles were developed so that each cut could be made with straight wrist.
with spaces that can catch fingers or flesh.

IN SOME CASES TOOLS CAN BE CHANGED TO KEEP THE ARMS LOW AND ELBOWS IN BAD DESIGN

SOLDERING IRON WITH BENT HANDLE ALLOWS ELBOW TO BE LOWERED AND WRIST STRAIGHTENED GOOD DESIGN

Controls

Control switches, levers, and knobs also need to be designed with the worker and the task in mind. Here are some guidelines for the design of controls:

- Control switches, levers and knobs should be within easy reach of the machine operator from a normal standing or sitting position. This is particularly important for frequently used controls.
- Select controls that are appropriate for the job task. For example, choose hand controls for precision of high-speed operation and foot controls, such as pedals, for operations that require more force. Two or more pedals should not be used per operator.
- Design or redesign controls for two-handed operation.
- Triggers should be operated by several fingers, not just one.
- It is important to show a clear distinction between emergency controls and those which are used in normal operations. Such distinctions can be marked by physical separation, colour coding, clear
labelling or machine guarding.

- Design controls to prevent accidental activation. This can be done by proper spacing, adequate resistance, recesses or shields.
- It is important that operating procedures for controls are easy to understand using common sense. Common sense reactions may differ among countries and these differences should be taken into consideration, especially with imported equipment.

**BAD DESIGN**

**GOOD DESIGN**

Sometimes a job needs to be redesigned to protect the arms, neck and shoulders from developing RSI. For example, controls can often be moved (or extended) to solve the problem.

Lowered palm buttons can allow arms to be lower than shoulders and still provide safety.

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**Points to remember about hand tools and controls**

1. Hand tools should be designed according to ergonomic requirements. Poorly designed hand tools, or tools which do not fit the individual worker or the task can cause negative health effects and decrease a worker's productivity. In order to prevent health problems, as well as to maintain the worker's productivity, hand tools should be designed so that they fit both the individual and the task.

2. There are a number of ergonomic factors to consider when designing or redesigning hand tools.

3. Control switches, levers, and knobs also need to be designed with the worker and the task in mind.

**E. Heavy physical work**

Manual work must be designed properly so that workers will not overexert themselves and develop muscle strain, especially in the back. Performing heavy physical work for long periods causes the rate of breathing and the heart beat to increase. If a worker is not in good physical condition, he or she is likely to get tired easily while doing heavy physical work. Whenever possible, it is helpful to use mechanical
power to do the heavy work. This does not mean that employers should replace workers with machines, rather, that workers can use machines to perform the most arduous tasks. Mechanical power reduces the risks to the worker and at the same time provides more work opportunities for people with less physical strength. Use the following guidelines for designing jobs that require heavy physical work:

- Heavy work should not exceed the capacity of the individual worker.
- Heavy physical work should be varied throughout the day at regular intervals with lighter work.
- Rest periods must be included in the day's work.

**Note:** a job that requires no physical effort is just as undesirable as a job that only entails heavy physical work. Jobs that require no physical movement are generally tiring and boring.

**To design a heavy physical job appropriately, it is important to consider the following factors:**

- the weight of the load;
- how often the worker must lift the load;
- the distance of the load from the worker lifting it;
- the shape of the load;
- the length of time required to do the task.

The following are more detailed recommendations for heavy work, especially work that involves lifting. (See **Appendix 1** at the back of this Module for guidelines on proper lifting and carrying techniques.)

**Reduce the weight of the load:**

- repackage to reduce the size;
- reduce the number of objects carried at one time;
- assign more people to lift extra heavy loads.

**Make the load easier to handle:**

- change the size and shape of the load so that the centre of gravity is closer to the person lifting;
- store the load at or above hip height to avoid the need to bend;
- use mechanical means to raise the load to at least hip height;
- use more than one person or a mechanical device to move the load;
- drag or roll the load with handling aids such as carts, ropes, or slings;
- transfer the weight of the load to stronger parts of the body using handgrips, straps or belts.

**Use storage techniques to make handling materials easier:**

- use wall brackets, shelving or pallet stands of appropriate height;
- load pallets so that heavy articles are around the edges of the pallet and not in the centre. This will help to distribute weight evenly on the pallet. You must ensure, however, that articles do not easily fall off the pallet and injure someone.

**Minimize the distance a load must be carried:**

- improve the layout of the work area;
- relocate production or storage areas.

**Minimize the number of lifts required:**
• assign more people to the task;
• use mechanical aids;
• rearrange the storage or work area.

Minimize twisting of the body:

• keep all loads in front of the body;
• allow enough space for the whole body to turn;
• turn by moving the feet rather than twisting the body.

Points to remember about heavy physical work

1. Whenever possible, use mechanical power in place of heavy work. Machines can be used by workers to perform the most arduous tasks, not to replace workers.

2. Heavy work should be varied with lighter work throughout the day.

3. Rest periods must be included in the job.

4. Consider ergonomic factors, such as the weight and shape of the load and how often a worker must lift the load, when designing heavy physical job tasks.

5. Other ergonomic recommendations include: reducing the weight of the load; making the load easier to handle; using storage techniques to make handling easier; minimizing the distance a load must be carried; minimizing the number of lifts; and minimizing twisting of the body.

F. Job design

It is important to design jobs taking into consideration human factors. Well designed jobs consider the worker's mental and physical characteristics as well as health and safety conditions. The way a job is designed determines whether it is varied or repetitive, whether it allows the worker to be comfortable or forces him or her into awkward positions, and whether it involves interesting/stimulating tasks or boring monotonous ones. The following are some ergonomic factors that should be considered when designing or redesigning jobs:

• the types of tasks that need to be done;
• how tasks need to be performed;
• how many tasks need to be performed;
• the order in which tasks need to be completed;
• the type of equipment needed to complete tasks.

Additionally, a well designed job should do the following:

• allow the worker to vary the position of the body;
• include a variety of mentally stimulating tasks;
• allow the worker some decision-making latitude so he or she can vary the work activities according to personal needs, work habits and the workplace environment;
- give the worker a sense of accomplishment;
- provide adequate training to teach the worker what tasks are required and how to perform them;
- provide adequate work/rest schedules which allow the worker enough time to complete tasks and to get sufficient rest;
- allow an adjustment period for new job tasks, especially when they are physically demanding, so that the worker can gradually become accustomed to the work.

### Points to remember about job design

1. Well designed jobs consider the worker's mental and physical characteristics as well as health and safety conditions.

2. Job design determines whether the work is varied or repetitive, whether it allows the worker to be comfortable or forces him or her into awkward positions, and whether it involves interesting/stimulating tasks or boring/monotonous ones.

3. There are a number of ergonomic factors that should be considered when designing or redesigning jobs, such as the type of tasks, how they need to be accomplished, and the type of equipment that is needed to complete the tasks.

4. A well designed job should allow a worker to vary the body position; it should include a variety of interesting tasks; give the worker some decision-making authority; provide a sense of accomplishment; include training for new job tasks; provide adequate work/rest schedules; and allow an adjustment period for new job tasks.

### IV. Role of the health and safety representative

As the health and safety representative you can play an important role in ensuring that ergonomics is used in the workplace. Your efforts to ensure that equipment and jobs are designed or adapted to fit workers will help to prevent a variety of health problems caused by poor working conditions.

*Health and safety representative*

*Remember:* the goal of ergonomics is to look for ways to make the job fit the worker, instead of forcing the worker to conform to the job.
When trying to eliminate — or prevent — problems that may exist owing to the non-application of ergonomic principles, asking the following questions may help you to identify the cause of the problem:

(a) How well suited is the operator to his or her job, tools and workstation?

(b) How much time and effort does the worker spend on a particular task?

(c) How repetitive is the task?

Try to work together with the union, management and workers to implement ergonomic changes in the workplace. Use the health surveys and check-lists in the Appendices at the back of this Module to help you identify problem areas in your workplace. Then you can begin to establish priorities and work with the different groups to develop solutions. In many cases, you may have to think of ways to improve on an existing situation, since you may not, for example, have the luxury of getting new equipment which is designed according to ergonomic factors.

**Remember**: it is vital that the workers who will be affected by ergonomic changes — minor or major — are involved in discussions before changes are implemented. Their input can be very helpful in determining necessary and appropriate changes. They know their job better than anyone else does.

The following six points are a strategy which you as the health and safety representative can use to help workers win ergonomic improvements in the workplace.

**Six-point strategy for winning ergonomic improvements in the workplace**

Source: International Ladies’ Garment Workers’s Union, Health and Safety Department.

1. **Reach out to other workers**
   
   a. Distribute copies of information factsheets or leaflets at work.
   
   b. Listen to what others have to say about ergonomics-related issues.
   
   c. Write down the names and work areas of people who are experiencing symptoms which you suspect may be caused by the non-application of ergonomic principles.

2. **Collect information to identify problem areas**

3. **Study the areas you suspect are a problem**
   
   a. Walk through any problem areas and review the work tasks.
   
   b. Start thinking of solutions, such as raising tables, rotating work, etc.

4. **Gather recommendations from**:
   
   a. the workers who are affected;
   
   b. maintenance and repair workers;
   
   c. the union health and safety department (if one exists);
d. other health and safety specialists.

5. Push for necessary changes

Worker support (plus documentation) will give you the necessary encouragement for winning health and safety contract language, grievances, or other agreements with management.

6. Communicate with workers

Two-way communication is important in building and maintaining solidarity within the union.

V. Summary

Ergonomics is a science which, when applied effectively, can lead to marked improvements in working conditions. Improvements can be made by properly designing or redesigning the way jobs are performed, the content of job tasks, the methods in which equipment is handled or set up, the way work schedules are set, the equipment used to perform a job, etc.

Positive changes in these areas or others can help to prevent injuries and illnesses — physical or psychological — caused by a lack of attention to ergonomic principles in the workplace.

Implementing ergonomic improvements does not have to be complicated or difficult. The union, workers and management should work together to assess priority problem areas and develop solutions.

Exercise. Identifying problems and developing solutions to ergonomic problems

Note to the instructor

For this exercise, you will need a flipchart (or large pieces of paper taped to the walls) and markers, or a chalkboard and chalks. Give each trainee a copy of the action plan form. If you cannot make copies, then trainees can make their own action plans on a plain piece of paper. Put a copy of the six-point strategy for winning ergonomic improvements in the workplace (see p. 30) on the wall where everyone can see it. You may also want to give each participant a copy of the strategy.

Instructions

The first part of this exercise should be done in plenary or with the group as a whole. The second part will be a small group activity.

1. Ask members of the group to think of one or two important problems at their workplaces which they think may be related to the non-application of ergonomic principles. Trainees should explain the characteristics of the problem which are related to ergonomic principles and state what kinds of health problems result from the existing situation. If at first trainees cannot think of any problems in their workplaces related to ergonomics, then you may be able to
use the building where your training group is located to provide examples. For example, look around your training room. How are the chairs designed? Are trainees required to sit for more than two hours at a time (which is not healthy for your musculoskeletal system)? You may be able to arrange to take the trainees to visit other worksites in the building, if they exist. Is there an office in the building? Discuss with the participants whether ergonomic principles have been applied for the secretaries. Is there a kitchen in the building? Does the cook have to stand on a hard floor all day? Does he or she have to do a lot of lifting? Ask trainees to think of other ergonomic issues.

2. Make three columns on the flipchart labelled as follows and write in the trainees' responses. You can put several responses on one paper.

<table>
<thead>
<tr>
<th>Problems</th>
<th>What are the ergonomic characteristics of this problem</th>
<th>Resulting health problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>2</td>
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<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. After you have written down as many problems as you have time for, divide the trainees into small groups of three to five people. If the group of trainees is composed of workers from different workplaces, ask the groups to mix, so that there are people from different workplaces in each group.

4. Next, assign one problem from the flipchart to each working group. If there are not enough stated problems to go around, you can give the same problem to two different groups, or you can ask a couple of groups to come up with their own problems.

5. The members of each group should propose as many equipment design and/or organizational solutions to their problem as they can. One person in each group should volunteer to write on a piece of paper the solutions the group proposes.

6. From the list of proposed solutions, each group should identify three to four solutions that it selects as priorities. The priorities may be identified as such because they may seem to be the easiest and cheapest to implement (these are important considerations from management's point of view), or because they have the greatest potential for impact. The group must consider actions management can take to solve the problem, things the union can do, as well as things the worker(s) can do to improve the situation.

7. Review the six-point strategy with the plenary. When used effectively, it can help to win ergonomic improvements in the workplace. Each working group should fill in an Action Plan form with its priority solutions. While completing the form, the group should discuss and develop an actual strategy for action for solving the problem.
8. Each group should also discuss potential barriers to change which they might face when attempting to implement its strategy for action. What strategies can the group think of for overcoming these potential barriers?

9. Once the groups have completed their Action Plan forms, the plenary should reconvene. Each working group should identify a spokesperson who will state the following to the plenary:

   (a) the problem it was assigned;

   (b) the priority solutions it proposed;

   (c) why it chose those solutions as priorities;

   (d) the potential barriers to change it anticipated;

   (e) strategies it developed for overcoming those barriers.

Try to plan enough time so that each group can present its Action Plan to the plenary.

10. After every group has made its presentation, collect all the Action Plan forms. Return the forms to the trainees, giving each trainee the Action Plan form that attempt to solve the problem that the trainee identified in his or her own workplace (step 1 of this exercise).

11. Ask if there are any questions.

*Action plan for solving ergonomic problems in the workplace*

1. **The problem:**

2. **Priority solutions:**

   
   Equipment Design
   
   Organizational

   (a)

   (b)

   (c)

3. **What are some of the potential barriers you may encounter when trying to implement solutions to this problem?**

   (a)

   (b)

   (c)

4. **What strategies can you think of for overcoming those barriers?**
Appendix I. Lift and carry properly


Lift and carry properly

Lifting and carrying are physically strenuous, and there is always a risk of accidents and in particular of injury to the back and arms. To avoid this it is important to be able to estimate the weight of a load, the effect of the handling level and the lifting environment. You must also know how to choose a safe working method and how to use devices and equipment that make your work lighter.

Lift the object close to your body, otherwise the muscles of the back and the ligaments stretch and the pressure in the intervertebral discs increases.

Tense your stomach and back muscles so that your back stays in the same position all the time you are lifting.

Position of the back and legs

Position of the legs
Stand close to the object. The closer you can get to the object, the safer it is to lift.

Keep your feet apart to maintain your balance well.

Position of the arms and grip

Try to grasp the object firmly using your whole hands at right angles to your shoulder. You cannot get a firm grip using only your fingers.

Lift with both hands if possible.
Lifting to the side

Lifting a weight and twisting the body at the same time increases the risk of back injury. Place your feet in a walking position, one foot pointing slightly in the direction of the lift. Lift the object and then shift the weight of the body onto the foot in the turning direction.

Lifting upwards

If you have to lift something above shoulder level, place your feet in a walking position. First raise the object to chest level. Then begin pushing upwards by moving your feet out in order to get the object moving and shift the weight of your body onto the front foot.

For many people a suitable lifting height level is 70 to 80 centimetres. Lifting something off the floor can be three times as strenuous.

Lifting with others
People who often lift things together should be more or less equally strong and they should practise lifting things together. **The lifting movements must be made at the same time and at the same speed.**

The maximum weights recommended by the International Labour Organization are:

Men: .................. occasionally 55 kg., repeatedly 35 kg.

Women: .................. occasionally 30 kg., repeatedly 20 kg.

**Do not lift anything if you have backache. Once the pain has gone, start lifting with caution and gradually practise.**

**Carrying**

Carrying places most strain on the back of the neck and the upper limbs, the heart and the circulation. **Carry objects close to your body.** Minimum effort is then required to keep your balance and to carry the object. A round object is difficult to carry because the weight is far from the body. Good handles or grips make the work easier and bring additional safety. **Spread the weight evenly over both hands.**

**Carrying** is always strenuous. Check whether the object can be shifted on a conveyor belt, wheels or a trolley. Make sure you do not try to shift an object that is too heavy on your own, that there are proper hand grips, that the hand grips are at a suitable distance, that there is room to lift and carry the object, that the floor is not slippery, that there are no obstacles in your way and that there is sufficient lighting. Unless well designed, steps, doors and ramps are dangerous.

**Clothing**
Your clothing should regulate the temperature between the air and the heat generated by you body. Clothes must not be so loose, or so long or flapping as to be dangerous. Gloves should protect your hands and help you to get a good grip. Footwear should be sturdy, non-slippery and have broad soles. The uppers should protect your feet from falling objects. A helmet is essential for mechanical lifting. The helmet must be firmly fastened so that it cannot fall off at the vital moment or obstruct your view. A wide belt giving the back support (a weightlifter's belt) may be useful.

**Auxiliary devices**

Devices used to make your work easier must be light and easy to use, in order to reduce exertion and the risk of accidents. For example, magnets, eccentric and lever grabs, suction cups, carrying frames, such as yokes and backpacks, give you a good grip on the load and improve your working position. Trolleys, lifting tables, roller and disc conveyors and conveyor belts reduce shifting work.

**Appendix II. Job design check-list**

Source: United Auto Workers' Union
**Difficult work positions**

Can the time spent in one position (sitting, standing, bending, twisting) be reduced by redesigning the job, providing rest breaks, rotating workers, or providing chairs or stools? 

Can the work height be adjusted? For example, can an adjustable table or counter be provided so that each worker can adjust it for his or her height and for sitting or standing?

Can adjustable chairs be provided?

Can machine controls or materials be placed so workers can reach them more easily?

**Mental stress**

Can workers who must maintain close concentration be given extra breaks?

Can employees who work alone be rotated to other jobs for part of the shift to alleviate feelings of isolation? Can workers who deal with the public spend part of their day doing other kinds of work?

Can workers have more control over the pace of work? For example, could custodians be told what needs to be done during a given week and then be allowed to determine how and when the work is performed?

Can the quota of work for each person be adjusted to a more realistic level?

**Stress from the work environment**

Can sources of noise and vibration be removed or controlled? For example, a noisy motor or generator which causes stress for nearby workers might be enclosed or moved to a remote location.

Can chemical hazards that cause headaches or minor irritations be controlled?

Can lighting be improved?

Can workers be given control over the temperature in their work environment?

**Tools and machinery design**

Can tools be designed to eliminate twisting of the hand or wrist?

Can trucks or other machinery be designed so the driver or operator has a clearer view?

Can gauges be made easier to read?

Can machinery be used to lift heavy loads instead of moving them by hand? For example, in hospitals, slings and other equipment can be used to help lift patients.

**Appendix III. What do you do if you think you have a cumulative trauma disorder?**

Source: International Ladies Garment Workers’ Union, Health and Safety Department.

**Notify your employer**
Do this with a witness or in writing and keep a copy for yourself.

**See a doctor as soon as possible**

Because cumulative trauma injuries develop slowly, workers often ignore the symptoms until they become severe. By that time, the injury may be permanent. Make sure you explain to your doctor the type of work you do.

**Document**

Keep notes of the events related to this injury, including whom you spoke to and when, as well as all medical expenses related to the injury and any conversations with or correspondence from your employer. These notes could be invaluable if a dispute arises regarding your injury.

**Contact your union for assistance**

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**Appendix IV. Evaluate your job for risk factors**

**Does your job require you to:**

- Repeatedly bend and twist your wrists?
- Repeatedly twist your arms?
- Repeatedly hold your elbows away from your body?
- Repeatedly use a pinch grip?
- Repeatedly reach or lift things above shoulder level?
- Repeatedly use a tool that vibrates?
- Repeatedly use your hand to apply force?
• Repeatedly twist or flex your back?
• Repeatedly lift objects from below knee level?
• Repeatedly work with your neck bent?

All of the above are “risky positions” that can lead to the development of repetitive strain injuries. If you answer “yes” to any of the questions above, tell your union and your employer.

**Appendix V. Controlling vibration hazards; health survey: whole-body vibration and hand-arm vibration**

Source: Guidelines on hazards of vibration, Australian Council of Trade Unions.

*Fit the job to the worker*

**Controlling vibrating hazards**

• **Eliminate** the need to use vibrating machinery. Example: improved mould-making techniques in foundries have reduced the need to settle castings.
• **Substitute** a different process. Example: air-arc gouging is a vibration-free way of removing metal.
• **Automate**. Example: using robots to bring workpieces into contact with a grinding wheel.
• **Find a vibration-reduced tool**. Example: some modern pneumatic tools have been specially designed to produce less vibration than their predecessors.
• **Fit vibration-isolating handles**. Example: some modern chain-saws.
• **Provide adequate maintenance**. Examples:
  - correct dressing of wheels;
  - regular renewal of vibration-isolators;
  - regular tuning of engines;
  - frequent sharpening of cutters;
  - regular general maintenance;

• **Support the tool or workpiece**. Examples:
  - resting posts at grinding wheels;
  - suspension systems for left-hand tools;

• **Warm the tool or workpiece**. Examples:
  - chain-saws with heated handles;
  - pneumatic tools with plastic covers;
  - pre-heating castings prior to settling;
  - air exhausts piped away from the operator’s hands;

• **Warm the workplace** by providing adequate heating and warm rest areas.
• **Reduce time on the job** by job rotation, cutting output, or regular breaks.
Health survey: whole-body vibration

Personal description (if you want to give it)

Name .................................................................................................................................

Age .................................................................................................................................

Male .............................................. Female .................................................................

Job description

Present job title...................................................................................................................

When did you start on this job? ........................................................................................

What vibrating equipment do you use? ............................................................................

For how long each day? ......................................................................................................

Past jobs where vibration was a factor: ...........................................................................

Length of time employed ..................................................................................................

Machines or tools used ......................................................................................................

Health description

If you are exposed to mainly whole-body vibration (near machines, concrete vibrators, buses, trucks, tractors, etc.) do you or have you suffered from:

<table>
<thead>
<tr>
<th>Problem</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>back pain</td>
<td></td>
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<tr>
<td>arthritis</td>
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<td>varicose veins</td>
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<td>piles</td>
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<td>groin trouble</td>
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<td>indigestion</td>
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<td>high blood pressure</td>
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<td>heart trouble</td>
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<tr>
<td>aching muscles</td>
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</tr>
</tbody>
</table>

For each problem ticked indicate:

A  for All the time
R for Regularly

O for Occasionally

Did you suffer from any of these complaints before you started your present job? If yes, please give details: ........................................................................................................................................
........................................................................................................................................

Any other comments? ........................................................................................................................................
........................................................................................................................................

Health survey: hand-arm vibration

Personal description (if you want to give it)

Name ........................................................................................................................................

Age ........................................................................................................................................

Male ........................................ Female ..........................................................

Job description

Present job title ........................................................................................................................................

When did you start on this job? ........................................................................................................................................

What vibrating equipment do you use? ........................................................................................................................................

For how long each day? ........................................................................................................................................

Past jobs where vibration was a factor: ........................................................................................................................................

Length of time employed ........................................................................................................................................

Machines or tools used ........................................................................................................................................

Health description

If you are exposed mainly to hand-arm vibration (from pneumatic tools, chain-saws, grinders, etc.) do you or have you suffered from:

- tingling in fingers or hands;  
- numbness of fingers or hands;  
- whiteness of fingers;  
- whiteness of several fingers or hands;  

□
□
□
□
in winter only; ☐

at any season; ☐

cramping or pain in arms or shoulders; ☐

numbness of arms; ☐

drooping wrists; ☐

For each problem ticked indicate:

A for All the time

R for Regularly

O for Occasionally

Did you suffer from any of these complaints before you started your present job? If yes, please give details: ............................................................... ............................................................... 

................................................................................................................................

Any other comments? ...........................................................................................................

......................................................................................................................................