



## Ergonomic Job Design: Eliminating and Reducing Risk Factors for Musculoskeletal Disorders

Musculoskeletal disorders do not have to happen. Tools, equipment, workstations and jobs can be redesigned in ways that eliminate or reduce “risk factors” and thus eliminate or reduce the musculoskeletal injuries that these risk factors cause.

Ergonomic job design has two major components:

1. Eliminate Exposure to Physical Risk Factors: Force, Repetition, Posture (Awkward or Static), Vibration, Contact Stress, Cold Temperature

➤ Examples of Things to Look At:

Workstation design	Tools and tool design
Machinery design	Equipment design
Weight of things that are lifted	Location of things that are
Height of objects, equipment	lifted or handled

2. Change How Work Is Organized: Does the structure or set-up of the job or task promote or protect against exposure to ergonomic risk factors?

➤ Factors to Look At:

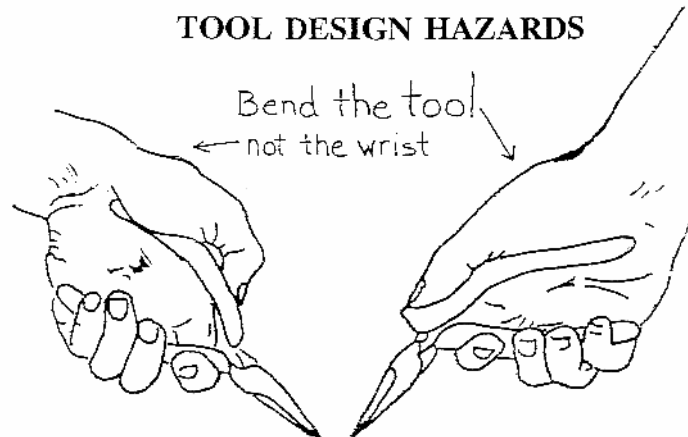
Variety of tasks/motions	Pace or speed of work
Work load	Number of people doing the job
Production quotas or pressures	Deadlines
Rest breaks	Supervision
Number of lifts	Hours of work
How much control worker has over the work	

This material has been funded in whole or in part with federal funds from the Occupational Safety and Health Administration, U.S. Department of Labor, under Grant Number 46C0-HT16. These materials do not necessarily reflect the views or policies of the U.S. Department of Labor, nor does mention of trade names, commercial products, or organization imply endorsement by the U.S. Government.

After identifying risk factors for musculoskeletal disorders on a job, the second step in ergonomic job design/redesign is to identify ways to change the job that would eliminate/reduce those risk factors.

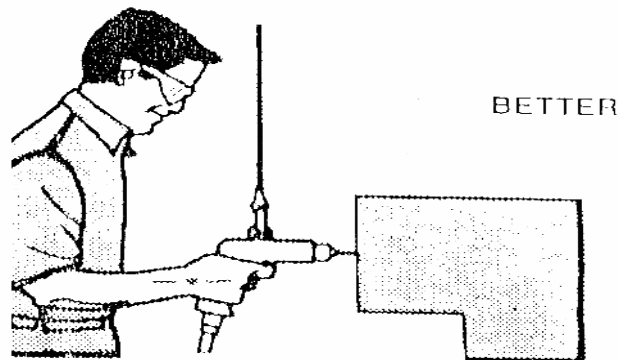
### **Some Issues To Keep In Mind Regarding Physical Aspects of the Job**

- The design of the workstation has to take into account workers' different sizes. Workstations should be designed to eliminate reaching, stretching, bending and other awkward postures.
- Workstations and equipment should be adjustable.
- Equipment and tools should be designed with the worker in mind and for the job being performed. Well-designed tools allow all workers to be able to work with them comfortably, or they must be specifically designed for right-handed and left-handed individuals.



- Edges of tools should be padded to reduce the forces that can damage soft tissue.
- Power tools can reduce some of the forces required by manual tools.

- Overhead supports can be installed so that operators of heavy tools or equipment are not required to support that tool or equipment while operating it.



- Hazards of vibration can be eliminated by using a different kind of tool or by dampening or cushioning the handles and/or providing certain kinds of gloves.
- Well-maintained equipment such as sharpened knives and drill bits, and repaired and lubricated cart wheels, will reduce or eliminate forces that can cause musculoskeletal injuries.
- It is always an ergonomic design goal to eliminate manual handling and lifting as much as possible.
- For jobs that can not be redesigned to eliminate manual handling and lifting, the use of lift tables, carts, dollies, hoists, levers and other mechanical aids can reduce forceful exertions.
- Materials can be stored so that the heaviest loads are stored above-knee and below-shoulder heights.
- Containers should be designed with handles or cut-outs for hands.
- Workers should know the weight of objects or materials before they have to handle them. Suppliers should label materials and packages with their



weights, and be encouraged to package items in smaller-size packages.

- There are times when two workers rather than one should be performing manual handling tasks.

### **Some Issues To Keep In Mind Regarding How Work Is Organized**

- The quantity and pace of work, the ability to take rest breaks, the number of repetitions that must be performed, certain pay and incentive schemes, staffing levels, the nature of supervision and the presence of machine-paced rather than operator-controlled work are all work organization factors that can affect the development of musculoskeletal disorders.
- Jobs should be designed in ways that eliminate the overuse of muscles, tendons and other soft tissues.
- To prevent body parts from being over-exerted or over-used, tendons, ligaments, muscles, and other soft tissues need rest in order to recover.
- Sometimes rest can be accomplished by "mini-breaks". Workers who worked with typewriters had far fewer musculoskeletal injuries than workers who work on computer keyboards. It is thought that changing sheets of paper, pushing the carriage return bar, using correction tapes or fluids all provided the "mini-breaks" needed to prevent musculoskeletal disorders from developing. The human body has great abilities to recuperate given the opportunity to repair itself.
- Rest can mean stopping a particular activity that is taxing certain muscles and tissues for a period of time, taking a break from everything to get a cup of coffee or switching to a different activity that does not tax the same body parts. Sometimes "rest" can mean a second or two; in particular situations it can mean longer and more frequent rest breaks. If damage is occurring to certain soft tissues, the rest needed could be hours or days; it can even mean having to stop an activity for weeks, months or even permanently.



- Piece work, where workers' income depends on the number of pieces produced, or incentive schemes where workers receive bonuses for increased production, promote increased repetitions, fewer rest breaks and therefore musculoskeletal injuries. These schemes should be reviewed and work redesigned in ways that do not penalize workers economically.
- Reduced staffing levels often result in increased work loads and intensified work for the remaining workforce – all of which can increase workers exposure to risk factors for musculoskeletal injuries.
- Some jobs are redesigned or reorganized in ways that eliminate one risk factor (like an awkward posture), but increase another risk factor (like repetition.) For example, a job where the worker has to twist and bend (awkward posture) to reach a part before working on it in some way could be redesigned to eliminate the twist and lift (perhaps the parts are placed on a table next to the worker), and at the same time the production quota is doubled, meaning that the worker is now expected to increase the number of parts being worked on, dramatically increasing the number of repetitions performed. It is important to make sure that one risk factor is not reduced or eliminated at the same time that another risk factor is increased. The goal of ergonomic job design is to eliminate or reduce exposure to ALL risk factors!
- Production quotas, excessive supervision, machine-paced work or other pressures can cause workers to work with tense muscles, which increase the risk of musculoskeletal injuries developing.
- Worker rotation, whereby workers perform a variety of tasks, has been used to reduce exposure to ergonomic hazards. However, there is a down-side to exposing a greater number of workers to ergonomic hazards. The long-term goal should be to redesign the job and eliminate the risk factors. Further, if worker rotation is going to be used even temporarily, it is important to evaluate the whole rotation scheme to make sure workers are not being rotated through jobs that tax the same muscles and soft tissues.
- There should be worker and union involvement in decisions regarding how work is organized and restructured. All plans to reorganize work should be analyzed for their impact on ergonomic job design.



### **Ergonomic Job Design and Worker/Union Involvement**

It is important for workers and unions to be able to identify particular control measures, and a range of control measures, for ergonomic hazards.

Ergonomics involves *fixing the job, not the worker!*

There is no technical reason that all jobs can not be redesigned to eliminate or reduce worker exposure to risk factors for musculoskeletal disorders.

It may be necessary to think in terms of short-term/temporary and long-term/permanent solutions to ergonomic problems.

Workers and unions have important and essential roles to play in identifying control measures that will effectively eliminate or reduce risk factors for musculoskeletal injuries.