Purpose

Ergonomics has been a much discussed and sometimes misunderstood subject throughout American industry for a number of years. The Occupational Health and Safety Administration (OSHA) proposed federal rules that, after much discussion and review, were put into effect on November 14, 2000. Subsequently, these same rules were overturned by congress early in 2001. This action did not however make the problem of ergonomics go away. Ergonomics is a major issue with industry because ergonomic injuries cost companies millions of dollars and thousands of hours of valuable worker productivity. In addition, while all workers may not suffer an ergonomic injury, poorly designed workstations result in productivity losses.

This document is designed to provide a general overview of ergonomic principles as applied to the design and installation of packaging machinery. The information presented here should not be construed to create either expressly or by implication any certification or guarantee that the use of these principles will necessarily reduce or eliminate ergonomic injuries.

The Packaging Machinery Manufacturers Institute (PMMI) has developed this guide to assist packaging machinery manufacturers, rebuilders and users in better understanding some basic ergonomic principles. This guide is not the sole or complete authority on ergonomics, nor will the guidelines discussed be applicable to each and every machine that meets the definition of packaging or packaging–related converting machinery. Therefore, PMMI encourages packaging machinery manufactures and users to consult with their own professional advisor in developing and implementing ergonomic designs for their equipment and worker activities. PMMI and all persons involved in the preparation be incorrect and review of this guide disclaim responsibility for any statement that may be found to, inaccurate or incomplete, and for the omission of information that may be considered pertinent.
## Acknowledgements

This guide has been developed with assistance, careful review and critique from the following individuals:

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<tr>
<th>Name</th>
<th>Company</th>
<th>Location</th>
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<tr>
<td>Atlantic Risk Services</td>
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<td>Atlantic Mutual Insurance</td>
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Ergonomic Basics

Introduction
From staples to stoves, toothpaste to trimming machines, avocados to armoires, every product imaginable is, at some point in its distribution cycle, wrapped and packaged. What that means is that for all commodities, someone, somewhere is operating the machinery that gets these products into a box, bag, carton, crate or barrel. Whether that person works comfortably and at peak productivity is largely due to the degree to which the packaging machinery is designed and operated in an ergonomically sound manner.

What exactly is ergonomics? Ergonomics is the science of designing tools and equipment, the layout of workplaces and the overall organization of work to improve employee well-being and workplace efficiency. In simple terms, ergonomics means “designing the job to fit the person” instead of forcing people – with all their variable heights, weights and physical capabilities – to fit the job.

Ergonomics is closely related to “human factors engineering,” which is the systematic application of knowledge regarding human sensory, cognitive and physical limits/capabilities to the design, operation and maintenance of manned systems. Human factors engineering includes the design of operating procedures and training programs.

Why Worry About Ergonomics?
When designing packaging machinery, many factors are considered: speed and maximum productivity; space; ease of maintenance; cost; the nature of the product being packaged; and the type of packaging material being used. And increasingly, ergonomics is also a major factor influencing the design of packaging machinery. Why?

Despite the recent repeal of the Occupational Safety and Health Administration’s (OSHA) Ergonomics Standard, the purchasers of packaging equipment are more and more often demanding ergonomic design in the machinery they buy. Even without the threat of OSHA fines, manufacturers and employers understand the consequences of uncomfortably designed machinery. It is a rare employer who has not experienced firsthand the monetary and time costs associated with ergonomic injury. Some face state ergonomics regulations, while others are pressured by labor union representatives who understand the impact poorly designed jobs and equipment have on workers’ health. Some watch as their health and workers’ compensation premiums rise, while still others wonder why their competitors seem to operate with greater efficiency and productivity.

For many of these machinery consumers, ergonomically designed equipment is the answer to their concerns. All things being equal, purchasers will buy the ergonomic machine over the machine that ignores employee comfort. Thus, it makes good business sense for the designers of packaging machinery to provide what their customers want and design machinery to minimize ergonomic injury.

Ergonomics Basics
Machinery and jobs that are not ergonomically sound can lead to work-related musculoskeletal disorders (WMSDs). These are defined as “disorders of the muscles, nerves, tendons, ligaments, joints, cartilage, blood vessels or spinal
discs affecting the neck, shoulder, elbow, forearm, wrist, hand, abdomen (hernia only), back, knee, ankle or foot.” WMSDs may be caused, aggravated or precipitated by intense, repeated or sustained work activities with insufficient recovery.

Several **job factors** contribute to the development of work-related musculoskeletal disorders (WMSDs) including:

**Repetition**
- Repeating the same motion every few seconds or repeating a cycle of motions involving the neck, shoulder, hand, wrist, arm, back, trunk, hip leg, knee or ankle more than twice per minute or for more than two consecutive hours in a workday.
- Using an input device, such as a keyboard and/or mouse, in a steady manner for more than four hours total in a workday.

**Force**
- Lifting more than 75 pounds at any one time; more than 55 pounds more than 10 times per day; or more than 25 pounds below the knees, above the shoulders or at arms length more than 25 times per day.
- Pushing/pulling with more than 20 pounds of initial force (e.g. equivalent to pushing a shopping cart with five 40 pound bags of dog food) for more than two hours total per day.
- Pinching an unsupported object weighing two or more pounds per hand or use of equivalent pinching force (e.g. holding a small binder clip open) for more than two hours total per day.
- Gripping an unsupported object weighing 10 pounds or more per hand, or use of an equivalent gripping force (e.g. crushing the sides of an aluminum soda can with one hand), for more than two hours total per day.

**Awkward Postures**
- Repeatedly raising or working with the hand(s) above the head or the elbow(s) above the shoulder(s) for more than two hours total per day.
- Kneeling or squatting for more than two hours per day.
- Working with the back, neck or wrist bent or twisted (i.e. more than 30 degrees or more) for more than two hours per day.

**Contact Stress**
- Using the hand or knee as a hammer more than 10 times per hour for more than two hours per day.
- Being forced by equipment, tool or workstation design to work against hard, sharp or uncomfortable surfaces for more than two hours per day. Key areas of the body affected by contact stress include the shoulder, hand, wrist and arm.

**Vibration**
- Using vibrating tools or equipment that either have high vibration levels (such as percussive or riveting tools) or moderate vibration levels (such as sanders, drills, grinders or small air tools) for more than 30 minutes per day (for high vibration tools) and two hours per day (for moderate level vibration tools). Minimize exposure to both whole body and hand-arm vibration.

**Environmental Factors**:
- **Temperature** extremes within the working environment that are either cold or to hot causing reduced circulation to muscles (in cold environments) or increased fatigue (in hot environments).
- **Lighting**: Common lighting problems include: shadows that hide details, glare that shines in your eyes or off work surfaces and light that creates a poor contrast between work and the background. Lighting should enhance and not obscure details of work.
According to the Bureau of Labor Statistics (BLS) “disorders associated with repeated trauma” (i.e. involving the neck, shoulder, hand, wrist, arm and back) are the most common nonfatal occupational illness types. A recent study of “nonfatal occupational injuries” within the United States found that about 27 percent of all injuries in private industry involved the back as the injured body part. That same study also showed that “overexertion in lifting” was the leading exposure resulting in back injury, which accounted for about 75 percent of all injuries to the entire back. In reviewing other BLS data related to occupations with the largest number of disorders associated with repeated trauma, “packaging and filling machine operators” rank ninth and “hand packers and packagers” rank 12th.

Weeks, months or years of performing intense or repeated tasks, or sustained work activities with insufficient recovery can potentially lead to the following medical diagnoses of a WMSD:

- Low back pain;
- Tension neck syndrome;
- Carpal tunnel syndrome;
- Rotator cuff syndrome;
- DeQuervain’s syndrome;
- Trigger finger; and
- Tarsal tunnel syndrome.

Less serious, but still significant WMSD injuries include muscle strains and tears, ligament sprains, joint and tendon inflammation, pinched nerves and spinal disc degeneration.

Fortunately, machinery that is ergonomically designed can not only reduce WMSDs, it can also improve productivity, enhance the quality, reduce employee turnover and absenteeism which can result in reduced errors, defects and production costs.

Six basic goals of ergonomic design can be identified. They include:

- Keep everything in easy reach
- Work at proper heights
- Reduce excessive force
- Working with your body in “neutral” position
- Provide clearance and access
- Maintain a comfortable environment.

**Ergonomic Interfaces Between the Worker and the Machine**

*Note: Material in this section taken from Draft (10-14-99) NIOSH “Guideline for Ergonomics in Packaging Operations “written by Dr. William Arndt and used with permission by author.*

Though ergonomic principles can be applied to machinery during installation, it is far better to incorporate them during the initial design of the machinery. In general, equipment designers should apply ergonomics during seven major phases of equipment/worker interface:

- Machine operation;
- Feeding/loading of machine or data;
- Work in progress;
- Output removal;
- Setup and changeover;
- Clearing jams and cleanup;
- Maintenance.

For each of these interfaces, the designer should consider workers’ heights, reach distances, accessibility, obstructions, forces and weight, work methods and machine speeds. Machinery should be designed to minimize repetitive or extended forceful physical exertions and awkward or stressful postures. The demands placed on workers by the machinery should not exceed the physical, biomechanical or psychological capabilities of the worker.
Machine Operation

For each of the worker/machine interfaces, specific considerations need to be taken into account. During machine operation, special attention should be focused on the design of controls and displays.

Controls and displays should be easy to use, consistent with other machines, consistent with human expectations and capabilities. They should also be easily accessed.

Controls and displays should be easy to use, consistent with other machines and compatible with human expectations and capabilities. They should be positioned so that they can be seen and accessed easily; this is especially true for any emergency controls. Controls and displays should be designed so that they are adjustable. This can best be achieved by mounting them on articulating arms so that workers of different heights can use them comfortably.

Feeders, in particular, must be positioned or oriented so that difficult working positions are eliminated or minimized.

Feeding or loading can cause significant WMSDs. Feeders, in particular, must be

Feeding/Loading

Packaging materials and the commodity to be packaged differ from industry to industry, but some general risk factors can be identified and some ergonomic principles applied regardless of the industry. To load or feed a packaging machine, a worker must input some or all of the following:

- Product
- Packaging components
- Closing components (e.g., caps, lids, staples, adhesives)
- Decorating and marking components (e.g., ink, labels, foils)
- Grouping/separating components (e.g., partitions, strapping, cushioning)
- Other components (e.g., coating, inserts, desiccants, liners, applicators)
- Containers (e.g., bags, pouches, bottles, boxes, cartons, cases, cans, trays, tubes, pallets, etc.)
- Data or information
On many machines workers must bend, reach overhead, or reach across the machine to position rolls of film on spindles. When at all possible, equipment designers should strive to eliminate or minimize these awkward postures.

Many packaging components use large, heavy rolls of paper, foil, plastic, labels, bags, or other materials. On many machines – both old and new – workers must bend, reach overhead, or reach across the machine to position these rolls on spindles. When at all possible, equipment designers should strive to eliminate or minimize these awkward postures.

Gravity feed hoppers used for unscrambling and orienting bulk components, such as bottles, caps, dispensers and product, present special problems. Often, stairs or catwalks are built to provide access to the hopper, but there are inherent dangers to this approach, so alternatives should be provided whenever possible. Ideally, parts should be brought to the platform mechanically so workers are not made to carry boxes or other heavy containers up stairs.

Equipment used to load knock-down (KD) boxes should also be designed to minimize WMSDs. Feeders, in particular, must be positioned or oriented so that difficult working positions are eliminated or minimized.

**Work in Progress**

During this stage, the worker will interact with machinery in different ways depending on the industry and level of automation. Activities can be classified roughly in the following five categories:

- Direct packing or manual loading;
- Wrapping, sorting, selecting;
- Filling, inspecting, counting;
- Closing, inserting, combining; and
- Aligning, testing, weighing, and transferring.

These activities are usually performed at workstations along the packaging line, usually at some type of conveyor. Proper attention to workstation design can prevent ergonomic problems. It should be noted that, at this stage especially, rework or makeshift workstations may be used to remove or replace products that are backing up the line or to re-align products or components when the primary equipment is not
working properly. Consideration should be given to the proper design of these makeshift workstations or unusual activities.

Machine and conveyor workstations may be at the machine itself, on conveyor lines between different machines or at the end of the line. Conveyor line workstations may also be adjacent to the conveyor. For sit-down workstations, there must be adequate leg and foot room so work can performed without awkward leg postures, leaning, or repetitive reaching. At stand-up workstations, there must be adequate toe space, and objects must be delivered close enough, so that reaching and bending are not required.

Output Removal

The output of a machine may be the product, the product in a primary or secondary container, or any of the components. Output removal design considerations are similar to those for work in progress. Any component or product discharged from a machine should be presented at a height and location where bending and reaching is not required. Good ergonomic design will deliver the finished product at an appropriate height, depending on the product size (size, weight, form), where the product is going (to another machine, to a worker for hand packing, to be palletized), and the height of the workers (stature, sitting, standing). In general, an adjustable height conveyor can accommodate all of these variables. In addition, the machine or conveyor parts that could rub on the hands, arms or legs, or lead to awkward body postures or movements should not obstruct access to the product. Consider also that packaging machines can present items to workers at very high speeds. If the machines or conveyors orient items appropriately, however, worker motions can be reduced, thus improving efficiency and reducing the risk of WMSDs.

Set-up/Changeover/Jam Clearing/Maintenance

Before ergonomics are considered when designing equipment for these activities, safety must be taken into account. None of these tasks should expose workers to moving parts, pinch points, sharp edges or hot surfaces. In addition, the machinery should be designed so that downtime is reduced (i.e., no time, no tools, no talent).

Once these factors are dealt with, ergonomics should be stressed. For instance:

- Adequate space for visual and physical access should be provided.
- Appropriate clearances and reach distances for the hands, arms and body to lubricate, make adjustments, clear jams or clean parts should be provided.
- Clearances should be designed for a larger person and reach distances for a smaller one.
- Remember to provide enough room for clothing – including gloves – and tools.
- Remember that adequate clearance allows muscles to be used optimally when force must be exerted.

Specific principles should be applied to machinery design to minimize the occurrence of WMSDs during setup and changeover. For instance, levers and knobs should be easy to turn, and parts should go together and come apart without excessive force. If forces are excessive, power assist devices should be used. Holding devices or supports should be provided for heavy parts. If mechanized handling aids will be used, machinery should be designed to accommodate this and handles, or places to grip (preferably a power grip), should be placed on heavy parts and lifting eyelets.
Specific principles should be applied to machinery design to minimize the occurrence of WMSSDs during setup and changeover. For instance, levers and knobs should be easy to turn, and parts should go together and come apart without excessive force.

Machinery should be designed for easy clearing of jams and clean up. Here, a good preventative maintenance program and careful selection and specifications or packaging components should be recommended. Here too, package design changes and proper storage of components can also minimize the likelihood of problems. The best method of machine design to reduce injury during jam clearing and clean up is to minimize the need for these activities altogether.

Finally, the maintenance function should be simplified as much as possible. Provide extensions to ease adjustments, and use removable assemblies or components for ease of maintenance.

**Conclusion:**

Today, ergonomics is an integral part of good machinery design. Ergonomically sound machinery not only makes the people who must operate the machinery more comfortable, it makes the purchasers of the machinery more productive, and thus, more profitable.

This document is designed to provide a general overview of ergonomic principles as applied to the design and installation of packaging machinery. While the implementation of these principles may reduce worker injuries resulting from designed or installed packaging machinery that is not ergonomic, the information here should not be construed to create either expressly or by implication any certification or guarantee that the use of these principles will necessarily reduce or eliminate these injuries.

Washington State OSHA Ergonomic Program Standards
♦ Requires employers to develop a written program is MSD-type injuries present
♦ Washington offers employers a sample ergonomic program on-line
♦ Website contains guides, checklists and Power Point presentations
Website: http://www.lni.wa.gov/wisha/ergo/default.htm

National Institute for Occupational Safety and Health (NIOSH)
Application Manual for the Revised NIOSH Lifting Equation
♦ First written in 1981, revised 1994
♦ Contains an algebraic equation for analyzing two-hand symmetrical lifts
♦ Establishes three “regions” of lifting – Below the Action Limit (AL) or a reasonably safe range; Above the Maximum Permissible Limit (MPL); and between the AL and MPL
Website contains specific packaging related examples:
http://www.phppo.cdc.gov/cdcRecommends/showarticle.asp?a_artid=P0000427&TopNum=50&CallPg=Adv

GM-UAW
Risk Factor Checklist RFC2
Copies may be obtained from:
UAW-GM Center for Human Resources
Health and Safety Center
1030 Doris Road
Auburn Hills, MI 48326

♦ Published in 1993
♦ Provides ergonomic guidelines for the design, installation, and use of machine tools
♦ Discusses: basic ergonomic concepts and principles; ergonomic considerations for design; machine tool installation considerations; ergonomic considerations for the use of machine tools; and environmental and training considerations
Available from:
AMT - Association for Manufacturing Technology
7901 Westpark Drive
McLean, VA 22102
Phone 703-893-2900

♦ Published in 2000
♦ Provides procedures and methods to assess the risk associated with the design, construction, care, and use of machine tools
♦ Section 7.3.5 details how to evaluate human factors and ergonomic risk factors
Available from:
AMT - Association for Manufacturing Technology
7901 Westpark Drive
McLean, VA 22102
Phone 703-893-2900
Appendix B: Ergonomic Machine Design Checklist

*Material taken from Draft (10-14-99) NIOSH Guideline for Ergonomics in Packaging Operations written by Dr. William Arndt and used with permission by author.*

**Machine Operation**

**Controls and Displays**
- Are controls and displays easy to use?
- Are controls and displays consistent with other machines?
- Are controls and displays compatible with human expectations and capabilities?
- Are controls and displays positioned so they can be easily seen and accessed (especially emergency controls)?
- Are frequently accessed controls and displays adjustable?
- Is it necessary to reach above shoulder level or bend to reach controls?
- Are controls and displays hard to read or understand?
- Are controls and displays mounted on articulating arms to accommodate workers of different heights?
- Are keyboards in locations that require reaching or awkward hand postures?
- Are hand scanners used for long periods of time?

**Feeding/loading of machine**

**Special Considerations**

**Loading rolls of stock:**
- Are large and heavy rolls of paper, foil, plastic, labels, bags other materials loaded into the machine?
- Is bending required?
- Are overhead reaches required?
- Does the operator have to reach across the machine to position rolls on spindles?
Loading bulk hoppers:
- Are Gravity feed hoppers used for unscrambling and orienting bulk components such as bottles, caps, dispensers and product?
- Are stairs or catwalks needed or used to provide access?
- Given the inherent hazards in stairs or catwalks used to provide access were alternatives considered?
- Can supplies be brought to platforms by mechanical equipment so it is not necessary to carry boxes or other containers up stairs?

Loading KD boxes:
- Are knock down (KD’s) boxes fed into case erectors and erector/sealers?
- Are difficult working positions required due to improper positioning or orientation of feeders?

Other factors related to Feeding/loading of machine:
- Does loading blanks, containers, inserts, product, etc., require activity above shoulder level?
- Does loading require reaching forward or to the side?
- Is heavy lifting above waist or below knuckle height required?
- Is climbing while lifting required?
- Are containers or materials hard to grip?
- Does loading require maintaining a posture or holding objects for a prolonged time (more than 30 seconds)?

Work In Process

Special Considerations

Rework or work performed when the machinery is down:
- Is rework or work performed when the machinery is down or not working properly done at makeshift workstations?
- Is special attention given to these workstations if these events occur frequently?
- Is the machine, conveyor, conveyor lines at different machines, or end line used as a workstation?.
- Is their adequate leg and foot room at sit down workstations?
• Can work be performed without awkward leg postures, leaning or repetitive reaching?
• Is there adequate toe space and are objects delivered close enough so that reaching and bending are not required at standup workstations?

Other factors related to Work in Process:
• Are activities performed at workstations along the packaging line and is some type of conveyor used?
• Is leg room or foot space obstructed at any other workstations?
• Is manifor reorientation of the product required to align, pack, or inspect?
• Is there unnecessary handling of objects?
• Is the product package hard to grip for any reason?
• Is lighting inadequate at packing or inspection stations?
• Is sight obstructed, does the worker have to adopt an awkward posture to see clearly?
• Are bags or cartons positioned and are they difficult to see into, so leaning is required?
• Does the lack of buffers or accumulators on packing lines make it necessary to remove and replace items during backups?
• Do workers have to push product down the line (e.g., into tapers)?

Output removal

Special Considerations
• Are any components or product discharged from a machine presented at a height and location where bending or reaching is required?
• Are finished products delivered at an appropriate height depending on the product (size, weight, form)?
• Are finished products delivered at an appropriate height depending on where the product is going (to another machine, to a worker for hand packing, to be palletized)?
• Are finished products delivered at an appropriate height depending the height of the workers (stature, sitting, standing)?
• Is a adjustable height conveyor used?
• Is access to product obstructed by the machine or conveyor that could rub on the hands, arms and legs?
• Can poor access lead to awkward body postures or movements?
• Does the machine and conveyor(s) orient output appropriately to reduce worker motions?

Other factors related to Output Removal:
• Are packages or shippers unstable, too large, too heavy?
• Is access obstructed or difficult where product is removed?
• Do workers have to reorient or move each piece?
• Are packages difficult to reach?
• Are data screens hard to see or understand from the output removal vantage point.
Setup, change over, clearing jams, clean-up and maintenance

Special Considerations

Setup and change over:
- Do tasks require workers to be exposed to moving parts, pinch points, sharp edges or hot surfaces?
  - Is adequate space provided for visual and physical access?
- Has attention been paid to anthropometry data to determine appropriate clearances and reach distances for the hands, arms or body?
- Has access to lubrication and adjustment points been provided?
- Has design for clearances and reach distances used this principle of design: design clearances for the largest person and reach distances for the smallest person?
- Is enough room provided for clothing (including gloves) and tools?
- Is their enough room for adequate clearance to allow muscles to be used optimally when force is exerted?
- Are functions simplified to reduce downtime?
- Are possible awkward postures or forceful exertions reduced?
- Can levers and knobs turn easily?
- Do parts go together and come apart without excessive force?
- Are power assist devices available if forces are excessive?
- Are holding devices or supports provided for heavy parts?
- Is consideration given in design to accommodate mechanized handling aids if they will be required?
- Are handles provided or places to grip (preferably a power grip) on heavy parts?
- Have lifting eyelet’s been placed on parts when mechanized handling aids will be used?

Clearing jams and clean-up:
- Has the machinery been designed for easy clearing of jams and cleanup?
- Are methods and work practices used that minimize the chances of jams and scrap?
- Are components properly stored to reduce the likelihood of jams and excessive clean-up?
Special Considerations

**Maintenance:**
- Is the machine designed to simplify maintenance functions?
- Is there a good preventive maintenance program in place?
- Is the machine designed to allow easy access?
- Are extensions provided to ease adjustments?
- Are removable assemblies used?
- Are components designed for ease of maintenance?
- Does maintenance require working with the arms, wrists or hands in awkward positions?
- Does maintenance require reaching, bending or twisting?
- Are high forces required during maintenance?
- Does maintenance require forceful, repetitive, or awkward hand motions?
- Is there any difficulty seeing and accessing jams?
- Is it necessary to reach into dangerous areas on the machine?
- Is it difficult to read gauges or adjust controls?
- Are heavy parts lifted manually or in awkward positions?
- Are there sharp edges to bump or lean against?
- Are workstations located in areas that are too loud?
- Does inadequate lighting contribute to eyestrain or unsafe conditions, reduce productivity, or reduce quality?
### Table W-1 - Basic Screening Tool

You need only review risk factors for those areas of the body affected by the MSD incident.

<table>
<thead>
<tr>
<th>Risk Factors This Standard Covers</th>
<th>Performing job or tasks that involve:</th>
<th>Body Part Associated With MSD Incident</th>
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</thead>
<tbody>
<tr>
<td>Repetition</td>
<td>(1) Repeating the same motions every few seconds or repeating a cycle of motions involving the affected body part more than twice per minute for more than 2 consecutive hours in a workday.</td>
<td>Neck/Shoulder</td>
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<td></td>
<td>(2) Using an input device, such as a keyboard and/or mouse, in a steady manner for more than 4 hours total in a workday.</td>
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<tr>
<td>Force</td>
<td>(3) Lifting more than 75 pounds at any one time; more than 55 pounds more than 10 times per day; or more than 25 pounds below the knees, above the shoulders, or at arms’ length more than 25 times per day.</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>(4) Pushing/pulling with more than 20 pounds of initial force (e.g., equivalent to pushing a 65 pound box across a tile floor or pushing a shopping cart with five 40 pound bags of dog food) for more than 2 hours total per day.</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>(5) Pinching an unsupported object weighing 2 or more pounds per hand, or use of an equivalent pinching force (e.g., holding a small binder clip open) for more than 2 hours total per day.</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>(6) Gripping an unsupported object weighing 10 pounds or more per hand, or use of an equivalent gripping force (e.g., crushing the sides of an aluminum soda can with one hand), for more than 2 hours total per day.</td>
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Table W-1 - Basic Screening Tool - continued

You need only review risk factors for those areas of the body affected by the MSD incident.

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<th>Performing job or tasks that involve:</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Awkward Postures</td>
<td>(7) Repeatedly raising or working with the hand(s) above the head or the elbow(s) above the shoulder(s) for more than 2 hours total per day;</td>
<td>Neck/Shoulder Hand/Wrist/Arm Back/Trunk/Hip Leg/knee/Ankle</td>
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<td></td>
<td>(8) Kneeling or squatting for more than 2 hours total per day;</td>
<td>√ √ √</td>
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<td></td>
<td>(9) Working with the back, neck or wrists bent or twisted for more than 2 hours total per day (see figures:)</td>
<td>√ √ √</td>
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<td></td>
<td></td>
<td>√ √ √</td>
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<tr>
<td>Contact Stress</td>
<td>(10) Using the hand or knee as a hammer more than 10 times per hour for more than 2 hours total per day;</td>
<td>√ √ √</td>
</tr>
<tr>
<td>Vibration</td>
<td>(11) Using vibrating tools or equipment that typically have high vibration levels (such as chainsaws, jack hammers, percussive tools, riveting or chipping hammers) for more than 30 minutes total per day;</td>
<td>√ √ √</td>
</tr>
<tr>
<td></td>
<td>(12) Using tools or equipment that typically have moderate vibration levels (such as jig saws, grinders, or Sanders) for more than 2 hours total per day.</td>
<td>√ √</td>
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