## Core Ergonomic Control Methods – Examples

*From the Department of Labor & Industries*

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<th>Hazard</th>
<th>Ergonomic Control Methods</th>
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<td><strong>AWKWARD POSTURES</strong></td>
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</table>
| Working with hand(s) above the head or the elbow(s) above the shoulder(s), more than 4 hours total per day | - Raise the worker up with elevated work platforms or ladders  
- Make tools longer with articulating arms or extension handles  
- Bring the work down and tilt it on its side for better access  
- Provide adjustability where possible for multiple users  
- Design reach distance for the shortest worker  
- Provide arm supports  
- Use sloping platforms with overhead conveyers to adjust for variable worker heights |
| Repetitively raising the hand(s) above the head or the elbow(s) above the shoulder(s) more than once per minute, more than 4 hours total per day | - Limit overhead storage to infrequently used items  
- Raise the worker up with elevated work platforms or ladders  
- Make tools longer with articulating arms or extension handles  
- Bring the work down and tilt it on its side for better access  
- Provide adjustability where possible for multiple users  
- Design reach distance for the shortest worker |
| Working with the neck bent more than 45° (without support or the ability to vary posture), more than 4 hours total per day | - Raise and tilt objects being viewed to keep neck more upright  
- Use magnifiers when working on objects with the hands in order to keep the arms and shoulders down  
- Support the head with a chin/forehead cradle.  
- Use monitor arms or stackers to raise up monitors  
- Use video or mirror systems to view objects or locations that are difficult to see (dental/medical/surgical tasks, fork trucks) |
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| Working with the back bent forward (without support or the ability to vary posture) more than 30 degrees for more than 4 hours per day, or more than 45° for more than 2 hours per day | • Raise and tilt the work to provide better access  
• Use a sit/stand stool to lower the worker  
• Make tools longer with articulating arms or extension handles  
• Alternate between bending, sitting, kneeling and squatting  
• Make tools longer with articulating arms or extension handles  
• Use clamps or vices to eliminate forceful pressing or pinches  
• Use fasteners requiring minimal pinch force (e.g. plastic rather than metal)  
• Use fasteners that can be inserted by tool |
| Squatting more than 4 hours total per day                              | • Raise the work to provide better access  
• Make tools longer with articulating arms or extension handles  
• Alternate between bending, sitting, kneeling and squatting  
• Use body carts for ground level work  
• Use short portable stools for ground level work |
| Kneeling more than 4 hours total per day                              | • Wear knee pads  
• Raise the work to provide better access  
• Make tools longer with articulating arms or extension handles  
• Alternate between bending, sitting, kneeling and squatting |
| HIGH HAND FORCE                                                      | • Redesign hand-tool interface for use of a power grip  
• Reduce weight of tool or object  
• Use clamps or vices to eliminate forceful pressing or pinches  
• Use fasteners requiring minimal pinch force (e.g. plastic rather than metal)  
• Use fasteners that can be inserted by tool |
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| Pinching an unsupported object(s) weighing 2 or more lbs. per hand or pinching with a force of 4 or more pounds per hand, combined with wrists bent in flexion 30° or more or in extension 45° or more for more than 3 hours total per day | • Redesign hand-tool interface for use of a power grip  
• Reduce hand-object interface to reduce slipperiness  
• Reduce weight of tool or object  
• Change tool, work surface orientation, or worker location to reduce bent wrist postures |
| Pinching an unsupported object(s) weighing 2 or more lbs. per hand or pinching with a force of 4 or more pounds per hand for more than 4 hours total per day | • Redesign hand-tool interface for use of a power grip  
• Reduce weight of tool or object  
• Rotate jobs between workers  
• Use clamps or vices to eliminate forceful pressing or pinches  
• Use fasteners requiring minimal pinch force (e.g. plastic rather than metal)  
• Use fasteners that can be inserted by tool |
| Gripping an unsupported object(s) weighing 10 or more lbs. per hand or gripping with a force of 10 or more pounds per hand, combined with highly repetitive motions for more than 3 hours total per day | • Reduce weight of tool or object.  
• Use balancers, adjustable fixtures, articulating arms to hold handled items or minimize weight held in the hand  
• Use two hands rather than one  
• Alternate between hands  
• Sharpen cutting tools to reduce force requirements during use  
• Rotate between tasks |
| Gripping an unsupported object(s) weighing 10 or more lbs. per hand or gripping with a force of 10 or more pounds per hand, combined with wrists bent in flexion 30° or more or in extension 45° or more or in ulnar deviation 30° or more for more than 3 hours total per day | • Reduce weight of tool or object.  
• Change tool, work surface orientation, or worker location to reduce bent wrist postures  
• Use balancers, adjustable fixtures, articulating arms to hold handled items or minimize weight held in the hand  
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<td>Gripping an unsupported object(s) weighing 10 or more lbs. per hand or gripping with a force of 10 or more pounds per hand, more than 4 hours total per day</td>
<td>• Reduce weight of tool or object &lt;br&gt;• Rotate jobs between workers &lt;br&gt;• Use balancers, adjustable fixtures, articulating arms to hold handled items or minimize weight held in the hand &lt;br&gt;• Use two hands rather than one &lt;br&gt;• Alternate between hands &lt;br&gt;• Sharpen cutting tools to reduce force requirements during use &lt;br&gt;• Preventive maintenance of tools to reduce high hand forces &lt;br&gt;• Use bench mounted adapters to provide more leverage</td>
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<tr>
<td>HIGHLY REPETITIVE MOTIONS</td>
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<td>Using the same motion with little or no variation every few seconds (excluding keying activities) more than 6 hours total per day</td>
<td>• Rotate jobs with other workers, varying the types of motion &lt;br&gt;• Use job enlargement, increase the number of tasks performed by the worker, varying the types of movement &lt;br&gt;• Reduced the speed of the motions if possible &lt;br&gt;• Use mechanical assists &lt;br&gt;• Use multifunction tools</td>
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<tr>
<td>Using the same motion with little or no variation every few seconds (excluding keying activities) combined with wrists bent in flexion 30° or more or in extension 45° or more or in ulnar deviation 30° or more, and high, forceful exertions with the hand(s), more than 2 hours total per day</td>
<td>• Re-orient or move objects into positions where bent wrists are eliminated &lt;br&gt;• Rotate jobs with other workers, varying the types of motion &lt;br&gt;• Use tools (with power grip) if exertions are required &lt;br&gt;• Provide jig/vice to hold parts reducing forceful grasping and allowing the use of two hands &lt;br&gt;• Use mechanical assists &lt;br&gt;• Use multifunction tools</td>
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<td>Intensive keying for more than 7 hours total per day, or combined with awkward postures for more than 4 hours total per day</td>
<td>• Enlarge the job to include tasks other than keying</td>
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<td>• Provide equipment to reduce awkward postures such as wrist rests, arm rests, adjustable keyboard shelves</td>
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<td>• Rearrange workstation to eliminate awkward postures e.g. raise monitor, lower keyboard, bring mouse closer to keyboard</td>
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<td>• Utilize voice-recognition software</td>
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<td>• Utilize software macros that automate repetitive keystrokes</td>
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<td>• Schedule breaks</td>
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<tr>
<td>REPEATED IMPACT</td>
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<td>Using the hand (heel/base of palm) as a hammer more than once per minute more than 2 hours total per day</td>
<td>• Use rubber mallets, bean bags, or other padded tools to strike with instead of the palm</td>
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<td>• Press objects into place using levers, or hydraulic or pneumatic tools</td>
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<td>• Redesign assembly processes to avoid the need to pound parts in by hand</td>
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<td>• Use viscoelastic padded palm pads to reduce impact</td>
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<td>• Cover sharp or hard objects with pads</td>
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<td>• Use different types of palm button guards such as light sensors for manual activation of equipment</td>
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<td>Using the knee as a hammer more than once per minute more than 2 hours total per day</td>
<td>• Use tools that don't require knee kicks, such as power stretchers for carpet laying, or long handled mallets.</td>
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<td>• Press objects into place using levers, or hydraulic or pneumatic tools.</td>
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<td>• Relocate knee switches so that the thigh or the foot presses them.</td>
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<tr>
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<td>• Redesign processes to avoid the need to pound parts in by knee</td>
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| HEAVY, FREQUENT or AWKWARD LIFTING | • Reduce weight of load  
• Increase weight of load so that it requires mechanical assist  
• Reduce the capacity of the container  
• Use slides, gravity chutes to eliminate lifting  
• Use mechanical assist such as overhead hoist, manipulator, vacuum lift, pneumatic balancer, forklift  
• Use telescoping extendible conveyors with powered belts that reach deep into trailers  
• Reduce the horizontal distance of the load away from the body by reducing the size of the packaging  
• Reduce the horizontal distance of the load away from the body by removing barriers, obstacles that make access to the object difficult  
• Team lift the object with two or more workers  
• Improve layout of work process so the need to move materials is minimized  
• Provide handholds which increase lifting capability up to 15%  |
| Heavy lifting                |                                                                                                                                                           |
| Frequent lifting             | • Use mechanical assist such as overhead hoist, manipulator, vacuum lift, pneumatic balancer, forklift  
• Reorganize work method to eliminate repeated handling of the same object  
• Rotate workers to jobs with light or no manual handling  
• Use slides, gravity chutes to eliminate lifting  
• Use mobile storage racks to avoid unnecessary loading and unloading  |
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| Awkward lifting          | • Redesign workstation layout to eliminate trunk twisting by locating objects within arm’s reach  
                           | • Design workstation with adjustable heights to eliminate bent forward posture when lifting  
                           | • Eliminate the use of deep shelves that require a worker to bend and reach for objects.  
                           | • Store objects at 30” off the floor  
                           | • Provide sturdy walk-up ladder with handrails to access stored parts on high shelves/racks.  
                           | • Provide rigid containers to better control the load                                                                                               |
| HAND-ARM VIBRATION       |                                                                                                                                                          |
| Segmental vibration      | • Select power tools with lower vibration emission levels  
                           | • Provide regular maintenance to eliminate vibrations caused by imbalanced mechanical parts e.g. grinding wheels  
                           | • Increased tool weight could reduce vibration transmitted to the hands, though cautions should be taken not to introduce other risk factors  
                           | • Using balancers, isolators, damping materials, articulating arms, vertical suspension, and counter weighting to reduce grip requirements and provide an alternative transmission route for vibrational energy  
                           | • Use battery operated rather than air powered tools where possible  
                           | • Isolate vibration between source and hand by providing handles with a well designed mass-spring system or anti-vibration gloves  
                           | • Tools should have a high power to weight ratio, have low torque with a cutoff rather than a slip-clutch mechanism and have handles with a non-slip surface to reduce the need to grip tightly.  
                           | • Reduce vibration exposure duration                                                                                                               |

**Note:** This table provides examples of how the core ergonomics principles can be used to reduce exposure to musculoskeletal hazards. These examples are a selection from the rulemaking file.