

Core Ergonomic Control Methods – Examples

From the Department of Labor & Industries

Hazard	Ergonomic Control Methods
AWKWARD POSTURES	
<p>Working with hand(s) above the head or the elbow(s) above the shoulder(s), more than 4 hours total per day</p>	<ul style="list-style-type: none"> • 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
<p>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</p>	<ul style="list-style-type: none"> • 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
<p>Working with the neck bent more than 45°(without support or the ability to vary posture), more than 4 hours total per day</p>	<ul style="list-style-type: none"> • 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)

Hazard	Ergonomic Control Methods
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	<ul style="list-style-type: none"> • 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 • Use a chest pad to support the weight of the upper body • Locate objects well within arms’ reach • Use body carts for ground level work
Squatting more than 4 hours total per day	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	
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 highly repetitive motions for more than 3 hours total per day	<ul style="list-style-type: none"> • 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

Hazard	Ergonomic Control Methods
<p>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</p>	<ul style="list-style-type: none"> • 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
<p>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</p>	<ul style="list-style-type: none"> • 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
<p>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</p>	<ul style="list-style-type: none"> • 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
<p>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</p>	<ul style="list-style-type: none"> • 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 • Use two hands rather than one • Alternate between hands • Sharpen cutting tools to reduce force requirements during use

Hazard	Ergonomic Control Methods
<p>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</p>	<ul style="list-style-type: none"> • Reduce weight of tool or object • Rotate jobs between workers • 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 • Preventive maintenance of tools to reduce high hand forces • Use bench mounted adapters to provide more leverage
HIGHLY REPETITIVE MOTIONS	
<p>Using the same motion with little or no variation every few seconds (excluding keying activities) more than 6 hours total per day</p>	<ul style="list-style-type: none"> • Rotate jobs with other workers, varying the types of motion • Use job enlargement, increase the number of tasks performed by the worker, varying the types of movement • Reduced the speed of the motions if possible • Use mechanical assists • Use multifunction tools
<p>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</p>	<ul style="list-style-type: none"> • Re-orient or move objects into positions where bent wrists are eliminated • Rotate jobs with other workers, varying the types of motion • Use tools (with power grip) if exertions are required • Provide jig/vice to hold parts reducing forceful grasping and allowing the use of two hands • Use mechanical assists • Use multifunction tools

Hazard	Ergonomic Control Methods
<p>Intensive keying for more than 7 hours total per day, or combined with awkward postures for more than 4 hours total per day</p>	<ul style="list-style-type: none"> • Enlarge the job to include tasks other than keying • Provide equipment to reduce awkward postures such as wrist rests, arm rests, adjustable keyboard shelves • Rearrange workstation to eliminate awkward postures e.g. raise monitor, lower keyboard, bring mouse closer to keyboard • Utilize voice-recognition software • Utilize software macros that automate repetitive keystrokes • Schedule breaks
REPEATED IMPACT	
<p>Using the hand (heel/base of palm) as a hammer more than once per minute more than 2 hours total per day</p>	<ul style="list-style-type: none"> • Use rubber mallets, bean bags, or other padded tools to strike with instead of the palm • Press objects into place using levers, or hydraulic or pneumatic tools • Redesign assembly processes to avoid the need to pound parts in by hand • Use viscoelastic padded palm pads to reduce impact • Cover sharp or hard objects with pads • Use different types of palm button guards such as light sensors for manual activation of equipment
<p>Using the knee as a hammer more than once per minute more than 2 hours total per day</p>	<ul style="list-style-type: none"> • Use tools that don't require knee kicks, such as power stretchers for carpet laying, or long handled mallets. • Press objects into place using levers, or hydraulic or pneumatic tools. • Relocate knee switches so that the thigh or the foot presses them. • Redesign processes to avoid the need to pound parts in by knee

Hazard	Ergonomic Control Methods
HEAVY, FREQUENT or AWKWARD LIFTING	
Heavy lifting	<ul style="list-style-type: none"> • 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%
Frequent lifting	<ul style="list-style-type: none"> • 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

Hazard	Ergonomic Control Methods
Awkward lifting	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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
<p>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.</p>	