

## Appendix I-C-11

**Common Control Measures**

This table does not include all possible options for control measures. Priority should be given to controls that do not rely primarily on changes in worker behavior to reduce the risk of MSI. Try to eliminate the risk, but if that is not practicable, minimize the risk.

<b>Risk factor</b>	<b>Common Control Measures</b>
Force: Lift, Lower, or Carry	<p>Eliminate the need to manually lift, lower, or carry objects by using engineering controls such as hoists, pallet jacks, carts, and conveyors. If that is not practicable, consider options such as the following to minimize risk:</p> <ul style="list-style-type: none"> <li>• Minimize the distance of the load from the worker (e.g., use turntables; move the worker closer to the object,; don't place obstructions close to the object).</li> <li>• Minimize the vertical distance over which the load is lifted or lowered (e.g., use pallet jacks; limit shelf height).</li> <li>• Avoid tasks below knuckle height (e.g., use scissor lifts, pallet jacks),</li> <li>• Avoid tasks above shoulder height (e.g., limit shelf heights; improve storage practice; raise the worker).</li> <li>• Avoid stooped or twisted positions (e.g., provide unrestricted work space; arrange the workstation to minimize twisting when the worker picks up or puts down a load).</li> <li>• Minimize the size of the load (e.g., order loads in smaller containers; have worker take two trips rather than one).</li> <li>• Minimize carrying distance (e.g., have a well-designed work flow).</li> <li>• Avoid handling heavy or unbalanced objects while sitting down (e.g., stand so that stronger muscles are used to perform physically demanding tasks; avoid handling more than 4.5 kilograms/10 pounds while sitting down).</li> <li>• Improve the grip on the load (e.g., provide good handles on containers; add clamps or other devices to improve grip).</li> <li>• Change the design of the task (e.g., from a lifting task to a lowering tasks; from a lifting, lowering, or carrying task to a pushing or pulling task).</li> <li>• Use pause periods or job enhancement to permit muscles to recover from applying force for prolonged periods.</li> </ul>
Force: Push or Pull	<p>Eliminate the need to manually push or pull objects by using engineering controls such as conveyors, hoists, and gravity-fed systems. If that is not practicable, consider options such as the following to minimize risks:</p> <p>Use carts that are well designed and appropriate to the task:</p>

Risk factor	Common Control Measures
	<ul style="list-style-type: none"> <li>• Handle can be grasped between waist and shoulder height (e.g., vertical handles that can accommodate workers of different heights).</li> <li>• Load can be secured on the cart if necessary (e.g., belts or clamps provided).</li> <li>• The size, number, and type of wheels are appropriate for the floor surface and weight carried.</li> <li>• Moving parts are maintained (preventive maintenance).</li> <li>• The worker has good visibility when pushing the cart.</li> <li>• Use carts in an unrestricted area:               <ul style="list-style-type: none"> <li>• The worker is able to push and is not forced to pull the cart.</li> <li>• The worker can assume a comfortable position to initiate and maintain movement of the load.</li> <li>• The worker is not forced to assume awkward postures because of restricted work space or poor visibility.</li> </ul> </li> <li>• Use carts in areas with proper flooring or surface:               <ul style="list-style-type: none"> <li>• The floor is clean (e.g., no debris or clutter on floor).</li> <li>• The floor does not slope and is not slippery.</li> <li>• There is no thick, plush, or shag carpet.</li> <li>• The surface is level (e.g., minimize surface height changes in areas such as the entrance to elevators; fill potholes and cracks in surface).</li> </ul> </li> </ul> <p>Reduce the load (e.g., make two trips).</p> <ul style="list-style-type: none"> <li>• Reduce the total time spent pushing or pulling, or break the total time into smaller blocks of time doing that task.</li> </ul>
<p>Force: Grip</p>	<p>Eliminate the need to manually grasp or handle objects by using engineering controls such as clamps or automated tools. If that is not practicable, consider options such as the following to minimize risks:</p> <ul style="list-style-type: none"> <li>• Maintain a straight wrist (neutral position) through:               <ul style="list-style-type: none"> <li>• Improved design of handles (e.g., bent instead of straight handles)</li> <li>• Improved design of workstation (e.g., part containers that are tilted instead of flat; use of inline tools)</li> <li>• Improved work practices (e.g., conscious effort to keep wrist straight).</li> </ul> </li> <li>• Use power grip to grasp objects through:               <ul style="list-style-type: none"> <li>• Improved design of objects or handles on tools (e.g., using boxes with cut-outs to permit power grip; adding handles to objects)</li> <li>• Improved layout of workstation (e.g., objects positioned to permit easy access to handles)</li> </ul> </li> <li>• Improved work practice (conscious effort to avoid pinch</li> </ul>

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	<p>grip)</p> <ul style="list-style-type: none"> <li>• Avoid strong or hard grasping of vibrating tools through:</li> <li>• Improved design of tools (e.g., tools with built-in vibration-dampening sleeve)</li> <li>• Improved work practice (conscious effort not to grasp too hard)</li> <li>• Use of personal protective equipment (e.g., well-fitting vibration-dampening gloves to reduce grip force)</li> <li>• Avoid handling objects with cold surface temperature through:               <ul style="list-style-type: none"> <li>• Improved work practice (e.g., at the end of the day, store the next day's supplies inside instead of keeping them outside where they will be cold by morning)</li> <li>• Improved work procedure (e.g., avoid skin contact by using tools or utensils for grasping; use warm water periodically to warm water)</li> <li>• Use of suitable gloves</li> </ul> </li> <li>• Improve grip while handling slippery objects by using friction-enhanced, well-fitting gloves with fingers removed.</li> <li>• Reduce the total time spent manually gripping objects, or break the total time into smaller blocks of time doing that task.</li> </ul>
<p>Repetition</p>	<p>Eliminate highly repetitious tasks by using engineering controls such as mechanization (e.g., power tools) or automation. If that is not practicable, consider options such as the following to minimize risk:</p> <ul style="list-style-type: none"> <li>• Combine or eliminate some parts of work to reduce the pace of repetition.</li> <li>• Incorporate flexibility over pace (e.g., allow the worker to take rest breaks and micro-pauses or to control the speed of the conveyor).</li> <li>• Use good work techniques (e.g., avoid unnecessary repetitions as with multiple scanning of grocery items or multiple turning of lumber fro grading).</li> <li>• Reduce the duration of exposure to repetition (e.g., offer job rotation or job enhancement).</li> </ul>
<p>Work Posture</p>	<p>Eliminate awkward postures by using engineering controls such as adjusting work heights, minimizing reaching distances, changing orientation or work, changing layout of workstation, using adjustable or angled tools and equipment, and using turntables, conveyors, tilted surfaces, or spring loaded surfaces. The objective is to enable the worker to work in a comfortable posture. Every posture requires periodic changes and movement</p>

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	<p>or it becomes static. If elimination of awkward postures is not possible, consider options such as the following to minimize risk:</p> <ul style="list-style-type: none"> <li>• Minimize awkward postures of the trunk:               <ul style="list-style-type: none"> <li>• Minimize forward bending by increasing the work height or moving objects closer (e.g., use turntables; improve layout of workspace). Minimize side bending by reducing the reach distance or moving objects to the front of the worker (e.g., improve layout of work space; move closer to the objects).</li> <li>• Minimize twisting by reducing reach distance or moving objects to the front of the worker (e.g., improve layout of work space; move closer to the objects).</li> </ul> </li> <li>• Minimize awkward postures of the shoulder:               <ul style="list-style-type: none"> <li>• Minimize reaching forward by reducing the reach distance or lowering the work height.</li> <li>• Minimize reaching sideways by reducing the reach distance, lowering the work height, or moving objects to the front of the body.</li> <li>• Minimize reaching behind by moving objects to the front of the worker.</li> <li>• Minimize reaching across the body by moving closer to the objects or transferring objects from one hand to another.</li> </ul> </li> <li>• Minimize awkward postures of the wrist by selecting the required tools with appropriate handles (e.g., angles handles). Minimize forearm rotation by using power tools or mechanical turners.</li> <li>• Minimize squatting and kneeling by raising the work.</li> <li>• Minimize static postures:               <ul style="list-style-type: none"> <li>• Provide footrests to allow the worker to transfer weight from one foot to another.</li> <li>• Provide opportunities for the worker to move about periodically.</li> </ul> </li> <li>• Minimize awkward postures while sitting by providing an appropriate chair that is adjusted to give good back support, maintain a comfortable posture, and minimize contact stress.</li> <li>• Provide tilted sit-stand stool to take weight off the worker's feet and legs while allowing mobility.</li> </ul>
Local Contact Stress	<p>Eliminate or minimize exposure to local contact stress:</p> <ul style="list-style-type: none"> <li>• Change or modify equipment (e.g., use a long-handled screwdriver to prevent the butt from digging into the palm).</li> <li>• Change or modify work area to prevent sharp edges from digging into the skin (e.g., use knee pads while kneeling; use</li> </ul>

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	<p>padded gloves when lifting heavy objects by narrow plastic strapping).</p> <ul style="list-style-type: none"> <li>• Improve or change work practice:               <ul style="list-style-type: none"> <li>• Avoid resting or leaning against sharp edges.</li> <li>• Avoid using a body part (e.g., hand or knee) as a hammer.</li> </ul> </li> </ul>
Environment	<p>Eliminate or minimize exposure to whole-body vibration:</p> <ul style="list-style-type: none"> <li>• Avoid sitting or standing for prolonged periods on a vibrating surface if practicable (e.g., catwalks on vibrating machinery).</li> <li>• Isolate the source of vibration from the rest of the work space to prevent transmission of vibration to the sitting or standing area (e.g., isolation of truck cabs from diesel engine vibration).</li> <li>• Keep equipment well maintained to reduce vibration.</li> <li>• Reduce total exposure to vibration by breaking up driving tasks or incorporating job rotation.</li> <li>• Keep road surfaces well maintained where possible.</li> </ul> <p>Keep the body warm at a comfortable temperature:</p> <ul style="list-style-type: none"> <li>• Use local source heating.</li> <li>• Wear warm clothing.</li> <li>• Take rest breaks in warm areas.</li> </ul> <p>Ensure that lighting is proper for the task being performed and glare is avoided so that the worker does not assume awkward posture to compensate for glare, brightness, or inadequate lighting</p>
Work Organization	<p>Ensure that repetitive or demanding tasks incorporate opportunities for rest or recovery (e.g., allow brief pauses to relax muscles; change work tasks; change postures or techniques).</p> <p>Incorporate task variability so that the worker does not have to perform similar repetitious tasks throughout the full shift. Provide the worker with the opportunity to vary work tasks by rotating jobs or increasing the scope of the job.</p> <p>Ensure that work demands and work pace are appropriate.</p>