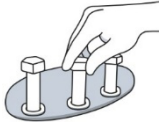
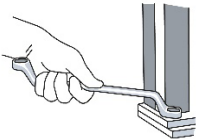


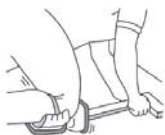
MSD Control Strategies

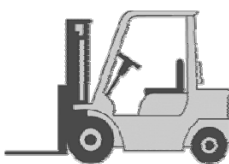
Awkward Posture		Control Strategies
	Neck extended greater than 10°	- Elevate worker or lower object - Move further away if visual requirements are low - Use mirrors or videos to view the object above - Provide an incline bench long enough to rest the head against
  	Neck flexed greater than 30°	- Use platforms placed on top of work surface to raise objects being viewed - Tilt items as may be necessary; consider placing a slant board to the work surface, or tilt the table itself - Use magnifiers to improve viewing and to keep the arms and shoulders down - Support the head with a chin/forehead cradle - Use mirrors or videos to view objects or locations that are difficult to see - Use a sit/stand stool to lower the worker - Make tools longer with articulating arms or extension handles - Use body carts for ground level work - Raise and tilt objects being viewed - Ensure adequate task lighting and elimination of glare or shadows that may prevent proper viewing
	Neck rotated greater than 30°	- Redesign work layout - Reduce clutter on top of as well as beneath the work surface - Use mechanical assistance to orient work in a different position
	Back laterally flexed greater than 10°	- Reorient item to eliminate bending; use mechanical assistance if necessary - Ensure adequate task lighting and elimination of glare or shadows that may be preventing proper viewing
	Hands above head, or elbows above shoulders	- 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 - Limit overhead storage to infrequently used items.
  	Arms reaching laterally, forward, or behind body	- Elevate the worker or lower the object - Use mirrors to see into awkward spots - Use sit/stand stools to lower the worker - Make tools longer with extension handles - Use slant boards, tilt surfaces
  	Back flexed or rotated greater than 30°	- Reduce reach requirements by designing for shortest worker - Tilt the item or work surface toward the worker - Use slant boards placed on top of the work surface - Use a cut-out in the work surface to bring the worker closer to the work - Keep depth of shelves at a minimum to reduce reaches or use gravity chutes
 	Squatting / Kneeling	- Raise the work to provide better access - Make tools longer with articulating arms or extension handles - Use body carts for ground level work - Use short portable stools for ground level work - Alternate between bending, sitting, kneeling and squatting - Provide kneepads, kneeling boards, or inserts that slide into a pocket over the knee

High Repetition Motions		Control Strategies
 	Repeating the same motion with the neck, shoulders, elbows, wrists, hands or feet with little or no variation every few seconds	- Reduced the speed of the motions if possible - Use multifunction tools - Rotate jobs with other workers, varying the types of movement - Increase the number of tasks performed by the worker, varying the types of movement

Mobility		Control Strategies
	Standing Stationary	- Provide a rail to rest one foot upon - Purchase the best footwear you can afford - Consider viscoelastic anti-impact insoles to improve foot, knee and back comfort - Provide sit – stand stools where appropriate - Ensure a suitable workstation height based on work being performed (above elbow for precision, below elbow for large items or when delivering downward force) - Use anti-fatigue mats
	Walking over rough, uneven, slippery or sloping surfaces	- Regularly grade yard or road surfaces to reduce tripping hazards - Purchase the best footwear you can afford - Consider viscoelastic anti-impact insoles to improve foot, knee and back comfort - Only carry what is required on your tool belt to reduce fatigue levels and stress on the joints - Use push carts to transport materials rather than carrying
	Climbing of stairs, ladders or equipment	- Provide platforms and moveable staircases for easier access/egress on and off of equipment - Utilize man lift devices when accessing higher locations while handling materials such as in warehouses - Bring work down to the worker - Ensure proper handrails - Ensure slip resistant treads on steps
	Sitting with no backrest	- Tilt item or work surface towards worker - Switch to a sit-stand stool to reduce back compression - Elevate work and provide chair with proper backrest

Forceful Gripping	Control Strategies
 Fingertip pinch  One handed pinch grip	- Reduce weight of tool or object - Weight of tool should be less than .5 kg (1 lb) if precision is required - Reduce hand-object interface to reduce slipperiness - Use fasteners requiring minimal pinch force (e.g. plastic rather than metal) - Use fasteners that can be inserted by tool - Redesign hand-tool interface for use with a power grip - Use balancers, adjustable fixtures, articulating arms to hold handled items or minimize weight held in the hand - Sharpen cutting tools to reduce force requirements during use; maintain tools to reduce high force requirements - Use bench mounted adapters to provide more leverage - Use two hands rather than one where possible, or alternate between hands - Re-orient or move objects into positions where bent wrists are eliminated - Use tools (with power grip) if exertions are required - Provide jig/vice to hold parts - Change tool, work surface orientation, or worker location to reduce bent wrist postures
 One handed power grip	- Tool should be less than 2.25 kg (5 lbs) if used frequently; consider electric tools over cordless - Use actuators to eliminate constant compression of trigger devices; avoid single finger trigger activation - Activation force should not exceed 1.1 kg or (2.4lbs) - Trigger should not have grooves for fingers - Use slings, tool balancers and retractors if possible to reduce manual effort requirements - Provide pistol grips and swivel hoses for high pressure washers and air devices - Add a secondary handle for the other hand to help support the weight of the object - Maintain sharp cutting edges of tools - Inspect tools for wear or damage before using - Provide tools that can be used by either hand - Compressible grip surface for better distribution of pressure, better grip - Re-orient or move objects into positions where bent wrists are eliminated - Use tools (with power grip) if exertions are required - Provide jig/vice to hold parts

Contact Stress		Control Strategies
	Using hand or knee as a hammer	- Use rubber mallets, beanbags, 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 - Cover sharp or hard objects with pads or pipe insulation - Use different types of palm button guards such as light sensors for manual activation - Use viscoelastic palm pads to reduce impact
	Pressure from object pressing into soft tissue or from leaning against a hard edge	- Utilize hand tools that extend past the base of the hand to eliminate contact stress - Ensure edges are rounded - Use pipe insulation on sharp metal edges - Reduce reach requirements - Use cut-outs to bring worker closer to the work - Provide gloves (ensure proper fit to prevent tool slippage or increase in gripping requirements)

Vibration		Control Strategies
	High vibratory or impact tools: Impact wrenches, chain saws, tampers, jack hammers, riveting or chipping hammers	- Select power tools with lower vibration emission levels - Add vibration dampening within equipment first (bushings), then handles, then person (gloves) - Periodically replace shock absorbers - Consider transducer tools that torque to preset amounts, reducing kickback and force requirements e.g. a torque wrench vs. a snipe - Suspend heavier tools so that a light grip can be utilized - Keep hands warm (minimize air blowing from pneumatic tools); replace leaking compressed air valves - Keep hands dry to reduce squeezing harder and increasing vibration transmission - Provide regular maintenance to eliminate vibrations caused by imbalanced mechanical parts, dull edges, or screws that aren't tight
	Low vibratory tools: Grinders, sanders, jigsaws, weed whackers	- Use balancers, isolators, articulating arms, vertical suspension, and counter weighting to reduce grip requirements and provide an alternative transmission route for vibration energy - Use battery operated rather than air powered tools where possible - Purchase tools with a high power to weight ratio, low torque with a cutoff rather than a slip-clutch mechanism, and handles with a non-slip surface to reduce the need to grip tightly - Use viscoelastic, full fingered anti-vibration gloves or tool wraps to reduce impact /vibration - Reduce exposure frequency - Mount vibrating device onto isolating mounting pads
	Heavy equipment operation: Bobcats, graders, loaders, tractor trailers	- Vertical stiffness/damping of seat should vary proportionally to weight of operator - Train operators in how to adjust the weight balance when using suspensions seats - Independent cab suspension - Air suspension system - Include secondary springs to enhance the shock isolation capabilities of the suspension by minimizing the risk of bottoming out - Replace tires before they reach wear limits - Regularly check air pressure in tires (over or under-inflated will increase vibratory effects) - Battery-driven
	Light equipment operation: Riding mowers, forklifts	- Invest in lumbar rolls to support the lower back during - Use viscoelastic cushions designed to reduce vibration transferred through the seat pan and back rest - Grade road surface regularly; smooth rough entries between building and yards - Operate vibrating processes by remote control to put distance between worker and vibration source - Design the job so worker only spends time on vibrating surfaces when absolutely necessary - Place machine controls off the vibrating surface whenever possible - Isolate the vibrating source where the workers are stationed to reduce exposure - Carefully maintain vibrating machinery to prevent the development of excess vibration - Isolate vibration at source by eliminating the need for sliding contact between components.

Material Handling	Control Strategies
 Heavy Lifting	▪ Reduce weight of load ▪ Reduce the capacity of the container ▪ Increase weight of load so that it requires mechanical assisted equipment ▪ Use mechanical assist such as overhead hoist, manipulator, vacuum lift, pneumatic balancer, forklift ▪ Reduce horizontal distance by reducing size of packaging or by removing obstacles that make access to object difficult ▪ Provide handholds to increase lifting capability ▪ Team lift the object with two or more workers ▪ Improve layout of work process so the need to move materials is minimized
 Awkward Lifting	▪ Place heaviest and most frequently handled items between knuckle and chest levels to minimize bending, lifting, reaching ▪ Provide height adjustable pallet trucks that can hold the load at a comfortable level (above knee height) when manually handling material off of or on to the pallet ▪ 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 ▪ Keep depth of shelves at a minimum to reduce reaches ▪ Store objects at least 75 cm (30") off the floor whenever possible ▪ Provide rigid containers to better control the load ▪ Require suppliers to include the weight on all objects or packages that are manually handled
 Repetitive Lifting	▪ Use slides or gravity flow chutes to reduce lifting ▪ Invest in scissor pallets, turntables, or automatic dumping devices ▪ Eliminate unnecessary rehandling of items ▪ Use mobile stacks to avoid unnecessary loading and unloading ▪ Rotate workers to jobs with light or no manual handling
 Pushing or Pulling	▪ Design for pushing instead of pulling so that core strength can be used ▪ Provide carts that have adjustable handle heights; handles below waist height cause stooping ▪ Use larger wheels for rolling over cracks or uneven ground surfaces ▪ Ensure suitability between ground surface, wheels or castors, and weight of cart ▪ Ensure there is enough space to maneuver without using awkward postures, otherwise use smaller cart ▪ Grade road surface regularly ▪ Maintain wheels and wheel bearings

Environment	Control Strategies
Temperature: Colds and Drafts	▪ Ensure workers wear well-fitting gloves. ▪ Educate workers in proper layering of clothing that will keep them warm without increasing bulk and prevention of sweat-freeze-sweat episodes ▪ Ensure hand tools are stored in a warm place prior to use. ▪ Provide alternating periods of cold and warm work (worker rotation) and rest breaks in warm areas. ▪ Avoid having workers use tools that vent over the hand. ▪ Provide portable heaters for workers ▪ Educate workers about the adverse effects of cold and its influence on MSD
Temperature: Heat, Humidity and Ventilation	▪ Provide alternating periods of cool / shaded and warm work (worker rotation) and allow workers to take rest breaks in cool areas. ▪ Provide local source cooling (portable spot chillers) for workers. ▪ Educate workers about the adverse effects of heat and its influence on MSD ▪ Encourage workers to stay well hydrated ▪ Maintain HVAC system
Lighting	▪ Well lit entryways, pits and stairways ▪ Use non reflective surfaces ▪ Proper location of light source ▪ Task lighting ▪ Use of colour to improve contrast
Noise	▪ Eliminate the noise at the source ▪ Segregation and insulation (baffles and physical barriers, etc) ▪ Hearing protection

Work Organization	Control Strategies
Work Scheduling and Breaks	▪ Encourage microbreaks (beyond scheduled breaks), with a focus on activities that will increase circulation to an area of the body or that involves stretching in the opposite direction from the work being performed ▪ 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). ▪ Incorporate task variability so that the worker does not have to perform similar repetitious tasks throughout the full shift. ▪ Ensure that work demands and work pace are appropriate. ▪ Incorporate formal or informal job rotations ▪ Cross train employees so that they can perform a variety of tasks (job enlargement); this will also help with coverage when workers are absent ▪ Ensure workloads and deadlines are achievable ▪ Monitor and control overtime and shift work ▪ If shift work is involved, poll employees to see how current work schedules are affecting them personally, including impacts on family and personal relationships ▪ Consider biomathematical modeling of current shift schedules to identify fatigue related risk factors that may be built in to the schedule design
Work Procedures	▪ Allow for a gradual build up to full production speed with new hires or those returning from injury ▪ Analyze the differences in work methods between individuals to find the best work methods ▪ Review and revise standard operating procedures as is necessary and corresponds with what workers are actually doing (work practices) ▪ Provide appropriate training and supervision to develop and maintain skills required ▪ Ensure good communication and reporting of problems ▪ Allow workers some latitude to influence workload, work methods and changes in the workplace ▪ Institute a preventative maintenance program ▪ Identify whether a physically demanding task requires two people or mechanical assistance, then incorporate it into standard operating procedures ▪ Establish roles, responsibilities, and communication procedures with other departments such as quality, facilities, planning, engineering, purchasing, etc. ▪ Incorporate pre-shift checklist/inspections
Materials	▪ Organize stock on shelves taking weights into consideration ▪ Improve workflow of materials ▪ Reduce frequency of substandard/poor quality materials ▪ Purchase in manageable weights/sizes ▪ Purchase materials in bulk containers ▪ Consult with suppliers to modify packaging for better handling (e.g. incorporate handles, improve location of handles, modify handles, etc.) ▪ Incorporate ergonomic purchasing guidelines
Training	▪ Ensure training and education on MSDs meets provincial and federal requirements. ▪ Training should include - Signs & symptoms of MSDs - Common MSDs - MSD hazard identification - How to report symptoms - Process to report MSD hazards - Work techniques (optimal biomechanics) - Risk reduction strategies