

BOILERMAKERS

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Musculoskeletal disorders (MSDs), such as chronic back pain or shoulder problems, often take time to develop. Forceful exertion, awkward positions, hand-arm and whole-body vibration, contact stress, and repetitive tasks can add up over time to produce an MSD.

This profile can help you identify and control MSD hazards in your job. We recommend that you add the best practices outlined here to your company's health and safety program. The hazards in a particular job, however, may be different than the ones on this profile, so evaluate the risks of your particular activities.

In general, when implementing controls, consider the following ergonomic principles:

- 1. Use handling equipment when possible.** The most effective intervention to control the risk of developing an MSD is to eliminate or reduce the frequency of lifting, carrying, pushing, and pulling. Use material-handling equipment such as carts, dollies, pallet jacks, or manual forklifts.
- 2. Don't lift a load from the floor.** Lifting from the floor or below standing knuckle height can expose your back to significant stresses and reduce your lifting capacity. Avoid this procedure by storing objects above standing knuckle height and below standing shoulder height.
- 3. Avoid working on the floor.** Constantly working on the floor can result in injuries to your back, hips, and knees because it usually requires kneeling and bending your back forward. When possible, raise the work height by using a workbench.
- 4. Minimize work above your shoulder.** High lifting or constant reaching above the shoulder level is harmful for three reasons.
 1. Your muscle strength is reduced because most of the muscle work is performed by your shoulders and arms instead of by the bigger muscles in your back and legs.
 2. Your shoulder and arm muscles fatigue more quickly than your back and leg muscles because of reduced blood flow.
 3. Lifting or removing an object from a high shelf can be dangerous because you could drop the object.
- 5. Move smaller weights often or get help.** Smaller weights put less stress on your back than larger weights, even if the frequency of lifting is increased.
- 6. Exercise programs.** Consider exercise programs. They help to prevent MSDs and promote general good health.
- 7. Minimize vibration exposure.** Vibration can be transmitted from work processes—such as operating hand-held power tools (hammer drills, chipping guns, jackhammers)—into workers' hands and arms. Frequent exposure to moderate and high-intensity hand-arm vibration can lead to permanent health problems.

New Construction, Maintenance and Repair

Related components: steel plants (blast furnaces, stoves, coke ovens, tanks, stacks, vessels, ductwork), generating and penstock plants (boilers, ductwork, stacks, precipitators, scrubbers, tanks, rectifiers, burners, water heaters), refineries (towers, exchangers, stacks, crackers), pulp mills (boilers, tanks, ductwork, bag houses), vessels, tanks, towers, hoists, boilers, furnaces and other structures, ancillary equipment and fixtures made of steel, other metals, fibreglass, and other materials.

Tools and equipment: Lifting tools and equipment, leveling and alignment tools, common tools, regulations, and plant policies, and procedures.

Tasks	What can happen (Hazards/Risks)	Potential Controls
<p>Mobilizes for work</p> <ul style="list-style-type: none"> ▶ Transports tools and equipment for maintenance and repair using cranes, forklifts, carts, dollies, etc. 	<ul style="list-style-type: none"> ▶ Swinging/dropping loads ▶ Pinch points ▶ Strains and sprains ▶ Heavy manual material handling 	<ul style="list-style-type: none"> ▶ Plan ahead to minimize material handling. ▶ Use mechanical lifting equipment whenever possible, especially when loading or unloading material. ▶ Use height-adjustable mobile lift tables for transporting material into the workshop. These tables can also be used to support material when loading machines. A smaller table can be used for smaller sheets of metal or small machines, such as a punch press. A larger table can be used for the “break and bending presses” and for incoming materials. ▶ Use hand trucks and carts when available. ▶ Use motorized pallet jacks whenever possible, especially when moving material frequently or over long distances. ▶ When using carts or hand trucks: <ul style="list-style-type: none"> • Select models with appropriate wheels for ground conditions. • Select models with swivel wheels on the rear and fixed wheels on the front to make pushing easier over long distances. • Maintain wheels in good condition. • Make sure handles are located at the rear of the cart and at waist level. • Make sure the load height on the cart does not obstruct your vision. • Keep the loads balanced and under the manufacturers’ recommended weight limits. ▶ Push rather than pull because pushing reduces lower back bone-on-bone compression.

Tasks	What can happen (Hazards/Risks)	Potential Controls
		<ul style="list-style-type: none"> ▶ Whenever possible, use overhead crane devices to lift and transport heavy items. When installing an overhead crane on site, ensure that the system or device is rated for the weight you are going to transport. Consider the movement patterns before installing the crane. ▶ Consider storing all materials in large containers to make transporting easier. This will reduce material handling and improve efficiency. Large quantities of material (e.g., cables, welding units, hoses, rigging equipment) can be transported at one time using a forklift or crane. ▶ Attach pulley systems to tools or equipment. This reduces the force needed to lift, position, or operate the tools or equipment. ▶ Implement a shelving system that makes it easier to store and move materials, tools, and equipment. The shelving system can position materials within easy reach, allowing you to lift or move objects without bending or twisting. If rack systems are used, store items between knee and shoulder height whenever possible. ▶ Use a pry bar whenever possible. ▶ Use tag lines when a load is above shoulder height. ▶ Use proper lifting techniques (i.e., lift materials with your legs, do not bend over or lift with your back, and keep the load close to your body). See the "Back Care" chapter in IHSA's <i>Construction Health and Safety Manual (MO29)</i>. ▶ Get help with heavy or awkward loads. ▶ Use ladders to climb on and off trailers. Do not jump. ▶ Use proper personal protective equipment when working with powered hand tools (e.g., hearing protection and double eye protection when welding, grinding, etc.). ▶ Consider using anti-vibration gloves to reduce the vibration transmitted to your hands and arms from tools such as grinders, needle guns, and sanders.

Tasks	What can happen (Hazards/Risks)	Potential Controls
<p>Assembles and fits components, fastens components, and repairs or replaces components</p> <ul style="list-style-type: none"> ▶ Transfers components (hoisting and rigging equipment, carts, and dollies) ▶ Pre-assembles components (welding, bolting, rigging, and hoisting equipments) ▶ Secures components (securing, lashing, bolting, welding, clamping, and lifting/hoisting components) ▶ Expands tubes ▶ Bolts and tacks components ▶ Maintains and repairs components 	<ul style="list-style-type: none"> ▶ Personal injury (e.g., burns, strains, pinch points, etc.) ▶ Heavy manual material handling ▶ Hand-arm vibration exposure from air tools (e.g., impact gun, grinder, hand saw) ▶ Awkward postures such as forward bending, working with your arms above shoulder height, and constant kneeling/squatting. ▶ Forceful hand exertions from working with hand tools (hammer and air tools) 	<ul style="list-style-type: none"> ▶ Use mechanical lifting equipment whenever possible, especially when loading or unloading material. ▶ Use auto-darkening helmets that darken as soon as the welding torch is activated. These helmets eliminate the need for you to snap your helmet closed. They promote neutral neck postures. ▶ Where welding sets have to be handled, select ones with comfortable, well-positioned handles so that you can easily carry them. Try to avoid protruding controls and vents. When selecting larger sets, look for ones that you can comfortably push or pull over uneven surfaces. ▶ Put your welding leads on pulleys. ▶ Use welding guns that have swivels and can be used in either hand. ▶ Use pre-assembly and material handling equipment to reduce unnecessary lifting. ▶ Sit on a work stool when the work is low. ▶ Use lifting and turning tables with wheels. ▶ Use a rotating clamp for pipes. ▶ Use a pry bar to avoid strains and pinch points. ▶ Position the work between your waist and shoulders (e.g., use a work table or workbench instead of bending over to work on the ground or floor). ▶ Consider using a sawhorse with a hands-free clamp system. These devices can reduce the force needed to position, turn, or rotate parts, tools, and equipment on a workbench. ▶ Get help with heavy or awkward loads. ▶ Keep cutting tools sharp to reduce the force required to cut. ▶ If you do a lot of cutting, use a power saw. ▶ When working, position yourself close to the work area and centre yourself to the work area to reduce overreaching or bending at the waist.

Tasks	What can happen (Hazards/Risks)	Potential Controls
		<ul style="list-style-type: none"> ▶ Use hand tools that have, <ul style="list-style-type: none"> • low vibration and weight. • a comfortable handle that provides a good grip, (e.g., rubber or spongy-type grips). • appropriate-sized grips that are designed to be used by either hand. • a power grip for heavy work and a pinch grip for fine work • a neutral wrist posture • a torque reduction and low kickback where possible ▶ If available, use a scissor lift or other work platform. ▶ Let your supervisor know if you need training on a new tool or process. ▶ Practice good housekeeping. Discard or pick up debris and scrap material to prevent repetitive bending, slips, trips, and falls. Keep pathways clear for carts, wheelbarrows, and dollies. ▶ Change your work position often. Working overhead or in a cramped space forces your body into an awkward posture. To relieve muscle tension and improve circulation, change body positions, alternate tasks, and take stretch breaks throughout the day. ▶ Use portable electromagnetic and air presses that hold parts in place during installation operations. These devices can reduce the awkward postures and forceful exertions associated with manually clamping parts before and during installation. They can also significantly reduce the time needed to complete a job. ▶ Consider a three-point lift method when handling heavy or long material alone. <ol style="list-style-type: none"> 1) Squat and lift on one end. 2) Walk up the load. 3) Lift the object. ▶ When lifting objects, always keep the load or tool close to your body.

Tasks	What can happen (Hazards/Risks)	Potential Controls
		<ul style="list-style-type: none"> ▶ Use elbow pads to protect your elbows from contact stress. They are useful for working in cramped spaces and when you are leaning on your elbows for long periods. Elbow pads should fit snugly, but should not compromise the circulation in your arm. ▶ Use shoulder pads when a heavy item cannot be transported with a cart or other transport device. Carrying heavy objects on your shoulders applies excessive pressure on a small area. Wearing shoulder pads can reduce the contact stress on your shoulders. ▶ Wear proper personal protective equipment at all times (e.g., hearing protection and double eye protection when welding, grinding, etc.). ▶ Consider using anti-vibration gloves to reduce the vibration transmitted to your hands and arms from tools such as grinders, needle guns, and sanders.
<p>Demolishes components</p> <ul style="list-style-type: none"> ▶ Dismantles components ▶ Removes materials 	<ul style="list-style-type: none"> ▶ Heavy manual material handling ▶ Hand-arm vibration exposure from air tools (impact gun, grinder, hand saw) ▶ Awkward postures such as forward bending, working with arms above shoulder height, and constant kneeling or squatting. 	<ul style="list-style-type: none"> ▶ Actively assess the job and implement controls before starting work to avoid overexertion and awkward postures. ▶ Use mechanical lifting equipment whenever possible, especially when loading or unloading material. ▶ Use pry bars when applicable to avoid strains and sprains. ▶ Rent or purchase hand tools with minimal vibration and weight. ▶ Wear proper personal protective equipment to avoid vibrations, cuts, burns, lacerations, etc. Face shields must be worn for de-blinding operations. ▶ Be aware of pinch points around your hands and feet. ▶ Use proper lifting techniques to avoid strains and sprains. ▶ Get help with heavy and awkward loads.

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