

# SHEETMETAL

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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.

Tasks	What can happen (Hazards/Risks)	Potential Controls
<p><b>Installs air systems, material handling systems, and sheet metal components</b></p> <ul style="list-style-type: none"> <li>▶ Prepares installation site</li> <li>▶ Installs hangers, braces, brackets, and supports</li> <li>▶ Does venting and bracing</li> <li>▶ Forms and assembles ductwork, fittings, and components</li> <li>▶ Installs sheet metal ducts and fittings</li> <li>▶ Finishes seams, joints, and penetrations</li> <li>▶ Applies insulation and cladding to outside of ducting</li> <li>▶ Connects chimney to appliance</li> <li>▶ Installs cladding and lagging to mechanical components</li> <li>▶ Welds components, hangers, braces, and brackets</li> </ul>	<ul style="list-style-type: none"> <li>▶ Overexertion due to lifting and carrying sheetmetal materials, supplies, tools, fasteners, and ladders</li> <li>▶ Duct, power tools, hand tools, and fasteners require high grip force</li> <li>▶ Kneeling, crawling, and crouching</li> <li>▶ Stress on shoulders, elbows, and knees due to working in confined spaces and with hard-to-reach materials</li> <li>▶ Shoulders and neck problems due to static and awkward postures while welding</li> <li>▶ Ankle and feet problems due to prolonged use of portable ladders</li> </ul>	<ul style="list-style-type: none"> <li>▶ Actively assess the job and implement controls before starting work to avoid overexertion and awkward postures.</li> <li>▶ Plan ahead to minimize material handling.</li> <li>▶ Use portable mechanical lifting equipment whenever possible, especially when loading or unloading heavy materials. Material handling equipment can include a Genie lift, a light mobile overhead crane, or a powered buggy.</li> <li>▶ There are many makes and models of hoists and balancers, as well as a variety of attachments to lift different objects. Choose the most appropriate for your task. Ensure the hoist is rated for the required load weight.</li> <li>▶ Motorized pallet jacks are preferred when moving material frequently or over long distances.</li> <li>▶ When using carts or hand trucks:             <ul style="list-style-type: none"> <li>• Select models with appropriate wheels for the ground conditions.</li> <li>• Select models with swivel wheels on the rear and fixed wheels on the front. It will make it easier to push over long distances.</li> <li>• Maintain the wheels.</li> <li>• The handles should be located at the rear of the cart and at waist level.</li> <li>• Load height on the cart should not obstruct vision.</li> <li>• Keep loads balanced and under the manufacturers' recommended weight limits.</li> <li>• Carts and hand trucks are available in many shapes and sizes and can be customized for special applications. Talk to your purchasing department or supervisor about getting the correct handling equipment for your needs.</li> </ul> </li> <li>▶ Pushing is preferred to pulling because pushing reduces lower back bone-on-bone compression.</li> <li>▶ Whenever possible, use overhead crane devices to lift and transport heavy items. When installing overhead cranes on site, ensure the system or device is rated for the load weight. You should also consider movement patterns before installing the crane.</li> </ul>

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		<ul style="list-style-type: none"> <li>▶ Consider using conveyor systems such as tabletops or work surfaces with manual or powered roller systems. Conveyor systems can eliminate the need to carry large sheets of metal or heavy objects between workstations, and can reduce shoulder and back fatigue. Conveyors can be designed to move material around corners. They can also extend into trucks or be pushed together so they don't block forklift traffic aisles.</li> <li>▶ Consider using large containers to store and transport materials, tools, and equipment. This technique will reduce material handling and improve efficiency.</li> <li>▶ Use pulley systems attached to tools or equipment to help with manual handling and positioning. This will reduce the force needed to lift, position, or operate tools and equipment.</li> <li>▶ Whenever possible, use height-adjustable benches with rotating tabletops that allow objects to be easily turned, rotated, and positioned.</li> <li>▶ Implement a shelving system that can move and store materials, tools, or equipment within easy reach.</li> <li>▶ Use teamwork and mechanical aids such as carts whenever possible.</li> <li>▶ Make your work easier by working in comfortable postures. Use existing equipment to create a stable work bench that allows you to work while standing upright with your arms close to your sides.</li> <li>▶ Use devices that position work between your knees and shoulders and within easy reach. This provides easy access to tools and materials, reduces the time wasted untangling parts, and reduces forceful exertions needed to pull tangled tools apart.</li> <li>▶ Keep cutting tools sharp to reduce the force required to cut.</li> <li>▶ If you do a lot of cutting, use a power saw.</li> <li>▶ Move closer and centre yourself to the work area to reduce overreaching and bending at the waist.</li> <li>▶ If available, use a scissor lift or other work platform.</li> <li>▶ Use a lightweight tools whenever possible.</li> </ul>

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		<ul style="list-style-type: none"> <li>▶ To reduce working above shoulder height, consider using a tool that has an extended arm that allows you to extend your reach.</li> <li>▶ Select the right tool. Choose tools that fit your hand comfortably. Whenever possible, use power tools that require less force. For example, use a power sheetmetal shear gun instead of a manual sheetmetal shear. For large quantities of seam closing, use a pneumatic seam closer machine instead of doing it manually.</li> <li>▶ Let your supervisor know if you need training on a new tool or process.</li> <li>▶ 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.</li> <li>▶ Change work positions often. Working overhead or in cramped spaces forces the body into awkward postures. To relieve muscle tension and improve circulation, change body positions, alternate tasks, and stretch throughout the day.</li> <li>▶ Use a more comfortable handle whenever possible. For example, when lifting a bucket, you will use a lighter grip if you increase the diameter of the handle by adding padding or by using a larger handle.</li> <li>▶ Consider a three-point lift method when handling heavy or long material by yourself.             <ol style="list-style-type: none"> <li>1) Squat and lift on one end.</li> <li>2) Walk up the load.</li> <li>3) Lift the object.</li> </ol> </li> <li>▶ When lifting objects, always keep the load or tool close to your body.</li> <li>▶ Wear gloves with anti-vibration properties. These gloves can reduce the vibration being transmitted to your hands and arms from tools such as grinders, needle guns, and sanders.</li> <li>▶ Use elbow pads to protect the elbow from contact stress. They are very useful when working in cramped spaces. Elbow pads should fit snugly but should not compromise circulation in your arm.</li> </ul>

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		<ul style="list-style-type: none"> <li>▶ Use shoulder pads when a heavy item cannot be transported with a cart or other transport device. Carrying heavy objects on your shoulder often causes excessive pressure applied over a small area. Wearing shoulder pads can reduce the stress on the shoulder.</li> <li>▶ Always use a proper work platform. Work from a ladder only when it is not possible or feasible for you to use a work platform.</li> <li>▶ Use auto-darkening helmets. They darken as soon as you activate the welding torch. Auto-darkening helmets eliminate the need for the you to snap your helmet closed using your neck.</li> <li>▶ Use lighter cables that are not stiff.</li> <li>▶ Use overhead hoists whenever possible.</li> <li>▶ Where welding sets have to be handled, select welding sets with comfortable, well-positioned handles and few protruding controls. Make sure that you can easily carry them. When selecting larger sets, choose ones that you can comfortably push or pull over uneven surfaces.</li> <li>▶ Use lifting and turning tables with wheels when welding or transporting material. It will reduce manual lifting and carrying.</li> <li>▶ Use welding guns with swivels that are designed for use by both hands.</li> <li>▶ Height-adjustable mobile lift tables are recommended for transporting materials into the workshop because they reduce heavy lifting and carrying. You can also use mobile lift tables to support metal material when loading machines.</li> <li>▶ Position work between your waist and shoulder, when possible.</li> <li>▶ Use work stools when welding low-lying materials. A knee creeper can assist with mobility, reduce stress on the knees, and support the upper body when bending forward.</li> <li>▶ To reduce working with your back bent, use a work table or bench.</li> <li>▶ Use rotational clamps for pipes or a saw horse with clamps to help reduce awkward postures for your neck, shoulders, and arms.</li> </ul>

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		<ul style="list-style-type: none"> <li>▶ Put welding leads on pulleys to reduce heavy and awkward lifting.</li> <li>▶ Take stretching breaks during the day to relieve discomfort and encourage muscle movement.</li> </ul>
<p><b>Shop floor – Sheet metal fabrication</b></p> <ul style="list-style-type: none"> <li>▶ Fabricates sheet metal components for air and material handling systems</li> <li>▶ Cuts and forms ductwork, fittings, and components</li> <li>▶ Insulates and assembles ductwork, fittings, and components</li> <li>▶ Fabricates dampers, flexible connections, hanger systems, and equipment supports and bases</li> </ul>	<ul style="list-style-type: none"> <li>▶ Overexertion from lifting and carrying sheet metal materials, supplies, tools, fasteners, and ladders</li> <li>▶ Duct, power tools, hand tools, and fasteners requiring high grip force</li> <li>▶ Kneeling, crawling, and crouching</li> </ul>	<ul style="list-style-type: none"> <li>▶ Use overhead cranes, carts, or forklifts when moving heavy objects.</li> <li>▶ Position lights directly over a work area and/or equipment. Optimum lighting reduces neck and back strain because you can see what you are doing from a comfortable distance. Lights on adjustable arms are easy to position and can help avoid shadows and glare.</li> <li>▶ Use devices that position work between your knees and shoulders and within easy reach. This provides easy access to tools and materials, reduces the time wasted untangling parts, and reduces forceful exertions needed to pull tangled tools apart.</li> <li>▶ Arrange your tools so that the most frequently used tools are within easy reach.</li> <li>▶ Consider using tabletops or work surfaces with roller balls. They help to reduce force when moving, loading, or positioning large sheets of metal, wood, or pipe into a machine. Roller tops can be put on top of existing work surfaces and tables. Some rollers are capable of rotating 360 degrees, allowing for objects to rotate and turn easily.</li> <li>▶ Whenever possible, use turntables and rotating tabletops that allow you to easily position objects, keep things within easy reach, and reduce awkward postures. If you use a turntable, you should conduct regular maintenance to minimize the force needed to position, turn, or rotate objects on the workbench.</li> <li>▶ Use a height-adjustable table under a long piece of sheet metal tube for support as it passes through a machine. This technique will reduce static and awkward postures. It will also reduce static exertions while loading the ducts into the machine. When using these types of support devices, make sure the table is stable and can support the load.</li> </ul>

Tasks	What can happen (Hazards/Risks)	Potential Controls
<p><b>Installs metal roofing, cladding systems, and exterior components</b></p> <ul style="list-style-type: none"> <li>▶ Prepares surface</li> <li>▶ Lays out roof and walls</li> <li>▶ Installs insulation, waterproof membrane, isolation material, and building envelope</li> <li>▶ Installs roofing and cladding system components</li> <li>▶ Seals exposed joints</li> <li>▶ Installs decking</li> <li>▶ Fastens exterior components</li> </ul>	<ul style="list-style-type: none"> <li>▶ Lifting and carrying sheet metal materials, supplies, tools, fasteners, and ladders</li> <li>▶ Hand and arm injuries due to constant and repetitive high-hand force from gripping sheet metal ducts, power hand tools, and fasteners</li> <li>▶ Overexertion injuries due to manual balancing of swing stage</li> <li>▶ Kneeling, crawling, and crouching when assembling or installing products</li> <li>▶ Shoulders and neck problems due to static and awkward postures during cladding and welding tasks</li> <li>▶ Repetitive use of a manual button punch</li> </ul>	<ul style="list-style-type: none"> <li>▶ Plan ahead to minimize material handling.</li> <li>▶ Whenever possible, use machines to lift and place exterior components (e.g., a crane, telescoping forklift with appropriate attachments, or a boom truck). Use a tag line to control large pieces of material from the ground. Don't reach out, push, or pull. Use the equipment to place the material.</li> <li>▶ If mechanical lifting devices are not available, use a power tugger to assist with pulling ropes from a pulley system when lifting cladding components.</li> <li>▶ Deliver and store work materials near the installation area when space is available.</li> <li>▶ Avoid cutting materials at or near the floor. Instead, use a bench or sawhorse.</li> <li>▶ When installing a metal roof deck, use an upright fastening tool to avoid bending forward repetitively (e.g., a Hilti DX 860 or Pneutek).</li> <li>▶ Use mechanical or pneumatic punching machines instead of doing button punching on metal decks manually.</li> <li>▶ Whenever possible, use wood planks as spacers to keep swing stages balanced.</li> <li>▶ Pick up garbage and scrap materials as you go to prevent injuries from poor housekeeping. Distribute garbage bins around your site and empty them regularly.</li> <li>▶ If you can't use mechanical devices, make sure that there are enough workers to lift heavy materials. Lifting as a team requires cooperation among your crew.</li> <li>▶ Determine the weight of your load and use proper lifting techniques (e.g., lift with your legs rather than your back, and keep the load close to your body)—see the "Back Care" chapter in IHSA's <i>Construction Health and Safety Manual (M029)</i>.</li> </ul>

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