Appendix B – Hazards and Safe Work Procedures for Common Job Components in Mechanical Construction

Note: MCAA recommends that workers wear hardhats, safety glasses, work gloves, and protected toe boots or shoes at all times while working on a jobsite.

Job Components	Hazards	Safe Work Procedures
Acids	• Burns • Eye damage • Respiratory irritant/possible chronic damage	• Review/observe SDS • Wear splash proof goggles, face shield, and impermeable gloves and clothing • Provide adequate ventilation • Use respiratory protection when needed
Adhesives	• Respiratory irritant • Skin irritant	• Review/observe SDS • Wear safety glasses and impermeable gloves • Provide adequate ventilation
Ammonia	• Burns to the eye, skin, and/or lungs • Corrosive • Fire • Potentially explosive	• Review/observe SDS • Provide adequate ventilation • Wear splash goggles, face shield, impermeable gloves, and cotton clothing • Use respiratory protection when needed • Keep away from oil/combustible materials • Keep a fire extinguisher nearby
Asbestos	• Asbestosis • Lung cancer • Mesothelioma	• Identify materials containing friable asbestos • Determine exposure (sample/monitor) • Provide adequate ventilation with HEPA filter collection • Use respiratory protection when needed • Establish decontamination practices • Ensure that only certified abatement personnel remove asbestos
Cable Machine	• Struck by • Pinched • Electric shock • Soft tissue – back • Spine	• Inspect the machine for defects • Inspect attachments to ensure that they are in good condition/working properly • Wear safety glasses/gloves • Use GFCI • Monitor cable slack • Prevent cable from wrapping around body parts • Use proper lifting techniques
Carbon Monoxide	• Asphyxiation	• Provide adequate ventilation • Monitor CO in excavations/enclosed spaces • Ensure that exhaust systems are well maintained

Compressed Air	• Struck by object • Object in eye • Injection	• Determine/observe maximum safe air pressure • Wear hardhat, safety glasses, face shield, and gloves • Ensure that hoses and attachments are properly secured • Keep air release attachments pointed in a safe direction • Never use compressed air to clean off clothing or body parts
Confined Spaces	• Asphyxiation • Fire • Explosion • Toxic exposure	• Identify/designate a competent person • Test the atmosphere for O_2 level and flammable, explosive, and toxic substances • Secure permit if required • Provide adequate ventilation • Use respiratory protection when needed • Continuously monitor space • Provide a properly trained attendant • Ensure that rescue equipment is available and in place
Copper Cutting/Prep Machine	• Laceration • Object in eye • Electric shock	• Inspect for defects • Wear safety glasses and gloves • Use GFCI • Ensure that material is properly secured • Remove adjusting keys or switches before starting • Establish good housekeeping in the work area
Core Drilling (Floor)	• Struck by object • Electric shock • Trip • Fall	• Inspect for defects • Identify and mark utilities and post stress tension cables • Properly size the machine and core bit • Ensure that the machine is properly leveled and anchored • Barricade the area below the drilling operation • Use GFCI • Wear a hardhat, safety glasses, gloves, and ear plugs • Properly position workers to use the machine safely • Prevent water and electric current from coming together • Immediately cover holes that are 2" or larger • Install friction rings when changing bits • Use the proper wrench when changing bits
Core Drilling (Wall)	• Struck by object • Electric shock • Trip	• Inspect for defects • Barricade the work area on both sides of the wall • Use chain fall to lift the drill into place • Properly size the machine and core bit

		• Ensure that the machine is properly leveled/anchored • Ensure that leveling legs are in place • Use GFCI • Wear a hardhat, safety glasses, gloves, and ear plugs • Properly position workers to use the machine safely • Provide a continuous flow of water • Prevent water and electric current from coming together • Install friction rings when changing bits • Use the proper wrench when changing bits • Lock the slide down when the machine is moved • Use proper lifting techniques when moving the machine
Corrosives	• Burns to the eyes, skin, and/or lungs	• Review/observe SDS • Provide adequate ventilation • Wear splash proof goggles, a face shield, and impermeable gloves and clothing • Ensure that the container is properly labeled • Close/seal containers when not in use
Cut Off Tool (High Speed)	• Laceration • Object in eye • Struck by object	• Secure required permits • Inspect for defects • Use only dual-action trigger type/no positive locking switch on tool • Ensure that the guard is in place • Ensure that the support handle is in place • Replaced the cutting wheel immediately when needed • Ensure that the cutting wheel RPMs match the tool RPMs • Ensure that the cutting wheel rotation matches the tool rotation • Ensure that locking nut is tight • Establish good housekeeping in the work area • Secure material in place before cutting • Ensure there is no pressure stored in the material being cut • Wear safety glasses, a face shield, gloves, and ear plugs • Use two hands to operate the tool • Keep the cutting wheel perpendicular to the cut • Prevent the cutting wheel from being pinched/bound by the material • Never use this tool for grinding

Drill (Hammer Drill – Electric)	• Struck by • Electric shock	• Inspect for defects • Ensure that the plug's ground prong is in place • Use only in dry conditions • Protect the cord from cuts/insulation damage • Use GFCI • Ensure that guards are in place • Wear a face shield, gloves, safety glasses, and ear plugs • Ensure that the proper bit is used • Replace dull bits immediately • Establish good housekeeping in the work area • Identify hidden electrical lines, pipes, rebar, or objects • Use two hands to operate the drill • Properly position the operator to use the drill safely
Drill Press	• Laceration • Object in eye • Electric shock • Burn	• Inspect for defects • Use GFCI • Ensure that the bit is sharp • Ensure that the bit is installed straight and tight • Wear safety glasses, gloves, ear plugs, and snug clothing • Provide adequate lighting • Ensure unrestricted access to E-stop • Set up and secure the drill table at the proper height • Keep the drill table clean • Secure/clamp the material before drilling • Set the proper drill speed • Use only the proper cutting fluid
Duct Spray Sealer	• Skin/eye damage • Electric shock • Respiratory sensitization	• Inspect for defects • Ensure that the plug's ground prong is in place • Use GFCI • Wear safety glasses, a face shield, and gloves • Provide adequate ventilation • Keep pressurized discharge in a safe direction • Ensure that the nozzle tip guard is in place • Barricade the work area • Isolate overspray to prevent contact with energized electrical conductors • Engage the trigger lock when not spraying • Relieve the unit of pressure when not in use
Excavations	• Struck by • Asphyxiation	• Secure the required permit • Determine/designate a competent person to oversee the work • Use a qualified utility locator service to Identify and mark utilities

		• Address affected power lines • Ensure that a protective system is in place, including benching, sloping, and shielding • Ensure access/egress within 25' of every worker in the excavation • Keep the spoil pile 2' or more from the edge of the excavation • Wear a hardhat, safety glasses, and gloves • Barricade the area around the excavation • Establish and monitor oxygen content when needed
Extension Cord	• Electric shock	• Inspect for defects • Ensure that the plug's ground prong is in place • Use GFCI • Protect the cord from chemicals • Protect the cord from extreme heat or burns • Protect the cord from sharp edges • Protect the cord in doorways • Prevent the cord from being run over by jobsite vehicles or traffic • Ensure the cord is never hung by nails, staples, or other sharp objects • Ensure the cord is never suspended with uninsulated wire • Keep the cord away from standing water and puddles
Fiberglass	• Skin irritation • Respiratory sensitization	• Review and observe SDS • Wear safety goggles, a face shield, impervious gloves, and a Tyvek suit mask • Provide adequate ventilation • Wear a dust mask • Wear a respirator in place of a dust mask when needed • Remove sources of heat or ignition from the work area • Keep a fire extinguisher nearby • Secure pipe in place before cutting or grinding • Set up an airborne dust particle vacuum when cutting or sanding fiberglass • Use a coarse sanding drum on a low speed drill to reduce dust • Establish good housekeeping in the work area • Consider and address solvent spills • Seal and properly store solvents and solvent containers when not in use

Flammable/ Combustible Liquids	• Fire • Burn • Asphyxiation • Respiratory sensitization	• Use only in small quantities • Keep contained in metal cans with self-closing lids • Ensure that containers are properly labeled • Ensure that liquids are used and stored away from sources of ignition • Ground drum/bond container to drum when transferring liquid from drum to container
Forklift	• Struck by • Crushed by • Pinched	• Inspect for defects • Test controls • Ensure that the operator is properly qualified • Wear a hardhat, safety glasses, and gloves • Use and fuel solid tire forklifts on solid, smooth surfaces • Provide adequate ventilation for internal combustion powered lifts • Properly secure the load • Check the structural integrity of pallets • Transport the load as low to the ground as possible • When not in use, park the forklift on level ground • When not in use, place the forks down, turn off the ignition off, and set the parking brake
Fusion Machine	• Lacerations • Struck by • Soft tissue – back, spine • Carbon monoxide	• Inspect the machine for defects • Position the machine for proper clearance • Secure the machine in place • Test to ensure the machine is working properly • Maintain safe clearance when the facing tool is upward • Place the blades in the down position before start up • Ensure proper shoes are in place, clean, and free of debris • Wear a hardhat, safety glasses, and gloves • Provide adequate ventilation in the work area and control fumes • Monitor carbon monoxide in affected excavations • Use two workers to operate machine together • Properly position workers to use machine safely • Use proper lifting techniques • Clearly mark pinch points

Gantry	• Struck by • Pinched	• Inspect for defects • Wear a hardhat, safety glasses, and gloves • Make affected workers aware of pinch points • Communicate movement during operation, assembly, and disassembly • Keep the wheels clean • Install roof protection • Inspect sling/shackles for defects and proper capacity rating
Gas Cylinders (Compressed Gas)	• Fire • Explosion • Struck by • Soft tissue – back, spine	• Use proper manual material handling techniques • Move cylinders in wheeled cylinder carts • Secure cylinders in the upright position • Inspect for defects • Keep caps in place until cylinders are ready for use • Inspect valves, hoses, and torch for defects • Clean the torch tip • Clean (pop) cylinder valves before attaching the regulator • Check hoses and valves for leaks • Remove flammable/combustible materials from the work area • Keep a fire extinguisher nearby • Leave wrenches on cylinder valves while in use • Use only friction lighters for ignition • Keep cylinders a safe distance from sources of excessive heat or ignition • Keep cylinders out of confined spaces • Close valves, bleed hoses, and replace caps when finished • Keep oxygen cylinders separate from fuel gas cylinders when storing
Generators (Portable)	• Electric shock • Carbon monoxide • Fire	• Inspect for defects • Provide adequate ventilation • Shut off before refueling • Ensure the unit is properly grounded
Glycol	• Skin irritation • Eye irritation • Organ damage (chronic exposure) • Soft tissue – back, spine	• Wear safety goggles, a face shield, and impermeable gloves and suit • Use drum carts for handling drums • Provide adequate ventilation • Review/observe SDS • Properly dispose of used glycol
Grinder (Bench)	• Laceration • Abrasion • Object in eye • Electric shock • Burns	• Inspect for defects • Ensure guards/shields are on unit • Ensure guards/shields are properly positioned • Set tool rests within 1/8" of wheel surfaces • Provide adequate lighting

		• Ensure that the plug's ground prong is in place • Use GFCI • Ensure the correct wheels are installed • Ensure that the maximum RPM of the wheels is greater than or equal to the maximum RPM of the grinder • Ensure wheels are tight • Ensure wheels are clean and in good condition • Wear safety glasses, a face shield, gloves, ear plugs, and proper clothing • Remove flammable/combustible materials from the work area • Keep a fire extinguisher nearby • Unplug the unit before making adjustments or changing wheels
Grinder (Saddle Grinder)	• Laceration • Abrasion • Object in eye • Electric shock • Burns	• Inspect for defects • Ensure that the plug's ground prong is in place • Use GFCI • Replace the belt when it becomes worn or torn • Keep belt tension properly adjusted/monitored • Ensure that guards are in place and properly positioned • Wear safety glasses, a face shield, gloves, ear plugs, and proper clothing • Secure the piece being saddled • Monitor the belt and keep it in place while grinding • Remove burrs from pipe • Turn the power and breaker switches off before working on or adjusting the grinder • Establish good housekeeping in the work area
Grinder (Tungsten)	• Laceration • Abrasion • Object in eye • Electric shock • Burns	• Secure required permits • Inspect for defects • Ensure that the plug's ground prong is in place • Use GFCI • Ensure that the jig and grinding wheel are tight • Ensure that guards are in place and properly positioned • Wear safety glasses, a face shield, gloves, and ear plugs • Remove flammable/combustible materials from the work area • Keep a fire extinguisher nearby • Secure tungsten in the holder • Insert tungsten in the proper diameter guide • Turn the power and breaker switches off before working on or adjusting the grinder

		• Establish good housekeeping in the work area
Groover Machine	• Electric shock • Pinch point • Laceration	• Inspect for defects • Use GFCI • Use the proper size/condition extension cord • Wear safety glasses, gloves, protected toe boots, and snug clothing • Use the machine on level, firm ground • Anchor the machine when required by the manufacturer • Keep the work area well lit • Check the machine daily before use • Use an adequate number of workers • Ensure operation is by foot switch only • Make the operator aware of moving parts • Establish good housekeeping in the work area • Use a mechanical method to manage large pipe • Support work with adjustable/mobile pipe stands • Re-check setup after changing dyes
Helicopter (Hoisting by Helicopter)	• Struck by • Object in eye • Crash	• Establish/review rigging signals • Ensure helicopter crew reviews rigging procedures/hoist area • Verify the weight of the unit/load • Conduct a pre-lift meeting with riggers, pilot, and crew • Wear a hardhat with chin strap, mono-goggles, gloves, and appropriate clothing • Provide an adequate number of workers for the process • Clear all loose material off the roof • Ensure that rooftop fall prevention/protection is in place • Keep workers clear of the elevated load at all times • Ensure proper dissipation of static electrical charge • Establish barricades around the hoist area • Determine whether weather conditions are suitable for the lift
Hexavalent Chromium	• Carcinogen	• Review/observe SDS • Determine the concentration of chromium in stainless steel • Provide adequate ventilation • Position affected workers to keep fumes away from breathing zone • Use respiratory protection when needed

Hi-Jacker	• Struck by • Crushed by • Pinched	• Inspect for defects • Wear safety glasses, gloves, and protected toe boots • Keep wheels clean • Make the operator and affected workers aware of pinch points
Hoist (Duct Hoist)	• Struck by object • Struck against object • Crushed by object • Pinched	• Ensure that the hoist is properly sized for the job • Inspect for defects • Ensure that wheels and cables are in good condition and working properly • Establish and observe the manufacturer's rated capacity • Use a bottle holder for air hoists • Extend outrigger • Prohibit electric drill use for raising hoist • Stabilize the load before the lift • Use tie down straps/clamps when needed • Use cradles for round ducts • Never leave a load unattended in the raised position • Prohibited modifications to the hoist • Establish good housekeeping in the hoist area • Use the hoist only on flat/level work areas
Hoist (Chain Fall)	• Struck by • Pinch Point	• Inspect for defects • Wear hardhat/safety glasses/gloves/protected toe boots or shoes • Barricade area under chain fall/hoist area
Hoist (Come Along/ Chain Hoist)	• Struck by object • Struck against object • Crushed by object • Pinched	• Ensure that the hoist is properly sized for the job • Inspect for defects • Ensure that the attachment/anchor point is capable of handling the load • Determine and observe the manufacturer's rated capacity • Wear safety glasses, gloves, and protected toe boots • Barricade the work area • Ensure that the Come Along is in the correct gear • Establish good housekeeping in the hoist area
Hoisting (Material)	• Fall • Struck by object • Struck against object • Crushed by object • Pinched • Electric shock	• Inspect for defects • Wear safety glasses, gloves, high visibility vest • Ensure that a fall prevention/protection system is in place when needed • Keep loads/load lines 10' or more away from energized electrical conductors • Establish hoist equipment load limits

		• Establish good housekeeping in the work area • Use load platforms when needed • Barricade the hoist area • Make affected people in the area aware of the operation • Ensure that the signal person and operator agree upon and understand signals
Hydrostatic Testing	• Struck by object • Object in eye	• Secure required permit • Notify other affected trades • Wear safety glasses, a face shield, gloves, and proper clothing • Barricade the work area • Isolate equipment • Ensure that hoses and pipe are rated for the anticipated test pressure • Ensure that all welds are free of insulation • Visually inspect all pipe welds • Ensure that gauges are inspected and calibrated • Ensure that test gauges range from 1½ to 4 times test pressure • Use a gauge at the pressure source • Use a gauge at the highest or furthest point from the pressure source • Ensure that vents have been installed to blow off air • Ensure that drains have been installed • Ensure that the hold time is enough to steady the pressure and walk line • Increase test pressure in increments of 20% or less • Ensure that the gauge is stable before increasing pressure • Consider and address affected energized electrical conductors
Jack Hammer (Electric)	• Struck by • Soft tissue – back, shoulder, spine • Hernia	• Inspect for defects • Ensure that the operator has reviewed the manufacturer's instructions • Wear safety glasses, a face shield, gloves, ear plugs, and proper clothing • Identify and mark utilities • Confirm that no soil hazards are present • Confirm that pulverized material won't create a hazardous atmosphere • Ensure that bits are sharp and in good condition • Use GFCI • Ensure that attachments are locked into the unit

		• Barricade the work area
Jack Hammer (Pneumatic)	• Struck by • Soft tissue – back, shoulder, spine • Hernia	• Inspect for defects • Ensure that the operator has reviewed the manufacturer's instructions • Wear safety glasses, a face shield, gloves, ear plugs, and proper clothing • Identify and mark utilities • Confirm that no soil hazards are present • Confirm that pulverized material won't create a hazardous atmosphere • Ensure that bits are sharp and in good condition • Ensure that the air supply is disconnected before connecting or disconnecting tools • Ensure that air hose connections are secured • Ensure that attachments are locked into the unit • Barricade the work area
Ladder (Portable Straight)	• Fall • Contact with electrical conductor	• Inspect for defects • Ensure that the support surface is firm, level, and non-slippery • Set up at proper 4 to 1 pitch • Extend at least 3' above the landing • Secure in place, tie at top and/or brace at bottom • Consider and avoid contact with energized electrical conductors • Use non-conductive ladders around energized electrical conductors • Ensure rungs are free of ice, mud, and slippery substances • Maintain 3-point contact at all times while climbing • Stay off the top two rungs while climbing or working • Keep the belt buckle inside the ladder side rails to avoid reaching too far • Never carry tools, materials, or objects while climbing
Ladder (Stepladder)	• Fall • Contact with electrical conductor	• Inspect for defects • Ensure support surface is firm, level, and non-slippery • Consider and avoid contact with energized electrical conductors • Use non-conductive ladders around energized conductors • Ensure steps are free of ice, mud, and slippery substances

		• Never use stepladder as a straight ladder • Maintain 3-point contact at all times while climbing • Stay off the top two steps while climbing or working • Keep the belt buckle inside the ladder side rails to prevent reaching too far • Never carry tools, materials, or objects while climbing
Laser	• Eye damage	• Keep laser beam controlled and in a safe direction • Wear anti-laser eye protection • Consider and address reflected laser light • Consider and address the safety of other affected workers/trades
Lead	• Organ damage • Nervous system problems • Reproductive system problems	• Identify lead containing materials • Establish and monitor exposure • Provide adequate ventilation • Use respiratory protection when needed • Wear protective clothing • Establish and use proper decontamination practices
Lifts (Articulating Boom – Electric)	• Fall • Struck by • Pinch point	• Inspect for defects • Test controls • Ensure the battery is charged • Inform affected workers about lift operation pinch points • Use a fall restraint system/full body harness/lanyard • Move the lift only in the fully down position • Establish good housekeeping on platform decks • Use the lift only on smooth, solid, level surfaces • Maintain a clear view of the area being navigated
Lift (Boom Lift)	• Fall • Struck by • Carbon monoxide	• Inspect for defects • Wear full body harness/lanyard/fall restraint system • Establish good housekeeping on platform decks • Use the lift only on solid, level ground • Determine/observe rated capacity • Use only for positioning workers/tools/equipment • Ensure that all tools and equipment fit within the basket • Barricade the area under the lift • Ensure a clear view of the work area for lift navigation

		• Turn off gas powered lifts immediately after they are positioned inside the structure • Provide adequate ventilation
Lifts (Scissors)	• Fall • Struck by • Pinch point	• Inspect for defects • Test controls • Inform affected workers about lift operation pinch points • Use a fall restraint system/full body harness/lanyard • Move the lift only in the fully down position • Establish good housekeeping on platform decks • Use the lift only on smooth, solid, level surfaces • Use the lift only for positioning workers and small tools • Barricade the area under the lift • Prohibit the operator from running over cords, hoses, or welding leads • Maintain a clear view of the area being navigated
LP Gas	• Fire • Respiratory • Sensitizer • Asphyxiant	• Review and observe the SDS • Inspect the cylinder for leaks • Ensure the excess flow valve is on the cylinder • Inspect valves, connectors, manifold valve assemblies, hoses, and regulators • Provide adequate ventilation • Remove flammable and combustible materials from the area • Keep a fire extinguisher nearby
Material Handling (Manual)	• Soft tissue – back, spine • Hernia • Shoulder • Laceration • Pinch point • Fall • Struck by	• Deliver materials as close to the work area as possible • Use lifting and moving equipment whenever possible • Wear safety glasses and gloves • Use proper lifting techniques • Make affected workers aware of pinch points and sharp edges • Stage materials at waist level • Establish good housekeeping in the work area • Ensure an adequate number of workers for lifting and carrying
Manganese	• Nervous system problems	• Review and observe the SDS • Provide adequate ventilation • Position workers to keep welding fumes away from the breathing zone • Use respiratory protection when needed
Pipe Stand	• Struck by	• Inspect for defects and structural integrity • Install locking washer and bolt

		• Use only on firm, level ground • Use only within the designated height • Establish the weight of the materials • Establish and observe the weight capacity of the stand • Wear safety glasses and gloves • Loosely secure pipe to the understructure/roustabout • Use auxiliary pipe stands while moving the original stands • Use wide base stands in place of tripod stands for pipe over 4" diameter
Plasma Cutting	• Electric shock • Burn • Welder's flash • Fire	• Secure required permit • Establish the proper voltage • Inspect leads for defects • Wear a welding helmet, welder's gloves, acceptable clothing, and ear plugs • Use a #10 shaded lens at a minimum • Maintain adequate ventilation in the work area • Remove flammable and combustible materials from the work area • Use fire blankets and/or welding screens to contain sparks • Keep a fire extinguisher nearby • Assign a fire watch for at least 30 minutes after cutting is complete
Pneumatic Testing	• Struck by object • Object in eye	• Secure required permit • Notify other affected trades about operation • Wear safety glasses, a face shield, gloves, and proper clothing • Barricade the work area • Isolate the equipment • Identify the operating pressure • Ensure that all welds are free of insulation • Visually inspect all pipe welds • Inspect and calibrate all gauges • Ensure that test gauges range from 1½ to 4 times test pressure • Use a gauge at the pressure source • Use a gauge at the highest or furthest point from the pressure source • Use a pressure relief valve for tests of 100 psi or more/1-hour plus hold • Isolate branch lines where applicable • Use blow down valves when branch lines are isolated • Ensure blow down valves are installed in the proper location

		• Ensure hoses are properly rated • Keep hold times to a minimum, steady pressure and walk the line • Increase test pressure in increments of 20% or less • Ensure the gauge is stable before increasing pressure
Power Washer	• Laceration • Eye damage • Electric shock	• Inspect for defects • Ensure that the plug's ground prong is in place • Use GFCI • Wear safety glasses, a face shield, rubber gloves, boots and a rain suit • Review/observe SDS when chemicals are used • Consider and monitor wind direction • Properly set and monitor pressure
Powder Actuated Tools	• Puncture • Eye damage	• Ensure that operator has specialized powder actuated tool training, and the appropriate license when required • Inspect for defects • Wear safety glasses, a face shield, gloves, and ear plugs • Inform/alert others in the work area before firing • Keep action pointed in a safe direction • Select the most appropriate power setting • Make the operator aware of the potential for ricochets • Ensure that the operator knows not to move the tool for 30 seconds after a misfire
Propress	• Soft tissue – back, spine • Hernia • Electric shock • Pinch point • Laceration	• Inspect for defects • Use proper lifting techniques • Use proper work posture • Consider and address pinch points • Use GFCI • Wear safety glasses, gloves, snug clothing
Pumps (Sewage Ditch Electric)	• Electric shock • Struck by	• Inspect for defects • Ensure that the plug's ground prong is in place • Use GFCI • Wear safety glasses and gloves • Lower pump by rope • Ensure the area directly under the pump is vacant when lowering the pump • Immediately disinfect a pump used on a sanitary system
Pumps (Sewage Ditch Gasoline)	• Struck by • Carbon monoxide	• Inspect for defects • Wear safety glasses and gloves • Lower the pump by rope

		• Ensure the area directly under the pump is vacant when lowering the pump • Ensure ditch is properly ventilated and monitored • Immediately disinfect a pump used on a sanitary system
Roof Top Work	• Fall • Struck by object • Electric shock	• Wear safety glasses, gloves, rubber boots, and fall protection equipment • Tie off and secure the access ladder • Establish fall prevention/protection • Identify and address skylights, hatches, and other fall hazards • Wear arc flash protective equipment when working on energized units • Implement lockout/tagout when required • Identify and address slip/trip hazards
Rigging (Chokers)	• Struck by object	• Calculate the weight of the load • Select the proper size/load rating • Ensure the load rating tag is attached and legible • Inspect nylon for cuts, tears, and worn eyes and threads • Inspect the cable for kinks, wickers, rusting, and deterioration • Ensure shackles are properly sized and rated • Inspect shackles for defects/original pins only • Ensure shackle pins are not resting on the hook • Arrange shackles to prevent side-loading • Ensure the spreader bar is load rated and certified • Use softeners to protect chokers from sharp or angled edges • Ensure softeners are properly sized
Rigging (Power Rigging-Hand Crabs)	• Struck by • Crushed by • Pinched	• Inspect for defects • Inspect rigging equipment for proper function • Ensure rigging equipment is properly sized • Wear safety glasses, gloves, and protected toe boots • Ensure proper attachment to the beam • Ensure cable is tracking properly on the drum • Ensure base is concrete anchored with a backup plate • Ensure a stop is present on the beam • Ensure the load line is free and clear • Ensure snatch blocks are the proper size • Consider and address the proper location of the snatch blocks

		• Ensure adequate anchoring for sheaves • Ensure the locking device is secured • Notify other affected trades • Barricade the hoist area • Establish good housekeeping in the hoist area
Rigging (Power Rigging Pipe)	• Struck by • Crushed by • Pinched	• Evaluate the hoist area • Ensure rigging equipment is properly sized • Inspect rigging equipment for defects • Notify other affected trades • Barricade the hoist area • Wear safety glasses, gloves, and protected toe boots • Identify and address pinch points • Establish good housekeeping in the hoist area • Test load/ensure center of gravity is addressed
Rigging Sling (Alloy Steel Chain)	• Struck by object	• Inspect for defects • Ensure identification tag is in place and legible • Determine and observe the rated capacity • Ensure the correct type of sling is selected for the job
Rigging Sling (Natural – Synthetic Fiber)	• Struck by object	• Inspect for defects • Ensure identification tag is in place and legible • Determine and observe the rated capacity • Ensure the correct type of sling is selected for the job • Protect the sling from sharp edges and softeners
Rigging Sling (Synthetic Web)	• Struck by object	• Inspect for defects • Ensure identification tag is in place and legible • Determine and observe the rated capacity • Ensure the correct type of sling is selected for the job • Protect the sling from sharp edges and softeners
Rigging Sling (Wire Rope)	• Struck by object	• Inspect for defects • Ensure identification tag is in place and legible • Determine and observe the rated capacity • Ensure the correct type of sling is selected for the job • Protect the sling from sharp edges, corners, and softeners Ensure that each leg is secured at the hook • Use a shackle with choker hitches
Sander (Bench)	• Abrasion • Object in eye • Electric shock • Burn	• Inspect for defects • Ensure guards and shields are in place and properly positioned • Ensure tool rests within 1/8” of the wheel surface

	• Fire	• Ensure back sweeps within 1/4" of the wheel surface • Ensure adequate lighting • Ensure that the plug's ground prong is in place • Use GFCI • Ensure correct belt and disk are in place • Ensure that the maximum RPM of the wheels is greater than or equal to the maximum RPM of the sander • Ensure belts and disks are tight • Ensure belts and disks are clean and in good condition • Wear safety glasses, a face shield, gloves, ear plugs, and snug clothing • Remove flammable and combustible materials from the work area • Keep a fire extinguisher nearby • Unplug the sander before making adjustments or changing belts and disks
Saw (Chop Saw)	• Laceration • Electric shock	• Inspect for defects • Ensure that the plug's ground prong is in place • Use the saw only in dry conditions • Protect the cord from cuts and insulation damage • Use GFCI • Ensure the guard is in place • Wear a face shield, gloves, safety glasses, and ear plugs • Select the proper blade • Replace worn blades immediately • Establish good housekeeping in the work area
Saw (Circular Saw – Bench/Hand Held)	• Laceration • Object in eye • Electric shock	• Inspect for defects • Select the proper blade for the material • Ensure blade RPM is correct for the saw • Ensure the guard is in place and properly adjusted • Adjust the blade to the proper depth • Leave base mounted saws on the base • Wear safety glasses, a face shield, gloves, and ear plugs • Remove flammable and combustible materials from the work area • Use GFCI • Secure material in place • Ensure the blade is free from material before starting the saw • Use two hands to operate the saw

		• Consider and monitor the position of the power cord while cutting • Unplug the saw before changing the blade or servicing it
Saw (Porta Band Saw)	• Laceration • Object in eye • Electric shock	• Inspect for defects • Ensure guards are in place • Use GFCI • Wear safety glasses, gloves, and ear plugs • Use two hands to operate the saw • Establish good housekeeping in the work area • Secure material in place before cutting • Position yourself to use the saw safely • Keep feet and hands clear of operation • Unplug before maintaining the saw or changing the blade
Saw (Cut Off)	• Laceration • Object in eye • Electric shock • Burns	• Inspect for defects • Secure the saw and base • Ensure guards are properly placed • Set the proper cutting depth • Use GFCI • Wear safety glasses, gloves, ear plugs, and snug clothing • Ensure adequate ventilation • Ensure good housekeeping in the work area • Consider the extension cord's location before cutting • Unplug before changing the blade or performing maintenance
Saw (PDQ Saw – Electric)	• Laceration • Electric shock	• Inspect for defects • Wear safety glasses, a face shield, ear plugs, and snug clothing • Establish good housekeeping in the work area • Use GFCI • Ensure the blade is in good condition
Saw (PDQ Saw – Gas)	• Laceration • Fire	• Inspect for defects • Wear safety glasses, a face shield, ear plugs, and snug clothing • Establish good housekeeping in the work area • Keep a fire extinguisher nearby • Store gas at least 25' from the saw and work area • Provide adequate ventilation in the work area/control fumes • Ensure the blade is in good condition
Sawzall	• Laceration • Object in eye • Electric shock	• Inspect for defects • Ensure guards are in place • Use GFCI • Wear safety glasses, gloves, and ear plugs

		• Ensure the blade is properly inserted and locked in place • Use two hands used to operate the saw • Establish good housekeeping in the work area • Properly secure the material being cut • Position the operator to safely use the saw • Keep feet and hands clear of operation • Use the safety lock when not cutting • Disconnect from the power source before performing maintenance or blade changes • Check head room
Scaffold (Mobile)	• Fall from scaffold • Fall with scaffold	• Establish/designate a competent person to oversee erection and dismantling • Perform a daily inspection • Inspect for defects, incompatible parts, and improper erection • Ensure the scaffold will support at least 4 times the intended load • Use only on solid, level ground • Use top rails, mid rails, and toe boards when the work platform is 10' or higher • Ensure the scaffold it properly tagged • Establish good housekeeping on work platforms • Inspect the ground for holes, cracks, debris, and encumbrances • Ensure wheels are locked before climbing • Never move a scaffold with anyone onboard
Scaffold (Supported)	• Fall from scaffold • Fall with scaffold	• Establish/designate a competent person to oversee erection and dismantling • Perform a daily inspection • Ensure the scaffold is erected at least 10' from power lines • Inspect for defects, incompatible parts, and improper erection • Ensure the scaffold will support at least 4 times the intended load • Erect only on firm ground • Erect on base plates, mud sills, or other firm foundations • Use top rails, mid rails, and toe boards when the work platform is 10' or higher • Ensure the scaffold is properly tagged • Establish good housekeeping on work platforms • Ensure a ladder or other proper scaffold access is in place

		• Tie to a structure when the height is more than 4 times the width of the base • Ensure the scaffold is never overloaded
Silica	• Silicosis • Suspect carcinogen	• Provide adequate ventilation • Use dust collection cups with masonry drill bits • Use wet method or vacuum with HEPA filter when cutting concrete • Use respiratory protection when needed
Smoke Machine	• Respiratory sensitization • Eye irritation • Fire	• Review and observe SDS • Provide adequate ventilation • Wear safety glasses, gloves, and proper clothing • Determine and set proper pressure level • Establish emergency exits • Keep a fire extinguisher nearby
Soldering (Silver Soldering)	• Burn • Fire • Respiratory sensitization	• Secure required permit • Remove flammable and combustible materials • Ensure adequate ventilation • Keep a fire extinguisher nearby • Wear safety glasses, gloves, and proper clothing • Identify and isolate the contents of area pipelines • Complete required purging • Implement lockout/tagout where required • Secure oxygen and acetylene cylinders in the upright position • Secure B-tanks in the upright position • Turn off gas cylinders and tanks when leaving the area • Assign fire watch for at least 30 minutes after operation is complete • Shut down and cap oxygen and acetylene cylinders when work is completed
Solvents	• Fire • Skin irritant • Central nervous system • Depression	• Review and observe SDS • Provide adequate ventilation • Wear splash proof goggles, a face shield, and impermeable gloves and clothing • Close containers when not in use • Isolate from ignition sources • Keep a fire extinguisher nearby • Ensure containers are properly labeled
Stair Walker	• Struck by • Pinched	• Inspect for defects • Wear safety glasses and gloves • Barricade the stairwell • Ensure tires are properly inflated • Ensure battery is charged • Secure straps

		• Ensure that affected workers receive the proper training • Ensure affected workers are above the load • Inform affected workers about pinch points • Assign at least two workers to the task
Stored Energy	• Electric shock • Struck by object • Object in eye	• Identify stored energy • Turn off, block, and isolate sources of energy • Release/relieve stored energy • Lock out the source of energy • Ensure the worker who locked out is the only one who can remove the lock
T-Puller	• Struck by object • Electric shock • Object in eye	• Inspect for defects • Wear safety glasses, gloves, and snug clothing • Use GFCI
Tools (Hand Tools)	• Laceration • Puncture • Broken bone • Gouge • Struck by object	• Inspect for defects • Ensure handle is tight • Wear safety glasses, gloves, and protected toe boots • Ensure the tool is clean, dry, and non-slippery • Ensure cutting tools are sharp
Torch Cutting	• Burn • Fire • Explosion	• Secure required permit • Remove flammable and combustible materials • Keep a fire extinguisher nearby • Ensure the work area is properly ventilated • Secure gas cylinders in the upright position • Inspect valves, gauges, hoses, and torch for defects • Ensure gauges are equipped with reverse flow check valves • Keep hoses and gauges away from oil • Wear cutting goggles, gloves, a face shield, and appropriate clothing • Equip cutting goggles with #5 shaded lenses or face shield with #5 shaded lens • Cap and properly store cylinders when not in use • Only use a striker to ignite the torch • Assign a fire watch for at least 30 minutes after cutting is complete
Walker/Stacker	• Struck by • Crushed by • Pinched	• Inspect for defects • Ensure the fork length is considered and adequate • Wear safety glasses, gloves, and protected toe boots • Ensure the travel path is clear • Ensure ramps are gradual enough to keep wheels on the ground • Ensure the load is secure and balanced • Keep the load low during travel

		• Use a ratchet binding strap or equivalent when raising the load
Welding (Electric Arc)	• Electric shock • Burn • Fire • Respiratory sensitization • Welder's flash	• Secure required permits • Inspect for defects • Wear a helmet, safety glasses, welding gloves and clothing, and boots • Ensure the proper shade of lens is used • Provide adequate ventilation • Use respiratory protection when required • Use the proper size extension cord • Inspect the extension cord for defects • Inspect leads for defects • Ensure welding screens are in place • Barricade the work area • Remove flammable and combustible materials from the work area • Keep a fire extinguisher nearby • Position affected workers to keep fumes from the breathing zone • Turn off the machine before fueling • Use a metal bucket for discarding electrodes • Keep a fire extinguisher nearby • Assign a fire watch for at least 30 minutes after cutting is complete
Welding (Orbital)	• Electric shock • Burn • Fire • Respiratory sensitization	• Secure required permit • Inspect for defects • Ensure gas connections are snug and check for leaks • Wear safety glasses and gloves • Review and observe material SDS • Provide adequate ventilation • Use GFCI • Keep a fire extinguisher nearby
Welding (Tig)	• Electric shock • Burn • Fire • Respiratory sensitization • Welder's flash	• Secure required permits • Inspect for defects • Ensure gas connections are snug • Wear helmet, safety glasses, welding gloves and clothing, and boots • Ensure that the proper shade of lens is used • Provide adequate ventilation • Ensure and monitor adequate oxygen/breathing air supply • Use respiratory protection when required • Inspect leads for defects • Ensure guards on stinger are in place • Ensure welding screens are in place • Barricade the work area

		• Remove flammable and combustible materials from the work area • Keep a fire extinguisher nearby • Ground the clamp as close to the work area as possible • Remain insulated from electrical current • Position the worker to keep fumes away from the breathing zone • Stand to one side of the flow meter when charging the bottle
Zinc	• Respiratory sensitization • Zinc fume fever	• Provide adequate ventilation • Position worker to keep fumes away from the breathing zone • Use respiratory protection when needed

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