



Energy Wheel Field Guide:

Incident prevention for
critical risk activities

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Purpose

This guide will help you identify, assess, and control the energy hazards present during critical risk activities—before the work begins, during the work, and as conditions change.

Applying the Guide to Your Work

- This guide supports and enhances our existing Hazard Recognition, Assessment, and Control (HRAC) process. It does not replace current safe work practices (SWPs) or permitting requirements.
- Not every potential energy hazard or control is listed in this guide. Refer to your Risk Management Strategy (RMS1), Field Level Risk Assessment (RMS2), and SWPs to comprehensively assess each task.
- Before beginning any activity where critical risks exist, review the potential hazards and controls associated with that critical risk. Also, familiarize yourself with the Health, Safety, Security, and Environment (HSSE) Checkpoints – the fundamental tasks that must be implemented before any work begins (see page 39).
- Use this guide during all phases of the HRAC process: during hazard recognition, hazard assessment, development of controls, and on-site monitoring.
- Use this guide during task and project planning processes: risk management strategy development, field-level risk assessments, and while conducting last-minute risk assessments.
- Share and promote this guide with coworkers, supervisors, subcontractors, and client representatives during safety meetings, toolbox talks, field visits, and other communication opportunities with work teams.
- Use this guide during incident investigations: near misses, high potential incidents, injury or illness incidents, property damage incidents, and environmental release incidents.
- Use this guide while conducting observations and other auditing activities, including:
 - Worksite inspections: office, lab and field (RMS4 and RMS5)
 - Project file safety reviews (RMS6)
 - Planned job observations (RMS10)
 - Hazard identification reporting (RMS3)
- This guide and further details on our critical risk controls can be found on the HSSE & Sustainability area of StanNet. Please contact your HSSE representative if you have questions.

Energy Sources



Gravity

Force that attracts the mass of objects towards the earth.

EXAMPLES: falling objects, collapsing structures, slipping, tripping, falling



Mechanical

Rotation, vibration, or motion of equipment, machinery, materials, or tools.

EXAMPLES: rotating equipment (augers, pulleys, drive shafts), percussive tools (paving breakers), powered hand tools, compressed springs, drive belts, conveyors, and motors



Motion

Change in position of objects or substances.

EXAMPLES: vehicles (car, truck, all-terrain, amphibious, boat, snowmobile, bicycles, transit, mobile equipment, trailer), workers and other people (lifting, pushing, pulling, carrying, use of hand and power tools, body position, walking), flowing water, sprung tree branches



Noise

Sound that is undesired or interferes with hearing.

EXAMPLES: stationary or mobile equipment, impact noise, high pressure release, impact of noise on communication



Pressure

Force per unit area that is exerted by a gas, liquid, or solid.

EXAMPLES: pressure piping and pipelines, compressed cylinders (fire extinguisher, calibration gas, propane), control lines, vessels, tanks, hoses, pneumatic and hydraulic equipment



Radiation

Release of ionizing radiation, including alpha, beta, and gamma radiation.

EXAMPLES: welding, naturally occurring radioactive material (NORMS), x-rays, nuclear densometers, lasers, microwaves, ultraviolet, radioactive waste and sources



Thermal

Temperature of objects or environments (hot or cold).

EXAMPLES: open flame, electric ignition sources (including phones and friction), hot or cold surfaces, liquids or gases, weather conditions including humidity levels, wind, sun, snow, and ice



Biological

Living organisms that pose health, safety, or security hazards.

EXAMPLES: animals, bacteria, viruses, insects, blood-borne pathogens (needles), poisonous and noxious plants, contaminated water, human behaviors (protesters, concerned citizens, onlookers)



Chemical

Exposure to chemicals or chemical reactions in the environment or workplace.

EXAMPLES: flammable vapors, reactive substances, carcinogens or other toxic compounds, corrosives, pyrophorics, combustibles, oxygen-deficient atmospheres, fumes, dusts, naturally occurring gases



Electrical

The presence and flow of an electrical charge or current.

EXAMPLES: power and communication lines, static charge, lightning, energized equipment, wiring, batteries, ground fault circuit interrupter (GFCI), cords and plugs, lighting levels, double-insulated tools in wet environments

Energy Wheel



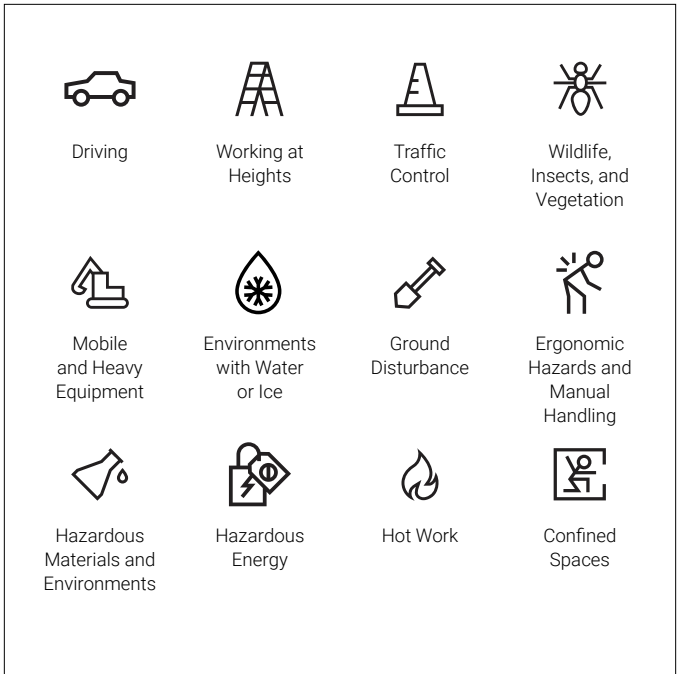
Energy Wheel and Sources of Energy

A visual tool used to identify the 10 sources of energy and to assess and control the hazards associated with each form of energy.

Definitions

Stantec's 12 Critical Risks

Tasks or environments that have the greatest potential to cause serious injuries, incidents, and fatalities.



Hazard

Any condition, device, substance, or practice that has the potential to cause loss, such as injury to people, or damage to equipment, materials, environment, property, or reputation.

Hazard Recognition, Assessment, and Control (HRAC) Process

The HRAC process will help you identify hazards, assess risk, and then implement the appropriate controls to prevent incidents. This process becomes even more essential for critical risk activities. The steps of the HRAC process are

1. Hazard Recognition

When a new project begins, review the overall scope of work for the project. Identify the potential hazards the project team might encounter during each work task, and that are present on the project site. Use the Risk Management Strategy (RMS1) or a Health and Safety Plan (HASP) to identify the energy sources or other hazards that might exist during the project lifecycle or in the work environment.

2. Risk Assessment

Once hazards have been identified, select the appropriate controls to mitigate these hazards and their associated risks. Safe Work Practices (SWPs) are documents designed around specific tasks to outline the control of hazards while reducing the risk to an acceptable level. If there is not an applicable SWP, a Quantified Hazard Assessment (RMS7) or equivalent will take into consideration both the severity of the potential loss, as well as the likelihood of it occurring. People, the environment, assets (structures/equipment), and the Company's reputation are all taken into consideration.

3. Select Controls

Implement controls to reduce the risk to an acceptable level. When selecting controls, consider that some controls are more effective than others. The Hierarchy of Controls chart in this guide (page 10) provides guidance on the effectiveness of each type of control. When possible, it is best to eliminate or substitute the hazards.

4. On-site Monitoring

While on site, use the Field Level Risk Assessment (RMS2) to verify that all hazards, risks, and controls have been identified. Use toolbox talks, check-in meetings, and Last-Minute Risk Assessments (LMRA) to communicate new hazards or changes in work conditions.

The HRAC process must be conducted and repeated

- When a new work process is introduced
- When a work process or operation changes
- At reasonable intervals to reduce the possibility of substandard acts or conditions being developed
- Before the initiation of new work at an existing site
- When an employee will be working alone or is the sole Stantec representative at a project site
- When field activities are added to a proposal or project

Hierarchy of Controls: Applying the right controls for the hazard

We must assess each project and task to determine the hazards and implement controls to eliminate or minimize exposure. When implementing controls, follow the Hierarchy of Controls, which are listed from most effective to least effective:

Hierarchy of Controls	MOST EFFECTIVE	1	ELIMINATION/SUBSTITUTION Remove or replace the hazard
		2	ENGINEERING Isolate people from the hazard
		3	WARNINGS Alert people to the hazard
		4	ADMINISTRATIVE CONTROLS Change the way people work
	LEAST EFFECTIVE	5	USE OF PERSONAL PROTECTIVE EQUIPMENT (PPE) Protect the wearer's body from injury or infection

Stop Work Authority

As per our Stop Work Authority Practice, you must stop work immediately if you become aware of an unsafe act or condition that could place anyone in danger, or if you are not confident in the work plan.

Stop work immediately if:

1.

You see an unsafe condition, action, behavior, omission, or non-action that could lead to injury or incident; or

2.

Work to be performed is not in accordance with the approved risk management strategy (RMS1), field-level risk assessment (RMS2), and/or health and safety plan; or

3.

You don't feel confident in the work plan.

On a multi-contractor job site where Stantec does not have authority over others, the client or prime contractor must be immediately notified of the unsafe act or condition so they can take prompt action. Stantec employees are always empowered and obligated to stop our own work on a site whenever it is unsafe to proceed.

There will not be any blame or fault assigned to any employee who follows this process and stops work or notifies others to stop work in good faith.

Human Performance Factors

Before You Begin, Assess Human Performance Factors

Human performance factors play a part in most workplace incidents. These are human factors that affect work behaviors beyond physical abilities and skills, such as:



Human Performance Factor

Individual Factors

1. Are you physically able to perform the task (strength, dexterity, coordination)?
2. Do you have the knowledge, experience, and skills necessary to perform the task safely?
3. Are you stressed, worried, or distracted by personal or work issues that could pull your attention from the task?
4. Will tiredness, fatigue, or other factors impair your ability to perform the work?

Job Factors

1. Do you have the correct tools and equipment for the task, and are they designed to work effectively?
2. Are instructions, labels, signs, and procedures clear and easy to understand?
3. Is your work schedule and workload appropriate for the time allotted?
4. Does the task require high levels of concentration or multitasking?

Organizational Factors

1. Do you feel empowered to use your Stop Work Authority?
2. Are you clear about your role and responsibilities?
3. Is there open communication among your co-workers, supervisor, and project management? Does your work team look out for one another?
4. Are you encouraged to take your time to be safe or are you encouraged to take risks to get the job done quickly?

Work Environment

1. Is the work environment (noise, lighting, temperature, vibration, access, egress) safe?
2. Are the working conditions static or constantly changing?
3. Are you exposed to hazards from adjacent work activities?
4. Are you easily distracted by elements of the work environment?

If any of the questions above result in a “yes,” have a discussion with your team and your supervisor to determine a prevention plan. You can

- Seek help if you are unclear about how the work can be carried out safely
- Check to make sure you fully understand how the work is to be carried out and what safety controls are required
- Actively eliminate or address distractions, and make sure you are calm, clear, and focused on what is required to get the work done safely
- Stop work if you feel uneasy or unsafe with the planned work, then seek assistance to address the situation

Driving



Energy Sources



Vehicle malfunctions such as flat tires, ineffective braking, and other vehicle system failures can contribute to collisions.



Poor visibility from weather (rain/fog/snow), poor lighting, or obstructed view (mirror angles, vehicle load, surrounding objects) increase the risk of vehicle collision.

Vehicle stability due to road conditions (wet surfaces, soft shoulders, mud, gravel, potholes) can lead to loss of vehicle control or rollovers.

Potential contact with other vehicles, cyclists, and moving or stationary objects can result in injury and damage to vehicle.

Vehicle operating in congested areas close to structures, mobile equipment, pedestrians, and objects increases risk of collision.

Unsecured cargo or loads can strike drivers, passengers, or workers in the area.

Not using seatbelts and personal protective equipment appropriate for the vehicle can result in injury.



Vehicles operating near explosive atmospheres or dried-out vegetation can create an additional ignition source, leading to fire or explosion.

Cold weather conditions such as ice, snow, and freezing rain can reduce driver vision and vehicle traction which may result in collision.



Unpredictable pedestrian movements and unanticipated animal crossings can lead to struck-by incidents.



Critical Risk Controls

- Consider the need to drive; use webinars and teleconferences to avoid unnecessary travel
- Develop a journey management plan for travels over 420 kilometers (250 miles) or 4.5 hours one way
- Conduct a vehicle inspection and verify maintenance prior to operation
- Verify drivers are competent and fit for duty
- Plan for emergencies and adjust for road and weather conditions
- Use seatbelts when vehicle is in operation
- Use mobile devices only when the vehicle is parked and in a safe location
- Avoid distractions
- Secure equipment and cargo
- Follow the speed limit
- Use a spotter to assist with safe vehicle parking and positioning



Human Performance Factors

Inappropriate speed for conditions can lead to loss of control of the vehicle and increases the risk of a crash.

Driver fatigue reduces reaction times, which along with risk of falling asleep, impairs driver judgment.

Distracted driving due to eating, drinking, adjusting vehicle controls, and use of cell phones and mobile devices is hazardous.

Impaired driving from use of medications or drugs and alcohol reduces motor skills and slows driver reaction time.

Risk-taking behavior (speeding, ignoring traffic control devices, etc.) while driving increases the risk of an incident.

Insufficient driver experience can increase the risk of collision. This applies to new drivers and drivers using new, unfamiliar vehicles.

Driver failure to maintain vehicle and keep it in road-worthy condition and keep it in good condition can increase the risk of an incident.

Working at Heights



Energy Sources



Falls to a lower level without fall protection can result in serious injury or death.

Suspension trauma injury can occur when someone is suspended in a fall protection harness if a rescue plan is not executed immediately.

Inadequate anchor points can negate fall protection equipment and result in a fatal fall.

Falling objects (tools, materials, equipment, etc.) can result in injury.

Elevated work platforms or scaffolding can fall or collapse, resulting in serious injury or death.



Wind, rain, and other weather conditions can create hazards while working at heights such as falls, struck-by, or other injuries.



Overhead power lines present electrocution hazard for employees working from ladders, scaffolds, or elevated work platforms.



Critical Risk Controls

- Consider alternatives to working at heights as the preferred method of control.
- Implement fall protection planning and training if there is a risk of falling. This is mandatory if height is greater than greater than 1.8 meters (6 feet); check local regulations and client requirements.
- Prepare and communicate an emergency retrieval and rescue plan.
- Document inspection of fall protection equipment, rescue equipment, ladders and platforms prior to use.
- Use proper ladders in good condition; consider base, angle, and tie-off.
- Keep three points of contact when ascending and descending.
- Use the correct fall arrest/restraint system when working on elevated work platforms.
- Select and use a proper anchor point.
- Do not work alone.

Human Performance Factors



Inadequate training and improper or non-use of fall protection measures and rescue plans can result in serious injury or death from falls.

Overconfidence in one's ability to react to an uncontrolled fall hazard.

Traffic Control



Energy Sources



Site topography (steep slopes, uneven surfaces, gravel, uneven paved edges) can cause slips, trip, or falls and can cause equipment or vehicles to tip or roll over, resulting in serious injury.



Moving vehicles on roadways and in work zones can strike nearby employees, leading to serious injury or death.

Pedestrians near work area entry or buffer zones can be struck by vehicles or mobile equipment.

People and vehicles can collide at rail crossings and bus stops.

Mobile equipment can strike and seriously injure workers.



Road traffic can create communication difficulties among workers; employees and pedestrians may not hear warnings or approaching vehicles/equipment.



Fog and other weather conditions such as rain, snow and ice can reduce visibility, create slick surfaces, and lead to injury.

Extreme temperatures can lead to heat or cold stress illness such as heat exhaustion, heat stroke, hypothermia, frostbite, etc.



Hazardous animals, insects, vegetation can be present in the work environment resulting in potential exposure injuries.



Exposure to vehicle exhaust can result in respiratory illness and other negative health conditions.



Critical Risk Controls

- Develop a written traffic control plan to be communicated and reviewed regularly (at least annually) or as conditions change.
- Test the traffic control plan by driving through the traffic control set up; monitor the traffic control measures to verify they are being used as intended.
- Confirm employees working in an area of traffic control and those setting up traffic control devices have received applicable training.
- Wear reflective personal protective equipment (PPE), minimum class 2, appropriate to the lighting, weather conditions, and local regulations. Additional controls may be necessary when working at night.
- Do not walk across highways. Use designated road crossings, traffic control measures, or a vehicle.
- A written, implemented traffic control plan is also required for work taking place off the shoulder of the road, in parking lots, on construction sites, and on forecourts where traffic is identified as a hazard.



Human Performance Factors

Traffic control plan is not created, reviewed, or implemented due to lack of understanding around implementation requirements.

Proper traffic control devices are not used due to lack of perceived risk or failure to follow appropriate safe work practices.

Wildlife, Insects, and Vegetation



Energy Sources



Animal (wild and domestic) encounters can lead to cuts, lacerations, broken bones, and other serious and even life-threatening injuries.

Rabies and other zoonotic diseases that can be transmitted from animals to humans.

Mosquito-borne and tick-borne diseases are transmitted to humans bitten by an infected insect, and in some cases these diseases can be life-threatening.

Allergic reaction to insect stings or bites ranging from mild reactions to life-threatening conditions such as anaphylaxis or anaphylactic shock.

Venomous bites or stings from snakes, spiders, scorpions, jellyfish, etc. can lead to cardiac, respiratory, pulmonary, and neurological conditions.

Noxious vegetation such as poison ivy, sumac and oak, giant hogweed, stinging nettle, etc. can cause rashes, blisters, and burns on the skin, while others, when ingested, could damage major organs and lead to death.

Handling wildlife during surveys or collections can result in bites or other injuries.



Exposure to pesticides (herbicides, insecticides, fungicides, rodenticides, etc.) used to kill weeds, insects, fungus, rodents, and other pests can lead to respiratory problems, cancer, and other diseases.



Critical Risk Controls

- When planning for field work, consider hazards posed by local wildlife, pets, livestock, insects, and noxious or poisonous plants.
- Prepare and review appropriate controls, emergency response procedures, and first aid training and supplies before beginning field work.
- Provide information on plant identification and wildlife awareness to field crews.
- Remain calm when confronted with potentially dangerous animals and leave the area if possible.
- Prompt identification of bites or skin irritation is essential; perform frequent personal survey checks and administer first aid treatment as soon as possible.
- If symptoms from bites or skin irritation continue, notify your supervisor and seek appropriate treatment advice. Follow the incident reporting protocol for your geographic area.

Human Performance Factors



Deficient planning and lack of proper control measures due to improper identification of hazardous animals, insects, and vegetation.

Mobile and Heavy Equipment



Energy Sources



Falling materials and loads can strike and injure employees.

Equipment tip over or rollover due to loss of traction, slope or trench failure, or uneven load distribution on sloped terrain can lead to property damage, serious injury, or death.



Equipment brakes not set, equipment left in gear, wheels not chocked, and controls not locked out can lead to equipment movement that could strike nearby workers.

Mechanical system failures such as hydraulic, steering, tailgate latching, lifting mechanism, tire pressure, etc. resulting in injury or property damage.



Standing in blind spots or equipment swing areas can lead to contact with equipment and result in serious injury or death.

Moving equipment parts can strike and seriously injure nearby workers.



Noise from equipment can distract workers and inhibit communication.



Hydraulic hose failure can release dangerous fluids, resulting in burns, and serious injuries.



Hot exhaust systems on mobile equipment can be an ignition source or can burn a worker if accidentally touched.

Fog and other weather conditions such as rain, snow, and ice can reduce visibility, create slick surfaces, and lead to injury.



Exposure to vehicle exhaust can result in respiratory illness and other health conditions.



Striking overhead power or communication lines or underground utilities can lead to electrocution.



Critical Risk Controls

- Verify operators and riggers are competent and fit for duty.
- Avoid distractions—use mobile phones only when in a safe location, and never when operating a vehicle.
- Do not walk or work under suspended loads, across or within paths of travel, or within swing zones.
- Conduct vehicle inspections and verify maintenance.
- Understand and avoid blind spots and tipping zones—make eye contact with operator and verify hands-off controls before entering work area. Establish an unobstructed escape route.
- Establish communication methods with spotters, operators, field staff, and signalers before work begins.
- Respect vehicle exclusion zones and paths of travel.
- Review, assess, and discuss the operation, equipment, and movement of all teams on the worksite.
- Be aware that changing weather, terrain, and ground conditions can impact the anticipated movement, stopping, and stability of mobile and heavy equipment.

Human Performance Factors



Operator error such as exceeding load capacity, operating on grade higher than specified for the equipment, or operating equipment at improper speed.

Workers not following approach plans around mobile equipment or failing to recognize blind spots.

Environments with Water or Ice



Energy Sources



Slips, trips, and falls due to wet or slick surfaces caused by ice, rain, snow, or other weather conditions can cause significant injury.



Drowning (through submersion in and inhalation of water) can occur when working around water and can result in death.

Employee may be struck by boat or motor when diving, working in water, or as a result of falling out of a boat, which can result in injury or death.

Water currents can sweep employees downstream or out to ocean and result in drowning.

Ice can move and create pressure cracks or weak spots, resulting in breakthrough due to the weight of personnel and equipment.



Exposure to cold weather or water can lead to cold stress illnesses such as frostbite, hypothermia, and trench foot that may result in tissue damage, organ failure, and possibly death.



Wildlife encounters such as insects, alligators, sharks, and snakes can occur when working on, in, or near water and result in bites, stings, cuts, or other serious injuries.



Critical Risk Controls

- Document vessel inspections and verify emergency equipment is appropriate and available
- Employees must have appropriate training to work on board any vessel
- Specialized communications and personal protective equipment (PPE) may be required
- Employees working near water or on ice must have first aid and CPR training, and emergency response plans must include rescue, transportation, and resources for cold-related injuries
- Assess water or ice depth, air and water temperature, and currents before working on or near any water body or frozen surface
- Monitor environmental factors which may affect working conditions, such as wind, rain, lightning, tides, currents, etc.
- Working alone is prohibited

Human Performance Factors



Lack of knowledge around environmental factors (water depth or ice thickness, water temperature, currents, weather conditions).

Assigning staff that are not trained or competent to work in environments with water or ice.

Ground Disturbance



Energy Sources



Spoil piles too close to the edge of an excavation or trench can result in collapse and entrapment.

Improper cut back or shoring of excavations or excavations performed in unstable soil types can cause collapse and entrapment.

Absence of hard barricades can lead to falls into the excavation.

Drilling rods could fall while being lifted, resulting in injury or damage to equipment or materials.



Contact with rotating equipment such as augers or excavation attachments like buckets can cause serious injury.



Mobile equipment operating too close to the edge of an excavation or trench can tip over or fall into the excavation or trench.



Noise from equipment can distract workers and inhibit communication.



Failure of hydraulic hoses on equipment.



Toxic gases that are heavier than air can collect in low areas and result in high concentrations.

Flammable gases may be present and can lead to explosion.

Risk of drowning from leaks or rain runoff that might fill the excavation or trench.

Contaminated land either naturally occurring or from previous land use (e.g. hydrocarbons, heavy metals, asbestos, or anthrax) can result in illness.



Underground utility strikes can lead to electrocution or release of pressurized, flammable, or toxic material.

Contact with overhead power lines can result in electrocution.



Critical Risk Controls

- Verify that all underground hazards (pipelines, electric cables, etc.) have been identified, located, and if necessary, isolated
- Assess contaminated land risk and identify health monitoring and personal protective equipment (PPE) requirements
- Obtain required permits and review local legislative requirements prior to excavation work
- Prevent contact with overhead power lines
- Ensure employees conducting ground disturbance activities are appropriately trained
- Establish methods for safe entry into and exit out of excavations
- Protect access to any excavation, trench, or coring activity with hard barricades or plates
- Stabilize ground through cutbacks, shoring, trench box, or other acceptable methods
- Keep spoil piles at least 1 meter (3 feet) from excavation edges, and if deeper than 1 meter, store no closer than the equivalent depth of the excavation
- Establish and communicate rescue and emergency planning
- Monitor conditions for change

Human Performance Factors



Incomplete permitting requirements or not following safe work practices.

Inadequate knowledge of ground disturbance hazards and controls.

Ergonomics and Manual Handling



Energy Sources



Unbalanced or uncentered materials or loads that are hard to grasp or may shift while being carried can cause the load to fall and potentially strike an employee.

Carrying loads that obstruct line of sight can lead to slips, trips, and falls.



Repetitive movements can cause overexerted muscles, joints, and soft tissue, causing injuries such as carpal tunnel syndrome, tendonitis, arthritis, or other conditions.

Awkward positioning of the body and its joints over time can cause wear and tear on the soft tissues.

Static body positions over long periods of time can put pressure on muscles and soft tissues and result in pain or injury.

The amount of force needed to complete a task can place strain on muscles and joints (e.g. pushing a heavy object).



Working in environments with increased noise stress can lead to inattention.



Cold temperatures can constrict blood vessels and reduce sensitivity and coordination, which may lead to slips, trips, and falls, dropped objects, burns, or cuts.

Hot environments can increase sweat production, making gripping and manipulating loads difficult, leading to increased force production or injury. Heat can also pose the risk of dehydration and heat illness.



Poor lighting can cause the eyes to work harder to see, resulting in eye strain, headaches, and tension.



Critical Risk Controls

- When lifting, pulling, carrying, or pushing, consider these factors:
 - Characteristics of the load
 - Surrounding environment
 - Body mechanics
 - Personal capabilities and limitations
- Do not lift more than 23 kilograms (50 pounds) without assistance
- When performing an ergonomic assessment of a task or workstation, remember the primary risk factors:
 - Awkward postures
 - Static positions
 - Excessive force
 - Movements that are frequently repeated

Human Performance Factors



Ignoring ergonomic principles (body positioning, repetitive activities, overexertion, not taking breaks, etc.) can create or contribute to aggravation of pre-existing ergonomic conditions and lead to musculoskeletal injuries (MSIs).

Pre-existing medical conditions that have potential to exacerbate or affect employee's ability to perform manual handling tasks such as lifting, pushing, pulling, and carrying.

Perceived time constraints could lead to lifting or manual handling being rushed or employees neglecting appropriate rest periods, increasing the risk of injury.

Hazardous Materials and Environments



Energy Sources



Exposure to radioactive materials without proper PPE can cause burns, radiation sickness, cancer, and death.



Exposure to hazardous chemicals can lead to health problems such as skin irritation, burns, sensitizations, heart ailments, kidney and lung damage, and cancer.

Inhalation of toxic gases such as chlorine, hydrogen sulfide, carbon monoxide, and weld fumes can lead to respiratory failure, lung damage, asphyxiation, and death.

Not containing hazardous chemicals and materials properly can result in unintended exposure, leading to injury or illness.

Improper labeling of hazardous chemicals or substances can lead to accidental ingestion, skin absorption leading to illness, or interaction with other chemicals or substances, resulting in fire or explosion.

Improper handling of corrosive, flammable, and combustible materials can lead to fire or explosion.



Critical Risk Controls

- Where possible, eliminate chemical use, or substitute more hazardous chemicals with safer ones
- Consider engineering controls for all chemical processes
- Develop and implement an Emergency Response Plan
- Confirm hazardous materials training for employees who may be exposed
- Properly store, handle, and dispose of hazardous materials
- Make Safety Data Sheets (SDS) readily available
- Verify labels on all storage vessels, containers, piping, and tanks. Properly label decanted products
- Provide employees with personal protective equipment (PPE) along with instructions on use, care, and limitations
- Monitor exposure where indicated

Human Performance Factors



Lack of proper emergency planning and response can complicate or worsen results of exposure to hazardous chemicals and materials.

Control of Hazardous Energy



Energy Sources



Items left in a raised or elevated position that are not secured against movement or release (such as a raised bucket on an excavator or a suspended load) can lead to crushing and struck-by injuries.



Energy stored in an item under tension (like a compressed or coiled spring) when unintentionally released may result in an individual being struck or crushed by the object.



Release of stored energy from a pressurized system containing liquid (such as hydraulic fluid) or gas can result in crushing or struck-by injuries.



Arc flashes release extreme heat that can vaporize metal in equipment.



Live electrical systems and energized equipment can cause electrocution, electric shock, and arc-flash burns and impacts.

Overhead power lines can result in electrocution when contacted, especially by ladders, drill rigs, cranes, excavators, and other tall equipment.

Underground utility strike from lack of or improper utility locates (location drawing and information), stacked utility services, cable loops, and faulty detection equipment.

Employees working outdoors can be exposed to lightning during weather events.

Incorrect wiring or a short in electrical equipment (such as power tools or extension cords) can create an electrocution hazard.



Critical Risk Controls

- Develop and implement a task-specific procedure, including an approved Lockout/Tagout plan.
- Identify all sources of energy and isolation points.
- Lock and tag energy sources. Lock keys are only accessible by those performing the work.
- Consider multiple energy source hazards and confirm zero energy state before starting work.
- Where lockout is not possible and a tagout plan is used, additional measures may be required to prevent unintentional operation.
- Identify and label all pinch points where body parts and equipment could be caught during the appropriate risk assessment process.
- Where lockout is not possible and a tagout plan is used, verify guards and barriers are in place and appropriate to the hazard and risk level present.
- Do not modify or alter any guards.

Human Performance Factors



Complacency of workers who routinely need to lock out equipment and fail to do so.

Failure to train staff or assign competent staff.

Hot Work



Energy Sources



Trip hazards from hoses can cause same-level falls.



Compressed gas cylinders can become projectiles if valves are broken in a fall or collision, or can explode if the tank overheats.



Certain hot work activities such as welding can create ultraviolet radiation, leading to eye injury.



Hot surfaces and welding equipment can lead to burns or fires. Unrestricted entry into work area by engine-driven equipment such as welding machines, generators, or vehicles can start a fire or can result in an explosion.



Flammable or combustible accumulations, spills, drips, or other releases can result in fire or explosions.

Flammable gas pockets may be present during drilling activities where grinding, cutting, or welding are present and lead to fire or explosion.

Hazardous by-products such as welding fumes or gases can lead to asphyxiation, fire or explosion, and toxicity or other illness.



Critical Risk Controls

- Identify type of hot work, and control flammable or combustible materials in the area
- Assess work by others that may present additional hazards
- Obtain a hot work permit
- Review the Emergency Response Plan and verify communications, tools, and control before beginning work
- Monitor the area for safe atmosphere throughout the hot work process
- Assign fire watch during hot work and for at least 30 minutes after all hot work is complete
- Stop work if conditions change

Human Performance Factors



Improper monitoring by competent fire watch personnel or not having a fire watch attendant on site.

Confined Spaces



Energy Sources



Slips, trips, or falls due to small entry and egress points; inability to position ladders for safe movement from level to level; slippery surfaces.



Flowing liquid or free-flowing solids can result in drowning, suffocation, burns, and other injuries.

Climbing into or out of confined spaces can lead to falls, being struck by an object, or injuries from unintended contact with structure walls or surfaces.



Noise produced in confined spaces can be amplified up to 10 times more than the same source placed outdoors, which can result in hearing damage.



Excessive heat due to the enclosed nature of a confined space can increase the risk of heat stress or heat stroke.



Spaces such as sewers may contain dangerous animals, insects, human waste, and other biological materials that can infect workers with a variety of diseases.



Hazardous atmospheres—such as flammable or explosive atmospheres, toxic atmospheres, or oxygen-deficient atmospheres—may lead to serious environmental effects, such as fire or explosion, or several health effects, including impaired judgment, unconsciousness, asphyxiation, and death.



Defective extension cords, welding cables, or other electrical equipment can result in electric shock or electrocution.

Failure to use GFCI in wet environment can lead to electrocution.



Critical Risk Controls

- Identify all hazards associated with the space and whether it meets permit-required criteria.
- Complete a job safety plan and a permit prior to entry.
- Make sure isolations are in place.
- Have an appropriate rescue plan in place, with equipment and trained employees readily available prior to entry.
- Confirm designated employees and contractors have appropriate training to perform confined space entry work.
- Vent and then verify the atmosphere prior to entry.
- Conduct appropriate air quality and meter function testing for hazardous atmospheres throughout any permit-required confined space entry.
- Verify two-way communication is established and tested.
- Restrict access to the space through signage and barricades.
- Check access and egress points. Plan for fall protection when access or egress is at an elevated height.



Human Performance Factors

Lack of knowledge, experience, and skills necessary to properly identify the workspace as a confined space.

Potential hazards not communicated or included in the plan or included in the rescue plan.

Keeping Ourselves and Others Safe



SaferTogether defines our HSSE culture at Stantec. Personal safety and the safety of others is always our first consideration; this mindset impacts the decisions and actions we take at work, at home, and in the community.

Preventing incidents takes discipline and consistency from everyone involved in a work activity. This means performing every task in a healthy and safe manner, every time. From initial planning activities, to daily hazard assessments and control, to post activity reviews—we must constantly monitor the work environment and be ready to respond to new hazards as conditions change.

HSSE Checkpoints

Be committed to your safety and the safety of those around you. Before starting any work activity, take note of and implement the following:

- **Hazard Recognition, Assessment, and Control (HRAC)**
Plan the work, discuss potential hazards and appropriate controls, confirm the workplan while onsite, and do a last-minute risk assessment.

- **Training and Competence**
Verify employees are appropriately trained and experienced for their tasks so they can effectively apply their knowledge and skills at the worksite.

- **Personal Protective Equipment (PPE)**
Select the right PPE for the task and associated hazards, wear it correctly, and care for it appropriately.

- **Stop Work Authority**
Stop work immediately when you become aware of an unsafe act or condition that could place anyone in danger or when you are not confident in the work plan.

- **Change Management**
If the planned activity or working conditions change, stop the job, reevaluate the risk and controls, and document the change.

- **Situational Awareness**
Be aware of your surroundings at all times and remember that working conditions can change at any time. Always take the time to work safely.

Identifying Energy Sources to Prevent Injury During Critical Risk Activities



Last-Minute Risk Assessment (LMRA)

This is not a form, but an important last step to check for potential hazards and determine if appropriate controls are in place before and during work.

- 1 Stop and Think**
Am I ready to work? Can I perform the task safely?
- 2 Look Around**
Are there any new hazards that were not addressed while planning the work?
- 3 Assess the Risk**
What are the potential impacts of the hazards?
- 4 Control the Risk**
Can I eliminate the risk? If not, are controls sufficient to keep myself and coworkers safe?
- 5 Begin/Resume Work**
Once I've evaluated the risk, I can begin or resume work.

