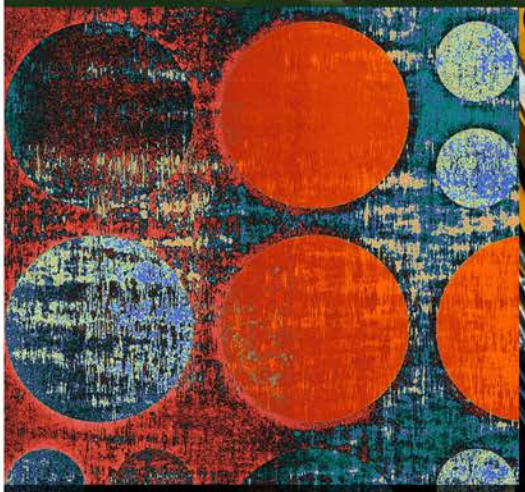

Public Works LOSS PREVENTION BEST PRACTICES GUIDE

MCIT
Minnesota Counties
Intergovernmental Trust

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Questions concerning this guide should be directed to MCIT Loss Control at 1.866.547.6516.

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02-2023

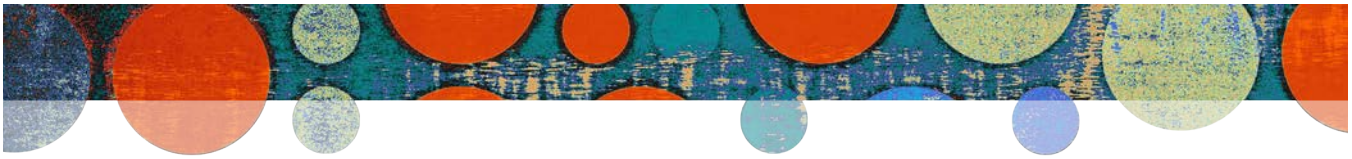
INTRODUCTION TO PUBLIC WORKS LOSS PREVENTION

1

INTRODUCTION

Many of the essential functions within a public works department carry various levels of risk. The nature of the work and the equipment used can sometimes expose people and property to harm. Keeping employees safe and property intact is a priority. This guide provides information and recommendations to help recognize and reduce the hazards of the job and protect public entities from liability and loss.

Each of the topics within this guide describes the safety exposures surrounding equipment and work tasks common in public works departments. Best practices are then outlined to help educate employees and reduce those exposures.



This guide is divided into two sections. The first section consists of topics that target specific equipment or work processes. Each topic is further divided into two sections: the narrative and a check list. The narrative describes hazards related to the topic and then offers guidelines or best practices to help recognize and reduce those hazards. The check list can be used as a targeted safety audit. It can quickly identify safety hazards and allow for action items to be developed to remedy the identified exposure.

The second section contains topics that outline policies and programs that should be in place as part of an overall safety program. These programs are required by OSHA and may need to be reviewed and updated annually or as needed. Each topic in this section is divided into a narrative and a checkup. The narrative outlines the components that are required in that specific safety program. The checkup is a list that can be used to determine quickly if all the components of the program are in place.

Consideration should be given to using any of the topics in this guide to initiate or augment regular safety talks ("Quick Takes" or "toolbox talks"). A Quick Take is a short discussion on one safety topic that is often held at weekly staff meetings. These discussions help give priority to safety and bolster previous training. The topics in this guide are presented with bulleted safety points that typically can be discussed within three to five minutes.

This guide does not provide resources to address liability arising out of human resources policies, insurance coverage, contracts or other nonemployee injury- or property damage-related exposures. These exposures are often specific to an organization and are not well-suited to a general guide.

Also, this guide does not cover pollution, pollution control or the Minnesota Pollution Control Agency's policies beyond including that additional requirements may be necessary. Beyond potential workers' compensation coverage, the MCIT Coverage Document excludes all liability claims resulting in bodily injury liability and/or property damage arising out of the actual, alleged or threatened discharge, dispersal, seepage, migration, release or escape of pollutants.

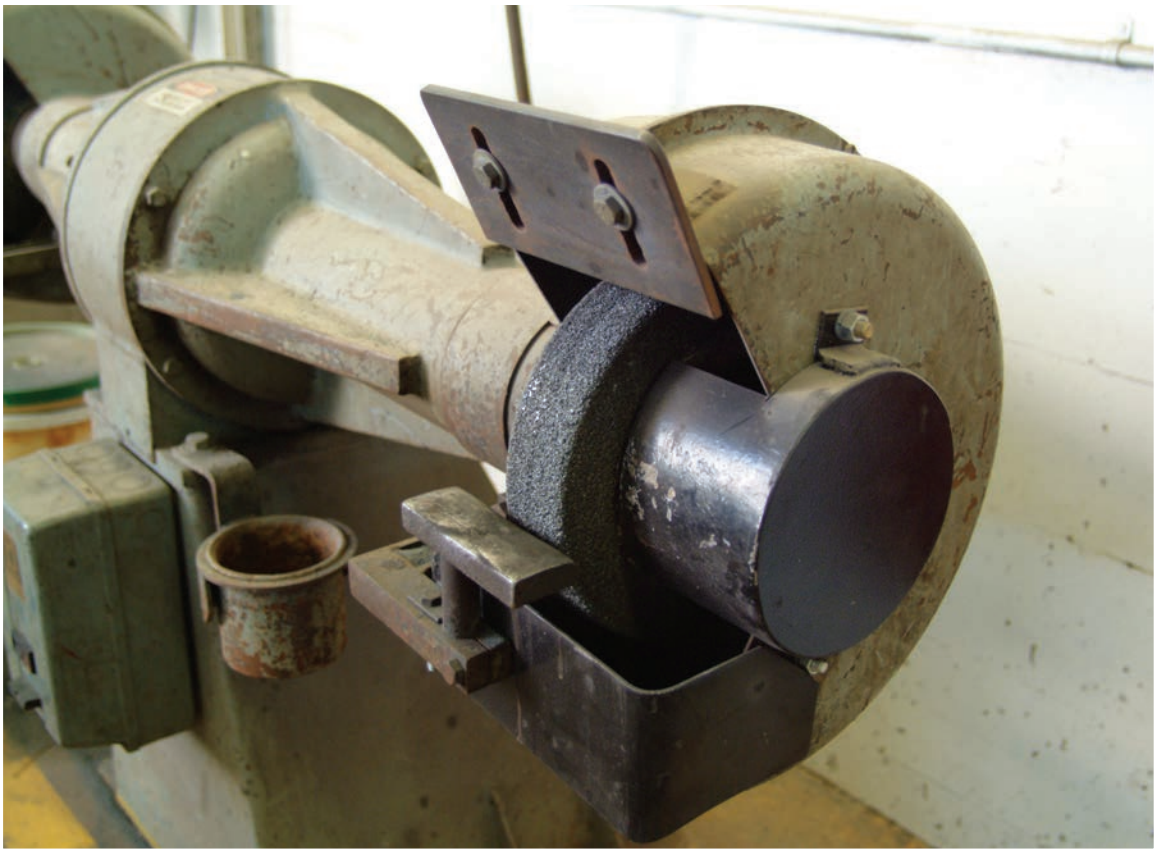
Members are encouraged to contact their MCIT risk management consultant for more information about the scope of MCIT coverage and exclusions, and other risk management questions.

ABRASIVE WHEEL GRINDERS

2

Abrasive wheel grinders come in many styles and sizes. Most commonly used in public works shops are fixed-position bench or pedestal grinders and portable grinders.

The wheels of these grinders operate at high speeds, often rotating at several thousands of revolutions per minute. Because of the speed of the rotating wheel, grinders can pose a significant hazard from projected debris. On rare occasions, the wheel itself may shatter, ejecting material at high speeds. Other hazards include contact with the moving wheel, burns, ignition of nearby combustibles, particle inhalation, noise and excessive vibration. These hazards can be mitigated with the following guidelines.



ALL ABRASIVE WHEEL GRINDERS

- Before replacing a vitrified or bonded adhesive grinding wheel, it should be visually inspected and given a ring test to determine if the wheel has cracks that could cause it to shatter. A solid wheel with no cracks will emit a ringing sound when tapped. When a wheel has imperfections, a dull thud will sound when it is tapped.
- Use flanges that are clean, flat and smooth, and have a diameter equal to or greater than one-third the wheel's diameter.
- Wheels should always be operated at speeds that do not exceed those set by the manufacturer.
- Only use the correct kind of wheel for the material to be ground.
- Before use, inspect grinding equipment for missing parts, visible defects and damage.
- Do not use a grinder until it has attained full speed.
- Avoid applying too much pressure to the grinding wheel.
- Do not use the side of the wheel for grinding unless it is specifically designed for this use.
- Wear proper personal protective equipment when using an abrasive wheel grinder. At a minimum, safety goggles, ear protection, protective gloves and a face shield should be worn during use. This protective equipment should be kept clean, in good condition and readily available. Depending on the work, aprons, safety boots or respiratory protection may be required.
- Gloves should not be worn when working close to the wheel. The spinning wheel could grab the glove and pull the hand into the grinder.
- Secure loose clothing that could get caught by the grinder.
- Keep the working area clean, well lit and free from obstructions. Check to make sure the work area is clear of flammable and combustible materials.
- When storing abrasive wheels, make sure they are protected from the environment and accidental damage.

PEDESTAL OR BENCH GRINDERS

- All pedestal and bench grinders should be permanently mounted. They should not move or fall over during use.
- Each electrically operated grinder should be effectively grounded and plugged directly into an electrical outlet or connected to the electrical supply through metal conduit.
- Each grinder should have its own on/off switch.
- Machine guarding should be in place and cover a minimum of 75 percent of the grinding wheel. In addition, there should be side guards that cover the spindle, end nut and flanges. Only a quarter of the wheel should be exposed and unguarded.
- To minimize hazards from undetected wheel defects or imbalance, stand to one side of the wheel until it has reached full speed.
- Grinding wheels should be equipped with a work rest adjusted so there is no more than a one-eighth inch maximum opening to prevent the work from slipping into the gap.
- Grinding wheels should be equipped with a tongue guard adjusted so there is no more than a one-fourth inch maximum opening to protect against ejected materials.

PORTABLE GRINDERS

- Right angle head and vertical grinders should have no more than half of the wheel exposed. The disk guard should be positioned between the user and the wheel, and deflect materials away from the body.
- Ensure the disk guard is positioned between the handle and wheel.
- Use both hands when operating the grinder.
- Do not clamp a portable grinder in a vise for use on hand-held work.
- Position yourself to avoid overreaching and overbalancing when using a portable grinder.
- Do not use a grinding wheel to cut material.
- Ensure working material is firmly positioned and will not move when the grinding wheel is applied. Some smaller materials may need to be held by a vise or other securing method. Do not hold materials in your hand when grinding with a portable grinder.
- Do not set portable grinder down until the wheel has come to a complete stop.

To mitigate repetitive motion injuries:

- Avoid continuous vibration exposure; take frequent breaks and consider using appropriate vibration-resistant gloves.
- Keep wrists as straight as possible.
- Minimize extent of reaching.
- Use a firm grip without excessive force.

Further safety rules and regulations regarding abrasive wheel grinders and their use can be primarily found in OSHA Standard 29 CFR1910.215, Abrasive Wheel Machinery.

PEDESTAL OR BENCH GRINDER CHECK LIST

ITEM	YES	NO	ACTION ITEM
Is the grinder permanently mounted without possible movement or tip over?			
Is the grinder effectively grounded and connected to the electrical supply with metallic conduit or other permanent wiring method?			
Does the grinder have its own on/off control switch?			
Is cleanliness maintained around the grinder? Is the work area free of flammables and combustibles?			
Are new abrasive wheels visually inspected and ring tested before they are mounted?			
Is the maximum revolutions per minute (rpm) rating of the abrasive wheel compatible with the rpm rating of the grinder motor?			
Do side guards cover the spindle, nut and flange, and 75 percent of the wheel diameter?			
Is the work rest used and kept adjusted to within one-eighth inch of the wheel?			
Is the adjustable tongue on the top of the grinder used and kept adjusted to within one-fourth inch of the wheel?			
Is personal protective equipment readily available and in good, clean condition? This may include safety goggles, face shields, ear protection, aprons, safety shoes or respiratory equipment, depending on work performed.			

PORTABLE GRINDER CHECK LIST

ITEM	YES	NO	ACTION ITEM
Does the abrasive wheel fit firmly around the grinder spindle?			
Is the abrasive wheel attached to the grinder spindle with the correct flanges, backing plate and locking nut?			
Is the power supply (electric or pneumatic) compatible with the requirements of the grinder?			
Is the abrasive wheel rated for the maximum possible speed of the grinder?			
Are guards and handles in place, secure and positioned between the wheel and user?			
Does the guard cover a minimum of 50 percent of the abrasive wheel circumference?			
Is the abrasive wheel clean and free of visible damage?			
Is the grinder's outer body and power cord or air hose free of visible defects, missing parts or damage?			
Is personal protective equipment readily available and in good, clean condition? This may include safety goggles, face shields, ear protection, aprons, safety shoes or respiratory equipment, depending on the work performed.			

AERIAL LIFTS

3

Not all tasks can be done from the ground. Aerial lifts are often used to reach inaccessible areas overhead and are equipped with some sort of platform or bucket to move people and equipment to these areas. Due to the nature of their operation, aerial lifts pose safety risks that should be understood and addressed.

Many of the risks associated with lifts occur when they are raised. Tip overs, falls, contact with objects and electrocution are some of the more common hazards related to aerial lift operation. In addition, without proper restraint, ejection from the bucket or platform can occur at any height if the lift is jarred during movement.

Employees should be trained specifically on each lift they use, understand the hazards and always conduct pre-start inspections.

PRE-START INSPECTIONS

Before using an aerial lift, two separate inspections should always be performed. The first is an equipment check. Function controls, fluid levels and warning devices are just some of the items that should be checked before use. Employing a pre-use check list would help ensure a more thorough and documented inspection.

The second inspection is a site inspection. It should be conducted before operating in an area. Ruts, slopes, unstable ground and debris can create conditions that adversely affect the stability of the lift and should be avoided or addressed.

OTHER SAFETY POINTS

- Always keep feet on the floor of the platform or bucket; do not lean over or climb on guardrails.
- Never use ladders or other equipment to further extend your height from the lift platform.
- Always use fall restraint/arrest protection equipment that is attached to an identified location on the boom or bucket, not other structures outside the platform. A body harness should be worn and connected as soon as you or any other worker enters the platform or bucket. Note: This safety point applies to all aerial lifts with the possible exception of scissor lifts. Please see notation below concerning fall protection with those lifts.
- Always have a thorough understanding of the specific load capacity, wind tolerance, reach and other limitations of the lift to be used. Do not exceed these limits.
- If used outdoors, always be aware of weather conditions that could adversely affect lift operation.
- Always be aware of what is in the travel path of the lift. Avoid electrical lines and other objects into which the lift or you could collide. Always be aware of your overhead clearance.
- Never use aerial equipment in place of a crane to lift materials. Ensure loads are not larger than the platform or bucket.
- Never travel with the lift raised more than what is given in the manufacturer's instructions.
- Never travel with someone in the elevated bucket or platform unless the equipment is specifically designed for that use.
- If the aerial lift has both platform controls and lower level controls and the worker is on the platform, the lower controls should not be operated without express consent from the worker, except in an emergency situation.
- Always ensure that the lift is stable before beginning work. If equipment has outriggers, they should be positioned on a solid, level surface, and the brakes should be set.
- If operations require the lift to be positioned on an incline, wheel chocks must be used, provided they can be safely installed.

SCISSOR LIFTS

Falling from any aerial lift, including scissor lifts, is a risk that should always be addressed and mitigated. However, OSHA does not require employees to be tied off when using scissor lifts as long as protection is provided by standard guardrails. It would still be prudent to employ restraint protection when working near or leaning on the guardrails.

Further safety rules and regulations regarding aerial lifts can be primarily found in OSHA Standard 29 CFR1910.67, Vehicle-mounted Elevating and Rotating Work Platforms.

AERIAL LIFT CHECK LIST

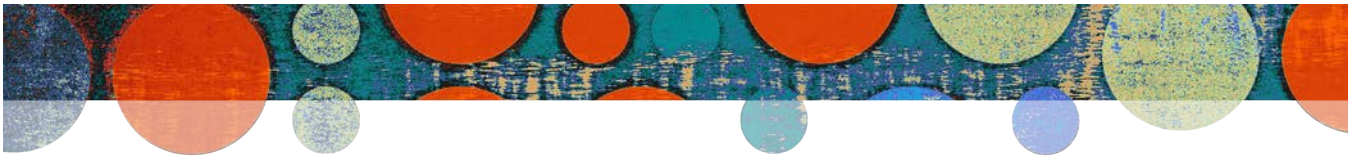
ITEM	YES	NO	ACTION ITEM
Are employees trained on the operation of the specific aerial lift before they operate it?			
Is there an inspection of the components and functions of the aerial lift before use?			
Is a check list used to help ensure a complete pre-start inspection?			
Are areas of operation inspected for features that could adversely affect the stability, operation or safety of the aerial lift?			
Are aerial lift operators required to wear and attach fall restraint/arrest equipment anytime they enter and use the platform or bucket?			
If operating a scissor lift, are all guard rails intact and is the entry door locked shut before use?			

APPLIANCES

4

APPLIANCES

Just as vehicles need fuel to operate, so it seems many people need coffee to get going. Unlike most coffee makers at home that are mainly used only for a short time, the coffee maker in the break room may be in continuous use during the work day. In addition, other appliances are used regularly: refrigerators, microwaves, toasters, etc. As with other equipment, appliances should be assessed from the perspective of safety.



Accidental fires and electrocution are among the most common safety hazards associated with appliances. However, members can take steps to reduce these hazards:

- Use only commercial grade UL* or another nationally recognized testing laboratory approved appliances. Residential grade appliances are not made to stand up to the use typically found in work settings.
- Ensure appliances have grounded plugs or are double insulated to reduce the risk of people being shocked.
- Plug appliances that use liquids into ground fault circuit interrupter (GFCI) outlets. These protected circuits are designed to cut off power when a disturbance in current is detected, which could signal possible electrocution.
- Plug appliances located within 6 feet of a water source or in areas where there could be wet floors or surfaces into a GFCI protected outlet.
- Plug appliances directly into wall outlets, not into extension cords or power strips.
- Unplug appliances that incorporate heating elements at the end of the work day.
- Immediately remove or repair appliances when there are signs of component damage.
- Locate appliances incorporating heating elements in designated break room areas on a laminated or metal surface away from combustible materials.
- Ensure that space heaters have a high-temperature shutoff device, have built-in tip over protection, and are positioned away from flammable and combustible materials.

Always follow the manufacturer's guidelines for the safe use of all appliances. If your organization has implemented an appliances in the workplace policy, follow those procedures and guidelines.

In addition to the precautions above, employees should not store, prepare or consume food and beverages in areas where toxic chemicals are used or stored.

Further safety rules and regulations regarding appliances and other electrical equipment can primarily be found in OSHA Standard 29 CFR1910.303, Electrical, General.

*UL is an independent safety science company.

APPLIANCES CHECK LIST

ITEM	YES	NO	ACTION ITEM
Are appliances UL or another nationally recognized testing laboratory approved and of commercial grade?			
Do all appliances have grounding, three-prong plugs?			
If not, are they double insulated?			
Are appliances that use liquid or are located near water sources plugged into ground fault circuit interrupter (GFCI) circuits?			
Are appliances plugged directly into outlet receptacles (not power strips or extension cords)?			
Are appliances that use heating elements (coffee pots, toasters, etc.) unplugged at the end of each work day?			
Are appliances that use heating elements located in a designated break room area on a non-combustible surface?			
If space heaters are used, do they have high-temperature shutoff devices, have tip over protection, and are located away from flammable and combustible materials?			
Are appliances showing signs of component damage (sparking, damaged plugs or cords, etc.) removed from service until repaired or replaced?			

BONDING AND GROUNDING

5

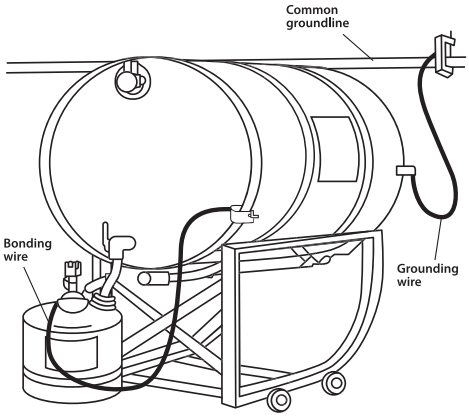
When certain liquids are agitated, poured or pumped, a static charge can build. The greater the amount of liquid and the faster the flow or agitation, the more a charge can build. If this liquid is flammable and releases vapors in a flammable range, the discharge of static in the form of a spark can create a tragic explosion. If flammable materials are transferred from container to container, they may need to be bonded and grounded.

REDUCE HAZARDS

By bonding and grounding containers used in the transfer of flammable liquids, any static charge that builds during agitation or flow will be directed harmlessly to the earth.

If you transfer flammables with flash points less than 100 degrees, the following bonding and grounding procedures should be observed:

- The bulk containers should have a metal-to-metal connection with an earth ground that uses a grounding wire. Screw-type clamps or other more permanent connections are often used for this.
- When connecting grounding and bonding wires, confirm metal-to-metal contact. Paint or rust can block the flow of electrical energy.
- The earth ground should be tested to make sure it is truly grounded. Certain piping may not have a continuous path to a ground.
- Although multiple bulk containers can be grounded in series, it is best to ground each individually. This reduces the chance of a poor connection at any junction in the series.
- When transferring liquid between the bonded container and a portable safety can, there should be a metal-to-metal connection with a bonding wire. This wire is often attached with spring-type clamps.
- If using polyethylene safety containers, the grounding connection should still be utilized. Most approved polyethylene safety containers have a grounding lug for this connection.
- Periodically inspect wires and connections to assure grounding will not be interrupted.
- All portable safety cans used in the transfer must be:
  - An approved container recognized by a nationally recognized testing laboratory.
  - No more than a 5 gallon capacity.
  - Have a flash arresting screen.



  - Have a spring-closing spout cap designed so it will safely relieve internal pressure when exposed to heat.

Further safety rules and regulations regarding bonding and grounding can be found in OSHA Standard 29 CFR1910.106(e)(6)(ii), Flammable Liquids; and the Minnesota State Fire Code.

BONDING AND GROUNDING CHECK LIST

ITEM	YES	NO	ACTION ITEM
Are all bonding cables and clamps in good condition?			
Do all bonding clamps have good metal-to-metal connections?			
Are all grounding wires securely attached to an earth-connected ground?			
Are metal portable cans bonded to dispensing drum when transferring flammable liquids?			
Is this connection made on a metal-to-metal contact?			
Are plastic portable cans bonded to dispensing drum when transferring flammable liquids?			
Are portable safety cans approved for use with flammable liquids?			
Approved Containers			
Are they recognized by a nationally recognized testing laboratory?			
Do they have a capacity of no more than 5 gallons?			
Do they have a flash arresting screen?			
Do they have a spring-closing spout cap designed so they will safely relieve internal pressure when exposed to heat?			

CARBON MONOXIDE

6

Carbon monoxide (CO) is a colorless, odorless gas that is a byproduct of burning fuel. Exposure to low levels of carbon monoxide can cause flu-like symptoms, such as headaches, weakness and dizziness. Higher levels or prolonged exposure can cause tissue or brain damage and potentially death. A common myth is that carbon monoxide sinks in air. It is actually slightly lighter than air and spreads normally throughout the room.

In Minnesota, risk increases in the winter because buildings are sealed to keep out the cold. Careful attention must be paid to the exhaust from vehicles and other fuel-burning equipment so that CO levels do not rise to hazardous levels.

MINNESOTA RULES

Minnesota Rule 5205.0200 states that any repair garage that houses six or more vehicles driven by internal combustion engines must abide by the following:

- Incorporate a ventilation system that can remove three-fourths of a cubic foot of air a minute per square foot of the floor area in garages and replaced with a tempered fresh supply of air.
- Place ventilation exhaust ducts no more than 18 inches above the floor and locate them to be able to remove carbon monoxide gas from the entire garage.
- When servicing running vehicles, exhaust must be discharged outside via duct or flexible hose or connected to a mechanical exhaust system.
- Inspection and repair pits require a ventilation system that can perform 12 complete air changes per hour.

If propane or other internal combustion-powered industrial trucks are used indoors, Minnesota Rule 5205.0116 requires:

- Quarterly air monitoring tests during a time of high usage where carbon monoxide exposure is most likely.
- Tailpipe exhaust gas analysis to ensure carbon monoxide emissions are below stated thresholds.

In addition to the Minnesota rules for ventilation and testing, employers should consider the following to help keep carbon monoxide levels below the threshold:

- Ensure ventilation intakes are not blocked. Even if materials are not directly in front of intake vents, they can still limit air flow if positioned too closely together nearby.
- Install CO detectors with audible alarms. Household detectors may alarm at CO levels above required workplace limits and typically cannot be calibrated. Installed CO monitors should be capable of calibration.
- Inventory gas-powered equipment and operate them outside whenever possible. If running equipment inside, ensure adequate ventilation.
- When operating gas-powered equipment outside, take care to stay clear of the building's fresh air intake vents.
- Keep equipment tuned and well-maintained.
- Ensure employees know the warning signs of carbon monoxide exposure.

Further safety rules and regulations regarding carbon monoxide can be primarily found in OSHA Standards 29 CFR1910.134, Respiratory Protection, and 29 CFR1910.178, Powered Industrial Trucks. See also Minnesota Rules 5205.0200, Garage Ventilation, and 5205.0116, Carbon Monoxide Monitoring.

CARBON MONOXIDE CHECK LIST

ITEM	YES	NO	ACTION ITEM
Does the garage bay house six or more vehicles when servicing?			
If yes, does the ventilation system move three-fourths of a cubic foot of air a minute per square foot of the floor area?			
When servicing vehicles indoors, is the exhaust discharged outside via duct or flexible hose, or connected to a mechanical exhaust system?			
Are service or repair pits equipped with a ventilation system that can perform 12 complete air changes per hour?			
If propane or other internal combustion-powered industrial trucks are used indoors, are quarterly air tests performed?			
If propane or other internal combustion-powered industrial trucks are used indoors, are tailpipe exhaust gas analyses performed to assure levels are below thresholds?			
Is all gas-powered equipment operated outside or with proper ventilation inside?			
When run outside, is gas-powered equipment positioned away from air intake vents?			
Are calibrated commercial-grade carbon monoxide (CO) monitors with audible alarms installed in areas with CO exposure?			
Is gas-powered equipment regularly tuned and maintained to help reduce carbon monoxide emissions?			
Are indoor air intake vents clear of materials that may impede air flow?			
Are employees trained to understand the symptoms of carbon monoxide exposure?			

CHAIN SAW USE

7

Felling trees while using a chain saw can expose employees to danger. Exposures include being struck by the tree and branches, lacerations and loss of hearing. Often, these accidents are severe. Employees must be trained on chain saw use, wear appropriate protective equipment and keep the equipment in good, working condition. Occupational Safety and Health Administration (OSHA) logging operations standards must also be followed, even if employees are simply trimming and clearing branches and brush.

TRAINING

Before using a chain saw, employees must be formally trained in hazard recognition, and the safe use, operation and maintenance of tools, machines and vehicles. This is OSHA-required training and should be recorded and retained.

First Aid and CPR Training

Every employee in the area where chain saws are in use must be trained in first aid and be CPR certified. In addition, there must be first-aid kits at each work site and in each vehicle. The number of first-aid kits and the contents of each kit should reflect the number of employees and the hazards reasonably anticipated at the work site.

OSHA requires a minimum amount of materials in these first-aid kits. This list of first-aid materials can be found in chapter 33, First-aid, CPR Training and Kits, and OSHA Standard 29 CFR1910.266, Logging Operations.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Essential to the safe operation of a chain saw, the following clothing and personal protective equipment should be worn, depending on the specific hazards to which the employee is exposed.

- Clothing should be close fitting with no loose material.
- Gloves must be made of a material that is cut and puncture resistant. Gloves offer a good grip on the chain saw and absorb some of the vibration, as well as offer protection for hands. Gloves also help prevent cuts when sharpening the saw.
- Leg coverings must be made of cut-resistant material, such as ballistic nylon, that covers the full length of the thigh to the top of the boot on each leg.
- Footwear must be made from cut-resistant materials that offer protection from contact with running chain saws. They should cover and support the foot and ankle, be waterproof or water repellent and offer traction for the type of terrain.
- Other PPE to be used includes eye/face protection, such as safety glasses with side shields and a face shield; hearing protection, for example ear muffs or ear plugs; and head protection, such as a hard hat.

CHAIN SAW OPERATION

Before Startup

- Inspect chain saw controls, bolts and handles, and adjust according to the manufacturer's instructions. Inspect the chain saw for loose, damaged or broken parts, as well as nicks or dents to the bar. If defective, remove the chain saw from service and tag it as "Out of Service, Do Not Use."
- Maintain a sharpened chain and proper chain tension.
- Check the chain to make sure it does not move when the engine is idling and adjust as necessary.
- Clear the area of obstacles that could interfere with cutting a tree or the retreat path.
- When felling a tree, consider the terrain and surroundings before starting a cut. Traffic, overhead lines and people should all be clear of the drop zone.
- No person should be allowed within two tree lengths of the person felling a tree.
- Have a preplanned escape route when felling a tree. This route should be 45 degrees away from the projected fall of the tree and clear of obstacles.

At Startup

- Keep others at a safe distance from the work area.
- Ensure chain brake is in place and operational.
- Start the chain saw by placing it on the ground. Never "air drop" or start a chain saw in midair.
- Maintain secure footing while operating a chain saw.
- Maintain a firm, two-handed grip of the chain saw.
- Never stand directly behind a cut. Stand at an angle to the chain saw.
- Be prepared for kickback and brace or position yourself accordingly.
- Shut off and engage the chain brake whenever the chain saw is to be carried more than 50 feet or across hazardous terrain.

During Operation

- Saw only with the bottom part of the chain, nearest the engine, with the work against the saw or saw bumper. Avoid contact with bar tip.
- Remove any broken or dead limbs that could fall before cutting the tree.
- Do not operate above shoulder height.

- If a chain saw stalls mid-cut, remove the saw blade before attempting to restart the chain saw.
- When cutting limbs from a felled tree, stand on the opposite side of the tree trunk.
- Trees may have internal tension that could cause them to spring outward when cut. Make small cuts on spring poles or branches from the underside.
- A backcut and an undercut must be used when felling a tree.
- Trees and branches may be loaded by snow and react unpredictably when cut.

Refueling

- Always make sure the engine is off when refueling. Allow the engine to cool before refueling.
- Slowly release pressure when opening gas cap.
- Always refuel in a well-ventilated place and away from any sources of ignition.
- Promptly clean up any spilled fuel.

After Use

- Clean chain saw according to the manufacturer's instructions. Always unplug the spark plug before cleaning to help prevent accidental startup.
- Store chain saw with chain bar covered by the sheath or holder made for that purpose.

Further safety rules and regulations regarding chain saw use can be primarily found in OSHA Standard 29 CFR1910.266, Logging Operations.

CHAIN SAW CHECK LIST

ITEM	YES	NO	ACTION ITEM
Is the chain saw operator trained in hazard recognition; in addition to the safe use, maintenance and operation of a chain saw?			
Is the chain saw operator trained in first aid and CPR?			
Are first-aid kits containing OSHA-required materials at each work site and in each vehicle used during logging operations?			
Is the chain saw operator required to wear eye/face, ear, hand and head protection, as well as cut-resistant footwear and leg coverings?			
Is the chain saw inspected before each use?			
Is the chain sharpened, lubricated and maintained at the correct tension?			
Does the operator use proper start-up methods?			
Does the operator start the chain saw on the ground and never air drops to start?			
Is the work site inspected for hazards that may affect the operation? Overhead hazards, rotted material, limbs under tension, etc.			
When felling a tree, is there always a preplanned escape route, and is the area clear of others?			
Is the chain saw off and allowed to cool before refueling?			
Is the chain saw refueled in a well-ventilated area away from ignition sources?			
Is the chain saw cleaned according to the manufacturer's instructions after use?			
Is the chain bar sheathed when chain saw is not in use?			

COMPRESSED AIR

8

AIR COMPRESSORS AND RECEIVERS

Air compressors create high-pressure air stored in receivers for use when operating pneumatic and cleaning tools. Proper care and maintenance are necessary to help prevent injury from vessel ruptures, explosions, entrapment and noise.

Most air compressors used in public works buildings are required to be registered and certified with the State of Minnesota. As a part of certification, pressure vessels require an inspection once every two years.

MCIT provides members equipment breakdown coverage through a partnership with Hartford Steam Boiler (HSB). As part of this coverage, HSB conducts jurisdictional inspections per state requirements at no charge to members.

REDUCE COMPRESSOR FAILURE AND INJURY

In addition to these once-every-two-years inspections, the following recommendations should be considered to help reduce the chance of compressor failure or injury:

- Air receivers should be drained frequently to prevent accumulation of water and oil inside the tank.
- Pressure relief valves and pressure gauges should be regularly inspected and tested to make sure they are in good working condition.
- Inlet filter cartridges should be inspected and cleaned or replaced per the manufacturer's specifications.
- Periodic inspection of the air receiver should be conducted to detect leaks or corrosion.
- Air hoses should be checked for signs of deterioration.
- The compressor should be oiled and lubricated according to the manufacturer's directions.
- Belt drive systems should be completely enclosed to protect against contact with moving parts.
- If the compressor has an automatic starting feature, a sign should be posted nearby that states, "Warning: Compressor starts automatically."
- When working on or near air compressors, eye and ear protection should be worn.

COMPRESSED AIR USE

Compressed air is used to run various types of equipment and for cleaning. However, compressed air can pose risks if used improperly.

Compressed air is a concentrated stream of air at high pressure and when released at high speed, can cause serious injury to the operator or those nearby. Potential injury can occur:

- When particulates are ejected during cleaning and become embedded under the skin, in wounds or other open areas, such as eyes and ears.
- When compressed high-speed air is directed at yourself or another person, it can cause damage to eyes or eardrums. It can even create air bubbles in the blood when released near the skin.
- From exposure to excessive noise, causing hearing loss.
- When the compressed air line becomes loose or damaged and whips around uncontrollably.

To operate effectively, most pneumatic tools, including air guns, require air lines to operate at pressures of 80 to 120 pounds per square inch (psi). However, the Occupational Safety and Health Administration (OSHA) requires that if the end of the air gun is blocked, the static output pressure at contact must be no greater than 30 psi. This is to protect employees who may come in contact with the tip of the equipment.

If an air pressure reducer is not incorporated in line, then air guns used for cleaning purposes must come equipped with a relief device that will drop the pressure to under 30 psi if the air system becomes dead ended.

Other ways to mitigate the risks of compressed air:

- For cleaning purposes, air guns must be equipped with chip guarding to help prevent chips, shards and other particulates from flying back toward the operator. These chip guards may be incorporated into the nozzle of the air gun or a safety shield may be attached to the equipment. Further protection may be required in the form of barriers, baffles or screens to protect other workers near the operator if they are exposed to flying chips or particles.
- Proper protective equipment should be worn when cleaning with compressed air. Goggles or a face shield should be worn over safety glasses to protect against flying particles. Appropriate gloves should be used to protect the operator's hands.
- Hearing protection should be provided through the use of personal protective equipment and/or noise-reducing air guns.
- Never use compressed air to clean dirt and dust off clothing or a body.
- Never direct the stream of compressed air toward another person.
- Ensure all hoses and components are rated to handle the supplied pressure from the compressor. Never use PVC for compressed air.
- Check air hoses and connections periodically for damage. Use only clamps designated for compressed air hose, and make sure they are tightened and secure and designed for the pressure to which they are subjected.
- Avoid allowing air hoses to lie on the floor where someone could trip on them or where they could be damaged by closing doors, vehicles or other equipment.
- Before making hose connections, make sure to shut off and relieve hose pressure. Do not crimp, couple or uncouple pressurized air hose.

Further safety rules and regulations regarding compressed air use can be primarily found in OSHA Standards 29 CFR1910.242(b), Hand and Portable Power Tools and Equipment; and 29 CFR1910.169, Air Receivers.

COMPRESSOR AND COMPRESSED AIR CHECK LIST

ITEM	YES	NO	ACTION ITEM
Is compressor registered, inspected and currently certified per State of Minnesota requirements?			
Is compressor equipped with functioning pressure relief valve(s) and pressure gauge(s)?			
Are all safety valves and devices tested at regular intervals to determine whether they are in good operating condition?			
Is compressor operated and lubricated in accordance with the manufacturer's directions?			
Are air filters installed on the compressor intake and periodically checked and cleaned when necessary?			
Is the belt drive system completely enclosed to provide protection on all sides?			
Is the compressor air receiver periodically drained of moisture and oil?			
Is a sign posted to warn of the automatic starting feature of compressor (if it has one)?			
When using compressed air for cleaning, is pressure reduced to no more than 30 psi when dead ended?			
Are relief tips in use?			
Are compressed air tools that are used for cleaning chip guarded?			
Are compressed air hoses and connections secure and free from damage?			
Are compressed air hoses used and stored in a manner to prevent trip hazards and damage?			
Are employees who are using compressed air tools wearing appropriate personal protective equipment, such as eye and ear protection?			

ELECTRICAL

9

Electrical incidents can cause serious injury, including burns, shock or death. In addition, they can cause fires and damage equipment. It is important not only to work safely around electricity, but also to make sure electrical equipment is sound and used in the correct manner.

ELECTRICAL WORK

- All employees who work with electricity must be trained, licensed and authorized for the work being done.
- Ensure that all equipment is de-energized and properly locked out prior to beginning work. Any equipment should be verified with appropriate test equipment to ensure that hazardous energy has been eliminated. Nearby equipment may still be energized; those working on electrical systems should identify energized and de-energized lines near the work area with which they could come in contact. See chapter 37 Lock Out/Tag Out for more information.
- A shock risk assessment should be conducted on new or existing electrical equipment prior to conducting work. This assessment should identify hazards, estimate the likelihood of shock and determine any necessary personal protective equipment requirements. The results of the assessment should be documented.
- Be aware of the risk of arc flashes. An arc flash is an unplanned electrical discharge passing between conductors or from a conductor to ground resulting in an explosive effect capable of ejecting heated gases or molten metal fragments in an area around the flash.
  - An arc flash risk assessment should be conducted prior to work on electrical equipment. This assessment should identify hazards, estimate the likelihood of occurrence and potential injuries, and determine any necessary personal protective equipment requirements. The results of the assessment should be documented.
  - Establish safe working boundaries and prevent others from entering. Arc flashes can cover a wide area depending on the current and voltage. Nonqualified persons should be trained to avoid approaching energized equipment during maintenance.
- When working with electrical equipment, use insulated or nonconductive tools to reduce the risk of arc flashes and electric shock.
- Use appropriate personal protective equipment for the work being done. This may include arc-rated clothing, gloves, insulated tools, arc-rated face shields or balaclavas and hearing protection.

ELECTRICAL PANELS

- The electrical breaker panel should be easily accessible at all times in the event of emergency. A clear space of not less than 36 inches deep and 30 inches wide (or the width of the electrical equipment) should be maintained. One method of maintaining this clear space is either to tape or paint a stripe on the floor around the electrical panel to mark the above dimensions. There should also be a clear, direct path to the panel.
- The panel should have a closed cover. The panel cover should be able to open at least 90 degrees without obstruction.
- The panel should have an index identifying each individual circuit breaker. The labels should be legible and easily understood. This index is typically found on the inside face of the cover.
- There should be no other openings or missing knock-out plugs on the panel box that would allow contact with the inside wiring.
- There should be no missing breakers or other openings in the faceplate that would allow contact with panel wiring.
- When tripping or resetting breakers, employees should face away from the panel and trip the breaker with an outstretched arm. While arc flashes are rare, this precaution helps mitigate potential injury.
- If the electrical panel has not been inspected in the past 10 years, it would be prudent to have a certified electrician check the equipment to ensure that circuit breakers, fuses and switch gears have no corrosion, evidence of arcing, excess wear or damage.

EMERGENCY DISCONNECTS

- Access to emergency disconnects must remain clear and accessible for people to disconnect the power in the event of an emergency. A best practice would be to maintain a clear area 36 inches in front of and 30 inches wide around the disconnect switch (similar to electrical panels).
- Avoid hanging objects on disconnect switches; switches must be clearly visible.
- Disconnect switches should be capable of accepting a lock to properly lock out a piece of equipment.

OUTLETS

- Outlet receptacles should show no signs of electrical burns or other damage. They should be secure in their electrical box and fully covered with a faceplate to protect against accidental contact with a “hot” wire.
- Outlets should be GFCI (ground fault circuit interrupted) if located near water or a water source. The Occupational Safety and Health Administration (OSHA) requires GFCI protection in bathrooms, rooftops, and other locations where water may pose a danger when using equipment plugged into the outlet. A GFCI-protected outlet or circuit quickly

opens the circuit, cutting power, when a minute change of current difference is detected. GFCI outlets should be tested periodically.

- Outdoor and wash bay outlets should be protected against water by being equipped with a splash-proof cover.

EXTENSION/POWER CORDS

- Extension cords are to be used for temporary work only. They are not meant to be used as a permanent source of electricity.
- Use extension cords that are the correct size or rating for the equipment. The diameter of the extension cord should be the same or greater than the cord of the equipment in use.
- Only use electrical cords rated for outdoor use when using a cord outside.
- Keep electrical cords away from areas where they may be pinched and areas where they may pose a tripping or fire hazard.
- Only use electrical cords with the grounding pin (round prong below two flat prongs on a plug) intact. The grounding pin should never be removed.
- Electrical cords should be inspected before use to ensure that insulation is not cut or damaged. Discard damaged cords, cords that become hot or cords with exposed wiring.
- Extension cords that are 12 gauge or larger may be repaired only if spliced so that the splice retains the insulation, outer sheath properties and usage characteristics of the cord being spliced.
- Do not unplug an electrical cord by pulling on the cord; pull on the plug.
- Consider using a cord strain relief device on areas of the cord that are under tension.
- Extension cords should be UL or another nationally recognized testing laboratory approved for their intended uses.

TROUBLE LIGHTS

Using trouble lights to illuminate work under vehicles can present several fire hazards. Leaking fuel vapors may accumulate in high concentrations in an unventilated service pit and ignite with a spark generated when an electric cord is plugged into or unplugged from a receptacle on the trouble light itself. A spark caused by an arc of a light's metal shield contacting the vehicle's electrical system could also ignite fuel vapors. Fires can be caused by flammable liquid dripping onto a hot incandescent bulb.

To mitigate these fire exposures, trouble lights used under vehicles should include the following features:

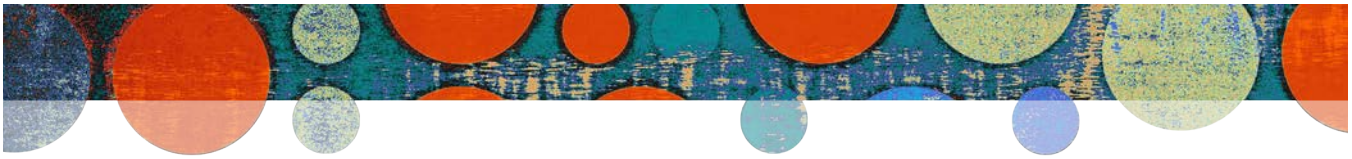
- Enclosed light bulb
- Nonmetallic shield
- Nonsparking electrical switches
- No outlet receptacles

ROADSIDE POLES AND ELECTRICITY

Many roadside poles use electricity, whether they support lights, traffic signals, utility transmission lines or transformers. When damaged or downed, these may pose hazards to public works drivers or road crews. When encountering downed or damaged power transmission lines, workers should contact emergency services and the appropriate utility to de-energize the line and restore service. Prior to repairs, the public should be prevented from approaching the location.

For light poles or traffic signals, the relevant organization should be contacted and extreme care should be taken when moving downed poles out of roadways to avoid contact with electrical wiring. Employees should be made aware of and trained about safe work practices involving energized lines and poles.

Further safety rules and regulations regarding electrical equipment can primarily be found in OSHA Electrical Standards 29 CFR1910.303, Electrical, General; 29 CFR1910.304, Wiring Design and Protection; 29 CFR1910.305, Wiring Methods, Components and Equipment for General Use; and Minnesota Department of Labor and Industry publication "Licensing Requirements for Employees Performing Electrical Maintenance Work on an Employer's Premises."



ELECTRICAL CHECK LIST

ITEM	YES	NO	ACTION ITEM
Electrical Work			
Are employees working on electrical equipment trained, licensed and authorized?			
Are electrical devices de-energized and locked out prior to maintenance per lock out/tag out instructions?			
Are these conditions verified with appropriate testing equipment and are other nearby energy sources tested that employees could contact?			
Has a shock risk assessment been conducted and documented on the electrical equipment prior to conducting work?			
Are employees working on electrical equipment aware of the risks of arc flashes?			
Are appropriate boundaries established when the risk of arc flash is present?			
Is staff trained not to cross the barrier without authorization and appropriate protective equipment?			
Are tools insulated or nonconductive when working on electrical equipment or systems?			
Is the appropriate personal protective equipment available for use when working on electrical equipment or components?			
Electrical Panels			
Is the area in front of electrical panels clear of materials to a distance of 36 inches and 30 inches wide or the width of the panel while maintaining a clear, direct path to the panel?			
Does the panel have a closed cover?			
Does the panel identify each breaker with its corresponding coverage area?			
Is the panel free of openings exposing electrical components? This includes missing breakers or knock out plugs.			
Emergency Disconnects			
Are electrical disconnect switches and the area around them clear and unobstructed?			
Are emergency disconnects free of hanging objects?			

CONT. ELECTRICAL CHECK LIST

Outlets			
Are outlets free of damage and fully covered with a secure faceplate?			
Are other electrical enclosures, e.g., junction boxes and switches covered with tight-fitting plates?			
Are outlets within 6 feet of water sources or in wet areas GFCI protected?			
Are outdoor and wash bay outlets GFCI protected and equipped with splash-proof covers?			
Are all GFCI-protected outlets tested periodically?			
Electrical Cords			
Are extension cords used for temporary work only (not in place longer than 90 days, not attached permanently)?			
Are extension cords approved by UL or another nationally recognized testing laboratory and rated for their intended uses?			
Are electrical cords stored in a neat, orderly manner and is care taken not to pose a tripping hazard?			
Are electrical cords free of pinching or crushing hazards?			
Are electrical cords free of damage caused by doors, equipment, vehicles?			
Are electrical cords free of damage?			
Are plug grounding pins intact?			
Trouble Lights			
Are trouble lights used under vehicles equipped with a nonmetallic shield, non-sparking electrical switch, enclosed light bulb and without an electrical outlet?			
Roadside Poles and Electricity			
Are employees aware of the hazards and trained about safe work practices involving energized lines and poles?			

FALL PROTECTION

10

Public works operations may require the use of stairways, mezzanines or elevated platforms and loading docks, as well as include bridge inspection and maintenance or other operations above ground level. All of these present fall hazards to employees.

FALL PROTECTION OPTIONS

To protect employees from falls of 4 feet or more along an unprotected edge, OSHA previously required the installation of a standard guardrail. With the adoption of the OSHA Walking/Working Surfaces standards, employers may install a standard guardrail, safety net system or personal fall protection system. All devices should be used according to manufacturer specifications.

GUARDRAILS

If this option is used, guardrails should be at a height no lower than 39 inches to 45 inches from the floor and include a midrail halfway between the top edge of the guardrail and the walking/working surface. If there is a risk of falling objects, a toeboard or screen should be installed.

Guardrails must be capable of supporting at least 200 pounds of force downward or outward, though more may be necessary when considering the combined weight of employees and equipment.

PERSONAL FALL PROTECTION SYSTEMS

These may include personal fall arrest systems, travel restraints or positioning systems. Personal fall arrest systems feature a harness; connector; and lanyard, lifeline, deceleration device or combination of the three.

When using personal fall protection systems, the system must be inspected before every shift, and any damaged or defective equipment must be removed from service.

Body belts are prohibited from use as a personal fall protection system. Personal fall protection systems are required to be connected to a secure anchor point.

- Anchorages for personal fall protection must be independent of platforms to support employees or work surfaces and follow manufacturer guidelines.
- Anchors must be capable of supporting at least 5,000 pounds per employee attached.
- Anchor locations must prevent employees from free-falling distances of 6 feet or more and may need to be placed overhead.
- Anchors for mobile work platforms or powered industrial trucks must be attached to an overhead member of the platform at a point located above and near the center of the platform.

SAFETY NET SYSTEM

If this option is used:

- Employers should follow the manufacturer's recommendations and ensure sufficient clearance beneath the system to prevent contact with objects or the ground below it.
- Nets should be visually inspected at least once a week for wear, damage and deterioration. Defective nets should not be used.
- Any materials, scraps, equipment or other items in the net should be removed as soon as safely possible.
- All inspections and corrective actions taken as described above should be documented and retained.
- Employers are required to provide for prompt rescue should an employee fall.

DESIGNATED AREAS

For work on flat or low-slope rooftops, employers may use a designated area in addition to the previous fall protection options. A designated area is a well-defined part of the roof surface delineated by a warning line in which employees may perform work without additional fall protection.

Any work that is done less than 6 feet from the roof edge requires the use of conventional means of protection as noted above. From 6 to 15 feet, a designated area may be used but only for infrequent or temporary work, with a warning line at least 6 feet from the roof's edge to serve as a warning that a worker is nearing an unprotected edge.

For work more than 15 feet from a roof edge, no fall protection other than a designated area is necessary, provided the work is infrequent and temporary.

When using designated areas, employees must be trained to understand the limitations of the protection and not to go beyond the delineation. The area must be clearly delineated by a rope, wire, tape or chain that is both highly visible and positioned between 34 and 39 inches above the walking surface.

TRAINING

Any employee using a personal fall protection system or others at risk of falls must be trained about fall hazards and any fall protection equipment or other related equipment before use. A qualified person must conduct the training, and instruction must include identifying and minimizing fall hazards.

Training must include the following if used:

- Procedures for installing, inspecting, operating, maintaining and disassembling the personal fall protection system(s) offered at the facility
- Proper hook up, anchoring, tie-offs, inspections and storage of fall protection systems
- Secure placement of dockboards
- Proper setup and use of rope descent systems
- Proper setup and use of designated areas

Retraining should occur after any changes in equipment or the workplace render previous training obsolete or when deemed necessary by the employer. All training should be documented.

FALLING OBJECTS

In situations where objects could fall on employees working below, employers are required to provide head protection and ensure that it is being used. Additionally employers are required to install devices to prevent falling objects from injuring those below. Employers may implement at least one of the following options:

- Toeboards, screens or guardrails to prevent objects from falling
- Canopy structures and placing loose items far from edges, holes or openings
- Barricading areas where objects could fall and prohibiting employees from entering the barricades

FIXED LADDERS

New fixed ladders that extend more than 24 feet above a lower level require the addition of a personal fall protection system or ladder safety system. These systems gradually phase out wells or cages on ladders as the primary form of fall protection.

Existing fixed ladders need to be updated with a personal fall protection system or ladder safety system when they undergo repairs or renovations between now and 2036.

Further safety rules and regulations regarding fall protection can be primarily found in OSHA Standard 29 CFR1910 Subpart D—Walking-working Surfaces. For specific equipment safety requirements, review OSHA Standard 29 CFR1910.140—Personal Protective Equipment, Personal Fall Protection Systems.

FALL PROTECTION CHECK LIST

ITEM	YES	NO	ACTION ITEM
Are employees protected from falls of 4 feet or more?			
If used, are safety nets inspected initially and at least weekly thereafter?			
Are personal fall protection systems inspected prior to use for each shift?			
Are inspections of and resulting corrective actions for safety nets, anchors or tie-offs and personal fall protection equipment documented?			
When using designated areas: Is the area clearly identified?			
Are employees trained to stay within the area?			
Are employees trained to identify and address fall hazards?			
Are employees who use personal fall protection equipment trained about the proper use, maintenance and storage of their equipment?			
Are employees trained about the proper use of dockboards, rope descent systems and designated areas?			
Is all training documented and retained?			
Have measures been taken to prevent injuries from falling objects?			
Are provisions in place to provide prompt rescue for employees in the event of a fall?			

FIRE EXTINGUISHERS

11

Portable fire extinguishers are used to help put out an incipient fire. This is the earliest stage of a fire and can typically be extinguished with a single portable fire extinguisher. However, extinguishers are only of benefit when they are in good, working condition and operated by someone who knows how to use them. In the 29 CFR1910.157 Standard, the Occupational Safety and Health Administration (OSHA) outlines requirements for placement, use and inspections of portable fire extinguishers.

INSPECTION AND TRAINING

To help ensure their proper working condition, fire extinguishers must be inspected and serviced yearly by a third-party vendor and visually checked using the manufacturer's inspection specifications at least monthly. These monthly checks ensure that fire extinguishers have not been removed, activated, tampered with or damaged. The back side of the extinguisher tag should be initialed and dated after each monthly check or another means of recording established.

If there is an expectation that employees use portable fire extinguishers in the event of a fire outbreak, OSHA requires they be trained in their use. This training includes not only fire prevention and evacuation procedures, but also hands-on training in the use of extinguishers. Training is to be completed prior to job assignment and annually thereafter.

Employees who are authorized to use portable fire extinguishers must also be included in a written emergency action plan. If the emergency action plan orders the immediate and total evacuation of employees in the event of a fire outbreak, fire extinguisher training is not required by OSHA; however, emergency procedure training is necessary. For more information about emergency action plans, see Chapter 30.

PLACEMENT

In addition to inspections and training, there are requirements concerning the placement of portable fire extinguishers. All fire extinguishers should:

- Have clear, unobstructed access and not be covered by jackets or other materials that obscure visibility.
- Have identifying labels or signage to mark their location clearly.
- Be mounted so that the base is at least 4 inches off the floor and the carrying handle is no higher than 5 feet from the floor. If fire extinguishers are greater than 40 pounds, the height of the carrying handle should be no greater than 3.5 feet from the floor.

Public works buildings often include work areas that require specific sizes and distances for portable fire extinguishers:

- Battery charging areas require minimum 4-A:20-B:C rating within 20 feet of battery charger.
- Fuel dispensing stations require minimum 2-A:20-B:C rating no more than 75 feet away.
- Flammable storage cabinets require minimum 20-B rating no less than 10 feet but no more than 25 feet away.
- Flammable storage rooms require minimum 20-B rating located outside the room but no more than 10 feet away.
- Hot works/welding areas require minimum 2-A:20-B:C rating no more than 30 feet away.

Additional areas, such as soil testing rooms, lunch rooms and other potential fire hazard areas, should be equipped with an appropriate fire extinguisher. Also powered industrial trucks should be equipped with a portable fire extinguisher if they travel beyond 75 feet of another extinguisher. Local requirements may be more strict; contact your local fire marshal for questions about specifications for your buildings.

Further safety rules and regulations regarding portable fire extinguishers can be found in OSHA Standard 29 CFR1910.157, Portable Fire Extinguishers; and the Minnesota State Fire Code.

More information about portable fire extinguishers and their use is available at OSHA.gov in the Evacuation Plans and Procedures eTool.

FIRE EXTINGUISHERS CHECK LIST

ITEM	YES	NO	ACTION ITEM
Do all fire extinguishers have unobstructed access?			
Are all fire extinguishers up to 40 pounds mounted so their bases are at least 4 inches and the carrying handle is no higher than 5 feet from the floor?			
Are all fire extinguishers labeled so their location is clearly identifiable?			
Are all fire extinguishers inspected yearly by a third party vendor?			
Are all fire extinguishers checked monthly for:			
Absence?			
Adequate pressure?			
Signs of tampering?			
Damage, defects or missing parts?			
Clear nozzle?			
Are monthly fire extinguisher checks signed and recorded on the back of the attached inspection tag?			
Are fire extinguishers mounted on vehicles that travel more than 75 feet away from another extinguisher?			
Are fire extinguishers located near fire hazard areas:			
Fuel-dispensing stations?			
Welding or grinding areas?			
Flammable storage cabinets or rooms?			
Battery charging areas?			
Soil testing room?			
Other fire hazard areas?			

FLAMMABLE STORAGE

12

Due to the wide variety of equipment used in public works, there is a need to store flammable materials. Gasoline, kerosene and many solvents present unique fire hazards. They emit vapors that can travel long distances and catch fire quickly or explode when ignited by something as small as a static discharge.

Careful attention needs to be paid to the safe storage of these materials and also to the recognition and control of ignition sources.

- All flammable rated materials such as gasoline should be stored in UL-rated safety cans with self-closing lids and flame arresters in place.
- Flammables should never be stored beneath stairs or anywhere near exits or other areas of safe passage for people.
- Occupational Safety and Health Administration regulations allow up to 25 gallons of Class 1 flammable liquids to be stored in approved containers outside of an approved cabinet or room.

FLAMMABLE STORAGE CABINETS

Flammable rated materials should be stored in an approved flammable storage cabinet.

- Up to 60 gallons of Class I and 2 flammable and combustible liquids can be stored in each cabinet. Some examples include gasoline, mineral spirits, diesel fuel and motor oil.
- Flammables cabinets should be clearly labeled with the words, “Flammable: Keep Fire Away.”
- Only flammable liquids and chemicals of the same hazard class should be stored in the same cabinet. Strong oxidizers and acids may not be compatibly stored with flammables and should have storage of their own. Consult safety data sheets to determine storage compatibility of flammable materials.
- Flammable storage cabinets must be located away from exits, stairways or other egress areas. They should also be located away from electrical equipment, heating equipment or other potential sources of ignition.
- No more than three cabinets can be located in a single “fire area” (a portion of the building separated from the remainder of it by construction having a fire resistance of at least one hour).
- At least one portable fire extinguisher, rated no less than 20-B, must be located no less than 10 feet but no more than 25 feet away from the cabinet.
- Flammable storage cabinets should be kept closed when not in use and latched to prevent accidental opening.

FLAMMABLE STORAGE ROOMS

Flammable-rated materials may also be stored in a flammable storage room.

- A flammable storage room requires fire resistant walls, doors and windows based on the size of the room with two-hour fire ratings for rooms between 150 and 500 square feet. Rooms 150 square feet or smaller only require one-hour fire-rated walls, doors and windows. The inclusion of sprinklers or fire protection does not change this requirement.
- Flammable storage rooms should not be larger than 500
square feet.
- The inclusion of sprinklers or other automated fire suppression systems permits larger amounts of flammable materials to be present in the room.
  - If a 150 to 500 square foot room is equipped with an automated fire suppression system, up to 10 gallons of flammable liquids may be stored per square foot of floor area. If the same room does not have an automated fire suppression system, only five gallons are permitted per square foot.
  - In a room 150 square feet or smaller protected with an automated fire suppression system, up to 4 gallons of flammable materials may be stored per square foot of floor area. If the same room does not have an automated fire suppression system, only 2 gallons are permitted per square foot.
- Flammable storage rooms require either liquid-tight sills or ramps at least 4 inches in height at doorways or must be located at least 4 inches below the surrounding floor.
- The walls of flammable storage rooms must be liquid tight, where the walls join the floor, or an open-grated trench may be located within the room that drains to a safe location.
- Electrical wiring and lighting within flammable storage rooms must be approved for hazardous locations if storing class 1 or 2 flammable liquids, such as gasoline, mineral spirits, diesel fuel, motor oil and some paints.
- Every flammable storage room must have at least one unimpeded aisle at least 3 feet wide.
- Containers larger than 30 gallons should not be stacked on top of each other.
- At least one portable fire extinguisher rated no less than 20-B must be located no more than 10 feet from flammable storage room doors.

Minnesota State Fire Code, Minnesota Pollution Control Agency or local jurisdictions may be more stringent with regard to containment and storage of flammable materials. Consult with the fire marshal for additional guidance.

Further safety rules and regulations regarding flammable storage can primarily be found in OSHA Standard 29 CFR1910.106, Flammable Liquids; and the Minnesota State Fire Code.

FLAMMABLE STORAGE CHECK LIST

ITEM	YES	NO	ACTION ITEM
Are flammable-rated materials, such as gasoline, stored in UL rated safety cans of no more than 5 gallon capacity and equipped with self-closing lids and flame arresters?			
Are all flammable materials stored away from stairs, exits and other areas of safe passage?			
Are safety storage cans designed to prevent spills and to relieve internal pressure of expanding vapors?			
Are fewer than 25 gallons of Class 1 flammable liquids stored outside of an approved cabinet or room?			
Flammable Storage Cabinets			
Are flammable storage cabinets clearly labeled with the words, "Flammable: Keep Fire Away"?			
Are flammable storage cabinets located away from exits, stairways or other paths of egress?			
Are flammable storage cabinets located away from electrical equipment, heating equipment or other potential sources of ignition?			
Are there no more than 60 gallons of Class 1 or 2 flammable and combustible materials stored in each cabinet?			
Are flammable materials of the same hazard class stored in the same cabinet? Strong oxidizers and acids should have storage of their own.			
Are no more than three flammable storage cabinets located in a single fire area?			
Are flammable storage cabinets kept closed when not in use and latched to prevent accidental opening?			
Is there at least one portable fire extinguisher located no less than 10 feet but no more than 25 feet away from the flammable storage cabinet?			
Flammable Storage Rooms			
Are flammable storage rooms no larger than 500 square feet?			
Are liquid-tight sills or ramps of no less than 4 inches in height present at doorways or is the floor at least 4 inches below surrounding floors or have other containment measures been installed per local jurisdictional rules?			

CONT. FLAMMABLE STORAGE CHECK LIST

Are walls in the flammable storage room liquid tight or protected with an open grated trench that drains to a safe location or have other containment measures been installed per local jurisdictional rules?			
Do rooms between 150 and 500 square feet: Have at least two hour fire-related walls, doors and windows?			
Have an automated fire suppression system?			
If equipped with an automated fire suppression system, are there less than 10 gallons of flammable materials per square feet?			
If *not* equipped with an automated fire suppression system, are there less than 5 gallons of flammable materials per square foot?			
Do rooms of 150 square feet or less: Have at least one hour of fire-related walls, doors and windows?			
If equipped with an automated fire suppression system, are there less than 4 gallons of flammable materials per square foot?			
If *not* equipped with an automated fire suppression system, are there less than 2 gallons of flammable materials per square foot?			
Are electrical wiring and lighting approved for hazardous locations?			
Is at least one unimpeded aisle of at least 3 feet wide maintained?			
Are containers of 30 gallons or more stacked on the floor and not on each other?			
Is there at least one portable fire extinguisher located outside the flammable storage room no more than 10 feet from the door?			
Have both Minnesota State Fire Code and Pollution Control Agency regulations been reviewed and the local fire marshal been contacted regarding additional requirements or local jurisdictional rules regarding flammable storage?			
Have any additional requirements been met?			

FLOOR SURFACES

13

A highway garage is often full of activity. Heavy vehicles, powered industrial trucks and employees are often moving about at the same time. When this activity is combined with maintenance operations in close quarters, the chance of injury increases.

To provide safer movement for employees through a maintenance or storage garage, attention should be paid to the following.

- Floor surfaces should be kept dry and clean as wet surfaces present a slip hazard
  - Routine checks should be made to assure hoses, extension cords and other materials are not left on walkways, creating a tripping hazard.
  - Absorbent materials should be available near oil and lubricant storage and quickly used to clean up spills.
  - Special attention should be paid in the winter to moisture from melting snow and ice. Wet surfaces should be addressed quickly.
  - If cracks or pits develop in a cement floor, they should be patched or otherwise repaired to reduce the tripping hazard they create.
- Floor holes should remain covered. Bridge plates over drainage cuts can become loose or floor hole covers can accidentally be left opened. A routine check can help discover these openings.
- Egress walkways should be kept free of obstructions, including vehicles and stored materials. These walkways should be sufficient to accommodate the maximum permitted occupant load and be at least 28 inches wide at all points. Walkways should be visually marked where appropriate.
- Review traffic management to ensure employees can move safely through areas shared by vehicles and other moving or hazardous equipment.
- All walking-working surfaces must be inspected regularly and as necessary be maintained in a safe condition. These inspections and any maintenance or repair work should be documented and retained.
- Whenever hazards are identified, they should be addressed promptly or guarded before employees are allowed near the hazardous area.

Further safety rules and regulations regarding floor surface safety can primarily be found in OSHA Standard 29 CFR1910.22, General Requirements Walking-Working Surfaces.

FLOOR SURFACES CHECK LIST

ITEM	YES	NO	ACTION ITEM
Are spill kits or absorbent materials available near oils and lubricants and used when spills occur?			
Are hoses, extension cords, power tools or other materials creating a tripping hazard?			
Are there cracks or pits in the flooring surface of sufficient size to create a tripping hazard?			
Are holes and drains covered?			
Are egress walkways clearly marked and kept free of obstructions to a width of at least 28 inches?			
Are walking-working surfaces regularly inspected and problems promptly addressed?			
Are these inspections and corrective actions documented?			

FORKLIFTS

14

Powered industrial trucks, most notably forklifts, are often used on public works property. Although invaluable for moving materials, forklifts can cause serious injuries or fatalities. Often these accidents involve the vehicle overturning or running into people or property.

Employees who operate forklifts are required to demonstrate competence and have a thorough understanding of the vehicle, as well as operations and hazards specific to the work area. Certified training is required for any employee who uses a powered industrial truck and a re-evaluation must be conducted every three years to assure continued safe operation of the vehicle.

Retraining is required if an employee displays unsafe performance or is involved in an accident while operating the forklift.

Though they may be included in the training, the following best practices should be considered in any forklift safety discussion:

- Inspect the forklift before use. A safety check list can help with these inspections.
- Overturning of the vehicles poses the most danger to forklift operators and is a leading cause of workplace deaths. When an operator jumps or is thrown from an overturning forklift, he or she is likely to be trapped or crushed by the vehicle. Operators should wear seat belts. The safest place in the event of a rollover is in the cabin of the vehicle. In addition, the following maneuvers should be avoided:
  - Turning sharply.
  - Traveling across uneven ground.
  - Traveling across an incline.
  - Traveling with forks raised high. When moving, forks should only be raised approximately 6 inches from the floor.
  - Braking hard when carrying a load.
  - Carrying a load forward down a slope.
  - Carrying an unbalanced load.
- If a load obstructs the forward view, it is recommended to drive in reverse. Always maintain clear sight lines.
- Operators should be aware of the safe load capacity for each vehicle.
- Never lift people or carry passengers (unless specific equipment is installed for that purpose).
- When getting on or off the forklift, always maintain three points of contact. Forklifts should be equipped with grab handles and steps with anti-slip surfaces.
- Always be aware of others. Sound the horn when approaching blind intersections or areas with heavier foot traffic.
- Consider installing forward- and rear-facing LED lights, positioned to create a visual cue to warn of an approaching forklift.

An assessment should be made to manage the risks of mixing people with powered industrial trucks. This assessment should answer the following questions:

- Where are the areas that forklifts and people could collide?
- Should there be areas where forklifts (or people) should not be allowed?
- Should there be designated walkways? If so, will these walkways be marked with paint or possibly barricaded?

All employees should be made aware of the hazards of working around forklifts and strategies put in place to mitigate those hazards.

Propane-, Gasoline- and Diesel-fueled Forklifts

When operating propane-, gasoline- or diesel-fueled forklifts indoors, precautions need to be taken to prevent carbon monoxide (CO) poisoning. This is especially important during the winter when doors and windows remain shut, allowing gases to accumulate.

Properly maintaining engines, reducing engine run time and assuring proper ventilation are ways to reduce emissions. Minnesota OSHA also has rules for CO monitoring, one of which is noted below.

MINNESOTA RULES FOR CARBON MONOXIDE MONITORING

General industry: Minnesota Rules 5205.0116, Carbon Monoxide Monitoring

Subpart 1. Internal combustion engine powered industrial trucks. The employer shall monitor environmental exposure of employees to carbon monoxide whenever internal combustion engine powered industrial trucks as defined in Code of Federal Regulations, Title 29, section 1910.178(a)(1) are operated indoors to ensure that carbon monoxide levels do not exceed those given in Code of Federal Regulations, Title 29, section 1910.1000, Table Z-1-A. The air monitoring shall be done at least quarterly and represent exposures during a day of highest usage in the areas where employee carbon monoxide exposure is most likely.

Subpart 2. Tailpipe exhaust gas analysis. The employer shall ensure that powered industrial truck engine exhaust gases do not contain more than 1 percent carbon monoxide for propane-fueled trucks or 2 percent carbon monoxide for gasoline-fueled vehicles measured at idle and at three-fourths throttle during final engine tuning in a regular maintenance program. More information about carbon monoxide is provided in Chapter 6.

Electric Forklifts

Electric forklifts virtually eliminate the hazard of carbon monoxide poisoning but present their own safety hazards. They are powered by lead-acid batteries that are routinely charged, changed and serviced. These batteries pose several potential hazards:

- Batteries contain highly corrosive sulfuric acid.
- Batteries can emit highly explosive hydrogen fumes.
- Contact with batteries may cause electrical burns.
- Batteries are heavy.

Proper procedures should be followed when charging and servicing batteries and should address the following:

- Safeguards in the event of chemical splash, including proper personal protective equipment and emergency shower/eyewash facilities.
- Precautions to prevent sparks, flames and other ignition sources near the battery changing area.
- Fire protection and adequate ventilation for fumes from gassing batteries.
- A means to flush and neutralize spilled electrolyte.
- Proper handling and lifting of batteries to reduce potential strains.

Further safety rules and regulations regarding forklifts and other powered industrial trucks can primarily be found in OSHA Standard 29 CFR1910.178, Powered Industrial Trucks; and Minnesota Rules 5205.0116, Carbon Monoxide Poisoning.

FORKLIFT CHECK LIST

ITEM	YES	NO	ACTION ITEM
Are employees trained and certified before they operate powered industrial trucks?			
Are employees who operate powered industrial trucks evaluated every three years to assure knowledge of safe operating procedures?			
Are employees who display unsafe operations or who have been involved in a powered industrial truck accident retrained and evaluated?			
Is the forklift inspected daily or before each shift?			
Is a seatbelt worn during forklift operation?			
Is each forklift equipped with a handhold and slip-resistant treads to help reduce slips and falls?			
Are pedestrian walkways clearly marked and/or protected from forklift traffic?			
If Gas-powered Trucks Are Used Indoors			
Is air quality tested quarterly to detect levels of carbon monoxide?			
Is there a regular maintenance program in place that includes tail pipe exhaust gas analysis?			
Are carbon monoxide detectors in place to monitor gas levels?			
If Battery-powered Trucks Are Used Indoors			
Is fire protection available near the battery charging area?			
Is the battery charging area kept clear of flames, sparks and other ignition sources?			
Is proper personal protective equipment kept near and worn during battery maintenance?			
Are safeguards in place in the event of a corrosive material exposure?			
Is there an emergency eyewash/shower?			
Are proper lifting techniques used when moving batteries?			

FUEL ISLANDS

15

The ability to fill vehicles' gas tanks on site is convenient and cost effective. Due to the flammable properties of fuel, safety should be a top priority. Whether fuel is dispensed on an island with multiple pumps or at a single pump, the following safety items should be in place.

- If fuel dispensers or storage tanks are susceptible to vehicular impact, a barrier should be created for protection. This barrier often consists of steel and concrete bollards no less than 4 inches in diameter placed at least 3 feet from the dispenser. These bollards should be spaced no more than 4 feet between posts on center and no less than 3 feet high. Other barriers meeting the requirements of local code are also acceptable.
- Warning signage should be conspicuously posted within sight of each dispenser. This signage should state the following:
  1. No smoking.
  2. Shut off motor.
  3. Discharge static electricity before fueling by touching a metal surface away from the nozzle.
  4. To prevent static charge, do not re-enter your vehicle while gasoline is pumping.
  5. If a fire starts, do not remove nozzle. Back away immediately.
  6. It is unlawful and dangerous to dispense gasoline into unapproved containers.
  7. No filling of portable containers in or on a motor vehicle. Place the container on the ground before filling.
- Additional warning signage regarding emergency procedures is also required and should state:

  IN CASE OF FIRE, SPILL OR RELEASE
  1. USE EMERGENCY PUMP SHUTOFF
  2. REPORT THE ACCIDENT!
  FIRE DEPARTMENT TELEPHONE:_____
  FACILITY ADDRESS:_____
- Operating instructions should also be posted in approved locations on each dispenser.
- Combustible materials, including weeds and brush, should be cleared to a minimum of 10 feet around fuel dispensing equipment.
- An emergency shut-off switch should be installed within 100 feet, but no less than 20 feet, from dispensers that will stop the flow of fuel in the event of an emergency. A conspicuous “Emergency Shut-off” sign should be posted near the switch.
- A fire extinguisher with a minimum rating of 2-A:20-B:C should be located within 75 feet of fuel dispensers. In addition to yearly inspection and service, this fire extinguisher should be checked monthly to assure it has not been removed, activated, tampered with or damaged. This monthly inspection should then be recorded on the back of the service tag.
- Consideration should be given to reducing winter slip exposures at fuel islands. Adequate snow removal and sanding procedures should be established. Appropriate lighting can provide more visibility when equipment is used during dark hours
- Systems should be in place to contain possible spills from above- or below-ground fuel tanks and fuel pumps. Regulations regarding containment can be found in the Minnesota State Fire Code and from the Minnesota Pollution Control Agency. Local jurisdictions may have more stringent rules; it is recommended to speak with the local fire marshal.

The local fire marshal is an excellent resource to discuss codes and other safety issues concerning fuel pumps and other fire hazards.

Further safety rules and regulations regarding fuel-dispensing equipment and operations can primarily be found in OSHA Standard 29 CFR1910.106, Flammable Liquids; the Minnesota State Fire Code; and the Minnesota Pollution Control Agency.

FUEL ISLAND CHECK LIST

ITEM	YES	NO	ACTION ITEM
Are fuel pumps protected against vehicle impact (concrete and steel bollards spaced no more than 4 feet apart, or other approved barrier)?			
Are warning signs posted within sight of each dispenser in the fuel dispensing area (no smoking, shut off motor, etc.)?			
Are operating instructions conspicuously posted on every fuel dispenser?			
Are combustible materials, including weeds and brush, kept a minimum of 10 feet from fuel handling equipment?			
Is a readily accessible emergency shut-off switch located within 100 feet but not less than 20 feet from the fuel dispensers?			
Is a clearly visible "Emergency Fuel Shutoff" sign posted near the emergency disconnect?			
Is a fire extinguisher with a minimum rating of 2-A:20-B:C located within 75 feet of fuel dispensers?			
Are procedures in place to reduce winter slip exposures (snow removal, sanding, adequate lighting)?			
Are systems in place to contain spills from above- or below-ground fuel storage tanks and fuel pumps?			
Are the fuel tanks or pumps in good condition?			

GAS CYLINDERS

16

Many types of gases can be stored in compressed gas cylinders: atmospheric, fuel, refrigerant, etc. The most common types of cylinders found in public works operations are oxygen, acetylene and argon, which are used during the welding process. Often these gases are pressurized to more than 2,000 pounds per square inch.

This pressurization, along with the gases themselves, can pose hazards that include oxygen displacement, toxic effects, explosions and physical hazards resulting from a ruptured cylinder. Care needs to be exercised when storing and handling these “sleeping giants.”

STORAGE

- Gas cylinders must be stored in a cool, dry and well-vented area. Care should be taken not to store the cylinders in areas that are near open flames, sparks, or other heat or ignition sources.
- Cylinders must be stored in areas away from exit routes and where passing vehicles or falling objects may strike them.
- Oxygen cylinders must be stored away from other fuel gas cylinders and combustible materials at a minimum of 20 feet or be separated by a noncombustible barrier at least 5 feet high. Oxygen and fuel gas cylinders stored on a welding cart are considered "connected for use" or "in use" and can be stored together on the cart if they are secured and the valves are protected.
- All compressed gas cylinders must be secured to prevent falling over. When using chains to secure cylinders against a wall, be sure they are kept tight so as not to droop and allow a cylinder to tip.
- When in storage, regulators must be detached from stems and valve protector caps must be attached if appropriate to cylinder design.
- Labels identifying cylinder contents should be intact and legible.
- Cylinders should be labeled “full” or “empty” as appropriate for employees’ awareness. Empty tanks need to be treated as full tanks with regard to storage and handling.

HANDLING

- Compressed gas cylinders should never be dragged or rolled. When moving, cylinders should be secured to a hand cart designed for that purpose. All cylinder valves should be closed before moving.
- Take care not to drop gas cylinders, allow them to collide together or strike hard surfaces.
- Special care should be given to maintain the integrity of the valve components. If the valve is compromised, pressure can quickly release, turning the cylinder into a dangerous projectile.
- When welding or performing other hot works, the gas cylinders must be located safely away from sparks.

TRAINING AND SAFETY DATA SHEETS

All employees working with compressed gas should:

- Be trained in the proper storage and handling of the cylinders.
- Have access to and understand the information found on the safety data sheet (SDS) kept on file for each gas. The SDS details the characteristics of the gas, safety hazards, first aid, emergency information and other data pertaining to the product.

Further safety rules and regulations regarding compressed gases can primarily be found in OSHA Standards 29 CFR1910.101, Compressed Gases; and 29 CFR1910.253, Welding, Cutting and Brazing.

GAS CYLINDER CHECK LIST

ITEM	YES	NO	ACTION ITEM
Are cylinders stored away from heat, sparks or other ignition sources in a well-ventilated area?			
Are oxygen cylinders stored away from fuel cylinders and combustible materials? *At a minimum of 20 feet apart or separated by a noncombustible barrier at least 5 feet high.*			
Are cylinders secured to prevent tip over?			
Are cylinders stored away from exit routes?			
Are cylinders stored away from areas where they could be damaged by falling or passing objects?			
When stored, are regulators detached from cylinder stems and are valve protector caps in place?			
Are all cylinders clearly and legibly labeled?			
Are empty cylinders segregated and labeled as such?			
Are cylinders moved via a hand cart or similar equipment to prevent being dragged or rolled?			
Are safety data sheets readily available for each type of gas used or stored?			
Are employees trained in the proper storage and handling of compressed gas cylinders?			

HOUSEKEEPING

17

HOUSEKEEPING

Housekeeping refers to the cleanliness and order of a workplace. Numerous safety hazards are created when work areas are untidy. Slips, trips and falls are among the most common accidents stemming from poor housekeeping. Disorderly work areas can also increase the likelihood of fire outbreak and hamper emergency procedures.

GENERAL HOUSEKEEPING

Employees can help reduce exposures to these and other hazards by:

- Coiling up and/or storing cords, hoses and other lines when taking a break or jobs are finished.
- Promptly cleaning up oil and other liquid spills. Bulk oil and lubricant dispensing stations should have appropriate containment systems in place to capture large leaks. Appropriate clean-up materials should be available for all possible spills.
- Fixing or reporting rugs or carpets that have buckled, been pulled up, have rolled up corners or become oversaturated.
- Keeping debris and other materials cleared from work surfaces, walkways and stairs.
- Covering or reporting holes open in the floor.
- Removing objects protruding at head height or, if necessary, capping them or flagging them as a visible warning.
- Ensuring adequate lighting. Burned out lights should be promptly reported and replaced.
- Returning tools to storage when a job is finished.
- Placing trash in appropriate containers. Sufficient trash containers should be provided, used and emptied before overfilling.
- Ensuring piled or stacked material is stable and cannot slip, fall or collapse.
- All walking-working surfaces must be inspected regularly and as necessary. They must also be maintained in a safe condition, which includes addressing slip, trip and fall hazards on the floor surface.
- Keeping flammable materials away from sparks or other ignition sources.
- Putting oily or paint-soaked rags into approved, covered metal waste receptacles.
- Keeping the areas in front of electrical boxes and disconnects clear. This cleared space should measure 36 inches in the front of the panel and be at least 30 inches wide or the width of the panel, whichever is larger.
- Keeping the area in front of fire extinguishers clear. It is recommended to keep at least 36 inches clear in front of the fire extinguisher.
- Keeping the area around air filtration intakes free of materials and storage. Items placed near intake vents can reduce the circulation of air.
- Maintaining clearance around emergency exits and egresses. Both sides of emergency exit doors should remain clear.

Keeping the workplace clean should be the responsibility of all employees. Housekeeping should be an integral part of the job and performed throughout the day. Periodic walk throughs can be performed to evaluate and control hazards created by poor housekeeping.

STORAGE SHELVING

- Employees must be made aware of the load capacity of storage shelving through training or posted load capacity signage.
- Storage shelving should be protected against vehicle impact, as damage may affect structural integrity and load capacity.

Further safety rules and regulations regarding housekeeping and sanitation can be found in OSHA Standards 29 CFR1910.141, Sanitation; and 29 CFR1910.22, Walking-Working Surfaces, General Requirements.

HOUSEKEEPING CHECK LIST

ITEM	YES	NO	ACTION ITEM
Are extension cords, air or water hoses and other lines properly stored away from walking areas?			
Are walking surfaces and stairs free of debris or other materials?			
Are all holes in the floor covered?			
Is the floor free of oil or other liquid spills?			
Are appropriate cleaning materials available for possible spills?			
Are rugs and carpets free of buckles and pulled up edges or corners?			
Are work areas free of protruding objects that could snag or be bumped into?			
Do all areas have adequate lighting?			
Are tools returned to appropriate storage when job is finished?			
Are oily or paint/stain-soaked rags put into a covered metal container?			
Is trash being placed in containers?			
Are trash containers emptied often enough to prevent overfilling?			
Are piled and stacked materials stable?			
Are flammable materials kept a safe distance from sparks or other points of ignition?			
Is the area in front of electrical panels and disconnect switches clear of all materials to a distance of 36 inches and 30 inches wide or the width of the panel?			
Are fire extinguishers accessible?			
Are fire exits kept clear?			
Is the area around air filtration intake vents clear of materials that may reduce air circulation?			
Are emergency exits and egresses kept clear? Are emergency exit doors clear both inside and out?			

CONT. HOUSEKEEPING CHECK LIST

Are walking-working surfaces regularly inspected?			
Are problems, including poor housekeeping, promptly addressed?			
Are employees made aware of storage shelving load limits?			
Are storage shelves that are subject to vehicle impact protected?			

LADDERS

18

Accidents stemming from the use of ladders are one of the leading causes of workplace injuries and fatalities. Ladder accidents can be divided into three categories:

1. Fall: When an employee falls from the ladder.
2. Electric shock: When an employee using, holding or carrying a ladder is electrocuted.
3. Struck by: When a person below the ladder is struck by an object falling from above.

To mitigate these accidents, the following guidelines should be followed.

GENERAL

- Always inspect the ladder before each use:
  - Look for broken rungs or rails.
  - Inspect all pulleys, ropes and locks.
  - Check for corrosion.
  - Check footings, pads and rungs to make sure they still provide a nonskid surface.
  - Pay particular attention to open-ended hollow rungs on metal ladders for signs of corrosion inside the rungs.
  - If any defect is found, the ladder should be tagged as unsafe and taken out of service. If it cannot be fixed, the ladder should be disposed of properly.
- Scan the work area to ensure there are no hazards above or around either the path of travel with the ladder or the work area. Pay particular attention to overhead electrical lines.
- If working near energized electrical lines or equipment, the ladder must have nonconductive side rails, such as wood or fiberglass.
- Always follow the manufacturer's rated load capacity before using the ladder. This includes the weight of the user and any tools or equipment. The load rating should be clearly labeled.
- Ladders should only be used for the purposes for which they are designed. Do not use ladders horizontally as a platform. Residential-use ladders should not be used in workplace settings.
- Ladders should not be placed in front of doors or in other high-traffic areas without preparation. Some examples of preparation include locking the door, using warning signs or cones to mark the area or having co-workers keep watch.
- Always set the ladder on a level and stable surface (unless secured). Do not use other materials to raise the height of the ladder.
- Always face the ladder when ascending and descending.
- Always maintain three points of contact (two hands and a foot or one hand and two feet) when ascending or descending a ladder.
- Do not extend the midline of the body beyond the side rails of the ladder.
- Secure all tools and work materials before ascending or descending a ladder. Do not carry tools or work equipment in your hands. They should be carried on a tool belt or pulled up with a rope or handed up from the ground after reaching the desired height. Do not rest tools on ladder rungs.

EXTENSION LADDERS

- When using extension ladders remember the 1-to-4 ratio. For every four feet of ladder height, the base should be one foot away from the object the ladder rests on. Therefore a 12-foot ladder would require the base to be 3 feet from the resting object.
- The ladder should reach at least 3 feet above the point of support and should be secured whenever possible.
- Only make adjustments when standing at the base, not when standing on the ladder or positions above it.
- Extension ladders should be fully retracted before attempting to reposition them.
- Ensure all locks are firmly engaged.
- Do not step or stand higher than the step indicated on the label marking the highest standing level.

STEPLADDERS

- When using a stepladder, make sure the folding cross braces are locked in the proper position before stepping onto the ladder.
- Do not use step ladders like an extension ladder and lean them against a wall. Step ladders should always be spread out fully.
- Avoid stepping on the top cap or top step of a step ladder. Follow all manufacturer warning stickers for more information.

FIXED LADDERS

Steps should be taken to prevent employees from falls from tall fixed ladders. OSHA requires all new fixed ladders (built after November 2018) over 24 feet in height from a lower level be equipped with personal fall arrest or ladder safety systems. For more information, see Chapter 10 Fall Protection.

Further safety rules and regulations regarding ladders and their use can be found in OSHA Standard 29 CFR1910.23, Ladders.

LADDERS CHECK LIST

ITEM	YES	NO	ACTION ITEM
Are steps free of cracks, defects and corrosion, and are they securely attached to side rails?			
Are the interiors of open-end hollow rungs of metal ladders free of corrosion?			
Are rails straight and free of cracks or other damage?			
Are spreaders secure, unbent and able to lock?			
Are locking mechanisms and casters (if present) intact and operable?			
Are pulleys and ropes (when present) intact and operable?			
Are all hardware and fittings securely attached, and movable parts operating freely without binding or too much play?			
Are nonslip safety feet provided on each metal or rung ladder, and are ladder rungs and steps free of grease and oil?			
Are portable metal ladders legibly marked with signs reading, "Caution: Do Not Use Around Electrical Equipment" or equivalent wording?			
Are all labels intact and readable?			
Are employees trained about ladder safety?			
Are ladders stored where they cannot tip over?			
Are ladders rated for industrial or commercial use, rather than residential use?			

LIFTS AND JACKS FOR VEHICLES

19

There are many types of jacks and lifts used in public works garages. Due to the weight of vehicles and other materials lifted, it is essential that lifts and jacks are in good operating condition and employees are trained in their use.

VEHICLE LIFTS

Training is essential for every employee who operates a vehicle lift. Training must be refreshed annually and records retained. At a minimum, training should include:

- Proper operation.
- Information about maximum lift weight.
- Vehicle spotting methods.
- Rules for safe lifting and working under the vehicle.

In addition to training, vehicle lifts should be regularly inspected according to the manufacturer's directions and annually inspected by a qualified lift inspector. Inspection documents and records of maintenance should be retained and available if needed.

Other safety considerations:

- Ensure prominent and legible marking of the load limits of each lift.
- Ensure load-locking devices are operable and secured before starting work.
- Keep the area around the lift clean and orderly.
- Wear proper personal protective equipment (e.g., hard hat, safety glasses, gloves, etc.) when working beneath a vehicle.

JACKS

Whether jacks are mechanical or hydraulic, understanding their use and load limits is essential. Each jack should have its load limit permanently affixed to it in such a way that it is legible and easy to see. Lubricants and dirt can quickly cover the load limit tag and must be periodically cleared to ensure visibility.

When using a jack, follow these safety rules:

- Never exceed the load limitations of the jack.
- Always use the jack on a stable, level surface. Blocking or cribbing the jack may be necessary if the required surface is not stable.
- Never exceed the point of overtravel. Many jacks have positive stops to prevent this.
- Always lubricate jack according to the manufacturer's direction.
- Never use the jack alone to hold up a vehicle. Jack stands or other cribbing devices should be in place before working under a vehicle.

Further safety rules and regulations regarding lifts and jacks for vehicles can be primarily found in OSHA Standard 29 CFR1910.244, Other Portable Tools and Equipment, and ANSI/ALI ALOIM Standard for Automotive Lifts.

LIFTS AND JACKS FOR VEHICLES CHECK LIST

ITEM	YES	NO	ACTION ITEM
Lifts			
Are lifts inspected annually by a qualified lift inspector?			
Are lift inspections documented?			
Are all employees who work with lifts trained annually?			
Are training records documented?			
Are lifts inspected regularly as per manufacturer's direction?			
Are lift load ratings prominently displayed?			
Are the lift's load-locking devices secured before starting work?			
Is the area around the lift kept clean and orderly?			
Is proper personal protective equipment worn before working under vehicles?			
Jacks			
Are jacks periodically inspected?			
Are jacks properly lubricated at regular intervals?			
Does each jack have a permanent and legible load rating prominent and visible?			
Where practical, do jacks have positive stops to prevent overtravel?			
When not on a firm foundation, are jacks blocked and cribbed to provide stability?			
Are jack stands or other cribbing devices used to hold up the vehicle after a jack is used?			

MACHINE GUARDING

20

The moving parts or electrical components of machines can be hazardous to both the operators and those nearby. If not properly guarded, these parts could cause injuries, such as amputation, crushing, cuts, impalement, blindness, electrocution or others. If any part of an employee's body can come into contact with a moving piece of equipment or electrical component or is exposed to flying debris, guarding must be in place to reduce the risk of injury.

Every machine is different, but the following general guidelines apply to all equipment. Machines with moving components should be assessed using these guidelines. Information about guarding specific equipment is provided.

GENERAL MACHINE GUARDING

- Guarding should be present at the point of operation to help prevent parts of the body from coming in contact with moving equipment. However, a guard should never be affixed so as to present an additional hazard in itself (e.g., creating visibility issues).
- Guards should prevent access to exposed areas not used at the point of operation, such as belts, pulleys, gears, shafts or other moving parts.
- Guards should help prevent sparks, chips or kickbacks from injuring the worker.
- Guards should cover any exposed wires or electrical devices in a machine.
- Fixed machinery should be secured from moving, rocking or excessive vibration.
- The use of tools to place or remove items at the point of operation does not remove the need for machine guarding.
- Guards should be of sufficient strength to contain any shards or other objects adequately.
- Guards should be inspected and evaluated after any failure of the machine causes the guard to absorb impacts.
- Protective guards should cover start buttons and foot pedals to prevent startup from accidental contact.
- Do not tamper with "dead man" safety switches that require constant pressure before a tool will operate.
- Machines that require guarding should not be used until guarding is installed.
- Do not remove guarding during normal operations.
- Follow lock out/tag out procedures whenever clearing jams, conducting maintenance or when removing guards.
- Conduct regular safety inspections and maintenance to ensure guards are present and in good condition.

SPECIFIC EQUIPMENT

Portable Hand Grinder

- No more than half of the wheel should be exposed.
- Disk guard should be positioned between the user and the wheel to deflect materials away from the body.
- Guard should be positioned between the handle and the wheel.

Bench or Pedestal Grinder

- Bench grinders should be securely mounted to the bench.
- Pedestal grinders should be securely fastened to the floor to prevent tipping over or excess movement when in use.
- Guarding should cover a minimum of 75 percent of the grinding wheel.
- Additional side guards should cover the spindle, end nut and flanges.
- Tongue guards should provide no more than a one-fourth inch opening to protect against ejected materials.
- Tool or work rests should be set no more than one-eighth inch away from the grinding wheel surface to help protect against objects being caught between the rest and the wheel.

Power Press

- Barriers should be used on power presses to prevent contact with pinch points or the point of operation.
- Barriers must be constructed to prevent the ejection of parts and scrap material.
- Barriers should not interfere with the operation of the machine.
- Barriers should always be in place before equipment start up.

Drill Press

- Drill presses should be securely anchored to the floor to prevent tipping over when in operation.
- Whenever possible, use a clamping device to hold materials and keep hands away from the bit.

Tire Rim Changing Equipment

- To reduce the chance of injury, MCIT recommends that a tire rack, cage or equivalent protection be provided and used when inflating, mounting or dismounting tires installed on multipiece split rims, or rims equipped with locking rings or similar devices.
- Restraining devices or barriers should have the capacity to withstand 150 percent of the maximum tire pressure for the rim wheel being served.
- Barriers or restraining devices should be visually inspected before use, and defective barriers or

restraining devices should be removed from service. Machines should not be used until the barriers or restraining devices are repaired or replaced.

Fans

- Fans with blades positioned below 7 feet high should have guarding over the blades with less than a half inch of spacing.

Table Saws (Circular Hand-fed Ripsaw)

- Blades should be guarded with a hood that encloses the saw blade above and below the table, and above the material being cut. The hood should automatically adjust itself to the thickness of the material and remain in contact with the material while sawing.
- The hood must be of sufficient strength to withstand incidental damage during the course of reasonable operation.
- Saws should use a spreader to keep the material in position against side thrusts and kept in alignment with the saw even when tilted. This is not required for grooving, dadoing or rabbeting.
- Non-kickback fingers or dogs should be used on both sides of the blade to prevent throwing of material or kickback to the user.

Radial Saws

- The blade should be enclosed in a fixed hood with a lower guard that automatically adjusts to the thickness of the stock and remains in contact with the material.
- Non-kickback fingers or dogs should be provided to prevent kickback or throwing of material.
- Stops should be installed to limit the distance a saw could be pulled forward to avoid going over the edge of the table.

Band Saws

- The blade should be enclosed either by solid material or by wire mesh not less than 0.037 inches (U.S. gauge No. 20) thick with openings no smaller than three-eighths inch.
- An adjustable slide should be set to the thickness of the material being cut and no greater.

Miter Saws

- Miter saws should be equipped with a guard that protects the portion of the saw above the table or material being cut. This guard should adjust itself to the thickness of the material being cut to provide continuous protection from the blade.

Chop Saws

- Guards should enclose all but the bottom of the blade throughout operation and return to the normal position quickly after use.

Portable Circular Saws

- Blade should be guarded by a fixed upper guard and a retractable lower guard that returns to cover the blade after use.
- Users should not wedge or wire the blade guard open. Replace worn out springs as needed to ensure smooth functioning of the retractable guard.

Further safety rules and regulations regarding machine guarding can be found in OSHA Standards 29 CFR1910.212, Machinery and Machine Guarding; and 29 CFR1910.213, Machinery and Machine Guarding/Woodworking Machinery Requirements.

MACHINE GUARDING CHECK LIST

ITEM	YES	NO	ACTION ITEM
General			
Are all belts, pulleys, gears, moving parts and electrical components guarded?			
Are guards in place to protect operator from sparks, chips or other flying debris?			
Are guards present at the point of operation?			
Are start switches and foot pedals protected from accidental contact and startup?			
Are machines secured to the ground to prevent tipping or movement during use?			
Are guards present without creating additional hazards (e.g., reducing visibility)?			
Is equipment regularly inspected and maintained to ensure guards are present and in good condition?			
Portable Grinders			
Is no more than half of the grinding wheel exposed?			
Is disk guard positioned between the handle and the wheel?			
Is disk guard positioned between the user and the wheel to deflect materials away from the body?			
Bench or Pedestal Grinders			
Are all grinders securely fastened to bench or floor?			
Is guarding in place that covers a minimum of 75 percent of the grinding wheel, as well as the spindle, end nut and flanges.			
Is the tongue guard positioned within one-fourth inch from the wheel?			
Is the tool/work rest positioned within one-eighth inch from the wheel?			
Power Press Equipment			
Are barriers in place to help protect against contact with point of operation or pinch points?			
Are barriers constructed to prevent the ejection of parts and scrap material?			
Are barriers in place before equipment start up?			
Are barriers designed not to interfere with equipment operation?			

CONT. MACHINE GUARDING CHECK LIST

ITEM	YES	NO	ACTION ITEM
Drill Press			
Are drill presses securely anchored to prevent tipping over or excessive movement during operation?			
Are devices used to hold materials to be drilled, keeping hands away from the bit?			
Tire Rim Changing Equipment			
Are employees protected against accidental explosive ejections when inflating, mounting or dismounting tires installed on multipiece split rims, or rims equipped with locking rings or similar devices through use of a restraining device or barrier?			
Is the restraining device or barrier inspected before use?			
Fans			
Are fans positioned less than 7 feet high protected with guards no greater than half an inch apart?			
Table Saws			
Are the blades guarded above the table by guards that enclose the blade and automatically adjust to the material?			
Is the blade guarded below the table?			
Is a spreader present to keep the material from shifting (except when dadoing, grooving or rabbeting)?			
Are anti-kickback fingers or dogs present and used?			
Radial Saws			
Is the saw blade guarded with a fixed guard on top and a movable guard on bottom that automatically adjusts to the material?			
Are anti-kickback fingers or dogs present on both sides of the blade?			
Are there stops in place to prevent the blade from going over the edge of the table?			
Band Saws			
Is the blade entirely enclosed except for the point of operation either entirely or by a wire mesh of no greater than three-eighths inch?			
Is the adjustable guard only as wide as the material being cut?			
Miter Saws			

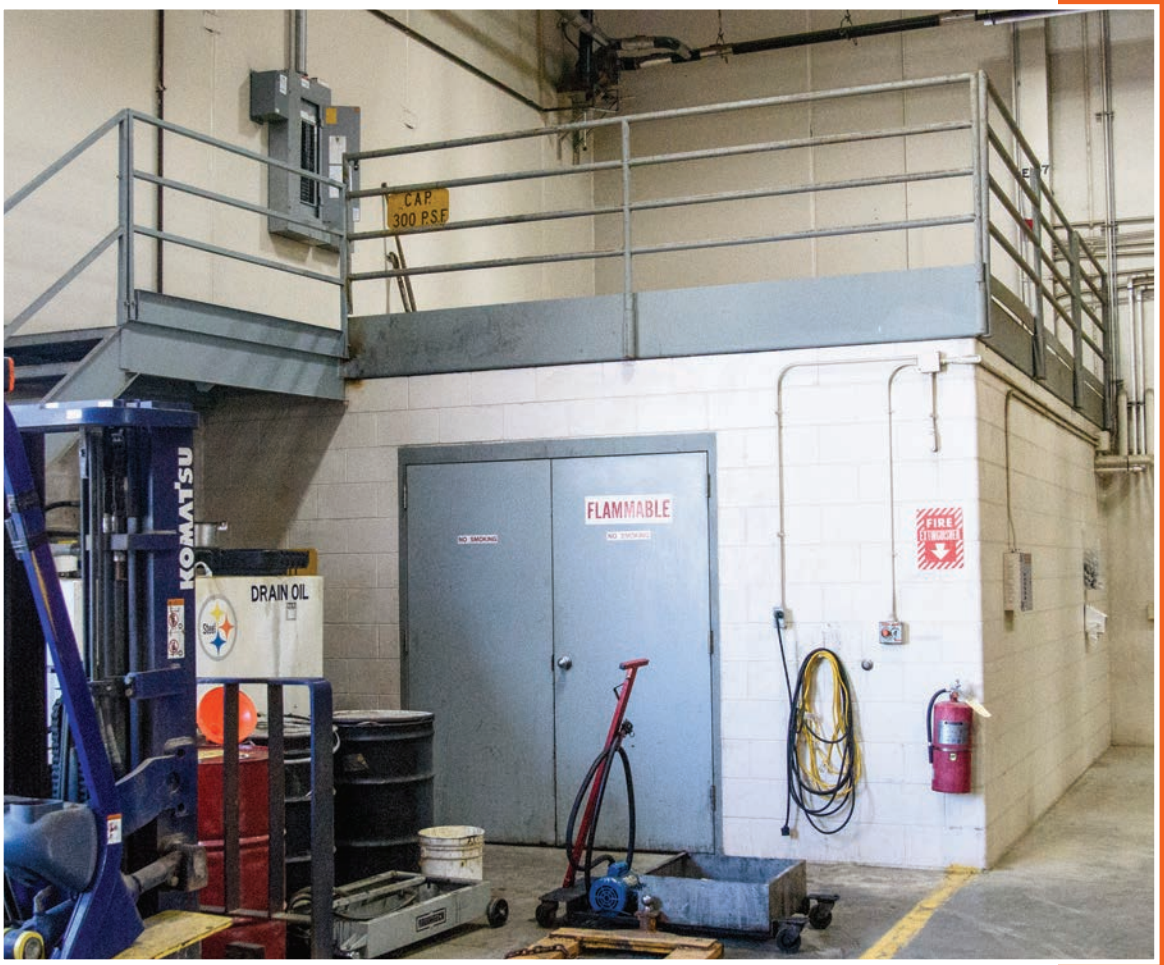
CONT. MACHINE GUARDING CHECK LIST

Is the blade guarded with a hood that automatically adjusts itself to the material being cut?			
Chop Saws			
Is the blade guarded by a hood that protects the top and sides of the blade throughout operation?			
Does the guard return to regular position quickly after use?			
Portable Circular Saws			
Is the blade guarded by a fixed upper guard and retractable lower guard that returns to cover the blade after use?			

MEZZANINES

21

Mezzanines offer extra space for storage. They are also used to house mechanical equipment such as water heaters and air compressors. Due to their height and nature of use, mezzanines can pose safety hazards. Fall hazards are of primary concern when working on a mezzanine, but other exposures include storage, housekeeping, and slips and trips. Mezzanines should include structural elements to mitigate these hazards, and attention should be given to other exposures.



STRUCTURAL ELEMENTS

- To reduce fall exposure, guardrails 39 to 45 inches in height must be in place around the perimeter of the mezzanine. A middle rail is also required.
- Openings that expose workers to a fall of more than 4 feet must also be guarded. These openings are often found at the top of fixed ladder or material loading platforms. Gates or other guards should be in place to prevent employee exposure to the opening. Dual gate systems should be considered for material loading openings. These systems help ensure that a barrier will always be in place during the loading and unloading of materials. If secure gating is not possible, another form of fall protection must be in place.
- If there is exposure from falling materials to people or equipment below, toe boards must be installed. Toe boards should be no less than 3.5 inches high and installed along the perimeter of the mezzanine. Toe boards must be located under both guardrails and gates.
- Employees must be made aware of the floor load capacity of the mezzanine. The floor load should be posted in a conspicuous location.
- Mezzanine stairways must have rails with midrails on unprotected sides. The treads on the stairway should be reasonably slip resistant.

OTHER SAFETY CONSIDERATIONS

- Attention should be given to storage near the edges of the mezzanine. If materials are stored above the guardrail or can slip through rail openings, a means of protection should be in place to keep them from tipping over the edge.
- Lighting should be sufficient to accomplish work tasks and illuminate potential tripping hazards.
- The floor of the mezzanine should be kept free of accumulated dust/oil and other slip and trip exposures.

Further safety rules and regulations regarding mezzanine spaces can be primarily found in OSHA standards 29 CFR1910.22, Walking-working Surfaces General Requirements; 29 CFR1910.28, Duty to Have Fall Protection and Falling Object Protection; and 29 CFR1910.29, Fall Protection Systems and Falling Object Protection, Criteria and Practices.

MEZZANINE CHECK LIST

ITEM	YES	NO	ACTION ITEM
Are standard guardrails in place to prevent falls from a height of 4 feet or more?			
Are openings in the guardrail equipped with gates that are designed to prevent an accidental fall?			
If falling materials could pose a hazard to people or equipment below, are 3.5-inch-high toe boards in place along the mezzanine perimeter, including gates?			
Are mezzanine stairways protected with rails when necessary?			
Are mezzanine stairway treads reasonably slip resistant?			
Are employees aware of the floor load capacity of the mezzanine?			
Is this information posted in a conspicuous spot?			
Are materials stored in a manner that prevents them from falling over the edge?			
Is lighting on the mezzanine sufficient to carry out tasks safely and illuminate potential hazards?			
Is the mezzanine floor kept free of excessive dust, oil or other hazards that could create slip and fall exposures?			

OVERHEAD CRANES AND HOISTS

22

Overhead cranes and hoists can be found in maintenance garages in a variety of styles and sizes. Their use—and the size of the loads they lift—can expose employees to numerous hazards. Given these exposures, they still tend to be among the most neglected equipment in a garage.

Operators, as well as those who work around the equipment, should have a good understanding of crane and hoist safety. In addition, equipment should always be checked before use and more thoroughly inspected on a monthly schedule.

Crane and hoist equipment should always be kept in good operating condition. Load chains or ropes should be kept clean and well-lubricated. Chain and nylon slings should be hung or stored in a manner to avoid damage and prevent a tripping hazard.

Equipment load ratings must be understood by all employees working with the crane or hoist. The Occupational Safety and Health Administration (OSHA) requires that load ratings be clearly marked on both sides of the crane and the hoist must have a load rating marked on it and be visible from the ground.

The following guidelines can also help mitigate crane and hoist accidents:

- Only trained individuals should operate a crane or hoist.
- The operator should check hoist chains, wire ropes, slings, hooks and other operating mechanisms before work proceeds. Any equipment that is suspect or unsafe should be tagged and not used until repaired or replaced.
- Before lifting, the operator should make sure that all personnel are clear.
- Personnel should never distract the operator when a load is lifted.
- The operator should be aware of the load weight and of the crane and hoist load rating.
- When operating, the load should be slowly pulled up in a straight line; avoid jerking the load.
- The crane or hoist should never be run all the way up or down, as this may damage the stops.
- When rigging the load, check for sharp edges that may damage the slings. Readjust or add padding.
- Never use the tip of a hook to load.
- If the load appears to be slung improperly during the lift, lower and readjust the rigging.
- The load should be kept as close to the floor as possible when traveling.
- If loads are required to be lifted at head height or higher, hard hats should be worn.
- Personnel should never walk under a load.
- Personnel should never step between a moving load and another object.
- Personnel should never ride on the load or hook.

MINNESOTA OSHA INITIAL, FREQUENT AND PERIODIC INSPECTIONS

Minnesota Administrative Rule 5205.1200 outlines the required inspections for cranes, hoists and equipment.

- Initial inspection: All new, repaired or altered cranes must be inspected before use.
- Frequent inspection: Equipment should be given a visual inspection daily before use. This includes hoist chains, hooks, wire ropes, slings and operating mechanisms to assure safe, proper operation.
- Periodic inspection: Once a month, a complete inspection of the crane must be performed. Hooks, hoist chains and ropes require monthly inspections with a certification record signed by a designated competent person.

In addition to the above inspections, all cranes and hoists should be inspected and serviced annually by a certified vendor. Any repairs to crane and hoist equipment must be made by a qualified individual.

Further safety rules and regulations regarding cranes and hoists can be primarily found in OSHA Standard, 29 CFR1910.179, Overhead and Gantry Cranes, and in Minnesota Administrative Rule 5205.1200, Cranes and Hoists.

OVERHEAD CRANE AND HOIST CHECK LIST

ITEM	YES	NO	ACTION ITEM
Are crane and hoist operators trained in use and safety?			
Are both sides of the crane and the hoist marked with the load rating and visible from the operating area?			
Are slings and chains stored in a manner to help prevent damage and tripping hazards?			
Are load chains and ropes kept clean and well-lubricated?			
Are slings, chains, ropes, hooks and other equipment visually inspected before use?			
Are hoist chains, ropes, hooks and other equipment and apparatus inspected monthly by a competent, designated individual?			
Are monthly inspections recorded and retained?			
Are cranes and hoists inspected and serviced annually by a certified vendor?			
Are loads checked for sharp edges and protrusions that could weaken or damage slings and rigging?			
Are hard hats worn when loads are lifted at head height or higher?			
Are all affected personnel aware of the hazards of cranes and hoists?			

OVERHEAD GARAGE DOORS

23

Industrial Overhead Garage Doors with sufficient weight or closing force can cause injury or damage to people or property caught in their path of travel. Because of this hazard, the Minnesota Administrative Rules and Department of Labor and Industry have outlined requirements for overhead door safety.

The requirements state that overhead doors must incorporate at least one of the following safety options:

- A constant pressure actuation switch that would be operated within sight of the door and could be released and manually reversed if a person or object were in the path of the closing door.
- An external reversing device that would immediately reverse the direction of the door upon striking an obstruction. Common reversing devices include:
  - A safety edge pneumatic air hose installed on the bottom edge of the door that signals the door to reverse when an obstruction is detected.
  - An optic sensor that detects objects in the path of the door and immediately reverses downward travel.
- A three-button control switch, but only if the following conditions are met:
  - A permanent sign must be placed adjacent to the switch and display wording similar to "Warning: To prevent entrapment, do not start door downward unless doorway is clear."
  - The control switch and sign are located within sight of the doorway.
  - The operator controlling the switch must observe the door until completely closed.
  - Automatic closing controls are not installed.

If reversing devices are installed, they should be periodically inspected and maintained to assure that they are in good working condition. These inspections and maintenance should further be recorded and retained in the event of an incident.

These above regulations regarding overhead doors can be found in the Minnesota Administrative Rules 5205.0675, Covers and Overhead Doors.

OVERHEAD GARAGE DOOR CHECK LIST

ITEM	YES	NO	ACTION ITEM
Are at least one of the following safety features incorporated into each door? 1. Constant pressure actuation switch within sight of door 2. External reversing device 3. Three-button control switch: a. Within sight of door b. Adjacent to warning sign c. With no automatic closing controls installed d. Where controller observes until door is completely closed			
Are overhead garage doors equipped with external reversing devices (safety edge, optic eye) periodically checked to ensure they are functioning correctly?			
Are overhead garage doors inspected and serviced annually by a qualified vendor?			
Are all inspection/maintenance records retained?			

PROPANE STORAGE

24

PROPANE STORAGE

Whether propane is used for running forklifts, tar pots or firing up an outdoor grill, attention should be paid to how it is handled and stored. Because of the potentially explosive concentration of compressed liquid gas, propane should never be stored with other flammable liquids. It should be stored in well-ventilated areas and protected from damage and potential ignition sources.

Storage of propane cylinders differs from larger ASME propane tanks. Listed below are safety considerations for both.

PROPANE CYLINDERS

- Cylinders should be stored outside of buildings—at least 20 feet away from doors and other egress points. They should be located away from direct sunlight to avoid overheating. Cylinders should also be protected from moisture that can cause rust.
- Although not recommended, cylinders can be stored in buildings not frequented by the public but must adhere to the following:
  - Cylinder storage is not located near exits, stairways or in areas meant for the safe egress of people.
  - The maximum quantity of propane allowed in an inside storage location cannot exceed 300 pounds or 735 pounds of water capacity. This translates to approximately nine, 30-pound cylinders.
  - Partial or empty cylinders are considered full containers for the purpose of determining the maximum quantity of propane allowed.
- Cylinders should be stored vertically on a flat surface. Some cylinders are made to be stored horizontally, but the relief valve should be situated at the 12 o'clock position on the canister to keep it above the liquid level in the tank. The relief valve should never be positioned below the liquid fuel level of the canister.
- All storage locations should be engineered to minimize physical damage or tampering of the cylinders. Storing cylinders in an LP-gas cage would help to mitigate damage.
- A warning sign reading, "LP Gas Storage: No Smoking or Open Flames Within 50 Feet" should be conspicuously posted at the storage location.

ASME ABOVE-GROUND TANKS

- Depending on the size of the LP-gas tank, certain required distances must be maintained between the tank and property lines or structures. Propane tanks having volumes of 125 to 500 gallons, 501 to 2,000 gallons or more than 2,000 gallons must be located at least 10 feet, 25 feet or 50 feet, respectively, from buildings or property lines.
- Weeds, long and dry grass and other readily ignitable material must be removed within 10 feet of any container.
- Propane tanks subject to damage or tampering of any kind should be protected from such activity by means of fencing or other barricades.
- Propane tanks that are subject to potential vehicle impact should be protected by means of fencing, curbing or concrete bollards.
- As with cylinder storage, a warning sign reading, "LP Gas Storage: No Smoking or Open Flames Within 50 Feet" should be conspicuously posted at the storage location.

Additional regulations and requirements regarding propane storage and spill containment can be found in the Minnesota State Fire Code and from the Minnesota Pollution Control Agency.

Further safety rules and regulations regarding propane storage can primarily be found in OSHA Standard 29 CFR1910.110, Storage and Handling of Liquefied Petroleum Gases; Minnesota State Fire Code; and from Minnesota Pollution Control Agency.

PROPANE STORAGE CHECK LIST

ITEM	YES	NO	ACTION ITEM
Propane Cylinder Storage			
Are outdoor propane storage areas located at least 20 feet from doors and protected from heat and moisture?			
Are indoor propane storage areas located away from exits, stairways and other paths of egress?			
Is the maximum quantity of propane stored indoors less than 300 pounds? *Partial or empty containers are considered as full for this count.*			
Are cylinders stored vertically on a flat surface?			
Are cylinders stored in an LP-gas cage or in a manner to prevent physical damage or tampering?			
Are warning signs reading "LP Gas Storage: No Smoking or Open Flames Within 50 Feet" conspicuously posted at the storage location?			
ASME Above-ground Tank Storage			
Are proper distances maintained between the tank and buildings, public ways or property lines? *For example, a 500-gallon tank must be located at least 10 feet from property lines or buildings.*			
Are weeds and other readily ignitable material removed within 10 feet of any tank?			
Are tanks subject to damage or tampering protected by a fence or other barricade?			
Are tanks subject to potential vehicle impact protected by fencing, curbing or concrete bollards?			
Are warning signs reading "LP Gas Storage: No Smoking or Open Flames Within 50 Feet" conspicuously posted at the storage location?			
Have additional requirements from the Minnesota State Fire Code, Minnesota Pollution Control Agency and local jurisdictions been implemented with regard to storage and containment?			

TEMPERATURE EXTREMES

25

Temperatures in Minnesota range from near 100-degree humid summers to below-zero winters. Working in either hot or cold temperatures can be hazardous, but work practices can manage them. Employers should emphasize the importance of symptom recognition and prevention methods to reduce incidents of employees suffering from heat and cold stress.

HEAT STRESS

Heat stress is the term for health conditions related to heat exposure. The most common types of heat stress are heat rash, heat cramps, heat exhaustion and heat stroke. Heat stroke is particularly serious and can result in death or permanent injury. Fortunately heat exhaustion frequently precipitates heat stroke and if detected at this stage can be treated more easily.

Common Symptoms of and Treatments for Heat Stress

HEAT STRESS	SYMPTOMS	TREATMENT
Heat Rash	Red cluster of pimples or small blisters, typically located on neck, upper chest, groin, under breasts or in elbow creases	• Keep rash dry. • Move to cooler, less humid work areas. • Avoid using ointment or creams.
Heat Cramps	Muscle cramps, pain or spasms in the abdomen, arms or legs	• Drink water. • Have a snack and/or electrolyte replacement beverage, such as a sports drink • If cramps do not subside in an hour, seek medical attention.
Heat Exhaustion	• Headache • Nausea/dizziness • Irritability • Thirst • Weakness • Heavy sweating • Elevated body temperature • Decreased urine output	• Remove worker to cool area (air conditioning if possible) and give liquids to drink, particularly cool liquid. • Remove unnecessary clothing from worker. • Cool the worker with cool water or compresses. • Bring worker to clinic or emergency room for evaluation and treatment. • Stay with the worker until help arrives.
Heat Stroke	• Confusion, altered mental state, slurred speech • Loss of consciousness • Sweating stops or profuse sweating • Seizures • Very high body temperature	• Call for emergency medical care. • Remove worker to cool area (air conditioning if possible, shade, etc.) and remove unnecessary clothing. • Cool worker aggressively with cold water or ice bath. • Place cold, wet cloth or ice on head, neck, armpits and groin. • Circulate air around worker. • Stay with worker until medical help arrives.

Heat Stress Prevention

- Be aware of dangerous heat index advisories and weather service forecasts and plan ahead.
- Provide water for employees and encourage them to drink plenty of it: 8 ounces of water every 15 minutes—32 ounces an hour is recommended for sustained heavy work. Avoid drinking more than 48 ounces of water an hour.
- Take frequent breaks in cooler areas particularly when feeling heat discomfort. Limit time outdoors and reduce the physical demands of workers when experiencing dangerous heat indexes.
- Maintain air circulation; consider a fan for vehicle interiors.
- Train workers and supervisors on warning signs of heat stress.
- Wear comfortable clothing that is not too warm.
- Avoid drinks with high caffeine and sugar.
- Implement a buddy system where workers observe each other for signs of heat stress.
- Consider providing cooling vests to workers on hot days.
- Consider acclimatizing workers to the environment over the course of a few weeks by scheduling 20 percent to 50 percent of the usual duration of work and gradually increasing it. Taking breaks within air-conditioned rooms does not affect the acclimatization rate.

COLD STRESS

Cold stress is the term for health conditions related to cold exposure. The three main types of cold stress are chilblains, frostbite and hypothermia. Extreme incidents of cold stress can result in amputations or death. However, cold stress can be prevented.

Common Symptoms of and Treatments for Cold Stress

COLD STRESS	SYMPTOMS	TREATMENT
Chilblains	• Redness • Itching • Possible blistering • Inflammation	• Avoid scratching. • Slowly warm the skin. • Corticosteroid creams help relieve itching and swelling. • Clean and cover blisters or ulcers.
Frostbite	• Reduced blood flow to hands and feet • Numbness, tingling or stinging • Aching, bluish or pale waxy skin	• Move to a warm area. • Avoid walking on frostbitten toes or feet when possible. • Immerse affected areas in warm—not hot—water. If immersion is not possible, warm fingers under arm pits or with body warmth. • Avoid rubbing frostbitten areas. Be aware that numb areas are easy to burn, for example with water that is too hot.
Hypothermia	• Early symptoms: shivering, fatigue, loss of coordination, confusion and disorientation • Late symptoms: no shivering, blue skin, dilated pupils, slowed pulse and breathing, loss of consciousness	• Call for emergency medical assistance. • Move affected individual to a warm area. • Remove wet clothing. • Warm center of the body first using an electric blanket or chemical hot packs. • Give warm nonalcoholic beverages to worker, but do not give beverages to unconscious workers. • After temperature has increased, keep worker dry and wrapped in a warm blanket including the head and neck. • Stay with worker until medical help arrives (as needed).

Cold Stress Prevention

- Be aware of weather reports, temperature and wind-chill forecasts, and plan accordingly.
- Wear appropriate clothing with multiple layers of loose clothing. Tight clothing can reduce blood circulation needed for warming.
- Protect ears, face, hands and feet.
- Wear waterproof, insulated boots.
- Take breaks in warm areas and limit time outside on cold days.
- Train employees and supervisors about the symptoms of cold stress.
- Consider including chemical hot packs in first-aid kits.
- Stay dry whenever possible. Consider having a separate set of clothes to change into if clothing becomes wet.
- Monitor self for signs of cold stress.
- Implement a buddy system where workers observe each other for signs of cold stress.
- Provide warm beverages to workers.
- Schedule long periods of outdoor work for the warmest part of the day or for the warmer months.
- Schedule additional workers for long or demanding jobs in the cold.
- Maintain vehicle heaters and general vehicle maintenance.

More information about heat and cold stress is provided by the Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health's website at CDC.gov/NIOSH.

TEMPERATURE EXTREMES CHECK LIST

ITEM	YES	NO	ACTION ITEM
Heat Stress			
Are supervisors and employees trained about the symptoms of heat stress?			
Do employees watch for signs of heat stress in themselves and others while working on hot days?			
Are employees encouraged to drink plenty of water during hot days?			
Do supervisors and employees review weather service forecasts, paying attention to heat advisories?			
Are employees made to take breaks or limit time outdoors on hot days?			
Is the clothing employees wear appropriate for the temperature?			
Do employees avoid drinks with high amounts of caffeine and sugar on hot days?			
Are employees and supervisors trained in basic treatment for heat stress?			
Does the air conditioning work in vehicles equipped with air conditioning?			
Are workers allowed to acclimatize to the hot environment?			
Cold Stress			
Are supervisors and employees trained about the symptoms of cold stress?			
Do employees watch for signs of cold stress in themselves and others while working on cold days?			
Do supervisors and employees review cold weather advisories?			
Are employees encouraged to wear multiple layers of loose fitting clothing on cold days?			
Are first-aid kits equipped with heat packs for cold days?			
Are employees or supervisors trained in basic treatment for cold stress?			
Are employees made to take breaks in warm areas during cold days?			
Do heaters work in vehicles equipped with them?			

VEHICLE SAFETY

26

More than any other department, public works employees operate a variety of vehicles and equipment. Because of this, employees can be exposed to several types of hazards when operating these vehicles.

Although all employees operating vehicles should have a valid driver's license and follow applicable laws, the following items should be considered as part of a vehicle safety program:

- Drivers should be familiar with the operating manual of the vehicle they operate and have received thorough training on its operation and in recognition of unsafe or hazardous conditions
- Employees who work near vehicles should be trained about safe procedures for working around vehicles and about hazard recognition.
- Large vehicles should be equipped with backup alarms.
- Training about vehicle use should include identification of blind spots for each particular piece of machinery. Consider using vehicles with cameras to monitor blind spots.
- Employees should make visual, voice or signal communication with vehicle operators prior to approaching equipment and maintain visibility with the operator while approaching. Eye contact with the driver is recommended.
- Employees who work around vehicles should wear high-visibility vests.
- Nonroad vehicles should only be operated in designated areas whenever possible.
- Vibration should be reduced whenever possible. Consider vibration-resistant devices or frequent worker rotation and breaks if excessive vibration exists. Regular maintenance may help reduce vibration.
- Vehicles are often noisy; employees operating vehicles or in close proximity to vehicles for extended periods may need to be part of a hearing conservation program. Review Chapter 34 for more information.
- Be aware of temperature extremes and ergonomics, including vibration, when operating vehicles. Refer to the temperature extremes and ergonomics Chapters 25 and 32 respectively for more information.
- A daily inspection should be made of each vehicle before use and a record kept of these inspections.
- Periodic preventive maintenance checks should also be performed by certified in-house or reputable independent mechanics. These checks should be based on vehicle manufacturers' recommendations and include scheduled repair items, recalls and problems noted by drivers. Records of these maintenance checks should also be retained.
- When a vehicle is operated away from public works buildings, it should be equipped with a fire extinguisher of a size and style to best handle an emergency specific to the equipment. It is important to include monthly inspections of vehicle fire extinguishers to assure they have not been removed, are not damaged and still hold a charge. These monthly inspections are in addition to the yearly service provided by a third-party vendor and should be recorded on the back of the service tag.
- A first-aid kit of supplies adequate for the types of injuries expected on the job should be located in any vehicle that travels beyond areas where medical services are available. These kits should be readily accessible and periodically inspected for content and expired products.
- Loose items should be secured inside the cab of the vehicle. In the event of a quick stop or accident, loose items can distract or injure occupants.
- Operators should always use three points of contact when entering or exiting any vehicle to help protect against slips, trips and falls. If climbing is required, the operator should face toward the vehicle when entering or exiting. The operator should never jump from a vehicle. MCIT has specific resources to promote using three points of contact. For posters, vehicle stickers, mini fliers and a training script, call MCIT toll-free at 1.866.547.6516 or visit MCIT.org/step-wisely/.

DEFENSIVE DRIVING TRAINING

Consideration should be given to providing defensive driving training for all employees. Defensive driving training helps employees anticipate situations, rather than react to them, and make safe, well-informed decisions based on road and environmental conditions. Defensive driving means understanding a vehicle's capabilities and limitations, and maintaining control while maneuvering it away from hazards. In addition to helping protect the fleet from physical damage; defensive driving also helps prevent injuries to employees and citizens.

MCIT offers defensive driving training to its members at no charge. Classes can be held on site or online. On-site classes can be tailored to meet the needs of public works departments.

For more information about or to schedule defensive driving training, members should call MCIT toll-free at 1.866.547.6516 or e-mail info@mcit.org. Further safety rules and regulations regarding vehicle safety are primarily provided in Minnesota Administrative Rule 5207.1000, Operation of Mobile Earth-moving Equipment.

VEHICLE SAFETY CHECK LIST

ITEM	YES	NO	ACTION ITEM
Are employees trained on each vehicle they operate, including blind spots and hazard recognition?			
Are employees who work around large vehicles trained about safe work procedures and hazard recognition?			
Are all nonroad vehicles equipped with backup alarms or cameras to monitor blind spots?			
Are all nonroad vehicles used within their designated areas?			
Do employees make visual, voice or signal communication and make eye contact with drivers when approaching vehicles?			
Have excessive vibration, noise or temperatures been addressed?			
Are inspections made on vehicles before operation?			
Are periodic preventive maintenance checks performed by certified in-house or reputable independent mechanics?			
Are inspections and maintenance checks recorded and retained?			
Are fire extinguishers located in vehicles that operate away from the shop?			
Are fire extinguishers inspected monthly and serviced annually?			
Are first-aid kits located in vehicles that travel beyond readily available medical services and contain materials appropriate to exposures?			
Are first-aid kits periodically inspected for missing or expired products and refilled as needed?			
Are loose items secured inside vehicles?			
Do all vehicle operators maintain three points of contact when entering and exiting vehicles?			
Is defensive driving training a part of the employee safety program?			

AWAIR (A WORKPLACE ACCIDENT AND INJURY REDUCTION) PROGRAM

27

AWAIR PROGRAM

Minnesota OSHA requires most employers, including public employers, institute a written AWAIR program. AWAIR acts as the overall umbrella for the safety program and must include the following five required components:

1. How managers, supervisors and employees are responsible for implementing the program and how continued participation of management will be established, measured and maintained

2. The methods used to identify, analyze and control new or existing hazards, conditions and operations
3. How the plan will be communicated to all affected employees so that they are informed of work-related hazards and controls
4. How workplace accidents will be investigated and corrective action implemented
5. How safe work practices and rules will be enforced

Every employee should be trained about the components of the program at the time they begin employment. In addition, the AWAIR program should be reviewed yearly and updated as needed.

SAFETY COMMITTEES

A joint labor-management safety committee can be an effective tool to assist in accomplishing the requirements of AWAIR. Although there already may be an organization-wide safety committee, public works departments should consider establishing an additional committee made up of representatives from the various areas of operations within the department.

A public works-specific safety committee can focus on safety issues relevant to the particular needs of its employees. A public works safety committee can:

- Bring employee safety and health concerns to the attention of management and suggest recommendations for correction.
- Help identify and analyze hazards through regular walk-around inspections, safety check lists and developing job hazard analyses. For more information about job hazard analyses, see Chapter 36.
- Review and evaluate incident and near miss reports.
- Assist in accident investigations.
- Promote safety in its member's prospective areas.

Even if a public works-specific safety committee is established, a representative should attend the organization-wide committee to discuss the activities and safety concerns raised within the group.

A public works safety committee should meet at least quarterly. Depending on its level of activity, more frequent meetings may be necessary.

Further rules and regulations regarding AWAIR and safety committees can primarily be found in Minnesota Statutes, Sections 182.653, Rights and Duties of Employers, and 182.675, Safety Committees. Also you can download the resource "Discussion Items and Resources for Safety Committees" from the MCIT website (MCIT.org/safety-committees/) or ask your MCIT loss control consultant for a copy.

AWAIR (A WORKPLACE ACCIDENT AND INJURY REDUCTION) PROGRAM CHECKUP

ITEM	YES	NO	ACTION ITEM
Is a written AWAIR program in place and reviewed annually?			
Do employees receive AWAIR training when first on the job?			
Are methods in place to identify, analyze and control workplace hazards?			
Are accidents promptly investigated?			
Are safe work practices and rules enforced?			
Does a joint labor-management safety committee meet regularly to review and discuss safety concerns and forward recommendations to management?			

BLOOD BORNE PATHOGENS

28

BLOOD BORNE PATHOGENS

It is probable that an employee will sustain a cut or minor injury at some point on the job. In addition to keeping a supply of first-aid materials on hand, employees should have an understanding of the potential hazards involved with exposures to blood.

In Minnesota, the Employee Right to Know annual training should include information about infectious agents for every employee. However, for some job classifications, more may be required in terms of training, such as inclusion in a blood borne pathogen written policy or additional requirements for first-aid kits. For more information about first-aid kits, see Chapter 33 First-aid, CPR Training and Kits.

BLOOD BORNE PATHOGEN (BBP) EXPOSURE

The universal precaution when encountering a blood exposure is to treat it as though it may be infected with a blood borne pathogen (e.g., hepatitis, HIV).

If employees have a reasonable expectation that they will come in contact with blood or other potentially infected materials in the course of their work, they are required by the Occupational Safety and Health Administration (OSHA) to be part of a blood borne pathogen (BBP) program. This includes employees whose duties include cleaning up blood spills, roadside cleanup or who are designated as responsible for rendering medical assistance.

Written Policy

If an organization has employees with an occupational exposure to blood borne pathogens, OSHA requires that a written policy be in place and followed. If the public works department does not have a specific BBP policy, check to ensure occupationally exposed employees are included in the countywide policy.

This policy should be updated annually and include:

- Identification of job classification(s) that are determined to have occupational exposure to blood or other potentially infected materials.
- Identification and use of work practice controls. This could include the method for cleaning contaminated surfaces or how to deal with contaminated items.
- Identification and use of personal protective equipment.
- Procedures for making hepatitis B vaccinations available to employees with occupational exposure.
- Procedures for offering post-exposure evaluation and follow-up care after an exposure incident.
- Procedures for providing information and training (both initial and annual refresher) to employees and maintaining training records.

Roadside Litter

Roadside trash collection presents a risk of blood borne pathogen exposure. Discarded needles, diapers, blood-stained debris and other potentially infectious materials may be found among the roadside trash. If county employees are responsible for roadside litter collection or handling, the following precautions should be taken:

- Proper personal protective equipment, such as heavy footwear and gloves, should be worn.
- Proper procedures should be followed when disposing of potentially infectious materials.
- Hands should be washed with soap and water after handling suspicious debris.
- Trash should never be crushed to make more room in collection containers.
- Trash collection bags should be held away from the body. They should not be slung over shoulders.

In addition to potentially infected materials, other hazardous materials may be found. Employees should be trained to identify drug manufacturing and associated hazardous materials or waste, such as toxic chemicals or sharps. This training should also include directions to notify law enforcement and appropriate cleanup services or procedures to take to address the hazards.

Further safety rules and regulations regarding blood borne pathogens can be primarily found in OSHA Standards 29 CFR1910.1030, Bloodborne Pathogens.

BLOOD BORNE PATHOGEN CHECKUP

ITEM	YES	NO	ACTION ITEM
Is a written program in place, updated annually and include classifications of employees that have occupational exposure to blood borne pathogens?			
Are employees who have an occupational exposure to blood borne pathogens trained about it upon employment and annually thereafter?			
Are hepatitis B vaccinations offered to all employees with an occupational exposure at no cost to the employee?			
Are cleanup procedures and materials in place to deal with blood or other potentially infectious material spills?			
Is personal protective equipment, such as gloves, eye protection and masks, provided?			
Are post-exposure evaluations and follow-up care offered to any worker who experiences an exposure incident?			
Is information and training pertaining to blood borne pathogen exposure provided to employees?			
Are medical and training records maintained?			
Are procedures in place for identifying and disposing of potentially infectious waste in roadsides and ditches?			

CONFINED SPACES

29

Confined spaces have potential to be dangerous places. Serious injuries and even death can result when workers enter a space with hazardous conditions and have difficulty getting out. Knowledge of these areas, and procedures for working in and around them, are important for the safety of employees.

Storage tanks, utility vaults, machinery cabinets, crawl spaces and even trenches are examples of possible confined spaces your employees may encounter. It is important to understand what defines a confined space. More important is understanding and identifying what makes a space a more hazardous “permit-required” confined space and what should be done to make entry safe.

CONFINED SPACE

To be considered a confined space, an area needs to have the following three characteristics:

1. It is large enough that an employee may enter. If the space is not large enough to allow someone inside, it is not considered a confined space.
2. It has a restricted means for entry or exit. This would include small or drop-down openings, ladders or anything that makes it difficult to get into or more important out of the space.
3. It is not designed for continuous employee occupancy. The space is only occasionally entered and not used on a routine basis. Often this space has poor lighting or ventilation.

PERMIT-REQUIRED CONFINED SPACE

A permit-required confined space meets the criteria above, plus has at least one of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere. This could include a flammable, toxic or oxygen-deficient atmosphere. Consideration should be given to confined spaces that have the potential to develop a hazardous atmosphere. For example, when opened, it could fill with carbon monoxide or other gases from the surrounding environment.
- Contains a material that could engulf an entrant. This is typically a dry bulk material, such as salt or sand; however, trenches and excavation also present the possibility of collapse or flooding.
- Has a design that could trap an entrant. This includes sloping floors or inwardly converging walls.
- Contains other recognized safety or health hazards. Electrical, fall, heat, noise and moving parts hazards are all examples of conditions that qualify.

If an area qualifies as a permit-required confined space, these steps should be taken:

1. Employees must be notified of the presence of the permit-required confined space. This can be accomplished through the use of identifying signage and training.
2. Determination must be made whether the space will be made enterable or worked in by employees. If not, measures must be taken to prevent entry into the space. If the space needs to be entered, a series of procedures must be followed and incorporated into a written program. As required by OSHA, the written program must include all of the following:*
   - Implement necessary measures to prevent unauthorized entry.
   - Identify and evaluate permit space hazards before allowing employee entry.
   - Test atmospheric conditions in the permit space before entry operations and monitor the space during entry.
   - Perform appropriate testing for the following atmospheric hazards in this sequence: oxygen, combustible gases or vapors, and toxic gases or vapors.
   - Establish and implement the means, procedures and practices to eliminate or control hazards necessary for safe permit-space entry operations.
   - Identify employee job duties.
   - Provide and maintain, at no cost to the employee, personal protective equipment and any other equipment necessary for safe entry and require employees to use it.
   - Ensure that at least one attendant is stationed outside the permit space for the duration of entry operations.
   - Coordinate entry operations when employees of more than one employer are working in the permit space.
   - Implement appropriate procedures for summoning rescue and emergency services, and preventing unauthorized personnel from attempting rescue.
   - Establish in writing and implement a system for the preparation, issue, use and cancellation of entry permits.
   - Review established entry operations annually and revise the permit-space entry program as necessary.
   - Implement the procedures that any attendant who is required to monitor multiple spaces will follow during an emergency in one or more of those spaces.
3. Entry permits must be obtained and displayed outside of the permit-required confined space when work is being performed. These permits require that pre-entry precautions have been followed and are signed by the entry supervisor.
4. All employees required to enter the permit-required space must be trained to assure that they have the understanding, knowledge and skills to work safely in this environment.
5. If rescue service personnel cannot respond in a timely manner (within three to four minutes) in the event of an emergency, trained individuals must be on hand with appropriate rescue equipment and valid first-aid, CPR certification. Any authorized person entering the permit-required space must also be equipped with a chest harness and retrieval line or other equivalent rescue gear.

Many serious injuries and deaths have occurred when unprepared individuals attempt to rescue someone from a permit-required confined space without proper training or equipment. Employees should be made aware that only trained rescue service personnel are to retrieve an individual.

Further safety rules and regulations regarding confined spaces can be primarily found in OSHA Standard 29 CFR1910.146, Permit-required Confined Spaces.

*From "Permit-Required Confined Spaces," OSHA.gov.

PERMIT-REQUIRED CONFINED SPACE (PERMIT SPACE) CHECKUP

ITEM	YES	NO	ACTION ITEM
Are all confined spaces identified as "permit required" or "nonpermit required"?			
If permit spaces are not meant to be entered, are they secured to prevent entry?			
If the confined space is below ground and near areas where motor vehicles will be operating, is it possible for vehicle exhaust or carbon monoxide to enter the space?			
Is the confined space checked for decaying vegetation or animal matter, which may produce methane or sulfurous gases?			
Are all permit spaces labeled as appropriate?			
Is there a written permit-required confined space entry program in place, and is it up to date?			
Are affected employees trained in permit space procedures?			
Is adequate illumination provided for the work to be performed in the permit space?			
Are appropriate tests performed to check for hazardous atmosphere or substances in the permit space before entry?			
Are all impellers, agitators or other moving parts and equipment inside permit spaces locked out if they present a hazard?			
Are all lines to a permit space that contain inert, toxic, flammable or corrosive materials valved off, and disconnected or separated before entry?			
Is either natural or mechanical ventilation provided prior to permit space entry?			
Whenever combustion-type equipment is used in a permit space, are provisions made to ensure the exhaust gases are vented outside of the enclosure?			
Is the atmosphere inside the permit space frequently tested or continuously monitored during work?			
Is approved respiratory equipment required if the atmosphere inside the permit space cannot be made acceptable?			
Is all portable electrical equipment used inside permit spaces either grounded and insulated or equipped with ground fault protection?			

CONT. CONFINED SPACE CHECKUP

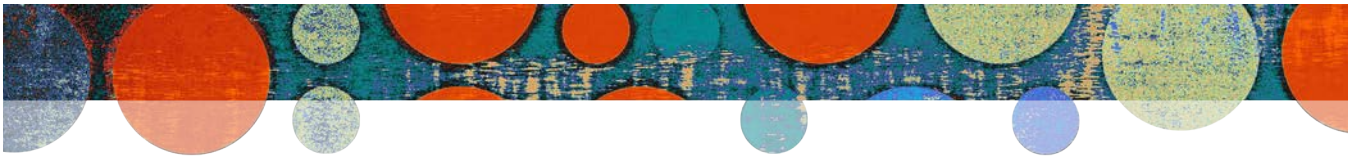
ITEM	YES	NO	ACTION ITEM
Are entry permits displayed outside the permit-required confined space when work is being done inside?			
Is each authorized entrant equipped with a retrieval line and harness (or effective alternative) before entering the permit space?			
Is there a trained and equipped standby employee positioned outside the permit space whose sole responsibility is to monitor the work in progress, sound an alarm if necessary and render assistance?			
Are employees or emergency responders trained and equipped to respond to emergency situations in a timely manner?			

EMERGENCY ACTION PLANS

30

In the event of fire, severe weather, gas leak or other emergencies, procedures should be in place to evacuate personnel quickly and safely. OSHA requires organizations with more than 10 employees to have a written emergency action plan, which must be communicated to all employees.

If the county already has an emergency action plan, ensure that it includes specific procedures for employees at the main shop, satellite shops and those off-site.



Emergency action plans must include the following procedures for all potential emergency situations.

Procedures for reporting a fire or other emergency, including:

- The process for notifying the proper authorities (fire, rescue, etc.)
- The process for notifying employees about the situation. Details for notification of employees off property or located at satellite shops should also be included.

Procedures for emergency evacuation or sheltering for severe weather defining:

- Who is responsible for authorizing and coordinating an emergency action.
- The chain of command and assigned responsibilities.
- Severe weather shelter locations and emergency procedures for severe weather.
- Exit routes that are clear and free of additional hazards.
- Target areas to gather during an evacuation. A secondary target destination should be identified in the event the first is compromised.
- How employees with special needs and visitors/ contractors will be assisted during the evacuation.

Procedures for employees who remain to perform critical operations before they evacuate, including:

- Utilities or equipment requiring shut down or protection during an emergency. Locations of utilities to be shut down are commonly added to the emergency action plans.
- Descriptions of each assigned operation.

Procedures to account for all employees after evacuation, defining:

- Who is responsible for taking a head count at the evacuation site.
- Process to identify if people are missing. Are means in place to account for them, such as knowing their last location or where they are?

Procedures for employees performing rescue or medical duties: Only if any persons are expected to perform these duties. If outside resources (e.g., hospitals and fire stations) are used to perform these duties, those resources need to be listed and contact information included.

In addition, the plan must include the name and job title of the employee(s) who may be contacted if other employees need more information or explanation concerning procedures and duties.

The written plan must be conveyed to employees. This information should be part of an employee's orientation, and training should be repeated when the plan or an employee's responsibility under the plan is changed.

Further safety rules and regulations regarding emergency action plans can be primarily found in OSHA Standard 29 CFR1910.38, Emergency Action Plans.

EMERGENCY ACTION PLAN CHECKUP

ITEM	YES	NO	ACTION ITEM
Is a written emergency action plan available, detailing procedures for all sites and employees?			
Is the emergency action plan available to employees for review?			
Are all employees trained on the emergency action plan and retrained when the plan changes or their responsibilities under the plan change?			

EMPLOYEE RIGHT TO KNOW: HAZARDOUS SUBSTANCES

31

Handling hazardous substances is part of the daily duties for many public work's employees. Antifreeze, fuels, battery acid, solvents and other cleaning agents are just some of the examples of chemicals that can expose employees to harm if not handled properly. The Occupational Safety and Health Administration (OSHA) requires that a safety program be in place to help protect employees who are exposed to dangerous materials.

EMPLOYEE RIGHT TO KNOW

EMPLOYEE RIGHT TO KNOW (ERTK)

Minnesota OSHA requires that employers have a formal, comprehensive written program that details how hazardous substances and other harmful physical agents, such as heat, noise, radiation and infectious pathogens, are identified and how employees will be trained to work safely with and around them.

The program must include all of the following:

- An inventory of hazardous substances and/or agents in the workplace.
- Identification of employees who are routinely exposed to these substances or agents.
- A system for obtaining and maintaining written information about these substances or agents.
- Methods for making ERTK materials, including safety data sheets, readily accessible to employees and other exposed workers (e.g., independent contractors) in their work areas.
- A plan for providing and recording pre-assignment and annual employee training.
- Implementation and maintenance of a labeling system and other warning methods.

SAFETY DATA SHEETS

A key to the Employee Right to Know program is safety data sheets (SDS). Each substance has a corresponding SDS that is made up of 16 categories, detailing information about that substance. This information includes the chemical composition, hazards identification, first aid, handling, storage and other details pertaining to the substance.

All distributors of these materials are required to make available corresponding safety data sheets, but it is the duty of the employer to maintain a copy for each substance used in the workplace. These SDS need to be retained for 30 years even if the material is no longer in use.

Whether SDS are kept in hard copy form in a notebook or maintained in an electronic version, they must be easily accessible to employees. Special consideration should be given to SDS access for employees working after normal operation hours, contracted individuals, and password protected computers when using online information.

Missing or outdated safety data sheets can often be replaced by obtaining them directly from the chemical supplier or from the manufacturer. They can also be found via Internet searches.

CONTAINER LABELING

Purchased chemical products should already come with a label that provides hazard warnings and other related health information. However, when a product is moved from its primary container to a secondary, workplace container, that secondary container needs proper labeling, too.

The labeling on secondary containers must provide employees with an immediate, clear understanding of the primary health and/or physical hazard(s) of the hazardous substance in the container through the use of words, pictures, symbols or any combination of these elements. Care must be taken to assure that these labels do not fade or get washed out.

If an employee keeps control of a secondary container and uses its entire contents or returns the remaining chemical back to the primary container, this labeling is not required. However, if this workplace container is put aside and not kept in the control of the employee, labeling is necessary.

TRAINING

Training is required to make employees aware of:

- Hazards to which they are exposed, to know the short- and long-term effects of exposure to substances or agents, and how to protect themselves from overexposure (e.g., appropriate personal protective equipment and/or clothing, etc.)
- How to find, read and use information on safety data sheets, labels or other reference materials.
- Appropriate work practices. Employers should enforce these work practices.

Employee Right to Know training is required for employees:

- When they are assigned to a workplace where they may be routinely exposed to a hazardous substance, harmful physical agent or infectious agent.
- When any new or additional hazardous substance or agent is introduced into the workplace and there is routine exposure.

- When information on a safety data sheet changes.
- When a hazard changes.
- Annually as a refresher.

Records of ERTK training must be retained for a minimum of three years but may be longer, depending on an organization's retention rules.

EMERGENCY EYE WASH/SHOWER STATION

If employees have potential splash exposure to corrosive chemicals, an emergency eyewash station and/or shower must be installed within 55 feet of the exposure area. At this distance, an employee should be able to reach the station within 10 seconds to rinse eyes or skin after a chemical splash.

Corrosive chemicals can be found in batteries, degreasers, cleaners and other products used in maintenance garages. If the chemical is a strong corrosive, an eyewash/shower station may need to be installed adjacent to the exposure site. The determination for the need of an eyewash/shower station is to be made regardless of personal protective equipment use.

Emergency eyewash and shower stations can be plumbed in or installed as stand-alone units. Plumbed stations should include a mixer to control temperature to a tepid range between 60 degrees and 100 degrees Fahrenheit. If the water temperature is beyond this range, an affected employee may not rinse long enough to be effective.

Plumbed stations must be evaluated weekly to ensure cleanliness, easy access and that all components are in good, working order. During these weekly inspections, the water must be run long enough to verify operation and to clean the lines of potentially harmful bacteria or other contamination. Inspection of portable or self-contained units should follow the manufacturer's instructions for content and frequency of inspection. If the manufacturer lacks guidelines on maintenance or frequency, checks should be done periodically to verify the level of solution, the flushing solution is changed per manufacturer guidelines, the unit is not blocked and that commercially available solutions for eye flushing are used. The weekly inspections for plumbed stations and periodic inspections for stand-alone stations should be recorded on a water resistant tag near the unit.

Further safety rules and regulations regarding the Minnesota Employee Right to Know program and additional details about emergency eyewash/shower stations are available at the Minnesota Department of Labor and Industry's website, DLI.mn.gov.

EMPLOYEE RIGHT TO KNOW CHECKUP

ITEM	YES	NO	ACTION ITEM
Is a written Employee Right to Know program reviewed annually and as necessary updated?			
Is the ERTK program available for all employees to see?			
Is there an inventory of workplace hazardous materials and harmful agents?			
Is there a record of employees who are routinely exposed to hazardous materials, substances and harmful agents?			
Is ERTK information, including safety data sheets, available and current on all hazardous materials and agents?			
Do all employees and contracted individuals have easy access to ERTK information in written or electronic format?			
Is training conducted and recorded on the safe use of hazardous substances and safely working around harmful agents for new employees before being assigned job duties?			
Is ERTK refresher training conducted and recorded annually?			
Are all primary and secondary containers of hazardous substances labeled to provide clear understanding of the product and its related safety information?			
Are any corrosive chemicals used that would require the installation of an emergency eye wash and/or shower station?			
If an emergency eye wash/shower station is installed: Is the flushing fluid temperature maintained between 60 degrees and 100 degrees Fahrenheit?			
Is the access path to the station kept clear and unobstructed?			
Are weekly inspections conducted of plumbed units with periodic inspections of self-contained units to ensure the cleanliness and working order of the station?			
Are weekly inspections recorded and kept in good condition near the station?			

ERGONOMICS

32

Public works employees perform numerous tasks that put strain on their bodies. When these tasks involve awkward postures, forceful lifting, pushing and pulling of heavy or bulky objects, vibration or prolonged repetitive motion, employees have an increased chance of injury. One method to help reduce these risks is to apply ergonomic strategies, such as the following, to work tasks.

STRETCHING

No baseball player would start a game without an extensive warm-up involving stretches. The demands on public works employees may not be the same as that of baseball players, but many tasks can put strain on their musculoskeletal system.

Simple stretching exercises before performing tasks that demand a great deal of physical effort can better prepare muscles for the job. Only use stretching techniques that are safe and work for each individual. Stretching should never reach the point of experiencing pain.

TAKING MICROBREAKS

When performing prolonged work, it is important to take microbreaks. These short breaks do not have to be more than a minute but should include time to stretch and relax. This allows the body time to recover and brings blood and oxygen to fatigued muscles and joints. Microbreaks should be regularly scheduled every 20 minutes or so.

REDUCING VIBRATION

Regular exposure to vibration can create tingling and numbness in fingers, hands and arms. Prolonged exposure can result in a condition known as "vibration syndrome."

Measures should be taken to reduce vibration in power tools and equipment. Among the types of equipment that pose vibration hazards are chain saws, pneumatic hammers and wrenches, concrete breakers and grinders.

Both administrative and engineering controls can be used to mitigate vibration. If possible:

- Alternate work involving vibration with tasks that do not, or allow rest breaks to reduce continuous exposure.
- Check tools before use to make sure they are in good working condition and operate without excess vibration.
- Keep cutting tools sharp. Dull blades can create more vibration.
- Let the tool do the work; maintain only enough grip to operate equipment safely and effectively. Do not force a tool more than is needed.
- Wear vibration-reducing gloves. They not only help decrease vibration, they also keep hands warm.
- Add anti-vibration tape to handles of power tools.

PLANNING AHEAD

Thinking about the different requirements of a coming task can help identify alternative ways to do the job more safely. For example:

- If the task requires handling large or awkward objects, consider ways to do this more safely and with less strain. Will there be obstacles in the path of movement or uneven ground? Is there equipment that can help move these objects more safely?
- If the task requires hand tools, are they the best for the job? Do they fit the employee's hand comfortably? Can they be used while maintaining a straight wrist?
- If power tools are used, can they be supported to relieve some force? Is the working surface at a height that reduces back strain or overextension of the arms?
- Does the task require squatting or kneeling? Consider using personal protective equipment, such as knee pads, to reduce impact from hard surfaces. Could a stool be used while performing this job?

Job hazard analysis can be an effective way to plan a job by breaking it down into separate actions. Each of these actions should be looked at from an ergonomic and safety perspective. Listing the exposures of each action can then help identify ways to remedy the hazards. For more information about job hazard analyses, please see Chapter 36.

USING SAFER LIFTING TECHNIQUES, ELIMINATING LIFTS

Handling heavy materials is common during the workday. Employees should focus attention on proper body mechanics when lifting, shoveling or handling heavy tools and equipment.

Safer lifting techniques include:

- Standing close to the load with solid footing.
- Bending at the knees and not the back.
- Keeping the back straight.
- Lifting with the legs.
- Contracting stomach muscles during the lift.

- Holding the load close to the body.
- Avoiding twisting or other awkward movements.
- Asking for help if the load is too heavy, awkward or long.
- Using handles or carrying tools when available.

If possible, consider using equipment designed to ease or eliminate lifting or carrying. A movable hoist or a dolly can make moving materials and lifting less strenuous. A Blade Buddy plow jack uses hydraulics to raise and hold snowplow cutting edges during replacement. Even a properly sized shovel handle can help reduce the amount of bending needed.

When storing materials, consider how they will be lifted off the shelf or pallet rack. If the materials are meant to be manually lifted from a shelf, positioning is important to reduce strain. Heavier objects should be stored between knee and shoulder height. This will reduce the amount of reaching or lifting required to move that object. Only lighter objects should be stored above shoulder height.

VEHICLE ERGONOMICS

Many of the vehicles used by public works employees expose them to health and ergonomic hazards, including awkward body postures, vibration, noise, extreme temperatures, dust, exhaust, etc. These risk factors should be examined and steps taken to reduce the hazards. You could consider engineering controls, such as maintenance, replacing equipment or providing more adjustability. You would also want to examine administrative controls, including job rotation and enforced breaks.

When evaluating ergonomic hazards, consider the following.

- Vibration: Efforts should be made to reduce the amount of vibration experienced by the vehicle operator. Maintaining tires and suspension should help to reduce vibration. The driver's seat should be designed to isolate and reduce the specific vibrations characteristic of the machinery.
- Awkward postures: The positioning of the seat and the controls are important to reduce awkward postures. While maintaining good views of the operation, the steering column and controls should be positioned to minimize arm extension. An adjustable arm rest can also be used to support the arm operating the controls. If the job task includes twisting the head or body, the cab should have a good field of vision. Swivel, lockable seats can also help reduce the amount of twisting.
- Adjustability: The driver's seat should be easily adjustable to most body types. The lumbar should be able to be positioned for maximum comfort, and the seat pan should be movable to provide support for the legs without pushing against the inside of the knee. The steering wheel and/or controls should be adjustable to reduce arm extension.
- Rotating shifts: For vehicles with high vibration, low adjustability and a large amount of awkward postures, minimizing the time individuals operate machinery can help reduce exposure to ergonomic hazards.

More information about ergonomics can be found in the OSHA publication No. 3125, "Ergonomics: The Study of Work" found at OSHA.gov.

ERGONOMICS CHECKUP

ITEM	YES	NO	ACTION ITEM
Is task rotation or are rest breaks encouraged when employees are engaged in a repetitive prolonged activity?			
Are safe stretching exercises encouraged before engaging in strenuous activities?			
Are tools the proper size and shape to fit the individual employee's hands?			
Are tools used during hand-intensive tasks designed so the wrist can remain straight?			
Is equipment vibration mitigated through the use of anti-vibration gloves or tape?			
Are cutting tools kept sharp to minimize vibration?			
If tasks require kneeling, are knee pads or cushions provided?			
Can equipment be used to reduce kneeling?			
If tasks require squatting, can equipment be used to reduce squatting?			
Are employees using safe lifting techniques?			
Is equipment available to help minimize strain when lifting heavy objects (e.g., blade buddy, hydraulic lift carts, etc.)?			
Are materials stored with ergonomics in mind (e.g., heavy objects between knee and shoulder height)?			
Has a job hazard analysis been performed on each common task?			
Are vehicles equipped with seats that can be adjusted for individual operators and offer full back and leg support?			
Are vehicles maintained to reduce vibrations that may affect the operator?			
Are controls in vehicles positioned (or adjustable) to minimize arm extension when used?			

FIRST-AID, CPR TRAINING AND KITS

33

Although every effort must be made to prevent accidents from occurring, if an injury does occur, a combination of employees trained in first aid and cardiopulmonary resuscitation (CPR), and adequate first-aid supplies may be required to prevent further injury and to save lives.

TRAINING

The Occupational Safety and Health Administration (OSHA) requires that at least one employee in workplaces not in near proximity to a hospital or emergency response be trained to render first aid and that adequate first-aid supplies be available.

OSHA has typically interpreted near proximity to mean three to four minutes of response time in areas where serious accidents are possible. In areas where the likelihood of serious injury is more remote, such as office buildings, a 15-minute response time is acceptable.

Consideration should also be paid to employees working alone. Solitary workers may not be capable of administering aid or calling for emergency services, which could increase response times. See Chapter 38 Lone Worker for more information.

Employers should survey sites and locations for hazardous activities and emergency response times. If necessary, employers should determine whether employees need to receive first-aid and CPR training. This may include employees working in remote locations.

Additionally, all employees in the specific area where chainsaws are used or those on a confined space rescue team are required to undergo first-aid and CPR training.

Other than the noted circumstances above, OSHA standards do not detail training content or refresher guidelines. Employers, therefore, determine the frequency of training, the trainers used and content of the training.

In any case, it is important that trained employees know how to respond should an event occur. Any trainers should be knowledgeable in the subject matter and should be available for questions. First-aid and CPR training should include a skills demonstration and evaluation component where results are documented and retained.

CONFINED SPACE FIRST-AID, CPR TRAINING

In the case of employees conducting confined space rescue, OSHA requires that all individuals be trained in first-aid and CPR. At least one employee on the team must maintain an active first-aid and CPR certification with the American Red Cross, American Heart Association or the National Safety Council. To maintain this certification, the individual must complete required refresher training every two years from a certified instructor.

LOGGING (CHAINSAW) OPERATIONS FIRST-AID, CPR TRAINING

There are specific OSHA requirements for chainsaw operations. First-aid training for employees involved in logging (chainsaw) operations must include the following at a minimum:

- The definition of first-aid
- Legal issues of applying first-aid (Good Samaritan laws)
- Basic anatomy
- Patient assessment and first-aid for:
  - Respiratory and cardiac arrest
  - Hemorrhage
  - Lacerations, abrasions
  - Amputations
  - Musculoskeletal injuries
  - Shock
  - Eye injuries
  - Burns
  - Loss of consciousness
  - Extreme temperature exposure (hypothermia/hyperthermia)
  - Paralysis
  - Poisoning
  - Loss of mental functioning (psychosis/hallucinations, etc.)
  - Artificial ventilation
  - Drug overdose
- CPR
- Application of dressings and slings
- Treatment of strains, sprains and fractures
- Immobilizing, handling and transporting injured persons
- Treatment of bites, stings or contact with poisonous plants and animals

FIRST-AID KITS AND AEDS

Employers are required to provide medical supplies corresponding to the hazards of the workplace. An examination of the work tasks and equipment should help better define the types and amounts of supplies that should be made available.

All first-aid kits should be checked periodically. These inspections should include restocking of used items and removal of expired products. Some items have printed expiration dates; others, such as adhesive bandages, typically do not. If the package shows signs of aging or the seal is broken, the items should be discarded. This applies to all first-aid kits whether in buildings or in vehicles.

Over-the-counter medicine, such as painkillers, antacids and cold medicines, are sometimes stocked in first-aid kits. Consideration should be given to the potential risks to providing this type of medicine to employees. Risks include undesired side effects, such as drowsiness, allergic reactions and overdosing.

If over-the-counter medication is included in first-aid kits, employers should institute safeguards, such as including only sealed, single dose, tamper-evident packaged medication with appropriate labeling that employees can review to make an informed decision upon use.

An automatic external defibrillator (AED) is a device that measures a person's heartbeat and if necessary sends an electric shock to restore the heartbeat to a normal rhythm. Although not required by OSHA, these tools can be valuable for first aid and improve survivability when compared to using CPR alone.

If an AED is available, the device should be periodically inspected for battery life, pad expiration or signs of tampering.

LOGGING (CHAINSAW) OPERATIONS FIRST-AID KIT CONTENTS

Although OSHA standards do not require specific contents for most first-aid kits, there is an exception for kits present during logging (chainsaw) operations. OSHA requires that logging first-aid kits be on site during chainsaw operations. They must contain at a minimum:

- Gauze pads (at least 4x4 inches)
- Two large gauze pads (at least 8x10 inches)
- Box adhesive bandages
- One package gauze roller bandage at least 2 inches wide
- Two triangular bandages
- Wound-cleaning agent, such as sealed moistened towelettes
- Scissors
- One blanket
- Tweezers
- Adhesive tape
- Latex gloves
- Resuscitation equipment (such as resuscitation bag, airway or pocket mask)
- Two elastic wraps
- Splints
- Directions for requesting emergency assistance

These kits are designed for small work crews of approximately two to three employees. For larger operations, additional kits or supplies may be needed.

MINIMUM FIRST-AID KIT RECOMMENDATIONS

Even though there are no mandatory requirements for first-aid kits other than the above logging (chainsaw) standard, employers have some options regarding first-aid kit contents. The contents of any first-aid kit should address the hazards of the workplace. Employers should reference the American National Standards Institute (ANSI) standard Z308.1-2015 regarding the contents of first-aid kits. These components are a recommended minimum and may need to be altered to accommodate different workplace hazards.

The recommended minimum contents from the ANSI standard are as follows:

- Adhesive bandages, 1 x 3 inches (16)
- Adhesive tape, 2.5 yards (1)
- Antibiotic treatment, 0.14 fl. oz. (0.5g) applications (10)
- Antiseptic, 0.14 fl. oz. (0.5g) applications (10)

- Breathing barrier (1)
- Burn dressing, 4 x 4 inches (1)
- Burn treatment, 1/32 oz. (0.9g) applications (10)
- Cold pack, 4 x 5 inches (1)
- Eye coverings (2)
- Eye wash, 1 oz. (1)
- First-aid guide (1)
- Hand sanitizer, 1/32 oz. (0.9g) applications (6)
- Medical exam gloves (4)
- Roller bandage, 2 inches x 4 yards (1)
- Scissors (1)
- Sterile pads, 3 x 3 inches (2)
- Trauma pads, 5 x 9 inches (2)
- Triangular bandage, 40 x 40 x 56 inches (1)

Further safety rules and regulations regarding first-aid and CPR training and first-aid kits can be primarily found in OSHA Standards 29 CFR1910.151, Medical Services and First Aid; 29 CFR1910.266(d)(2), First Aid Kits; and OSHA Publication No. 3317, "Fundamentals of a Workplace First-Aid Program" available at OSHA.gov.

FIRST-AID, CPR TRAINING AND KITS CHECKUP

ITEM	YES	NO	ACTION ITEM
Has a workplace assessment been made identifying the need for first-aid, CPR training and kits?			
Are employees on a confined space rescue team first-aid and CPR certified with valid certificates?			
Are employees involved in logging (chainsaw) operations trained on first-aid and CPR prior to chainsaw use?			
Have other employees been trained on first aid and CPR as needed?			
Are records retained and stored documenting the training and that demonstrations and evaluations were completed successfully?			
Are first-aid kit contents suitable for the potential injuries at the given workplace?			
Are first-aid kits present and periodically checked for restocking and disposal of expired products?			
If providing an AED, are these inspected regularly for battery life, expiration dates and evidence of tampering?			
Are OSHA-required first-aid kits nearby when using chainsaws?			

HEARING CONSERVATION

34

Public works employees often perform duties using noise-generating equipment. Over time, exposure to high noise levels can potentially result in not only hearing loss but also other detrimental physical, psychological and social effects.

The Occupational Safety and Health Administration (OSHA) requires that employers offer employees protection from these effects when sound levels exceed certain parameters. This protection consists of more than merely offering ear protection. A complete hearing conservation program must be established if an employee is exposed to a minimum time-weighted average of 85 decibels over eight hours, measured on the A-scale (dBA). This is also called the action level.

The operation of numerous pieces of equipment exceeds this action level. MCIT has measured the sound levels of different equipment used by public works employees. MCIT consultants have measured the following short-term noise exposures at member facilities: road grader, 89 dBA; push mower 91 dBA; lawn tractor, 94 dBA. Other examples of common equipment can be found in Table A.

TABLE A: NOISE LEVELS OF COMMON SOUNDS

80–90 Decibels	100+ Decibels
Hand Drill	Snow Blower
Push Mower	Leaf Blower
Road Grader	Chain Saw
Tractor	Circular Saw
Shop Vac	Car Horn

To determine if using this equipment exceeds the permissible noise exposure as directed by OSHA, both the sound level and time exposed are factored. For example, if an employee is clearing brush and operating a chain saw (dBA of 105) for more than one hour in a typical workday, this would trigger the implementation of a noise conservation program. This exposure would require inclusion in a hearing conservation program regardless of any hearing protection the employee may be wearing.

Table B shows the maximum hours per day that an employee can be exposed to different sound levels.

To determine whether an employee is exposed to the action level that would require inclusion in a hearing conservation program, start by determining the noise level that equipment makes when operated. To do this, consider the following:

- Work with employees to make a list of equipment that generate loud noise. As a rule of thumb, if you have to shout to be heard from three feet away, the level is close to 85 dBA.
- Determine the noise level of that equipment. Decibel ratings can often be found on the manufacturer's plate affixed to that equipment or in the owner's manual. A sound level meter can also be used to determine a snapshot of the equipment's noise level. An MCIT loss control consultant can assist with these readings.
- In situations where an employee is exposed to multiple noises over an eight-hour workday or where there is uncertainty of the noise level exposure, further determination can be made using a dosimeter. This device uses a monitor that is attached near the hearing zone of an employee and can calculate the eight-hour, time-weighted noise average.

TABLE B: OSHA DAILY PERMISSIBLE NOISE EXPOSURE

Hours Per Day	Sound Level (dBA)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or Less	115

MITIGATING NOISE EXPOSURE

When it is determined that an employee is exposed to noise at an eight-hour, time-weighted average of 85 dBA or more, the next step is to try to remedy the exposure through engineering or administrative controls. These remedies could include muffling the noise with baffles or other dampeners, replacing the equipment with quieter models, or changing work patterns to reduce an employee's exposure.

The use of personal protective equipment (PPE) to reduce the noise level will not affect this determination but may be required. Examples of engineering and administrative controls are found in Table C.

If, after these controls, the noise is still above the action level, OSHA requires employers to develop a written hearing conservation program. This program must include the following:

- Documentation of noise exposure levels.
- Identification and notification of employees exposed to noise at or above the action level.
- Implementation of an audiometric testing program, including a baseline audiogram and subsequent annual testing. These yearly follow-up tests indicate whether the hearing conservation program is preventing hearing loss.
- Employee training at least annually regarding the effects of noise on hearing; the purpose, advantages and disadvantages of various types of hearing protectors; the selection, fit and care of protectors; and the purpose and procedures of audiometric testing.
- Evaluation, selection, proper use, care and availability of hearing protection devices.
- Recording and retention of noise level and audiometric testing records.

Even if noise levels do not exceed the action level, measures should be taken to protect the hearing of employees in noisy surroundings. Hearing protection suitable for the environment should always be provided and encouraged when working around loud equipment. In addition, signs should be posted in noise hazard areas and labels placed on identified noisy equipment.

TABLE C:
EXAMPLES OF ENGINEERING AND ADMINISTRATIVE CONTROLS

Engineering Controls	Administrative Controls
Choose low-noise equipment and tools	Limit time that employee works with noisy equipment
Add mufflers or baffles to dissipate sound	Distance employees from noise source
Place barrier between source of noise and employee	Review work procedures to determine potential sound level reduction
Reduce equipment vibration	Increase noise awareness and training
Lubricate equipment	
Isolate or enclose noise source	

Further safety rules and regulations regarding hearing conservation can primarily be found in OSHA Standard 29 CFR1910.95, Occupational Noise Exposure. Additional information can be found in OSHA Publication No. 3074, "Hearing Conservation," available at OSHA.gov.

HEARING CONSERVATION PROGRAM CHECKUP

ITEM	YES	NO	ACTION ITEM
Is there an inventory of equipment that generates loud noise?			
Has the level of noise from inventoried equipment been determined?			
Have engineering controls been applied to mitigate noise?			
Have administrative controls been applied to mitigate noise?			
If the noise level of a piece(s) of equipment is greater than or equal to 85 dBA, does the time of employee exposure exceed the action level required to implement a hearing conservation program as per OSHA Standard 29 CFR1910.95?			
If a hearing conservation program is required by OSHA, does it document noise levels and employees who meet the action level of 85 dBA or greater during a time-weighted eight-hour work day?			
If a hearing conservation program is required by OSHA, does it include notification of employees meeting the action level and their involvement in the hearing conservation program?			
If a hearing conservation program is required by OSHA, does it document training on the effects of noise on hearing; the purpose and procedures of the program; and how to choose, use and care for proper ear protection equipment?			
If a hearing conservation program is required by OSHA, has a plan for baseline and subsequent yearly audiometric testing been put in place?			
If a hearing conservation program is required by OSHA, does it provide properly fitted ear protection that is worn and cared for?			
If a hearing conservation program is required by OSHA, are testing records retained for the entire length of employment?			
If a hearing conservation program is required by OSHA, is the hearing conservation updated to take into account changes in work processes and equipment?			
Is hearing protection made available to employees who are not included in a hearing conservation program but still have an exposure to noise?			

HOT WORK: WELDING, BRAZING AND SOLDERING

35

Welding, brazing, soldering and cutting all fall under the category of hot work. Most often, these processes are done in a designated area, but sometimes hot work needs to be performed in other locations. No matter the location, hot work presents safety risks that need to be addressed. Fire control, ventilation and personal protective equipment (PPE) are a few of the measures that should be included in a hot work safety protocol.

To reduce the risks of performing hot work, the following safety tips should be observed:

- Fuel and oxygen cylinders should be stored and handled in a safe manner. See Chapter 16, Gas Cylinders for more information about safe gas cylinder storage and handling.
- All equipment should be inspected before use. Connections should be tight, hoses in good condition and no leaks detected.
- Flashback arrestors and/or back flow preventers should be installed on equipment.
- Before arc welding, check that the equipment is properly grounded, work is performed on a dry surface and that there is clear access to emergency disconnect.
- Before welding or cutting, check the work area for flammable or volatile substances. Look above and below the work area and close any floor openings. If working on tanks, drums or barrels, ensure the inside is cleaned and free of flammable or toxic substances.
- Before starting work, combustibles should be cleared in an area measuring 35 feet around the hot work operation, including above and below. Sparks and molten metals can travel this far and smolder for long periods before igniting into a fire. If clearance is not plausible, a fire retardant blanket or other means of protection should be used.
- Fire extinguishers or other fire suppression equipment should be made available near the work area. At least one fire extinguisher with a minimum rating of 2-A:20-B:C must be readily accessible within 30 feet of any hot work location. These extinguishers should be maintained yearly and inspected on a monthly schedule.
- All hot work processes produce gases, some of which are more hazardous than others. Special attention should be given when working with galvanized metals, stainless steel and coated materials that could contain cadmium, chromium or other hazardous chemicals. Proper ventilation and/or respiratory protection should be provided. If respiratory PPE is required, a written program must be in place.
- Ventilation should be periodically inspected to ensure proper air flow. Filters may need cleaning or replacing. Flexible venting tubes should be checked for cracks or tears.
- Depending on the hot work process, suitable personal protective equipment should be available, kept in good condition and worn. This may include respiratory, hearing, vision and skin protection.
- Loose clothing, jewelry and hair should be controlled before starting work.
- Eye protection should be included for others near the work area. Keeping others at a distance, providing a light screen or requiring proper eye wear should be considered.

HOT WORK PERMIT PROGRAM

If hot work activities are performed by employees or contractors in an area away from a designated welding area, consideration should be given to establishing a written hot work permit program. This program formalizes many of the above best practices and outlines the procedures required to begin hot work. A permit includes a pre-inspection of the work area by a permit authorizing individual and a fire watch signature by an authorized individual tasked with watching over the area for potential fire hazard, as well as inspecting the work area after the work is completed. The individual must be:

- Trained about the use of a portable fire extinguisher and have fire-extinguishing equipment readily accessible.
- Able to view the entire area; more fire watchers may be needed if sparks or other items can fall vertically to other areas or out of a line of sight.
- Watching for a minimum of 60 minutes after conclusion of work.

The hot work operator then conspicuously displays this permit throughout the operation. Visible hazard identification signs are also required when the hot work area is accessible to persons other than the operator of the hot works equipment to warn people before they enter the area reading: CAUTION HOT WORK IN PROGRESS STAY CLEAR.

Further safety rules and regulations regarding hot work can be primarily found in OSHA Standard 29 CFR1910.252, Welding, Cutting and Brazing, and the Minnesota State Fire Code.

HOT WORK CHECKUP

ITEM	YES	NO	ACTION ITEM
Are fuel and oxygen cylinders stored and handled in a safe manner?			
Are flammables and other combustible materials located at least 35 feet away from hot work activities?			
Are fire extinguishers or other fire suppression equipment located within 30 feet of hot work activity?			
Are back-flow or flashback preventers installed between the torch and hose or built into the equipment?			
Is hot work equipment inspected before use?			
Is the work area, including above and below it, inspected for flammable or volatile substances?			
Are tanks, drums and barrels cleaned and free of flammable or toxic substances before hot work is started?			
Are hot work areas supplied with adequate ventilation?			
Is hot work ventilation periodically checked for adequate air filtration? Are filters regularly cleaned and checked? Are flexible vent ducts free of cracks and tears?			
Is personal protective equipment (PPE) available for all hot work activities?			
Are hot work operators trained on PPE care and how to wear it properly?			
If hot work requires the use of a respirator, is the operator fit-tested and trained as per a written respiratory program?			
Are signs present and staff trained to avoid entering hot work areas?			
Are other precautions taken to protect helpers and bystanders from eye hazards caused by hot work?			
Is a hot work permit program in place for activities outside the designated welding area?			
Is a designated fire watcher(s) who is trained about fire extinguisher use and stays at least 30 minutes after work is completed present during hot work in areas with combustibles or other fire hazards?			
When arc welding, is the equipment properly grounded and equipped with an easily accessible emergency disconnect breaker or switch?			

JOB HAZARD ANALYSIS

36

Minnesota's A Workplace Accident and Injury Reduction (AWAIR) program requires that workplace hazards be identified, analyzed and controlled. One technique recommended in the AWAIR program is the job hazard analysis (JHA) or job safety analysis. A job hazard analysis breaks down a job or process into its component tasks and identifies hazards within the steps required to do the particular job. Once the hazards are known, then measures to reduce or eliminate them, such as personal protective equipment, are identified before injuries occur. After the JHA is complete, including required safety controls, an evaluation should be conducted to determine if the JHA addresses all hazards inherent in the task or process.

Because a completed JHA has identified a job's hazards and corresponding safety measures, it can also be useful for conducting accident/incident investigations and safety training.

EMPLOYEE PARTICIPATION

A job hazard analysis offers the best results when employees are involved in the process. Employees are often the most familiar with the required activities for particular tasks and can offer valuable insights. Some tips for employee involvement include:

- Discuss what the JHA process is and why.
- Explain that the focus is on the task or step and not employee performance.
- Keep employees involved during the entire process for the JHA.
- Consider having employees from the safety committee participate.

IDENTIFYING JOBS FOR JHAs

To determine which jobs should have a JHA, consider the following:

- Jobs with the highest injury or illness rates.
- Jobs where there have been close calls—where incidents have occurred but no one was hurt.
- Jobs with identified violations of OSHA standards.
- Jobs with the potential to cause serious injuries or illness, even if there is no history of such problems.
- Jobs that are new to the operation or have been changed.
- Jobs complex enough to require written instructions.

6 STEPS FOR CONDUCTING A JOB HAZARD ANALYSIS

Six steps and tips for conducting a job hazard analysis are below.

1. Break the job task into steps.
   - Watch the employee do the job and list each step in order with employee input.
   - Begin each step with a verb, for example, "Turn on the saw."
   - Do not make steps too broad or too detailed.
   - Consider videotaping or photographing the process to review.
   - Review the steps with the employee and consult with other employees who do the same job.
2. Identify the hazards of each step. For each step of the process ask:
   - What can go wrong?
   - What could be the consequences?
   - How could accidents/injuries happen?
   - What is the likelihood that an accident would occur?
3. Review the list of hazards with employees who do the job. Discuss how to eliminate or reduce them, focusing on the hazards that have the most severe consequences and those that have the highest frequency.
4. Identify ways to eliminate or reduce hazards:
   - Remove unnecessary steps.
   - Implement equipment changes or engineering controls to manage the hazard, for example installing machine guarding or exhaust ventilation, or using different machines or tools.
   - Change how the task or process is done when engineering controls are not possible, for instance rotating jobs, changing steps or providing additional training.
   - Improve personal protective equipment, such as new gloves or different hearing protection.
   - Be specific; avoid generalizations such as "Be careful."
5. Correct unsafe conditions and processes: Train all employees who do the job about any changes and ensure they understand the changes.
6. Review the JHA when the task or process changes and when injuries or close calls occur doing the task.

Further resources for conducting a job hazard analysis are provided by OSHA in Publication 3071, "Job Hazard Analysis" found at OSHA.gov.

JOB HAZARD ANALYSIS CHECKUP

ITEM	YES	NO	ACTION ITEM
Have employees been involved in the process?			
Have jobs been identified and given priority for JHAs?			
Are all of the steps of a job included and are the hazards identified?			
Are all hazards assigned a level of risk?			
Are recommendations included to address each hazard?			
Have engineering controls been considered prior to other controls?			
Have any changes to the job process/safety measures been communicated to employees?			
Has the job hazard analysis been reviewed periodically?			

SAMPLE JOB HAZARD ANALYSIS FORM

JOB TITLE: Skid loader operator	**JOB TASK:** Skid loader operation	**DATE:** 01/05/2016
Department: Public Works	**Supervisor:** Joe Anyone	**Analysis By:** Jane Somebody
Required and/or Recommended Personal Protective Equipment: Hearing protection, safety glasses, leather gloves, steel-toe shoes		**Reviewed By**: Hector Inspector
Traffic Control Required ☒Yes ❑ No:		**Approved By:** Ima Boss
Sequence of Basic Steps	**Potential Hazards**	**Recommended Action/Procedure**
1. Start up	Skid loader movement—collisions with people	• Observe surroundings prior to entering machine • Beep horn prior to moving • Move slowly
2. Push materials with skid loader	• Collisions with objects • Collisions with overhead objects • Tip over	• Proceed slowly, lower skids for optimal vision • Remove low hanging objects if possible, or make low hanging objects highly visible with paint or tape • Rearrange workspace to minimize need for sharp turns, keep bucket low to the ground, proceed slowly and be aware of surroundings
3. Grapple material	• Powerful grapple jaws • Pinch point • Dropping materials • Visibility issues	• Proceed slowly, be aware of surroundings/ material being grappled • Keep grappler low to ground • Take multiple trips with smaller loads to minimize objects that may impair forward vision
4. Backing up	Impaired visibility—collisions with obstacles or people	• Proceed slowly, be aware of surroundings, maintain backup alarm, create safe spaces for employees to walk away from skid steer locations • Proceed slowly, look behind to the extent possible.
Training Requirements	**Internal (within organization)**	**External (by outside group)**
	Skid loader operator training and evaluation	

LOCK OUT/TAG OUT

37

Understanding the exposures of hazardous energy and implementing a program to control the hazard is important for the safety of employees who install, operate, maintain or remove equipment that may store or release this energy. Hazardous energy comes in various forms, including electrical, mechanical, pneumatic, hydraulic, thermal and chemical. Even gravity can be considered a form of hazardous energy.

Public works departments regularly work with equipment that should be included in an energy control program. Coiled springs and counter weights, pressurized fluids, steam from radiators and supports for dump boxes are just a few examples of energy that must be neutralized and controlled for safety with lock out/tag out procedures during service and repairs.

Lock out/tag out procedures must also be used any time an employee bypasses or removes a safety guard or places any part of his or her body near dangerous points of operation on the equipment.

Cord and plug equipment can be excluded from this program when all hazards from energy release can be controlled by unplugging the equipment and the plug is under the control of the employee performing service.

When lock out/tag out procedures are required, a written program must be created and used to:

- Identify hazardous energy sources for all equipment and processes that could pose a danger to an employee.
- Identify employees authorized to work on the equipment included in this program.
- Detail procedures to lock out and fully neutralize those energy sources before any work can start.
- Define tag out procedures to identify each individual working on the equipment and to ensure he or she is in control of the locked out energy.
- Coordinate training for all authorized employees who directly work with the equipment and affected employees who also work in the area.
- Provide direction when outside contractors or groups of individuals work on equipment.

When detailing the lock out/tag out procedures, a series of steps should be outlined for authorized employees to follow when working on equipment included in the program. The Occupational Safety and Health Administration (OSHA) considers these steps to be as follows:

1. Before starting service, all affected employees working in the area need to be notified that work is about to commence.
2. The employee(s) authorized to work on the equipment must be familiar with and use the procedures for lock out/tag out for that equipment.
3. Equipment is shut down by the normal stopping procedure (button, switch, valve, etc.).
4. Equipment is isolated by deactivating the energy-isolating device(s) (circuit breaker, disconnect switch or other device that mechanically prevents the transmission or release of energy).
5. The deactivated energy-isolating device(s) is then locked out with assigned, individual lock(s). If lock out is physically impossible, another method must be used that is as effective as locking out.
6. The locked out device(s) is tagged with individual identification.
7. Once locked out and tagged out, stored energy must be released or dissipated (hydraulic systems, air, gas, water pressure, wound coils, etc.).
8. Isolation of equipment is verified by attempting to restart the equipment with normal starting procedure.
9. Service can then be done on equipment.
10. When service is complete, an inspection must be made to assure that all nonessential items are removed and equipment is ready to be restarted.
11. A survey of the area must be done to assure that all employees are safely positioned or removed from work area.
12. Verify that all starting components are in a stop or neutral position.
13. Tags and locks are then removed by the same authorized individual that placed them.
14. Affected employees are notified that service is completed and restart will commence.
15. Restart equipment by normal starting procedure.

An example of lock out/tag out procedures for a tandem truck is provided at the end of this chapter.

The written lock out/tag out program must be reviewed on an annual basis and updated when new equipment is added or when a change is made to procedures.

Further safety rules and regulations regarding lock out/tag out can be found primarily in OSHA Standard 29 CFR1910.147, The Control of Hazardous Energy.

LOCK OUT/TAG OUT CHECKUP

ITEM	YES	NO	ACTION ITEM
Is a written lock out/tag out program in place and periodically reviewed at least annually?			
Are periodic reviews certified with the date of inspection and signature of authorized inspector?			
Are both authorized and affected employees trained and familiar with the elements of hazardous energy control?			
Is all machinery or equipment capable of movement or storing hazardous energy required to be de-energized or disengaged and blocked or locked out during cleaning, servicing, adjusting or setting up operations?			
Are the power disconnects, not the startup mechanism, for equipment identified, and is a means provided to ensure that the control circuit can also be disconnected and locked out?			
Are all equipment control valve handles provided with a means for locking out?			
Does each lock out procedure require that all stored energy (mechanical, hydraulic, air, etc.) be released or blocked before equipment is locked out for repairs?			
Are sufficient lock out devices available for any foreseeable repairs of equipment included in the lock out/tag out program?			
Are appropriate authorized employees provided with individually keyed personal safety locks?			
Are authorized employees required to keep personal control of their keys while they have safety locks in use?			
Is it required that only the authorized employees exposed to the hazard can place or remove the safety lock?			
Is there a means provided to identify authorized employees who are working on locked-out equipment by their locks or accompanying tags?			
Are identifying tag out devices self-locking, nonreleasable and durable?			
Are affected employees notified when lock out/tag out activities take place?			
Is it required that authorized employees check the safety of the lock out by attempting a startup after making sure no one is exposed?			
Are authorized employees instructed always to activate the equipment stop mechanism prior to re-energizing the main power switch?			
If equipment or lines cannot be shut down, locked out and tagged, is a safe job procedure established and rigidly followed?			

SAMPLE WRITTEN LOCK OUT/TAG OUT PROCEDURE FOR A TANDEM TRUCK

1. **Notify all affected employees that a lock out/tag out is going into effect and the reason for it.** Equipment operator and any other employees in area.

2. **Shutdown procedure:** Pull engine stop and turn ignition key to "off."

3. **Isolation of energy sources:**

TYPE/MAGNITUDE	ISOLATING DEVICE	LOCATION	PROCEDURE
Mechanical (start up)	Ignition key	Cab	Remove key, place in lock box and apply personal lock/tag to lock box. Place "out of service" tag on driver door.

4. **Blocking of Potential Mechanical Energy:**

HAZARD	EQUIPMENT NEEDED	PLACEMENT
Roll away	None	Set parking brake.
Truck hoist/attachments		Lower to floor. If truck hoist must be raised for maintenance, hydraulic locking valves must be engaged and hoist supported by jack stands, cribbing or blocking sleeves.

5. **Release of Stored Energy:** List any devices (capacitors, springs, hydraulic/pneumatic cylinders, pressurized piping) that contain stored energy and the process to safely release or contain this energy.

ENERGY	BLEED DOWN POINT	PROCEDURE
Electrical	Positive battery terminal	If working on electrical system, remove the positive terminal and place in plug cup and apply personal lock and tag. Only in cases of alternator, starter or engine repair.
Hydraulic	Bleed valves	Bleed hydraulic lines before disconnecting.

6. **Verify isolation or "test" start to ensure that equipment will not start.** Make sure area is cleared of all employees before this step. Ensure that all controls have been returned to "off" or "neutral" position after completion of this test.

CONTROLS TO TRY	PROCEDURE TO VERIFY ISOLATION
Lever controls	Equipment will not move position.

7. **Commence repair/maintenance/service work.**

8. **Release from lock out/tag out procedures:** Before lock out/tag out devices are removed and energy restored, do the following:
   - a) Notify all personnel in the start-up area.
   - b) Clear all tools and repair equipment.
   - c) Verify that all controls are in the neutral or "off" position.
   - d) Remove locking device(s).
   - e) Notify operating personnel that equipment is ready for operation.

LONE WORKER

38

Solitary work may expose an employee to greater risk, as response time for rendering aid in the event of severe injury is often delayed. If employees work alone, employers should identify and review hazardous tasks and situations, and modify these tasks as needed for the solitary worker. In addition, effective methods of communication or check-ins should be developed to minimize risks when individuals work alone.

IDENTIFYING HAZARDOUS TASKS

Begin by identifying hazardous tasks that may pose risks to employees while working alone. Particular attention should be directed to tasks involving powered equipment, working at height or using hazardous substances. Time of day may also be a factor, as it may affect the ability to communicate or check in.

Seasonal tasks should also be considered, as extreme heat and cold can create hazardous conditions. See Chapter 25 Temperature Extremes for more information about addressing risks of working in hot and cold weather.

A job hazard analysis (JHA) can be an effective tool in identifying workplace hazards. More information is provided in Chapter 36 Job Hazard Analysis.

An assessment should be made of the risks of the tasks and estimated response times for emergency services should an injury occur. Lone workers may not be in a position to self-administer first aid or call for assistance. For more information about first aid and CPR response times and training, see Chapter 33 First-Aid, CPR Training and Kits.

MODIFYING WORKPLACE TASKS

After hazardous tasks are identified, employers can take steps to modify procedures that pose a danger when working alone. Certain tasks may be modified to require more than one employee be present nearby.

If the hazards arise from the use of a particular piece of equipment, different equipment may make the task considerably safer. As manufacturers continue to improve equipment and safety, consider the tools and equipment used by employees.

Other tasks may be contracted to specialized vendors to transfer the risk away from employees.

The assessment should also include strategies to reduce the emergency response time in the event an injury does occur. These strategies could include requiring employees to check-in periodically. If working before or after typical shift hours, there must be protocol in place detailing who will respond to check-in procedures.

Cell phones, radios or other equipment may be necessary for employees to maintain communication. However, any equipment provided for communication should be reliable and capable of functioning in the intended locations.

Any changes in procedures should be developed with employee input after explaining the hazards. Employees should be trained and required to follow the lone worker safety rules and any changes periodically reviewed and revised as needed.

LONE WORKER CHECKUP

ITEM	YES	NO	ACTION ITEM
Have hazardous workplace tasks involving solitary work been identified?			
Have workplace tasks been modified to eliminate or reduce hazard risk when working alone?			
Are procedures in place for communication and to reduce the response time of emergency services?			
Are employees trained about changes in policies and procedures to limit hazards from working alone?			
Have any modified tasks been reviewed and revised as necessary?			

PERSONAL PROTECTIVE EQUIPMENT

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When a job poses a hazard and administrative and engineering controls cannot mitigate the risk, personal protective equipment (PPE) may be required. To function effectively, the equipment must fit properly, be kept clean and in good condition, and then actually be worn. When PPE is dirty, uncomfortable or not readily available, an employee may be less apt to wear it. To protect employees, the Occupational Safety and Health Administration (OSHA) requires the adoption of a written personal protective equipment policy that includes hazard assessment, proper PPE selection and employee training.

WRITTEN HAZARD ASSESSMENT

A hazard assessment must be made of the workplace to determine the need for PPE. Each hazard should be reviewed and a determination made of the type and level of risk to an employee. Conducting a job hazard analysis is one approach to identify hazards and controls for them (see Chapter 36 for more information). When completed, this information needs to be included in a written assessment that also includes the name of the workplace, date and name of the person who conducted the assessment. Based on these findings, appropriate personal protective equipment must be purchased for employees to use when working around the hazards.

PPE SELECTION

Personal protective equipment must fit properly and provide protection greater than the minimum required to protect employees from hazards. Consideration should be given to the size and fit for individual employees. PPE that is comfortable and fits well is more apt to be worn.

EMPLOYEE TRAINING

After appropriate personal protective equipment is provided to employees, training is essential. At a minimum, training must include:

- An understanding of the hazard, how PPE protects against the hazard and the limitations of the equipment.
- How to put on, take off and properly adjust the equipment.
- How to maintain and care for the PPE.
- An understanding of the useful life of the equipment and how properly to dispose of it.

Training should be provided when new personal protective equipment is introduced or there is a change in a process or hazard. The content and date of each employee PPE training must be recorded and retained.

ONGOING ASSESSMENT

Periodic assessments should be made to assure that the PPE is adequate and the employee is using it correctly. Retraining should occur if the employee has not retained the necessary understanding of the use of the equipment.

Regular site inspections should be conducted to ensure that PPE is kept clean, usable and readily available. Some equipment may require special storage (e.g., in bags or other containers) to ensure that it does not become dirty or damaged until used. Consideration should be given to storing PPE near the hazard area or piece of equipment to make it easier for employees to find and use.

ADDITIONAL PPE REQUIREMENTS

Some activities and exposures require specific rules when considering personal protective equipment. Please take note of the following chapters of this manual:

- Chain Saw Use
- Hearing Conservation
- Respirators
- Electrical

Further safety rules and regulations regarding PPE can be primarily found in OSHA Standard 29 CFR1910.132, Personal Protective Equipment. In addition, the OSHA publication, "Personal Protective Equipment" offers more information.

PERSONAL PROTECTIVE EQUIPMENT CHECKUP

ITEM	YES	NO	ACTION ITEM
Has a hazard assessment been made of the workplace?			
If a hazard assessment has been made, has it been certified in written form, including hazards found, the name of workplace, date and person who conducted the assessment?			
Has PPE been selected to protect adequately against the hazard, been fit to the individual and is comfortable?			
Are protective goggles or face shields provided and worn where there is any danger of flying particles or corrosive materials?			
Are approved safety glasses required to be worn at all times in areas where there is a risk of eye injuries, such as punctures, abrasions, contusions or burns?			
Is approved head protection required to be worn in areas where there are risks of falling objects or "bump into" hazards?			
Is appropriate foot protection required where there is the risk of foot injuries from hot, corrosive or poisonous substances, falling objects, crushing or penetrating actions?			
Are approved respirators provided when needed? See Respirators chapter.			
Is PPE kept clean and in good condition?			
Are employees trained on the limits of PPE, how the equipment protects them from hazards, how to wear and care for it and how to identify its useful life?			
Are employee PPE trainings recorded and retained?			
Are periodic assessments made to ensure PPE is adequate, clean and worn?			
Are adequate work procedures, PPE and other equipment provided and used when cleaning up spilled hazardous materials?			

RESPIRABLE CRYSTALLINE SILICA

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Crystalline silica is a common element often found in sand, granite and other materials. It can be harmful when inhaled over long periods, leading to chronic health ailments such as silicosis. Due to these risks, the Occupational Safety and Health Administration (OSHA) requires that employers protect employees from respirable silica when levels exceed certain thresholds.

This protection goes beyond simply providing respirators. A written program is required if employees are exposed to levels at or above the action level of a minimum time-weighted average of 25 micrograms

per cubic meter of air (25µg/m3) over eight hours. 50 micrograms per cubic meter of air (50µg/m3) is referred to as the permissible exposure limit (PEL) and is referenced in the requirements.

Certain public works operations, particularly road crack sealing and milling, can generate dust that may contain respirable crystalline silica.

ASSESSMENT

Part of the OSHA mandated respirable crystalline silica standard involves methods to assess employee exposure to silica. This can be accomplished in multiple ways.

The first option is to bypass formal air sampling and utilize Table 1 located in the OSHA respirable crystalline silica rule for construction. Table 1 outlines specific methods to control exposure to silica including the use of dust control devices and respirators.

If these controls and requirements are met, no testing is required. However, if the equipment is not listed or if the controls are not met, public works departments must use a different method to assess exposure. More information about Table 1 is provided below.

Another method is to use established objective data, either from industry or from past air sampling efforts with the same equipment and tasks. To be considered objective data, the information must come from employees doing similar tasks in a representative setting with the same manufacturer and model of equipment.

This data is often difficult to locate from industry and may not exist. However, past air sampling surveys conducted at the facility could be considered objective data for the purposes of determining exposure. Any changes to the equipment or process that could further expose employees to respirable silica would require a new test to be conducted.

The final option is to conduct scheduled monitoring. After an initial air sampling survey is completed, additional sampling is required within six months if results are between the action level and permissible exposure limit or three months if results are above the permissible exposure limit (50µg/m3). If the initial sample shows levels below the action level (25µg/m3), no additional testing is required.

The results of any sampling—from industry data or from sampling done with employees—should be recorded and retained. To conduct testing, consider contacting Minnesota OSHA consultation or a certified industrial hygienist.

TABLE 1 EXCERPT

Equipment/ Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(iv) Walk-behind saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade		
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions: • When used outdoors • When used indoors or in an enclosed area	None	None
		APF 10	APF 10

OSHA RESPIRABLE CRYSTALLINE SILICA RULE TABLE 1

Using Table 1 is one of the most popular methods of assessment. Located in the OSHA respirable crystalline silica rule for construction, the layout is as shown above.

In Table 1, the equipment or task is on the left, with engineering and work practice controls in the middle. If these items are implemented, then the requirements for respiratory protection in the columns on the right apply.

In the excerpt provided, if the walk-behind saw is equipped with an integrated water delivery system continuously feeding water to the blade and

operated and maintained according to manufacturer instructions to reduce dust emissions, it can be used outdoors without respiratory protection unless it is in an enclosed area.

In addition to walk-behind saws, the following pieces of equipment or tasks are included in Table 1 of the OSHA rule:

- Stationary masonry saws
- Hand-held power saws
- Hand-held power saws for cutting fiber-cement board
- Drivable saws
- Rig-mounted core saws or drills
- Hand-held and stand-mounted drills
- Dowel drilling rigs for concrete
- Vehicle-mounted drilling rigs for rock and concrete
- Jackhammers and hand-held power chipping tools
- Hand-held grinders for mortar removal
- Hand-held grinders for uses other than mortar removal
- Walk-behind milling machines and floor grinders
- Small drivable milling machines
- Large drivable milling machines
- Crushing machines
- Heavy equipment and utility vehicles used to abrade or fracture silica containing materials or used during demolition activities involving silica-containing materials
- Heavy equipment and utility vehicles for tasks such as grading and excavating but not including demolishing, abrading or fracturing silica-containing materials

EXPOSURE CONTROL PLAN

If employees are exposed at or above the action level or if using the Table 1 control method, a written exposure control plan must be established that contains the following items:

- Tasks that expose workers to respirable crystalline silica
- Controls used to limit exposure to respirable silica
- A description of housekeeping measures used to limit exposure to respirable silica
- Methods to restrict access to areas with respirable silica exposure

This plan must be implemented by a competent person designated by the employer whose duties also include frequent inspections of work sites where respirable silica dust is a hazard. The competent person must have the knowledge and authority to take prompt corrective actions to eliminate or minimize any respirable silica dust hazards.

Employees must also be made aware of whom the competent person is. The exposure control plan must also be reviewed at least annually and updated as necessary.

If using respirators as part of the exposure control plan, employers must still follow OSHA regulations regarding respirators, including medical evaluations, fit testing and training. For more information about respirator use, see Chapter 41.

HOUSEKEEPING

OSHA standards mandate control methods for housekeeping and cleaning of workplace surfaces where respirable crystalline silica may be present. Wet sweeping, HEPA-filter vacuuming or other methods are encouraged.

Dry sweeping, brushing or cleaning should only be considered if alternative methods are impracticable. Similarly, cleaning surfaces or clothing with compressed air is only permitted when adequate ventilation is provided or alternatives are not feasible.

MEDICAL SURVEILLANCE

In addition to the exposure control plan, medical surveillance may also be required. Medical surveillance is necessary when employees are required to wear a respirator for respirable silica for 30 or more days a year.

Medical surveillance must be conducted initially on affected employees within 30 days unless a similar assessment was made within the past three years. Follow up medical surveillance tests would then be made by a physician or other licensed health care professional and made available every three years or more often if deemed necessary by the health care professional.

The results of these tests must be shared with the employee within 30 days and a record kept with the employer.

TRAINING

The employer is required to train employees exposed to respirable crystalline silica about its hazards. Training requirements include:

- Health hazards associated with respirable crystalline silica
- Work tasks with risks of silica exposure
- Measures to protect employees from silica
- The purpose and description of the medical surveillance program if required

In addition to these requirements, employees must also know who the competent person is. This person is responsible for implementing the exposure control plan. Additionally, employees must be provided with access to the OSHA respirable crystalline silica standard.

Further safety rules and regulations regarding respirable crystalline silica standard can be primarily found in OSHA Standard 29 CFR1926.1153, Respirable Crystalline Silica. Additional information, including Table 1, can be found in the OSHA Small Entity Compliance Guide for the Respirable Crystalline Silica Standard for Construction.

RESPIRABLE CRYSTALLINE SILICA CHECKUP

ITEM	YES	NO	ACTION ITEM
Does the organization follow Table 1 found in the OSHA crystalline silica rule for construction?			
If not following Table 1, is respirable silica exposure assessed initially and for any required follow-up air monitoring, or are other methods of assessment used?			
Has an exposure control plan been written that lists the hazardous tasks, controls, housekeeping measures and methods to restrict areas with respirable silica dust?			
Is the written respirable silica exposure control plan implemented by a designated competent individual and reviewed at least annually?			
Is cleaning of potential respirable silica dust accomplished without the use of dry sweeping, brushing or compressed air?			
Are employees trained on the:			
• Health hazards of silica dust?			
• Work tasks that expose them to silica dust?			
• Control measures to minimize the risk of respirable silica?			
• Purpose and description of medical surveillance testing?			
• OSHA Respirable Crystalline Silica Standard?			
Do employees know who the designated competent person is and are they provided with access to OSHA Standard 29 CFR1926.1153?			
Do employees wear respirators as part of the OSHA respirable crystalline silica standard for more than 30 days?			
If yes:			
• Is medical surveillance offered initially and once again every three years?			
• Are physician reports shared with employees and retained by the organization?			
Are testing and training records retained?			

RESPIRATORS

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When employees are exposed to harmful gas or dusts—ranging from sawdust to silica dust—individuals often wear respirators as protection from the airborne hazard. Whether employees are required to wear respirators as part of the personal protective equipment (PPE) program or voluntarily use dust masks to filter airborne particles, consideration needs to be given to the OSHA standards for respiratory protection.

The first step is to assess the need for respiratory protection. If employees are not exposed to harmful levels of hazardous gases or dust, respiratory protection may not be needed. However, many employers make dust masks or filtering face pieces available for employees to use when they clean or perform other tasks that make airborne particulates a nuisance even though they are below permissible exposure limits.

If employees are required to wear any form of respiratory protection, employers must have a written program and employees must follow it. If employees voluntarily use their own or employer-provided respiratory protection, a more limited program as defined below must be followed.

RESPIRATORY PROTECTION PROGRAM

If respiratory protection equipment use is mandated, the required written program must include the following components.

- **Selection of respirator:** Depending on the hazards encountered in the workplace, specific respiratory equipment is required to filter that hazard best. These exposures and equipment are defined in the program.
- **Medical determination:** Some employees may experience claustrophobia or breathing difficulty when donning respiratory protection equipment. At a minimum, a medical evaluation is made of the employees using a questionnaire (Appendix C of OSHA Standard 29 CFR1910.134 is commonly used), which is then reviewed by a health care provider. The provider then determines whether individuals are able to wear a respirator or whether a follow-up medical exam is needed.
- **Fit testing:** If a tight-fitting respirator, such as a filtering face piece respirator, is required, a qualitative fit test must be conducted. This fit test often uses a challenge agent, such as isoamyl acetate or irritant smoke, to assure the equipment is properly fitted to the individual.
- **Training:** Employees must be trained before initial use and again annually on the following:
  - The respiratory hazards and why the respirator is necessary.
  - The limitation and capabilities of the respirator.
  - How improper fit, use or maintenance can compromise the protective effect of the respirator.
  - How to inspect, put on and remove, use and check the seals of the respirator.
  - How to clean, store and maintain the respirator.

VOLUNTARY USE OF A FILTERING FACE PIECE OR DUST MASK

If employees voluntarily want to use filtering face pieces (such as an N95 particulate filter), whether self- or employer-provided, the employer must:

- Determine that such use would not create an additional hazard (such as limit visibility or fog glasses); and
- Make the employee aware of the information in Appendix D of OSHA Standard 29 CFR1910.134 found at the end of this chapter.

The employee should read and sign the document, and it should be retained as acknowledgment of the information.

RISK MANAGEMENT CONSIDERATIONS

If gases, dust or other particulates are found to be above the permissible exposure limits, consideration should be given to engineering the hazard to acceptable levels or transferring the risk to a third party. Examples of engineering controls include:

- Installation of ventilation systems to help control and/or eliminate air contaminants.
- Enclosing or confining operations to mitigate employee exposure.
- Substituting chemicals or materials that are less hazardous.
- Transfer risk to a third party.

An example of risk transfer would be contracting with a third party to handle spray painting duties. Respirators and other personal protective equipment should always be the last option and used only after engineering or administrative controls are considered.

Further safety rules and regulations regarding respirator equipment, the written program and Appendix C can be found in OSHA Standard 29 CFR1910.134, Respiratory Protection.

RESPIRATOR CHECKUP

ITEM	YES	NO	ACTION ITEM
Has an assessment been made to determine if respiratory equipment is needed?			
Have engineering or administrative controls been considered to reduce or eliminate the need for respiratory protection?			
If respiratory equipment is needed, is a written respiratory protection program in place?			
Does the respiratory protection program include the following components?			
• Equipment selection			
• Employee medical determination			
• Fit testing			
• Employee training			
Are respirators regularly cleaned and maintained? Are records kept of these inspections?			
If employees voluntarily use filtering face pieces (such as N95 masks) or dust masks, are they presented with information from Appendix D of OSHA Standard 29 CFR1910.134?			

29 CFR1910.134, APPENDIX D—(MANDATORY) INFORMATION FOR EMPLOYEES USING RESPIRATORS WHEN NOT REQUIRED

Under the Standard, respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard. You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.
4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

TRENCHING

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Although trenching is not an everyday activity for county public works employees, it must always be performed with safety first and foremost in mind. The enormous weight of collapsing earth can quickly engulf a worker with tragic results. In addition to trench collapse, other risks include falls, falling objects, vehicle strikes and hazardous atmospheric conditions. To help mitigate these risks, employees should receive thorough training before entering a trench and a competent person should be at the site daily to confirm safe conditions.

COMPETENT PERSON

Every job that requires trenching must have a competent person on hand to review plans and procedures, employ appropriate safety measures and inspect the conditions of the trench. The competent person must be trained in trenching safety standards, be able to analyze different soil compositions and determine the type of protective systems that should be put in place.

Before any excavation takes place, the competent person must inspect the work area for hazardous or unsanitary conditions and ensure corrective measures are taken to eliminate them. The competent person then determines what type of protective system needs to be used given the conditions and dimensions of the trench.

The competent person must inspect the trench and protective systems daily or after an event that could compromise the excavation, such as a rainstorm or excessive vibration from equipment.

Above all, the competent person must have the authority to halt work if he or she determines that safety is compromised. Then he or she must take measures promptly to correct the hazard.

CONTRACTORS

Hiring a contractor or third party to perform trenching operations can be a convenient choice when trenching is necessary. Prior to any trenching work, public entities should verify contractor safety programs for trenching. During a project, it is important to verify that contractors are trenching safely. The public entity's employees working near contracted trenching operations should be aware of trenching safety rules and whenever possible maintain a distance from the contractor's trenching operation.

OTHER SAFETY POINTS

- Before any trenching project begins, a check should be made for the presence of underground utilities.
- All trenches 4 feet or deeper require a means of access. This could include ladders, steps or ramps. A means of access must never be farther than 25 feet away from a worker in the trench. Ladders should extend at least 3 feet above the trench edge. All means of access should be free of slipping and tripping hazards.
- All trenches 4 feet or deeper require testing for atmospheric hazards if reasonably expected to exist. Trenches near vehicle traffic or landfills could be exposed to carbon monoxide or other harmful gases. Rescue equipment must be readily available if the potential exists for atmospheric hazards. See Chapter 29 Confined Spaces for more information about testing for hazardous atmospheres.
- All trenches 5 feet or deeper require a protective system, unless dug into solid rock. All trenches, no matter the depth, require the competent person to decide on the need and type of protection.
- If a trench is 20 feet or deeper, a professional engineer must assess and design the protective system required for that excavation.
- All excavated soil and other equipment and materials should be kept no closer than 2 feet from the edge of the trench. These materials could pose a tripping hazard or fall into the trench.
- Operators of heavy equipment must be aware of the location of the trench either through line of sight or other signaling device.
- Heavy equipment should not be operated near trench edge.
- If trench boxes are used, they must extend 18 inches above the vertical part of the trench wall.
- If the trench is deeper than 6 feet, guard rails should be in place to protect from accidental falls.
- Trenches should be protected from the public when employees are not on site.
- If working near vehicular traffic, employees should wear high-visibility vests.
- Proper protective equipment should always be worn when entering the trench: hard hat, reinforced footwear, safety glasses, etc.
- Employees should never work under suspended materials.

Further safety rules and regulations regarding trenching and excavation primarily can be found in OSHA Excavations Standards 29 CFR1926.651, Specific Excavation Requirements, and 29 CFR1926.652, Requirements for Protective Systems.

TRENCHING CHECKUP

ITEM	YES	NO	ACTION ITEM
Are employees who work in trenches adequately trained on the hazards of trench work?			
Is there a designated "competent person" who has been trained in trenching safety, soil analysis and protective systems?			
Does the designated competent person have the authority to take prompt corrective action when trenching activity presents a hazard?			
Does the designated competent person inspect the trenching site before work proceeds and at least once a day for the duration of work?			
If contractors are used, are trenching safety programs verified prior to trenching and are they followed for the duration of the contracted project?			
Are protective systems used when trenching is at least 5 feet deep or the competent person deems it necessary?			
Are means of access (ladders, steps, ramps) located within 25 feet of any worker in the trench?			
If ladders are used as the means of access, do they extend at least 3 feet above the trench?			
Are all means of access easily accessible and free of tripping and slipping hazards?			
Is the area within 2 feet of the trench edge free of equipment and excavated materials?			
Are hazardous atmospheres accounted for in trenches at least 4 feet in depth?			
Do all workers wear appropriate personal protective equipment when in the trench?			
Do workers wear high-visibility vests when working near vehicular traffic?			
Do employees avoid working under suspended loads?			
Are operators of heavy equipment aware of trench edges or have a means to detect when they are nearing the edge?			
If trench boxes are used as a protective system, do they have 18 inches of clearance above the vertical part of the wall?			
Are trenches deeper than 6 feet guarded against accidental falls?			