

Hazard Alert



Carbon Monoxide in Ice Rinks

Recent incidents of Carbon Monoxide (CO) poisoning in indoor ice rinks have prompted Service NL to issue this hazard alert. With proper equipment maintenance and adequate ventilation, operators of these facilities can ensure they provide a safe atmosphere for skaters, spectators and employees.

What is Carbon Monoxide?

CO is an colourless, odourless, tasteless gas that is emitted from the exhaust of machines that use fuels, such as gasoline, diesel or propane. CO interferes with oxygen getting into the blood and thus to the rest of the body. Hemoglobin is the substance in blood that normally binds with oxygen molecules. However when CO is present, hemoglobin is 200 times more likely to bind with CO than with oxygen, even though there may be sufficient oxygen in the air.

What are the symptoms of Carbon Monoxide Poisoning?

Because CO is colourless, odourless and tasteless, you may be breathing in CO and not even know it. CO poisoning can lead to heart and/or brain damage and, in cases of high exposure, death.

The following symptoms are associated with early Carbon Monoxide poisoning:

- Headache
- Watery or itchy eyes
- Nausea
- Weakness or dizziness

As the level of Carbon Monoxide increases in the blood, further symptoms may occur:

- Fatigue
- Dulled senses
- Incoherent thinking and speaking
- Convulsions
- Unconsciousness



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Exposure Limits for Carbon Monoxide

25 Ppm (parts per million) as an eight hour exposure limit.

Where does Carbon Monoxide come from in an indoor ice rink?

CO is produced from the incomplete combustion of fuels, such as gasoline, diesel and propane, which are commonly used in ice resurfacing equipment (eg. Zambonis®). If this equipment is not functioning properly, CO can be produced and emitted to unsafe concentration levels into the atmosphere. This problem can be compounded if ventilation systems are not adequate, or CO monitors are not in place to warn of potential problems.

How can I determine what the levels of Carbon Monoxide are at an ice rink?

Arenas are tested for CO at the level of the ice surface to ensure the air quality is within acceptable standards. However, regular preventative maintenance of equipment is the key to ensuring safe levels at all times.

How can you prevent Carbon Monoxide from accumulating in an ice rink?

A number of things that can be done to prevent the build up of CO:

a) Maintenance

Ice resurfacing equipment should be regularly maintained in accordance with the manufacturers specifications. Many manufacturers have certified technicians who are qualified to conduct regular tune ups and maintenance on equipment. This would include regular emissions testing to ensure that CO emissions are within the acceptable levels recommended by the manufacturer.

A catalytic converter or “scrubber” should be installed on any equipment that uses gasoline, diesel or propane to reduce the levels of harmful emissions. Oxygen sensors installed on the equipment will also regulate fuel efficiency and ensure a complete burn.

Electric equipment does not produce these exhaust gases, so consider whether an electric edger or re-surfacer is practical for the size of arena.

b) Ventilation

Mechanical ventilation prevents the buildup of harmful gases in the atmosphere. Standards have been published on indoor air quality for recreational facilities, which recommend that ice rinks have a minimum exhaust rate of 0.5 cfm/ft². However, this may increase where internal combustion engines are used in ice resurfacing equipment.

Note: Gas detection should be connected to the ventilation system so that the ventilation fan would turn on if the CO reading reached a certain level.

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Warm-up of ice resurfacing equipment should take place in an area that is well ventilated or is equipped with a portable exhaust hose, which fits on over the exhaust pipe of the machine and vents to the outside.

c) Detectors

CO detectors are available to detect the concentration of CO in the air. An alarm will sound if the gas is building up to harmful levels. This can allow personnel to take the appropriate precautions if/when CO levels reach dangerous concentrations. If you are looking to install monitoring equipment, consult with an approved supplier to make sure the equipment is properly located and suitable for this particular type of application.

Personal monitors that can be worn by mobile equipment operators continuously monitor for exhaust emissions in the surrounding air, and sound an alarm when levels detected are too high. If a personal CO monitor is used, the equipment operator must be trained in its use.

The best option may be to use fixed monitors in addition to personal monitors worn by mobile equipment operators.

How to assist someone with Carbon Monoxide poisoning:

- Ensure that all workers know the hazards of CO build-up and can recognize the signs and symptoms of CO poisoning.
- Watch for symptoms such as headaches, dizziness, nausea or mental confusion.
- Take action immediately if you suspect CO poisoning. Quick action can mean the difference between life and death.
- Move the person to fresh air.
- Give the person oxygen, if available.
- Call for medical help.
- If the person is not breathing, perform artificial respiration or CPR until medical help arrives.
- Ventilate the area thoroughly.
- Determine the source of the CO and eliminate it.

If a person is unconscious as a result of CO exposure, the air may be a risk to the life of would-be rescuers. Call for help by those trained and equipped to rescue someone in an oxygen-deficient atmosphere.