

Controlling Carbon Monoxide Exposure

Actsafes Safety Bulletin #13

This bulletin provides education and guidance for controlling worker exposure to carbon monoxide (CO) and other harmful exhaust components when using equipment or processes that burn fuels (e.g., gasoline, diesel, propane, natural gas, wood, charcoal) in motion picture production workplaces.

This bulletin does not provide guidance on CO exposure in confined spaces. For information related to propane heater safety, see [Fact Sheet #11 — Propane Guidelines](#).

HAZARDS

Carbon monoxide is a gas that naturally occurs in the air we breathe. It is safe at low concentrations but can be fatal in just a few minutes at high concentrations.

CO has no odour, taste, or colour, which makes it impossible to detect without a CO monitor. It can interfere with a person's ability to recognize that they are at risk.

CO poisoning occurs when CO builds up in the blood. When too much CO is in the air, it replaces oxygen in the red blood cells. This stops oxygen from reaching vital organs. The resulting damage depends on how much of the gas is breathed in and for how long.

CO SOURCES

Sources of CO in motion picture productions include the following equipment and processes:

- **Mobile equipment** — Forklifts, mobile elevated work platforms, mobile cranes
- **Vehicles** — Trucks, cars, motorcycles, catering trucks, ATVs
- **Tools and equipment** — Propane heaters, kitchen appliances, generators
- **Special effects** — Pyrotechnics, flame bars, burning materials

SIGNS AND SYMPTOMS

Over time, CO exposure can lead to signs and symptoms that can be mistaken for a flu with no fever. Clearer signs and symptoms of CO poisoning can include:

- Headache
- Weakness
- Dizziness
- Drowsiness
- Nausea and vomiting
- Shortness of breath
- Confusion
- Blurred vision
- Changes in personality
- Loss of muscle control and seizures
- Loss of consciousness

FIRST AID AND EMERGENCY RESPONSE

If you experience signs or symptoms or observe others experiencing them, immediately evacuate the area. If it is safe to do so, turn off running equipment and extinguish flame sources.



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Immediately notify first aid and a supervisor. Ensure first aid is aware that no medications are to be administered to anyone suspected of CO poisoning.

Before workers return to the work area, production must engage a qualified person to investigate CO levels and ensure the work area is safe.

RISK FACTORS

The risk of CO exposure depends on the CO levels and how long you're exposed to the gas. CO levels are affected by how much gas is being produced at the source and how well a space is ventilated.

CO can accumulate in low-lying areas and enclosed spaces. Enclosed spaces include indoor spaces (e.g., tents, trailers, houses, parkades, basements, attics), as well as caves, tunnels, and soundstage pits.

To assess the risk of CO exposure, consider the following:

- **Multi-department coordination** — Multiple CO sources will increase CO levels.
- **Size of spaces** — CO levels can quickly reach dangerous levels in small spaces.
- **Type of fuel** — Different fuels produce different levels of CO and other by-products (e.g., gasoline will produce more CO than propane).
- **Equipment maintenance** — Poorly maintained equipment will produce more CO.
- **Working alone** — A worker's risk of severe outcomes from CO exposure increases if they are working alone.

Personal risk factors

CO can build up in blood over multiple days from multiple exposures. Workers who are exposed to CO sources in their personal lives or who smoke may experience symptoms faster than others. Personal risk factors include the following:

- **Reproduction** — CO harms a developing fetus. If a worker advises the production that they are pregnant or intend to conceive a child, the production must inform the worker about the risk and find ways to minimize the worker's CO exposure.
- **Youth and infants** — CO builds up in the blood of youth and infants more quickly because they have a faster rate of breathing than adults do.
- **Older workers** — CO exposure is more likely to cause brain damage.
- **Ototoxicity** — CO exposure can increase the risk of hearing loss.

CONTROL MEASURES

A multi-layered control strategy is required to control CO exposure to levels that are as low as reasonably achievable.

Elimination

Eliminate CO sources, where possible.

Substitution

- Use electrical- or battery-powered equipment instead of fuel-powered equipment, where possible.

- Substitute equipment and processes to reduce CO emissions, where possible. For example, replace propane heaters with forced air.

Engineering controls

- Ventilate the space to introduce clean air and remove air from the CO source area. Increase



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the number of outdoor air changes per hour to reduce CO levels.

- Ventilate exhaust from internal combustion engines to an outdoor location that is away from tents, trailers, and air intakes.
- Coordinate the direction of equipment exhaust to avoid inadvertent exposure, including exposure from being downwind of CO sources.
- Do not use fuel or fuel-powered equipment indoors unless the work area has adequate ventilation, local exhaust ventilation, or other controls.
- Install catalytic converters, exhaust gas scrubbers, or approved exhaust-purifier devices to reduce CO levels.
- Use CO monitors to measure levels.

Administrative controls

- The production must assess work areas and determine the appropriate CO controls.
- Supervisors must ensure controls are in place, followed, and monitored.

- Whenever CO sources are indoors or near enclosed spaces, supervisors must train affected performers and crew on the contents of this bulletin.
- Inspect CO sources to ensure workers from other departments are not exposed to exhaust.
- Inspect CO-producing equipment to ensure it is in good working condition.
- Park so exhaust gases disperse away from HVAC intakes, trailers, tents, and other vehicles. Minimize idling.
- Verify that existing ventilation is functioning (e.g., fans in parkades) and running, whenever possible. If it's turned off for filming, other controls must be implemented.
- Install warning signage in background holding tents and other areas that pose a risk of CO exposure.

Personal protective equipment

Only air-supplied respirators that have been properly fit tested are effective for CO exposure. Half-face respirators, full-face respirators and N95 masks do not prevent CO exposure.

OCCUPATIONAL HEALTH AND SAFETY REGULATION

- [Section 5.48, Exposure limits](#)
- [Section 5.57, Designated substances](#)
- [Section 5.58, Protective policy](#)
- [Section 5.73, Indoor operation](#)
- [Section 5.74, Emission controls](#)

RELATED RESOURCES

- [Fact Sheet #11 — Propane Guidelines](#)

Actsafes Safety Association

Actsafes is a not-for-profit health and safety association supporting British Columbia's arts and entertainment industries. Actsafes provides resources and training to employers, workers, and supervisors. We are always here to provide information relevant to best practices around health and safety in the arts and entertainment industries in B.C.

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