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## Fact sheet

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### Carbon monoxide monitoring

Carbon monoxide is a colorless, odorless gas generated by combustion processes, such as those found in heating units and internal combustion engines. Examples of workplace sources of carbon monoxide include propane- and gasoline-powered forklifts, temporary heating units and gasoline-powered pressure washers, compressors, pumps and other tools and small engines. Excessive exposure to carbon monoxide results in human tissue being deprived of oxygen. Carbon monoxide overexposure may cause chronic effects such as heart damage, or acute effects such as headaches, dizziness, nausea, weakness, increased heart rate, blurred vision, confusion, disorientation or, in extreme cases, death by asphyxiation.

Because of these health hazards, Minnesota OSHA (MNOSHA) established requirements for carbon monoxide monitoring for both general industry and construction.

#### Monitoring equipment

There are three types of carbon monoxide monitoring devices that are most suitable for determining worker exposure to carbon monoxide. There are advantages and disadvantages with each device.

Electronic sensing instruments, which display a digital readout of carbon monoxide in parts per million, are the most accurate. To ensure accurate results, these devices will require routine calibration; but systems have been developed to simplify the calibration process for easier use. Although these instruments will be more expensive, lower cost options are available.

Colorimetric detector tubes with a hand pump can be used to sample over a time period of about two to 12 minutes with an error factor of  $\pm 25$  percent. These tubes change color when exposed to carbon monoxide and can be read in parts per million. This method involves little maintenance. The detector tubes have a limited shelf life (typically 12 to 18 months) and the hand pump should be leak-tested before each use. If the hand pump leaks, the repair usually involves greasing components or replacing rubber gaskets. An annual volume calibration check should also be done.

The third carbon monoxide measuring device is a passive dosimeter tube. They are similar to the detector tubes discussed above, except a pump is not used. Carbon monoxide levels are indicated by a color change that reads in parts per million hour with an error factor of  $\pm 25$  percent. The passive dosimeter tube is useful for sampling over time periods of several hours and determining time-weighted average exposures. After the seal is broken, the tube can be attached to a worker's collar. The passive dosimeter tubes also have a limited shelf life (typically 12 to 36 months)

*This material can be provided in different formats (Braille, large print or audio) by calling the MNOSHA Training/Outreach Office at (651) 284-5050 or 1-877-470-6742.*

## **Residential monitors not recommended for OSHA compliance**

There have been many questions about using residential carbon monoxide detectors in the workplace. The voluntary manufacturing standard, UL 2034, allows alarm points to be set at carbon monoxide concentration levels that would result in blood levels between 2.5 and 10 percent. In addition it requires that alarms not be activated by low or intermittent levels of carbon monoxide in air. The purpose of the UL standard is to ensure the detectors alarm before potentially life-threatening levels of carbon monoxide occur. This means each detector can have a different alarm point and, under certain workplace conditions, employees could be exposed to carbon monoxide at levels above OSHA limits without an alarm sounding. Residential carbon monoxide detectors are not intended to be used as survey instruments in workplace settings.

## **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 35 parts per million as an eight-hour time-weighted average and 200 parts per million as a five-minute ceiling average. 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 one percent carbon monoxide for propane fueled trucks or two percent carbon monoxide for gasoline fueled trucks measured at idle and at three-fourths throttle during final engine tuning in a regular maintenance program.

*Construction industry:* Minnesota Rules 5207.0310 Carbon Monoxide Monitoring

The employer shall monitor environmental exposure of employees to carbon monoxide whenever internal combustion engines discharge engine exhaust gases indoors or unvented space heaters are operated indoors to ensure that carbon monoxide levels do not exceed those given in Code of Federal Regulations, title 29, section 1926.55, Appendix A. The air monitoring shall be done during initial operation and at least quarterly thereafter and during a period representing highest usage in areas where carbon monoxide exposure is most likely.

**Note:** The eight-hour time-weighted average exposure limit for carbon monoxide in the construction industry in Minnesota is 50 parts per million.

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