

# Maintaining SAFE PARKING GARAGE CO LEVELS

Doing it without driving up energy costs can be a challenge

By John Molnar and Daniela Lanos-Lee

Carbon Monoxide (CO) is a colourless, odourless gas whose effects range from mild flu-like symptoms to death in minutes depending on concentration. Its invisible deadly properties give it the reputation as a “silent killer”. All fossil fuel burning vehicles produce it and when several are driving through an enclosed space, the gas can accumulate quickly. Building codes have ventilation standards for parking garages to prevent this accumulation from reaching dangerous levels.

According to the Ontario Building Code (OBC), Section 6.2.2.3, for example, an enclosed parking garage may either:

- have continuous fresh air flow during operating hours which must be done using exhaust fans to create a negative pressure in the garage space or
- use sensors to turn on ventilation if CO levels rise above 100 parts per million (ppm) of air when measured at a height between 900mm and 1800mm (three to six feet) above the floor.

Since we’re using exhaust fans to pull out contaminated air, we’re using power. Running them continuously increases power consumption. Controlling the fans with a timer might seem like a logical option to reduce run time but cannot ensure proper



**The owners of Columbia Place wanted to find a solution to excessive parking garage operating costs.**

ventilation at all times of need as mandated by the building code. Condo buildings, for example, will not be able to use timers to turn ventilation on and off at scheduled times since occupants come and go freely around the clock. In such a situation, installing a timer puts you at risk for high CO levels during fan “off” times.

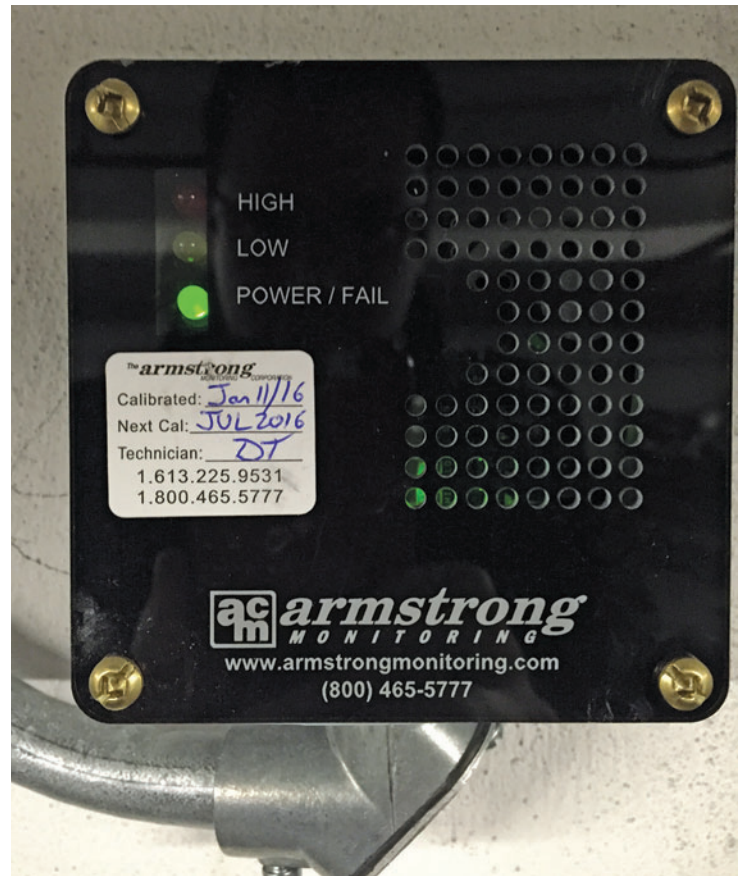
This brings us to option 2: Using CO detectors to turn on the fans and ventilate the garage only when needed.

## Design considerations

As discussed above, a carbon monoxide detection system is the ideal balance between safety and energy efficiency. The National Fire Protection Association (NFPA) issues a standard that governs the safe installation of carbon monoxide detection systems: NFPA 720: Standard for the Installation of Carbon



Running garage ventilation fans continuously was adding thousands of dollars annually to the energy bill.



The solution was to install CO sensors throughout the two-level garage.

Monoxide (CO) Detection and Warning Equipment. Any system installed must follow these guidelines.

When designing the system, several factors must be considered:

**1)** Initial cost versus operating costs: Installing the right-sized ventilation system is mandatory. Controlling it with a carbon monoxide detection system is optional. If you have an existing building, switching from a continuous flow system to one that provides ventilation as needed will save significant amounts of money in the long run. You will consume less electricity and you could potentially reduce heating and cooling requirements to the garage and adjacent spaces.

**2)** Locations and quantity of detectors: Detectors must be spaced according to the manufacturer's instructions based on sensor operation. They must be free from obstruction

and placed in locations where they would not be exposed to extreme temperatures. Hence, particular attention must be paid to garage layout. Detector height must be between three and six feet (900mm - 1800mm) above the floor, as per code requirements.

“ A carbon monoxide detection system is the **ideal balance** between safety and energy efficiency. ”

**3)** Size of exhaust fans: The OBC requires that the exhaust must be 3.9 L/s per square metre of garage (approx. 0.8 CFM per square foot).

Exhaust fans must be used in conjunction with intake openings to create a negative pressure in relation to the rest of the building. If there are parking attendant booths, they must be positively pressured with fresh air.

**4)** Locations of fans and intake openings: To create the airflow that would adequately ventilate the garage, exhaust fans and intake openings must be on opposite sides of the garage as far away from each other as possible.

**5)** Control sequences for exhaust fans: For multi-level parking garages, the carbon monoxide detectors should control the fans for the level on which they are located. Any one detector should activate the fan(s) for its zone. If the system is connected to a building automation system (BAS), it should register on the system.

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# A turnkey project

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The sensors are tied into a gas monitor, which controls the ventilation fans as required to minimize CO levels.

## A recent project

For the owners of Columbia Place in Waterloo, Ont., the cost of operating the parking garage fans at full capacity was running into the thousands of dollars annually. They were advised to install timers to switch off the fans and save energy. This was contrary to the building code and increased their liability should something go wrong. The condo corporation called in engineering firm CoEng Advisors, Burlington,

Ont., which recommended the installation of a CO detection system to control garage ventilation.

CoEng managed the installation as a turnkey project, taking charge of the entire process from design to installation by the contractors. The owners had one point of contact without having to deal directly with multiple engineers, inspectors or contractors.

They were also able to obtain a \$3,400 incentive for Columbia Place from the utility company as part of their service.

## Zoned system

Two fans per level ventilate the building's two-tiered parking garage. For the retrofit, 11 CO detectors were installed and the system was separated into two zones: one for each level. Creating the zones further reduced energy consumption by running only the fans needed to lower carbon dioxide to a safe concentration in that area. The detectors were connected back to the monitor with metal conduit for a tidy, durable installation.

## Substantial savings reported

After the installation, fan run time dropped by 87 percent. This translates into a reduction in electricity charges of about \$4,000 annually. By following the building code and ensuring that CO levels will remain within safe levels, the building owners also managed risk and mitigated against associated liability.

Having the right project manager ensured a top quality installation. With retrofit CO systems, wiring is primarily surface-mounted. Under CoEng guidance, wiring was routed through conduit, giving a durable installation that will withstand accidental damage and

protect the owner's asset.

For enclosed garages, it is possible to have a safe installation without skyrocketing operating costs. The expense of adding a carbon monoxide detection system will pay for itself with reduced energy costs for many years. In the process, the building owner minimizes liability and risk. A quality installation resists damage and reduces wear and tear, while protecting the building and those in it. +



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