

Confused about Carbon Monoxide and Ventilation? How does it affect you, the Building Owner and HVAC Contractor?

By Greg Reeves

There has been a lot of press regarding Carbon Monoxide Detectors (CO) and Smoke Detectors in the news over the past year. In most cases, this is justified and certainly the attention and awareness is important. As a contractor though, how does this affect you and the HVAC market place? It's important to understand the difference between private residential monitoring for personal safety and commercial or industrial monitoring for ventilation.

In residential dwellings, improvements to home insulation and the push to make older homes more energy efficient have resulted in many homes becoming more airtight. The reduced fresh air exchange has made the dangers of CO more prevalent. In recent years, there have been provincial requirements to install CO detection in dwellings that have wood burning appliances, such as a fireplace. Today, increased public awareness of the dangers of CO has resulted in a legal push in many municipalities towards the required installation of detectors in all homes, regardless of the appliances they may have.

In a home there may be low amounts of CO generated by the furnace, water heater, stove, etc. on a constant basis. The levels should not rise to dangerous levels under normal operating conditions. As such, the purpose of a detector is to alert of a dangerous situation, which requires evacuation and further human intervention to alleviate the problem source.

In the ventilation market however, a different rationale and approach applies. Carbon Monoxide in parking structures, loading bays, and service facilities can become a serious issue if not controlled through adequate ventilation. In these places, the concern is not whether CO may reach unsafe levels but rather how to control and ventilate the CO when it does rise above safe levels. In these cases, high levels of CO are generated from vehicles on a regular basis by the nature and use of the facility.

Since the general public and workers use these facilities, a new set of rules applies. The Ontario Ministry of Labour provides guidelines of exposure to hazards when workplace safety is considered. Typically, allowable exposures to CO are adopted from the ACGIH (American Conference of Governmental Industrial Hygienists). These are updated annually by the ACGIH and routinely updated within the regulating bodies of Ontario. In fact, this year the

province is updating its allowable exposure levels to toxic gases and CO levels may be affected. The new guideline may consider adopting 25 ppm CO on a time-weighted average over the course of a normal 40-hour workweek. Previously this was set at 35 ppm CO.

There are three main driving forces when considering ventilation and CO monitoring:

1. **Safety:** In any facility where people are working or the public and tenants may be active, there is a due diligence on part of the owner to assure a safe breathing environment. In Ontario, guidelines to minimum ventilation are offered under both the Ministry of Labour (Engineering Data Sheet 5-07) and the Building Code (section 6.2.2.3).
2. **Economics:** To provide fresh air in a facility where vehicles are present, a determined air change per hour is required. This can be expensive for a number of reasons.
 - The fans run continuously which incur wear and shorten the motor life.
 - The required maintenance frequency is higher for belt and lubrication services.
 - The electrical energy required to run the fans can be high.
 - The loss of heat in a garage is higher with the high volume air changes.
3. **Aesthetics:** In private facilities, the outside fan noise and loss of heat within the garage can affect the tenant satisfaction

By following the applicable guidelines, an installed and functioning CO monitor can be used to minimize the required air changes. To a property manager, this clause can actually be a windfall in savings! By installing a proper CO monitoring system, the benefits are immediately realized:

1. **Reduced fan run time** - Only run the fans when needed and only in areas of the garage that need it. Less wear and less energy use.
2. **Reduced Heat Loss** - Again, energy savings plus the added comfort to the people using the facility.
3. **Reduced Noise Levels** - This particularly applies to off hours such as the nighttime when tenants expect quiet.
4. **Increased Safety** - This applies to building staff, tenants, and public that may be using the facility.

Since the guidelines require *mechanical ventilation* to maintain safe levels of CO and not necessarily an actual monitoring device, there is always the

consideration as to whether or not the costs of a monitoring device can be justified. A review of the above benefits will assist in this consideration. Often, this consideration is ultimately determined by the economics of a system. The capital and operating cost of a monitor vs. the energy and maintenance of running the ventilation at higher volumes can be the deciding factor.

A typical parking structure may have 2 levels with a pair of fans on each level. If the 4 fans are 10 hp each and we assume KW consumption at .8 KW/hp, the total consumption is 32 KW/hour ($4 \times 10 \times .8$) The fans running 24 hours per day would consume 32 KW/hour x 8760 hours/year. The result is 280,320 KW/year. If the energy cost is 7-cents/KW hour; The annual bill is \$19,622.40

If a CO monitor reduced this to just half the usage, the savings are quickly realized. Now add in the cost savings of reduced fan wear, reduced heat loss and the aesthetic benefits. A CO monitor installed in conjunction with a ventilation system soon becomes a worthy consideration.

There are many other considerations when reviewing a CO monitoring system: How many sensors, where to install them, how to interlock the fans and so on. Support from gas detection suppliers, architects and consultants, and provincial authorities all offer sound advice. Be sure you understand the local and provincial regulations that apply, the desires of the facility owner, and the mechanical ventilation needs of the facility when considering the installation and maintenance of a CO monitoring system. The result will be a smooth project and a continued working relationship between the contractor and the building manager.