Top 5 Things to Know About CO

Nearly every residential and commercial dwelling includes flame-fueled devices of some sort. These may include gas and hot-water heaters, gas and oil furnaces, clothes dryers, fireplaces, vehicles, charcoal grills, engine-powered tools and lawnmowers. If any of these is not properly vented or malfunctions, carbon monoxide can be produced.

Carbon monoxide, or CO, is an odorless, colorless, tasteless and highly toxic gas. If inhaled, it will immediately absorb into your bloodstream, producing a toxic compound that will interfere with your body's ability to absorb and transport oxygen to your vital organs. The rate at which your body will feel the effects of CO depends on several variables, including the concentration of CO in the air, how long you've been exposed, your current health status and your lifestyle activity level.

See Table 1 for the National Fire Protection Association's (NFPA) breakdown of symptoms by CO concentration. These approximations are based on healthy adults. Children, elderly and persons with pre-existing physical conditions might be more susceptible to the effects of CO.

Because you cannot see, smell or taste CO, the only way to protect yourself from this deadly gas is with CO detectors. Although the CO detector market is one of the fastest growing in the life safety industry, security professionals are not always certain how to choose the best CO detector.

The Top 5 things you should know when choosing a CO detector are:

1. There are three common types of CO sensing technologies: Metal Oxide Semiconductor (MOS), Biomimetic and Electrochemical.

MOS sensors were the first CO sensors invented. An internal heating device heats tin oxide (SnO_2) to at least 250 degrees Celsius. When heated, oxygen atoms in the air bond to the SnO_2. If CO mixes with the oxygen atoms, it will release electrons into the semiconductor, increasing the current. This increase in current sets off the alarm in the detector. The drawback is that, typically, MOS detectors draw more current than other technologies due to the power consumed by the heater.

The second type of technology is biomimetic. Inside a biomimetic sensor, an infrared light passes through a synthetic hemoglobin membrane. When CO is present, the amount of light transmitted decreases and the alarm is activated. One drawback of biomimetic detectors is that as

Table 1: CO Symptoms

Concentration (ppm CO)	Symptoms
50	No adverse effects with 8 hours of exposure
200	Mild headache after 2-3 hours of exposure
400	Headache and nausea after 1-2 hours of exposure
800	Headache, nausea and dizziness after 45 minutes of exposure; collapse and unconsciousness after 2 hours of exposure
1,000	Loss of consciousness after 1 hour of exposure
1,600	Headache, nausea and dizziness after 20 minutes of exposure
3,200	Headache, nausea and dizziness after 5-10 minutes of exposure; collapse and unconsciousness after 30 minutes of exposure
6,400	Headache and dizziness after 1-2 minutes of exposure; unconsciousness and danger of death after 10-15 minutes of exposure
12,800 (1.28% by volume)	Immediate physiological effects; unconsciousness and danger of death after 1-3 minutes of exposure

*ppm = parts per million

NOTE: This article was updated on 5/18/09.

Carbon Monoxide Detector CO1224T

Safeguards life by providing early warning when its electrochemical sensing technology accurately measures carbon monoxide levels in the air.

Specifications	
Operating Voltage:	12/24 VDC
Audible Signal:	85 dB in alarm
Standby Current:	20 mA
Alarm Current:	40 mA (75 mA test)
Alarm Contact Ratings:	0.5 A @ 30 VDC
Trouble Contact Ratings:	0.5 A @ 30 VDC
Dimensions:	5.1 in L x 3.3 in W x 1.3 in H
Approximate Weight:	7 oz
Operating Temperature Range:	32°F to 104°F (0°C to 40°C)
Operating Humidity Range:	22 to 90% RH
Input Terminals:	14 to 22 AWG
Mounting:	Single-gang back box; surface mount to wall or ceiling

CO and other contaminants accumulate over time, these detectors tend to false alarm.

The newest, most refined sensors available today are the electrochemical sensors. These sensors provide accurate measurements (in parts per million) of CO concentrations. This is done through sensors that use a platinum/acid combination to promote the reaction between CO and the oxygen in the air. The electrons produced by this combination induce a small current between the two electrodes, which is proportional to the amount of CO in the air. External circuitry monitors changes in the current to calculate the concentration of CO gas. Readings are taken from low levels that may be hazardous over long periods of time to high concentrations that present an immediate danger.

2. Installation instructions clarified with NFPA 720-2009.
Before NFPA 720-2009 was released in October, the recommended placement of CO detectors was determined by manufacturers' published instructions. Often these differed and this confused installers and Authorities Having Jurisdiction (AHJ). Some manufacturers called for detectors to be installed on the ceiling, while others called for wall installation.

NFPA 720-2009 has specific requirements for the location of CO detectors in commercial buildings and dwelling units. In commercial buildings, CO detectors need to be located on the ceiling in the same room as permanently installed fuel-burning appliances and centrally located on every habitable level and in every HVAC zone of the building. In dwelling units, CO detectors must be installed outside each separate sleeping area and on every level of a dwelling unit, including basements. Applicable laws, codes and standards may require additional locations.

3. Although detectors require specific power sources, system-connected, monitored CO detectors are the most reliable choice.
There are three main power sources for CO detectors. The first, battery-powered CO detectors, require annual battery replacement. When the battery has reached its maximum lifespan, the detector will chirp at regular intervals to alert homeowners. However, some homeowners become annoyed by the chirping, and, instead of replacing the battery, they remove it. Therefore, battery-powered CO detectors require discipline (checking the battery) and maintenance (replacing the battery) by the homeowner.

The second, a 120-volt powered detector, runs off the main power supply in the dwelling. Like battery-powered detectors, most of these detectors do not have monitoring capabilities. So, if your detectors lose power in a blackout, for example, you may not realize your detectors are not working – unless the detector has a battery backup feature. Plus, a power outage is a crucial time to protect against CO because people tend to use more CO-generating appliances, such as space heaters and generators, for comfort.

The third, a 12/24-volt device, is the most reliable means of powering a CO detector. These system-connected CO detectors can be wired to either a security or fire panel. This type of system offers monitoring by a central station to provide extra protection if the residence is empty, if the residents are sleeping, or if the residents are already suffering the effects from CO. If a problem arises with the detector or CO concentration hits dangerous levels, the owner may not only be notified by the detector and the control panel, but also by the central station. If the owner is unreachable, the central station may send the proper authorities to investigate. Procedures will vary from station to station, but the residents will always be guaranteed protection 24/7.

4. System-connected CO detectors should be fully listed to UL 2075.
A system-connected CO detector should be more than just listed to UL 2075; it should be specifically designed for system operation. UL 2075 requires CO detectors to have a trouble relay and wiring supervision. CO detectors should be designed around these life-saving features to guarantee that if a problem exists with the sensing circuit or if the detector has reached its maximum lifespan, the trouble relay will send a message to the control panel.

5. Current draw matters.
Choose a CO detector with a low current draw so that more CO detectors can be connected to the panel, without having to purchase a more expensive panel or an extra auxiliary power supply. LS