Nathan Deal
Governor

Georgia™
Department of
Community Affairs

Mike Beatty
Commissioner

Memorandum

To: Georgia School Superintendents

From: Commissioner Mike Beatty, Georgia Department of Community Affairs
Commissioner Ralph Hudgens, Office of Insurance and Safety Fire Commissioner
Superintendent Dr. John Barge, Georgia Department of Education

Re: Carbon Monoxide Detector Advisory

Date: December 17, 2012

The Georgia Department of Community Affairs (DCA) in conjunction with the Office of the Insurance and Safety Fire Commissioner offers the following advisory for public and private school systems concerning the installation and maintenance of carbon monoxide detectors in existing and new educational facilities.

- Contact your local fire department to perform a safety inspection and request testing the air for carbon monoxide emissions. This can also be done by your gas provider.
- Make sure all fuel burning boilers have testing and certifications that are up to date.
- Make sure all fuel burning equipment is serviced annually for proper combustion and operation.
- Review existing emergency procedures for building evacuation.
- If carbon monoxide detectors are installed, do not use residential only type detectors.
- If carbon monoxide detectors are installed in your facilities, they should:
    - Be listed for commercial use and installed by a licensed low voltage contractor, licensed electrician or certified personnel to the appropriate NFPA 720 Standard.
    - Be placed in rooms where fuel burning equipment and appliances are located, for example mechanical/boiler rooms, kitchens, laboratories and laundries.
    - Have a remote alarm located on the outside of rooms that contain detectors.
    - Be interconnected to the fire alarm panel board to indicate “trouble”.
    - Be set up to automatically signal at the building’s alarm panel and notify school personnel.

If you have any questions you may contact the Georgia State Fire Marshal’s Office at 800-656-2298 or by e-mail at engineering@sfm.ga.gov. You may also contact DCA’s Construction Codes Program at 404-679-3118 or by e-mail at constructioncodes@dca.ga.gov. You may also contact the Facilities Services Unit of GA DOE at 404-656-2454 or by e-mail at mrowland@doe.k12.ga.us.

CARBON MONOXIDE DETECTORS FOR SCHOOLS TASK FORCE
CMD TASK FORCE LIST:

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2 Vice Chairman: Windell Peters, SCAC representing DCA Commissioner

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Nominee: Hal Cosper
4 Georgia State Inspectors Association (GSIA) – City/County Building Official
Nominee: Ron Anderson
5 Georgia Association of Fire Chiefs
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Nominee: Michael Rowland, Director of Facility Services
8 Georgia School Superintendents Association
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14 Plumbing and Mechanical Association of Georgia
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16 American Institute of Architects (AIA)
Nominee: Bill Clark
17 Georgia Automatic Fire Alarm Association
Nominee: Lt. Keith Person
18 Construction Suppliers Association
Nominee: Chuck Mailloux
19 Society of Fire Protection Engineers Greater Atlanta Chapter
Nominee: Simon Goodhead

Legend: (representing)

Fire Officials
Building Officials
Education
Utilities
Private Industries

CHARGE TO THE CARBON MONOXIDE DETECTORS FOR SCHOOLS TASK FORCE

The Carbon Monoxide Detectors for Schools (CMD) Task Force is charged with assessing the need for carbon monoxide detector requirements in new and existing educational occupancies and making recommendations regarding adoption of any necessary amendments (mandatory or voluntary) or guidelines to the State Codes Advisory Committee (SCAC).

The revision or amendment to the state minimum standard code shall have reasonable and substantial connection with the public health, safety, and general welfare. The financial impact and costs associated with the proposed changes shall also be considered.

The Task Force will make a preliminary progress/status report to the SCAC at the April 2013, SCAC meeting and its final report to the SCAC at the July 2013, SCAC meeting. The tentative effective date for any amendments is January 1, 2014.

Furthermore, resolve and amend as necessary the International Fire Code, International Building Code, and Life Safety Code for coordination purposes.

System-Connected Carbon Monoxide Detectors

SYSTEM SENSOR®

System-Connected Carbon Monoxide Detectors

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Preface

The use of early warning carbon monoxide (CO) detectors can result in a significant reduction of CO-related poisonings and death. Furthermore, system-connected, monitored carbon monoxide detection provides an extra level of protection for building residents or occupants who cannot appropriately respond to a local CO detection alarm. The sooner occupants and authorities are notified of dangerous CO levels in a given environment, the better the outcome for avoiding serious injury or death. This document provides guidance for the proper operation of system-connected CO detectors.

Correct installation and maintenance of CO detectors helps prevent unwanted alarms and ensures proper functioning of devices. The latest generation of CO detectors, when installed and maintained properly, significantly limits the nuisance alarms that initially desensitized occupants when repeated nuisance alarms occurred in earlier-generation CO detectors. Today's CO detection devices are effective, trustworthy, and the only means to detect the odorless, tasteless, and deadly carbon monoxide gas.

Introduction

The purpose of this guide is to provide information on the proper application of system-connected carbon monoxide (CO) detectors in ordinary indoor locations (not to meet outdoor EPA or indoor OSHA requirements). The guide outlines basic principles and standards that should be considered in the application of early warning CO detection devices in relation to the characteristics and effects of CO gas.

Section 1
Standards That Apply

National Fire Protection Association (NFPA)
Batterymarch Park
Quincy, MA 02269-9101

NFPA publishes standards for the proper application, installation, and maintenance of CO detection. NFPA 720-2012 is the ***Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment***.

Section 1.1.1 is primarily concerned with life safety, not with protection of property.
Section 1.1.2 covers the selection, design, application, installation, location, performance, inspection, testing, and maintenance of CO detection and warning equipment in buildings and structures.
Section 1.1.3 contains requirements for the selection, installation, operation, and maintenance of equipment that detects concentrations of CO that could pose a life safety risk to most occupants in buildings and structures.[1]

Highlights of the new standards, which should be reviewed in their entirety before specifying or installing CO detectors, follow. NFPA 720-2012:

- Nationally standardizes CO detection for all buildings, not just residences. This includes schools, hotels, nursing homes, apartment buildings and other commercial structures.

- Requires CO alarm signals to be distinct and "descriptively annunciated" from fire alarm, CO supervisory, and CO trouble signals. Furthermore, the CO alarm signal should take precedence over supervisory or trouble signals. CO detector trouble signals must be indicated visually and audibly at the control panel and supervising station. Therefore, the CO detector must have a means to signal the panel upon trouble conditions. For example, hardwired detectors require an integral trouble relay to send the trouble signal to the panel.

- Now holds CO detectors to the same life safety standard as smoke detectors: They will send trouble signals to the control panel and facilitate wiring supervision.

- Defines CO detector location more specifically than ever. In commercial buildings, CO detectors need to be located on the ceiling in the same room as permanently installed fuel-burning appliances. They also need to be 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.

- Requires CO detection systems to have sufficient secondary power to operate the system under quiescent load (system operating in normal condition) for at least 24 hours. After that time, the system must operate all of the CO notification appliances for 12 hours if a supervising station does not monitor the system. If monitored by a supervising station, the 12-hour requirement can be reduced to 5 minutes.

- Includes CO detector testing requirements. However, the requirement to be able to functionally test the CO detector in a manner similar to testing smoke detectors with canned smoke. Note that the System Sensor CO1224T with RealTest® meets this testing requirement.

- Clarifies what supervising stations should do when they receive a CO alarm signal. If the communications methodology is shared with any other usage, all fire alarm, CO alarm, supervisory, and trouble signals will take priority, in that order of priority, over all other signals unless otherwise permitted by the AHJ.

- The integral sounder of a CO detector may be sufficient for notifying occupants of commercial and residential buildings. It allows occupant notification to be limited to the notification zone encompassing the area where the CO signal is originated, if the CO alarm signal is transmitted to a constantly attended onsite location or off-premises location.

Testing Laboratories

Testing laboratories test smoke detectors, CO detectors, control panels, and other components of fire alarm systems to verify conformance with NFPA requirements and their own standards. Equipment that passes their tests is identified by a label and/or listing.

Underwriters Laboratories, Inc. (UL)
333 Pfingsten Road
Northbrook, IL 60062

455 E. Trimble Road
San Jose, CA 95131

1285 Walt Whitman Road
Melville, NY 11747

12 Laboratory Drive, P.O. Box 13995
Research Triangle Park, NC

2600 N.W. Lake Road
Camas, WA 98607

1. National Fire Protection Association (NFPA). "NFPA 720: Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment: Document Scope." NFPA.org. http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=720&cookie_test=1#.

The following UL standards apply to CO detectors:

ANSI/UL 2075 is the product standard for CO detectors connected to a control panel via conductors or low-power radio frequency (wireless).

ANSI/UL 2034 is the product standard that covers self-contained CO alarms that are not designed or listed to be connected to a control panel.

It is important to note that the alarm thresholds of UL 2034 CO alarms and UL 2075 CO detectors are the same. Section 15.1 (b) of UL 2075 requires detectors to operate within the sensitivity parameters defined by UL 2034. Table 38.1 of UL 2034 defines the actual alarm thresholds, which are:

- 30 ppm no less than 30 days
- 70 ppm 60 to 240 minutes
- 150 ppm 10 to 50 minutes
- 400 ppm 4 to 15 minutes

Section 2

Carbon Monoxide Overview

Carbon monoxide (CO) is an odorless, tasteless and highly toxic gas that results from the incomplete combustion of fossil fuels. It is often referred to as "the silent killer" because it is virtually impossible to detect without sensing technology. On average, from 2004 to 2006, over 20,000 people per year visited emergency rooms after accidental, non-fatal CO exposures.2 From 1999 to 2004, an average of 439 people died from accidental CO exposure.[3]

What is CO?

The CO molecule is made up of a carbon and an oxygen atom. CO has a density similar to air, but typically rises from the point of production due to the heat of combustion. As it cools to environmental temperatures, however, it circulates in the same manner as ambient air.

How CO Affects the Human Body

Through the normal process of respiration and circulation, oxygen molecules enter the lungs and are transported to cells throughout the body by attaching to hemoglobin in the blood. CO molecules, however, attach to hemoglobin far more readily than oxygen. When CO is present in the environment, these molecules interfere with the normal circulation of oxygen throughout the body by attaching to hemoglobin that would normally transport oxygen. (See Figure 1.) This can cause varying levels of injury and sickness, depending on length and level of exposure.

CO poisoning can result from prolonged exposure to low levels of CO or shorter exposures to higher concentrations. Table 1 shows the relationship between CO volume, length of exposure, and resulting symptoms to a person within a given environment.

Common Sources of CO

CO is formed from the incomplete combustion of fossil fuels. The operation of many common appliances, machinery, and heating equipment, if not working or vented properly, can result in dangerous CO build-up in a given environment. According to recent studies, the primary sources for CO fatalities are:

- Heating systems
- Power tools
- Charcoal grills or other charcoal sources
- Gas ranges or ovens
- Camp stoves or lanterns
- Other or multiple appliances

From 2004 to 2006, the top two sources for non-fatal, accidental CO exposures in the U.S. were home heating systems (16.4 percent) and motor vehicles (8.1 percent).[2] Other common sources of CO in and around the home include:

- Stove/gas ranges
- Gas line leaks
- Gas water heaters
- Blocked or clogged chimneys
- Gas or wood burning fireplaces
- Cracked heat exchangers
- Leaking, cracked, corroded, or disconnected flue or vent pipes
- Barbecue grills operated in enclosed areas, such as a garage
- Unvented gas space heaters

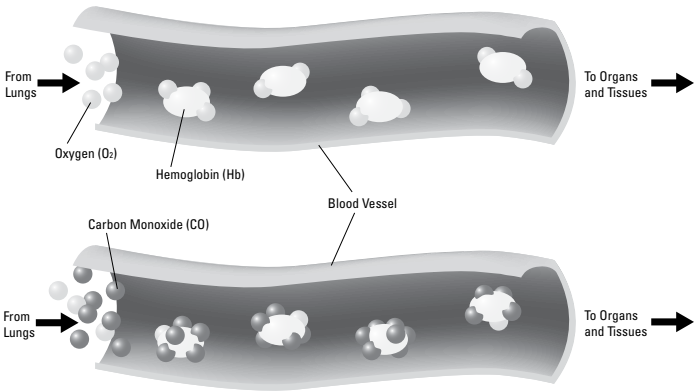

Figure 1. Carbon monoxide in the bloodstream

2. CDC. Unintentional non-fire-related carbon monoxide exposures in the United States, 2004-2006. MMWR 2008;57:896-899.
3. CDC. Carbon Monoxide-Related Deaths — United States, 1999-2004. MMWR 2007;56:1309-1312.
4. NFPA 720, 2012 edition, Annex B Dangers of Carbon Monoxide, B.1 Carbon Monoxide, Table B.1 Symptoms of Carbon Monoxide Exposure Based on Concentration.

CO Concentration in Parts Per Million (PPM)	Symptoms
50	No adverse effects with 8 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
6,400	Headache and dizziness after 1-2 minutes of exposure; unconsciousness and danger of death after 10-15 minutes of exposure

Table 1. Symptoms of carbon monoxide exposure[4]

Section 3

How Carbon Monoxide Detectors Work

Carbon Monoxide (CO) detectors are devices that monitor the amount of CO in the air over a given time period. Distinguished by their sensing technology, three basic types of CO detectors are used today: biomimetic, metal oxide semiconductor, and electrochemical.

Biomimetic CO Detector Operation

Biomimetic CO detectors mimic how hemoglobin in biological organisms reacts to CO. Specifically, a biomimetic sensor monitors infrared light that is passed through a disc of synthetic hemoglobin that darkens in the presence of CO. Thus, as CO concentrations increase, the light is obscured, triggering the alarm.

Sensor Technology	Advantage	Disadvantage
Biomimetic	– Low cost	– High false alarm rate – Long recovery after alarm
MOS	– Long life span	– High current draw – Expensive – Non-selective; sensitive to chemicals and gases other than CO
Electrochemical	– Reliable, few field defects	– High sensitivity to ammonia-based cleaners

Table 2. Comparison of carbon monoxide detection technologies

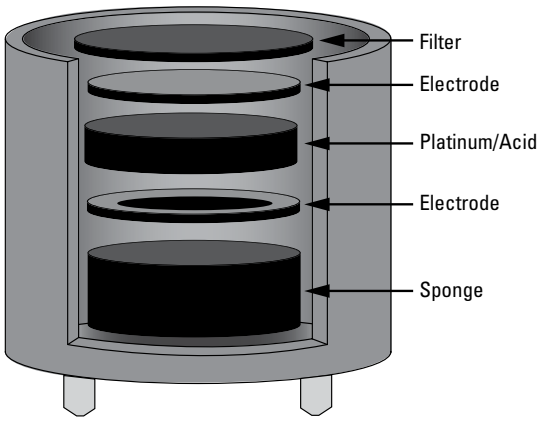

Figure 2. Cutaway view of an electrochemical CO sensor cell

Biomimetic detectors are low cost and require a low current draw to operate. However, these detectors are susceptible to false alarms if environmental conditions fluctuate outside peak operating ranges. Other types of sensors are much more reliable. Furthermore, biomimetic sensors have a shorter life than other types of CO sensors and they require a long recovery time after alarm.

Metal Oxide Semiconductor CO Detector Operation

With metal oxide semiconductor (MOS) detector technology, a tin dioxide semiconductor is heated by an electric current at periodic intervals. When tin dioxide reaches its operating temperature, it is capable of changing its resistance in the presence of carbon monoxide. Once the resistance change reaches its threshold, an alarm sounds.

MOS detectors have a long life span and can respond quickly to CO. However, they are more expensive to purchase and operate than other types of sensors. Because it uses an electrical current to heat the semiconductor, this type of sensor requires a high current draw. Furthermore, MOS detectors are susceptible to false alarms in the presence of some common household chemicals or gases other than CO.

Electrochemical CO Detector Operation

Electrochemical sensors use a platinum electrode and acid combination to promote a reaction between CO and the oxygen in the air, which then produces an electric current. When CO is present in the air over time, if the current increases beyond specific thresholds, the alarm is sounded.

CO detectors using electrochemical sensors have been in use in industrial applications for many years. These detectors are reliable, with few field defects, have a low current draw, and respond quickly to CO. However, they may be susceptible to false alarm in the presence of household cleaners that contain ammonia, such as glass cleaners.

The life of the electrochemical sensor is typically longer than that of biomimetic sensors. All CO detectors need to be replaced at the end of their sensors' lives.

Limited Life of System-Connected CO Detectors

All system-connected CO detectors on the market have a limited-life gas sensor and UL requires that CO detectors be replaced at the end of that component's life. Therefore, it is imperative that the gas sensor be supervised in order to avoid an undetected inoperable detector, which is a fundamental function of all fire alarm system devices and Central Station Service. **UL and NFPA 720 require every system-connected CO detector to provide a means to send the sensor's end-of-life signal to the control panel. To aid in ongoing maintenance and to ensure CO detectors are providing promised protection, it is highly recommended that you purchase CO detectors with an end-of-life signal.**

Section 4
Installation Guidelines

When installing a carbon monoxide (CO) detector, do not install it in any environment that does not comply with the detector's environmental specifications. All CO detectors should be installed in accordance with NFPA 720-2012 — the ***Standard for the Installation of CO Detection and Warning Equipment*** — which defines standards for both commercial and residential installations of CO detectors.

Commercial: Section 5.8.5.3 states that carbon monoxide detectors shall be installed in accordance with the manufacturer's published instructions in the following locations:

- On the ceiling in the same room as permanently installed fuel burning appliances
- Centrally located on every habitable level and in every HVAC zone of the building

Residential: Section 9.4.1.1 states that carbon monoxide alarms or detectors shall be installed as follows:

- Outside each separate dwelling unit sleeping area in the immediate vicinity of the bedrooms
- On every level of a dwelling unit, including basements
- In other locations where required by applicable laws, codes, or standards

Placement and Spacing

The following provides general guidelines for CO detector placement and spacing. Always follow manufacturer instructions regarding placement and spacing of your particular CO detector.

When wall mounting a system-connected CO detector, it should be at least as high as a light switch, and at least six inches from the ceiling. The detector should not be mounted near the floor. As noted in "Section 2: Carbon Monoxide Overview," CO gas typically rises from the point of production and then mixes evenly throughout the air as it cools. Furthermore, higher placement protects the detector from potential damage caused by pets and tampering by small children.

When ceiling mounting a system-connected CO detector, the detector should be located at least 12 inches from any wall.

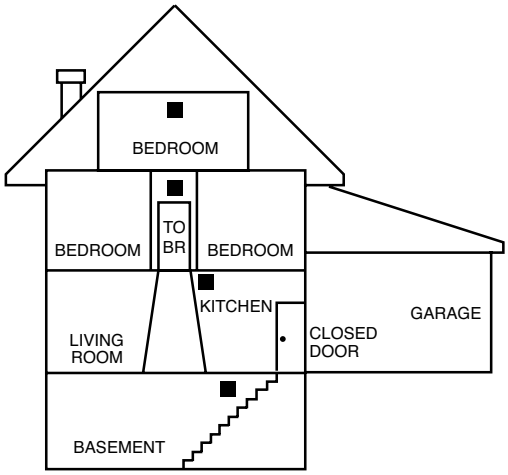

Figure 3. Recommended placement of carbon monoxide detectors in a residential application

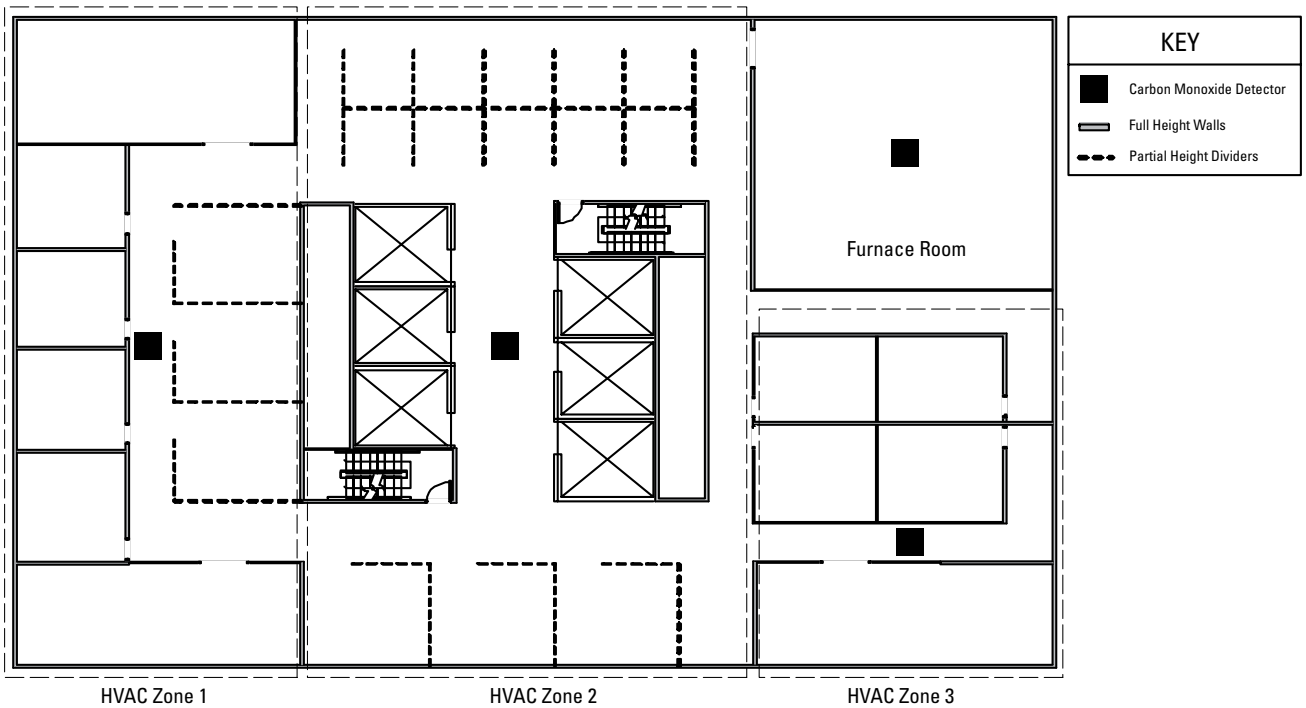

Figure 4. Recommended placement of carbon monoxide detectors in a commercial application

Section 5

Testing, Maintenance, and Service of Detectors

Carbon monoxide (CO) detectors are designed to be as maintenance free as possible; however, dust, dirt, and other foreign matter can accumulate inside a detector's sensing elements and change its sensitivity. They can become either more sensitive, which may cause unwanted alarms, or less sensitive, which could reduce the amount of warning time given if CO reaches a dangerous level. Furthermore, as discussed in "Section 3: How Carbon Monoxide Detectors Work," the sensing cell of CO detectors have a limited life span. Therefore, detectors should be tested periodically and maintained at regular intervals. Always follow the manufacturer's specific recommended practices for maintenance and testing. Also refer to NFPA 720-2012, sections 1.1.2 and 1.1.3.

Caution

Carbon monoxide detectors are sophisticated electronic devices that need periodic testing and maintenance. To maintain the integrity of any CO alarm system, it is important to have a qualified person periodically test the system.

Typical Inspection, Testing, and Maintenance Practices

It is recommended that a CO detector should be inspected visually and the functionality tested by the introduction of carbon monoxide into the sensing chamber immediately after installation and annually thereafter. This ensures that each detector remains in good physical condition and that there are no changes that would affect detector performance, such as building modifications, occupancy hazards, and environmental effects.

Notify the proper authorities that the CO detector is undergoing maintenance to avoid nuisance alarms and to prevent unwanted alarms and possible dispatch of emergency services. Next, make sure the detector's gas entry ports are not clogged. Follow the manufacturer's instructions to test the mechanical functioning of the detector. Typically, CO detectors come with a "Test" button for this purpose. Finally, perform a functional test of the CO detector's CO sensing cell (see "Future Testing Guidelines" below) if the detector has this capability. Again, refer to the manufacturer's recommended procedure for performing this test.

Once testing and maintenance is completed, restore the zone or system. Notify the proper authorities that testing has been completed and the system is again under normal operation.

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The Association of Electrical and Medical Imaging Equipment Manufacturers
www.nema.org

Setting Standards for Excellence

NEMA Statement on Carbon Monoxide Detection in Schools

The National Electrical Manufacturers Association (NEMA) supports the installation of carbon monoxide detectors in schools.

Carbon monoxide (CO) poisoning is the leading cause of accidental poisoning death in the United States. High concentrations of CO—a colorless, odorless gas that is produced when fossil fuel is incompletely burned—can cause cognitive impairment, loss of consciousness, coma, and often death. Because it is undetectable through human sensory experience, CO is commonly known as "the silent killer." The U.S. Centers for Disease Control and Prevention (CDC) reports that every year, more than 400 people die in the U.S. from accidental CO poisoning. In addition, over 20,000 individuals are injured due to CO poisoning each year.

Due to their smaller size, young children are especially vulnerable to the effects of carbon monoxide, may be more severely affected by exposure to the gas, and may exhibit signs (which often mimic the flu) sooner. As such, an adult teacher may not intuitively recognize that a number of sleepy students could be attributable to exposure to elevated levels of CO if he/she has not been affected to the same extent.

One of the most effective ways to reduce the incidence of CO poisoning is to ensure that effective CO detection devices are installed in places where people live, work, sleep, and study. Carbon monoxide detection devices are a cost-effective, reliable way to protect the public from CO poisoning. To assure that the technology and installation are on a comparable level with fire safety, CO detection devices should be tested and listed by a Nationally Recognized Testing Laboratory (NRTL) accredited by the U.S. Occupational Safety and Health Administration (OSHA) to applicable product standards (ANSI/UL 2075, *Standard for Gas and Vapor Detectors and Sensors*, or ANSI/UL 2034, *Standard for Single and Multiple Station Carbon Monoxide Alarms*). To be most effective, such devices should be installed in accordance with National Fire Protection Association (NFPA) 720, *Standard for Installation of Carbon Monoxide (CO) Detection and Warning Equipment*, which establishes requirements for proper installation and maintenance of systems that would go into schools.

It is important to ensure that children, faculty, and support staff are protected while they are away from home. Unfortunately, the recent incident at Finch Elementary School in Atlanta is not an isolated occurrence. During the past several years there have been a number of recorded incidents of CO exposure at schools nationwide. However, it is difficult to quantify the exact number of CO incidents in schools. Due to the fact that carbon monoxide affects each individual differently and symptoms of exposure mimic those of common ailments such as the flu, it is highly probable that the number of CO exposure incidents has been underreported. The number of CO incidents in schools could rise over the coming years, particularly if HVAC equipment is not properly maintained due to resource constraints or other factors.

Requiring CO detectors in schools has the potential to save lives, prevent illness, and lessen the time away from school. As the trade association representing manufacturers of CO detection devices and active participants in the development of national codes and standards, NEMA hopes that you will consider our industry as one of your best resources for carbon monoxide and life safety product information.

NEMA is the association of electrical equipment and medical imaging manufacturers, founded in 1926 and headquartered in Arlington, Virginia. Its member companies manufacture a diverse set of products including power transmission and distribution equipment, lighting systems, factory automation and control systems, and medical diagnostic imaging systems. NEMA Signaling, Protection, and Communication Section member companies manufacture fire, smoke, and carbon monoxide (CO) detection and warning equipment and systems.

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U. S. Carbon Monoxide Legislation

(current as of March 2013)

State:	Bill/Code I.D.	Effective Date	Occupancy Classification	Placement
Alabama	Alabama Energy and Residential Codes (AERC) Board voted to adopt the 2009 International Residential Code (IRC).	October 1, 2012	Detached one- and two-family dwellings and townhouses not more than three stories.	Outside of each separate sleeping area in the immediate vicinity of the bedrooms
Alaska	Chapter No. 60, SLA 2004 House Bill 351 (JUD) AS 18.70.095	January 1, 2005	New and existing dwellings.	Minimum one per building
Arkansas	HB 1385, Act 146	January 1, 2012	New dwellings.	Within or near the openings to garages, bathrooms, or 2 furnace rooms
California	California Residential Code (CRC): Section R315 of the 2010 edition California Building Code (CBC): Section 420 of the 2010 edition	January 1, 2011	All newly constructed one- two-family dwellings, townhouses not more than 3 stories, hotels, motels, duplexes, lodging houses, dormitories, condominiums, time-share projects, or dwelling unit in a multiple-unit dwelling unit building or buildings are required to install CO detection.	Installed outside of each separate sleeping area in the immediate vicinity of the bedrooms in dwelling units and on every level including basements within which fuel-fired appliances are installed and in dwelling units that have attached garages.
	Senate Bill (SB) 183: Carbon Monoxide Poisoning Prevention Act	July 1, 2011	All existing single-family dwelling units are required to install CO detection.	
		January 1, 2013	All existing duplex, lodging house, dormitory, condominium, stock cooperative, timeshare project, or dwelling unit in a multiple-unit dwelling unit building or buildings	
	Senate Bill (SB) 1394	January 1, 2016	All existing hotels and motels are required to install CO detection.	
Colorado	House Bill 09-1091	July 1, 2009	New and existing dwellings.	Place within 15 feet of a sleeping area.
Connecticut	House Bill No. 5326, Public Act No. 11-248; Public Act No. 05-161	January 1, 2012 October 1, 2005	Newly constructed one and two family dwellings, new and existing public and non-public school buildings	In a room containing a permanently installed fuel burning appliance
Florida	Fla. Stat. §509.211 Fla. Stat. §553.885	509.211: July 1, 2007 553.885: July 1, 2008	509.211: New commercial buildings where a portion thereof is used for sleeping purposes, including hospitals. 553.885: New one- and two-family homes and town homes (dwellings) of three stories or less. Building code ruling on how 553.885 applies to existing structures	509.211: Every room with a fuel-burning appliance and integrated with the fire alarm system. 553.885: Within 10 feet of any sleeping area.
Georgia	Georgia State Amendments to the International Residential Code (IRC) for One- and Two- Family Dwellings (2006 Edition); Section R313.	January 1, 2009	New one- and two-family homes and town homes (dwellings) of three stories or less.	Carbon monoxide alarms shall be installed in the general vicinity of each sleeping area.
Idaho	Idaho Administrative Code IDAPA 07.03.01	January 1, 2011	Detached one- and two-family dwellings and townhouses not more than three stories within which fuel-fired appliances are installed and in dwelling units that have attached garages	Outside of each separate sleeping area in the immediate vicinity of the bedrooms.
Illinois	Public Act 094-0741 House Bill 5284	January 1, 2007	New and existing single- and multi-family dwellings with a fuel-burning appliance. Dwellings without a fuel-burning appliance or an attached garage are not required to have a CO detector.	Every structure that contains more than one dwelling unit shall contain at least one approved carbon monoxide alarm in operating condition within 15 feet of every room used for sleeping purposes.
Iowa	661-301.8 (103A)	January 1, 2010	Detached one- and two-family dwellings and townhouses not more than three stories within which fuel-fired appliances are installed and in dwelling units that have attached garages.	Outside of each separate sleeping area in the immediate vicinity of the bedrooms
Kentucky	2007 Residentail and Building Code	June 1, 2011	Newly constructed one- and two-family dwellings, townhomes less than 3 stories, apartment buildings, dormitories, adult/child care facilities and assisted living facilities which contain a fuel-burning-appliance or an attached garage.	In the immediate vicinity of all bedrooms in dwelling units and sleeping units
Louisiana	2009 International Residential Code (IRC)	January 1, 2011	Newly constructed one- and two-family dwellings, townhomes less than 3 stories	In the immediate vicinity of all bedrooms in dwelling units and sleeping units

U. S. Carbon Monoxide Legislation

(current as of March 2013)

State:	Bill/Code I.D.	Effective Date	Occupancy Classification	Placement
Maine	Public Law, Chapter 162 LD 550	October 31, 2009	Single-family dwellings and multi-apartment buildings sold or newly constructed.	Install by the manufacturer's requirements at least one approved CO detector in each area within, or giving access to, bedrooms.
	Public Law, Chapter 553	August 1, 2012	New or renovated single family dwelling, hotel, motel, inn or bed and breakfast, fraternity house, sorority house or dormitory that is affiliated with a private or public school	N/A
Maryland	House Bill 401	January 1, 2008	New single- and multi-family dwellings and non-dwelling's, including hotels, motels, and dormitories.	Install within a certain distance from a central location outside of each sleeping area within certain dwellings or, under certain circumstances, within a certain distance (25 feet) from carbon monoxide–producing fixtures and equipment within certain dwellings.
	Senate Bill 173, Chapter 38	October 1, 2012	Newly constructed or substantially remodeled public schools containing a fuel fire appliance.	N/A
Massachusetts	Chapter 123 of the Acts of 2005	March 31, 2006 (battery-powered) January 1, 2007 (hardwired)	New and existing single- and multi-family dwellings, boarding houses, hotels, motels, dorms, apartments, and adult and child care facilities.	Locate detectors in conformance with the requirements of the board of fire prevention regulations.
Michigan	Act 376: House Bill 4730 Act 377: House Bill 5341 Adopting the 2009 IRC	HB 4730: December 23, 2008 HB 5341: March 23, 2009	HB 4730: New non-dwelling structures such as boarding houses, hotels, and motels. HB 5341: New and existing single- and multi-family dwellings.	HB 4730: A minimum of one detector per building installed at the fuel-burning appliance. HB 5341: A carbon monoxide device shall be located in the vicinity of the bedrooms, which may include one device capable of detecting carbon monoxide near all adjacent bedrooms; in areas within the dwelling adjacent to an attached garage; and in areas adjacent to any fuel-burning appliances. NOTE: The act does not mandate the installation of a CO device. Instead it gives authority to the Code Commission to adopt rules for the mandatory installation of a CO device.
Minnesota	299F.51	January 1, 2007 (new dwellings) August 1, 2009 (existing dwellings)	New and existing single- and multi-family dwellings.	Minimum one detector per building within 10 feet of any sleeping area.
Montana	Senate Bill 161	October 1, 2009	New and existing dwellings.	No details for location of CO devices.
New Hampshire	House Bill 120-FN-Local	January 1, 2010	Single-family dwellings and multi-apartment buildings substantially rehabilitated or newly constructed.	Minimum one detector per building on every floor level and in each common stairway and in each common hallway of a multi-unit dwelling.
New Jersey	Chapter 44 amending and supplementing: Public Law 1975, Chapter 217 Public Law 1999, Chapter 15	April 16, 2003	Existing single- and two-family homes.	Within 15 feet of sleeping areas in buildings with appliances that may emit CO.
New Mexico	State Residential Code	July 1, 2011	Detached one and two family dwellings and townhouses not more than three stories with a fuel burning appliance or an attached garage.	Installed outside of each separate sleeping area in the immediate vicinity of the bedrooms in dwelling units.
New York	Uniform Fire Prevention and Building Code Section 1225.2 Title 19	Effective March 6, 2003	One, two and multiple family dwellings that are newly constructed or offered for sale.	Immediate vicinity of bedroom's & lowest floor containing bedroom's.
	Residential Code New York State (RCNYS)	Effective December 28, 2010	Detached one- and two-family dwellings and townhouses not more than three stories.	Structures that contain a CO source including, but not limited to, fuel fired furnaces; fuel fired boilers; space heaters with pilot lights or open flames; kerosene heaters; wood stoves; fireplaces; and stoves, ovens, dryers, water heaters and refrigerators that use gas or liquid fuel, garages, and other motor vehicle related occupancies.
	Fire Code New York State (FCNYS)	Effective December 28, 2010	E, I-1, I-2 (except hospitals), I-4, R-1, R-2, R-3 or R-4. Several examples include but not not limited to hotels, apartment buildings, dormitories, adult/child care facilties, assisted living facilities, alcohol/drug centers, convalescent facilities and day care facilities.	See above.
North Carolina	Session Law 2008-219 Senate Bill 1924	January 1, 2010	Residential rental properties.	Landlords to provide a minimum of one carbon monoxide detection device per unit and per level.

U. S. Carbon Monoxide Legislation

(current as of March 2013)

State:	Bill/Code I.D.	Effective Date	Occupancy Classification	Placement
North Dakota	R315 of the 2009 edition of the International Residential Code (IRC)	January 1, 2011	Detached one- and two-family dwellings and townhouses not more than three stories	Outside of each separate sleeping area in the immediate vicinity of the bedrooms
Ohio	Residential Code	January 1, 2013	Detached one- and two-family dwellings and townhouses not more than three stories.	Outside of each separate sleeping area in the immediate vicinity of the bedrooms
Oklahoma	Oklahoma Administrative Code (OAC) 340:110-3-97; State Bulding Code	May 25, 2000 July, 15, 2011	Child day care facilities; New one and two family dwellings and townhouses not more than three stories.	In the same room used for child care.; Installed outside of each sleeping area near fuel-fired appliances and in dwellings with attached garages.
Oregon	House Bill 3450	April 1, 2011	New and existing one-, two-, and multi-family dwellings, rental dwellings and Group R occupancies (hotels, motel dormitories) having a CO source.	Minimum one detector per building and covering all sleeping areas.
Pennsylvania	2009 I-codes issued by the ICC. See the 2009 IRC Section R315 for more info.	December 31, 2009	Detached one- and two-family dwellings and townhouses not more than 3 stories.	Outside of each separate sleeping area in the immediate vicinity of the bedrooms in dwelling units.
Rhode Island	Fire Safety Code General Provisions 23-28.1-2	January 1, 2002	New and existing dwellings and non-dwellings (hotels, dormitories).	Minimum one detector per building in sleeping areas.
South Carolina	The South Carolina Building Codes Council (SCBCC) adopted the 2012 edition of the IRC and IBC	January 1, 2011	New one- two-family dwellings and townhouses not more than 3 stories, and Group-R occupancies.	Installed outside of each separate sleeping area in the immediate vicinity of the bedrooms in dwelling units within which fuel-fired appliances are installed and in dwelling units that have attached garages.
Texas	Texas Human Resources Code - Section 42.060	January 1, 2004	Child day care facilities.	One detector per floor.
Tennessee	Tennessee Code Annotated, Sect. 71-3-502	June 20, 2006	Child day care facilities.	Corridors, lounges, interior recreation areas, and sleeping room of child care centers.
Utah	Utah Administrative Code R156-56-801 (26) Utah Administrative Code R156-56-802 (16)	July 1, 2008	R156-56-801: R2, R3, R4, I1 buildings. R156-56-802: One- and two-family dwellings.	R156-56-801: Carbon monoxide alarms shall be installed on each habitable level of a dwelling unit or sleeping unit equipped with fuel-burning appliances. R156-56-802: Carbon monoxide alarms shall be installed on each habitable level in buildings with fuel-burning appliances.
Vermont	H. 243 No. 19 Chapter 77	July 1, 2005	New and existing (upon sale) dwellings and public buildings where people don't sleep.	One or more carbon monoxide detectors in the vicinity of any bedrooms in the dwelling in accordance with the manufacturer's instructions.
Virginia	Adopted the 2009 edition of the International Residential Code (IRC).	March 1, 2011	New in detached one- and two-family dwellings, townhouses (section R315) and Group-R occupancies (section 908.7) such as hotels, dormitories and apartment buildings containing fuel-fired appliances or with attached garages.	Outside of each separate sleeping area in the immediate vicinity of the bedrooms.
Washington	Substitute Senate Bill 5561	January 1, 2011	All newly constructed one- and two-family dwellings, townhomes not more than three, stories, hotels, dormitories apartment building.	No details for manner and location of CO devices.
		January 1, 2013	All existing one- and two-family dwellings, townhomes not more than three, stories, hotels, dormitories apartment building	
West Virginia	West Virginia Code Section 29-3-16a State Fire Commission	July 1, 1998	New dwellings with a fuel-burning appliance and existing buildings connected to newly built buildings with a fuel-burning appliance.; Detached one and two family dwellings and townhouses not more than three stores	Minimum one detector per building, installed outside of each separate sleeping area in the immediate vicinity of the bedrooms in dwelling units within which fuel-fired appliances are installed and in dwelling units that have attached garages.
	SD 597	N/A	newly constructed hotels, motels, apartment buildings, boarding houses, dormitories, hospitals, long-term care facilities, adult or child care facilities, assisted living facilities, one- and two-family dwellings intended to be rented or leased with or without a permanently installed fuel-burning appliance.	N/A

U. S. Carbon Monoxide Legislation

(current as of March 2013)

State:	Bill/Code I.D.	Effective Date	Occupancy Classification	Placement
Wisconsin	2007 Wisconsin Act 205	October 1, 2008 (new) April 1, 2010 (existing)	Hotels, tourist rooming houses, apartment buildings, dormitories, jails and bed & breakfast (any public building used for lodging). Hospitals and nursing homes are not included.	1. In the basement that has a fuel-burning appliance. 2. Within 15 feet of each sleeping area of a unit that has a fuel-burning appliance. 3. Within 15 feet of each sleeping area of a unit that is immediately adjacent to a unit that has a fuel-burning appliance. 4. Not more than 75 feet from a room that has a fuel-burning appliance and that is not used as a sleeping area. 5. In each hallway leading from a unit that has a fuel-burning appliance, in a location that is within 75 feet from the unit, except that, if there is no electrical outlet within this distance, the owner shall place the carbon monoxide detector at the closest available electrical outlet in the hallway.
	2009 Wisconsin Act 158	February 1, 2011	One- and two-family dwellings.	On floors that contain sleeping areas, a CO alarm shall be installed outside of the sleeping area, within 21 feet of the door opening to any sleeping area and in an exit path from any sleeping area. On floor levels that do not contain a sleeping area, a CO alarm shall be installed in a common area on each floor level.

The above information briefly summarizes installation requirements of carbon monoxide detectors for each state listed.
System Sensor does not take responsibility or assume any liability for the accuracy of the information contained in the summation.
For the actual number of carbon monoxide detectors required and appropriate wiring, installation, maintenance, and placement procedures, refer to the respective state code and applicable Underwriters Laboratory (UL) and National Fire Protection Association (NFPA) standards.

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systemsensor.com/co/map

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House Resolution 297

By: Representatives Beasley-Teague of the 65th, Brooks of the 55th, Chandler of the 105th, Kidd of the 145th, and Anderson of the 92nd

A RESOLUTION

Requesting that the State Board of Education and the Fulton County Board of Education mandate the installation of carbon monoxide detectors in schools; and for other purposes.

WHEREAS, recent events involving a carbon monoxide leak at Finch Elementary School, a school governed by the Fulton County Board of Education, have raised concerns about the safety of Fulton County's students; and

WHEREAS, carbon monoxide detectors, which were not present at Finch Elementary School and are not required in Fulton County schools or in schools state wide, could have prevented the carbon monoxide poisoning of approximately 40 students and ten adults at Finch Elementary School; and

WHEREAS, the House of Representatives believes that it is in the best interests of all students and school personnel in Fulton County schools and schools throughout the State of Georgia that carbon monoxide detectors be installed in all Fulton County schools.

NOW, THEREFORE, BE IT RESOLVED BY THE HOUSE OF REPRESENTATIVES that this body requests that the State Board of Education and the Fulton County Board of Education require the installation of carbon monoxide detectors in all schools in Georgia and all schools in Fulton County.

BE IT FURTHER RESOLVED that the Clerk of the House of Representatives is authorized and directed to transmit an appropriate copy of this resolution to the State Board of Education and the Fulton County Board of Education.

House Bill 23

By: Representatives Jones of the 53rd and Scott of the 76th

A BILL TO BE ENTITLED

AN ACT

To amend Chapter 2 of Title 25 of the Official Code of Georgia Annotated, relating to regulation of fire and other hazards to persons and property generally, so as to require every public and private school to have carbon monoxide detectors; to provide for related matters; to repeal conflicting laws; and for other purposes.

BE IT ENACTED BY THE GENERAL ASSEMBLY OF GEORGIA:

SECTION 1.

Chapter 2 of Title 25 of the Official Code of Georgia Annotated, relating to regulation of fire and other hazards to persons and property generally, is amended by adding a new Code section to read as follows:

"25-2-41.

(a) On and after July 1, 2013, every public and private elementary and secondary school in this state shall have carbon monoxide detectors and warning equipment.

(b) The carbon monoxide detectors and warning equipment required by this Code section shall be periodically inspected and maintained in good working order by the school.

(c) The carbon monoxide detectors and warning equipment required by this Code section shall be installed, operated, inspected, and maintained in accordance with rules and regulations established by the Safety Fire Commissioner, in consultation with the State Board of Education."

SECTION 2.

All laws and parts of laws in conflict with this Act are repealed.

Senate Bill 89

By: Senators Fort of the 39th, Tate of the 38th, Sims of the 12th and James of the 35th

A BILL TO BE ENTITLED

AN ACT

To amend Chapter 2 of Title 25 of the Official Code of Georgia Annotated, relating to regulation of fire and other hazards to persons and property generally, so as to require every public and private school and every early care and education program to have carbon monoxide detectors and warning equipment; to provide for related matters; to repeal conflicting laws; and for other purposes.

BE IT ENACTED BY THE GENERAL ASSEMBLY OF GEORGIA:

SECTION 1.

Chapter 2 of Title 25 of the Official Code of Georgia Annotated, relating to regulation of fire and other hazards to persons and property generally, is amended by adding a new Code section to read as follows:

"25-2-41.

(a) No later than July 1, 2014, every public and private elementary and secondary school and every early care and education program, as defined in Code Section 20-1A-2, in this state shall have carbon monoxide detectors and warning equipment installed in such school or facility in accordance with the rules and regulations established by the Safety Fire Commissioner pursuant to subsection (b) of this Code section.

(b) The Safety Fire Commissioner, in consultation with the Department of Education and the Department of Early Care and Learning, shall establish rules and regulations regarding the installation, operation, inspection, and maintenance of the carbon monoxide detectors and warning equipment required by this Code section."

SECTION 2.

All laws and parts of laws in conflict with this Act are repealed.

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[F] 908.3.2 Shutoff of gas supply. The gas detection system shall automatically close the shutoff valve at the source on gas supply piping and tubing related to the system being monitored for whichever gas is detected.

Exception: Automatic shutdown is not required for reactors utilized for the production of *highly toxic* or *toxic* compressed gases where such reactors are:

1. Operated at pressures less than 15 pounds per square inch gauge (psig) (103.4 kPa).
2. Constantly attended.
3. Provided with readily accessible emergency shutoff valves.

[F] 908.3.3 Valve closure. The automatic closure of shutoff valves shall be in accordance with the following:

1. When the gas-detection sampling point initiating the gas detection system alarm is within a gas cabinet or exhausted enclosure, the shutoff valve in the gas cabinet or exhausted enclosure for the specific gas detected shall automatically close.
2. Where the gas-detection sampling point initiating the gas detection system alarm is within a gas room and compressed gas containers are not in gas cabinets or exhausted enclosures, the shutoff valves on all gas lines for the specific gas detected shall automatically close.
3. Where the gas-detection sampling point initiating the gas detection system alarm is within a piping distribution manifold enclosure, the shutoff valve for the compressed container of specific gas detected supplying the manifold shall automatically close.

Exception: When the gas-detection sampling point initiating the gas-detection system alarm is at a use location or within a gas valve enclosure of a branch line downstream of a piping distribution manifold, the shutoff valve in the gas valve enclosure for the branch line located in the piping distribution manifold enclosure shall automatically close.

[F] 908.4 Ozone gas-generator rooms. Ozone gas-generator rooms shall be equipped with a continuous gas-detection system that will shut off the generator and sound a local alarm when concentrations above the PEL occur.

[F] 908.5 Repair garages. A flammable-gas detection system shall be provided in repair garages for vehicles fueled by nonodorized gases in accordance with Section 406.8.5.

[F] 908.6 Refrigerant detector. Machinery rooms shall contain a refrigerant detector with an audible and visual alarm. The detector, or a sampling tube that draws air to the detector, shall be located in an area where refrigerant from a leak will concentrate. The alarm shall be actuated at a value not greater than the corresponding TLV-TWA values for the refrigerant classification indicated in the *International Mechanical Code*. Detectors and alarms shall be placed in *approved* locations.

[F] 908.7 Carbon monoxide alarms. Group I or R occupancies located in a building containing a fuel-burning appliance or in a building which has an attached garage shall be equipped with single-station carbon monoxide alarms. The carbon monoxide alarms shall be listed as complying with UL 2034 and be installed and maintained in accordance with NFPA 720 and the manufacturer's instructions. An open parking garage, as defined in Chapter 2, or an enclosed parking garage ventilated in accordance with Section 404 of the *International Mechanical Code* shall not be considered an attached garage.

Exception: *Sleeping units* or *dwelling units* which do not themselves contain a fuel-burning appliance or have an attached garage, but which are located in a building with a fuel-burning appliance or an attached garage, need not be equipped with single-station carbon monoxide alarms provided that:

1. The *sleeping unit* or *dwelling unit* is located more than one story above or below any story which contains a fuel-burning appliance or an attached garage;
2. The *sleeping unit* or *dwelling unit* is not connected by duct work or ventilation shafts to any room containing a fuel-burning appliance or to an attached garage; and
3. The building is equipped with a common area carbon monoxide alarm system.

[F] 908.7.1 Carbon monoxide detection systems. Carbon monoxide detection systems, which include carbon monoxide detectors and audible notification appliances, installed and maintained in accordance with this section for carbon monoxide alarms and NFPA 720 shall be permitted. The carbon monoxide detectors shall be *listed* as complying with UL 2075.

SECTION 909
SMOKE CONTROL SYSTEMS

[F] 909.1 Scope and purpose. This section applies to mechanical or passive smoke control systems when they are required by other provisions of this code. The purpose of this section is to establish minimum requirements for the design, installation and acceptance testing of smoke control systems that are intended to provide a tenable environment for the evacuation or relocation of occupants. These provisions are not intended for the preservation of contents, the timely restoration of operations or for assistance in fire suppression or overhaul activities. Smoke control systems regulated by this section serve a different purpose than the smoke- and heat-venting provisions found in Section 910. Mechanical smoke control systems shall not be considered exhaust systems under Chapter 5 of the *International Mechanical Code*.

[F] 909.2 General design requirements. Buildings, structures or parts thereof required by this code to have a smoke control system or systems shall have such systems designed in accordance with the applicable requirements of Section 909 and the generally accepted and well-established principles of engineering relevant to the design. The *construction documents* shall include sufficient information and detail to adequately describe the elements of the design necessary for the proper implementation of the smoke control systems.

UL—continued

710B—04	Recirculating Systems—with Revisions through *December 2009*	904.11
723—2008	Standard for Test for Surface Burning Characteristics of Building Materials	202, 402.6.4.4, 406.7.2, 703.5.2, 720.1, 720.4, 803.1.1, 803.1.4, 803.9, 803.13, 806.5, 1404.12.1, 1407.9, 1407.10.1, 1409.9, 1409.10.1, 1509.6.2, 1509.6.3, 2303.2, 2603.3, 2603.4.1.13, 2606.3.5.4, 2603.7, 2604.2.4, 2606.4, 2613.3, 3105.4
790—04	Standard Test Methods for Fire Tests of Roof Coverings—with revisions through October 2008	1505.1, 2603.6, 2610.2, 2610.3
793—08	Standards for Automatically Operated Roof Vents for Smoke and Heat	406.8.5.1.1, 910.3.1
864—03	Standards for Control Units and Accessories for Fire Alarm Systems—with Revisions through *February 2010*	909.12
924—06	Standard for Safety Emergency Lighting and Power Equipment—with revisions through January 2009	1011.5
1040—96	Fire Test of Insulated Wall Construction—with Revisions through September 2007	1407.10.3, 1409.10.3, 2603.4, 2603.10
1256—02	Fire Test of Roof Deck Construction—with Revisions through January 2007	1508.1, 2603.3, 2603.4.1.5
1479—03	Fire Tests of Through-penetration Firestops—with Revisions through *March 2010*	202, 714.3.1.2, 714.3.2, 714.4.1.1.2, 714.5
1482—2010	Solid-Fuel-type Room Heater	2112.2, 2112.5
1703—02	Flat-Plate Photovoltaic Modules and Panels—with revisions through April 2008	1507.17.1, 1509.7.4
1715—97	Fire Test of Interior Finish Material—with Revisions through April 2008	1407.10.3, 1409.10.2, 1409.10.3, 2603.4, 2603.10, 2613.4
1777—2007	Chimney Liners—*with revisions through July 2009*	2113.11.1, 2113.19
1784—01	Air Leakage Tests of Door Assemblies—with Revisions through *July 2009*	710.5.2.2, 713.14.1, 716.5.3.1, 716.5.7.1, 716.5.7.3, 3007.7.3, 3008.7.3
1897—04	Uplift Tests for Roof Covering Systems—with revisions through May 2008	1504.3.1
1975—06	Fire Test of Foamed Plastics Used for Decorative Purposes	402.6.2, 402.6.4.5, 424.2
1994—04	Luminous Egress Path Marking Systems—*with Revisions through April 2010*	411.7, 1024.2.1, 1024.2.3, 1024.2.4, 1024.4
2017—2008	Standards for General-purpose Signaling Devices and Systems—with Revisions through *October 2009*	406.8.5.1.1, 3109.4.1.8
2034—2008	Standard for Single- and Multiple Station Carbon Monoxide Alarm—with revision through February 2009	908.7
2079—04	Tests for Fire Resistance of Building Joint Systems—with Revisions through June 2008	202, 715.3, 715.6
2200—98	Stationary Engine Generator Assemblies—with Revisions through *December 2009*	2702.1.1

ULC

Underwriters Laboratories of Canada
7 Underwriters Road
Toronto, Ontario, Canada M1R3B4

Standard reference number	Title	Referenced in code section number
CAN/ULC S 102.2—1988	Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies—with 2000 Revisions	720.4

USC

United States Code
c/o Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402-9325

Standard reference number	Title	Referenced in code section number
18 USC Part 1, Ch 40	Importation, Manufacture, Distribution and Storage of Explosive Materials	202

NFPA—continued

286—11	Standard Method of Fire Test for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth	402.6.4.4, 803.1.2, 803.1.2.1, 803.9, 2603.4, 2603.7, 2603.10, 2604.2.4, 2613.4
288—12	Standard Method of Fire Tests of Floor Fire Door Assemblies Installed Horizontally in Fire-resistance-rated Floor Systems	711.8
289—09	Standard Method of Fire Test for Individual Fuel Packages	402.6.2, 407.6.4.6, 424.2
409—10	Aircraft Hangars	412.4.6, Table 412.4.6, 412.4.6.1, 412.6.5
418—11	Standard for Heliports	412.7.4
484—12	Combustible Metals	415.8.1
654—11	Prevention of Fire & Dust Explosions from the Manufacturing, Processing and Handling of Combustible Particulate Solids	415.8.1
655—12	Prevention of Sulfur Fires and Explosions	415.8.1
664—12	Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities	415.8.1
701—10	Standard Methods of Fire Tests for Flame-propagation of Textiles and Films	410.3.6, 424.2, 801.4, 806.1, 806.1.2, 806.2, 3102.3, 3102.3.1, 3102.6.1.1, 3105.4, D102.2.8, H106.1.1
704—12	Standard System for the Identification of the Hazards of Materials for Emergency Response	202, 414.7.2
720—09	Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment	908.7
1124—06	Manufacture, Transportation and Storage of Fireworks and Pyrotechnic Articles	415.5.1.1, 415.3.1
2001—08	Clean Agent Fire Extinguishing Systems	904.10

PCI

Precast Prestressed Concrete Institute
200 West Adams Street, Suite 2100
Chicago, IL 60606-5230

Standard reference number	Title	Referenced in code section number
MNL 124—89	Design for Fire Resistance of Precast Prestressed Concrete	722.2.3.1
MNL 128—01	Recommended Practice for Glass Fiber Reinforced Concrete Panels	1903.2

PTI

Post-Tensioning Institute
8601 North Black Canyon Highway, Suite 103
Phoenix, AZ 85021

Standard reference number	Title	Referenced in code section number
PTI—2007	Standard Requirements for Analysis of Shallow Concrete Foundations on Expansive Soils, Third Edition	1808.6.2
PTI—2007	Standard Requirements for Design of Shallow Post-tensioned Concrete Foundation on Expansive Soils, Second Edition	1808.6.2

RMI

Rack Manufacturers Institute
8720 Red Oak Boulevard, Suite 201
Charlotte, NC 28217

Standard reference number	Title	Referenced in code section number
ANSI/MH16.1—08	Specification for Design, Testing and Utilization of Industrial Steel Storage Racks	2209.1

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908.5 Repair garages. A flammable-gas detection system shall be provided in repair garages for vehicles fueled by non-odorized gases in accordance with Section 2311.7.2.

908.6 Refrigeration systems. Refrigeration system machinery rooms shall be provided with a refrigerant detector in accordance with Section 606.8.

908.7 Carbon monoxide alarms. Group I or R occupancies located in a building containing a fuel-burning appliance or in a building which has an attached garage shall be equipped with single-station carbon monoxide alarms. The carbon monoxide alarms shall be listed as complying with UL 2034 and be installed and maintained in accordance with NFPA 720 and the manufacturer's instructions. An open parking garage, as defined in Chapter 2 of the *International Building Code*, or an enclosed parking garage ventilated in accordance with Section 404 of the *International Mechanical Code* shall not be considered an attached garage.

Exception: *Sleeping units* or *dwelling units* which do not themselves contain a fuel-burning appliance or have an attached garage, but which are located in a building with a fuel-burning appliance or an attached garage, need not be equipped with single-station carbon monoxide alarms provided that:

1. The *sleeping unit* or *dwelling unit* is located more than one story above or below any story which contains a fuel-burning appliance or an attached garage;
2. The *sleeping unit* or *dwelling unit* is not connected by duct work or ventilation shafts to any room containing a fuel-burning appliance or to an attached garage; and
3. The building is equipped with a common area carbon monoxide alarm system.

908.7.1 Carbon monoxide detection systems. Carbon monoxide detection systems, which include carbon monoxide detectors and audible notification appliances, installed and maintained in accordance with this section for carbon monoxide alarms and NFPA 720 shall be permitted. The carbon monoxide detectors shall be *listed* as complying with UL 2075.

SECTION 909
SMOKE CONTROL SYSTEMS

909.1 Scope and purpose. This section applies to mechanical or passive smoke control systems when they are required for new buildings or portions thereof by provisions of the *International Building Code* or this code. The purpose of this section is to establish minimum requirements for the design, installation and acceptance testing of smoke control systems that are intended to provide a tenable environment for the evacuation or relocation of occupants. These provisions are not intended for the preservation of contents, the timely restoration of operations, or for assistance in fire suppression or overhaul activities. Smoke control systems regulated by this section serve a different purpose than the smoke- and heat-venting provisions found in Section 910. Mechanical smoke control systems shall not be considered exhaust systems under Chapter 5 of the *International Mechanical Code*.

909.2 General design requirements. Buildings, structures, or parts thereof required by the *International Building Code* or this code to have a smoke control system or systems shall have such systems designed in accordance with the applicable requirements of Section 909 and the generally accepted and well-established principles of engineering relevant to the design. The *construction documents* shall include sufficient information and detail to describe adequately the elements of the design necessary for the proper implementation of the smoke control systems. These documents shall be accompanied with sufficient information and analysis to demonstrate compliance with these provisions.

909.3 Special inspection and test requirements. In addition to the ordinary inspection and test requirements which buildings, structures and parts thereof are required to undergo, smoke control systems subject to the provisions of Section 909 shall undergo special inspections and tests sufficient to verify the proper commissioning of the smoke control design in its final installed condition. The design submission accompanying the *construction documents* shall clearly detail procedures and methods to be used and the items subject to such inspections and tests. Such commissioning shall be in accordance with generally accepted engineering practice and, where possible, based on published standards for the particular testing involved. The special inspections and tests required by this section shall be conducted under the same terms as in Section 1704 of the *International Building Code*.

909.4 Analysis. A rational analysis supporting the types of smoke control systems to be employed, the methods of their operations, the systems supporting them, and the methods of construction to be utilized shall accompany the *construction documents* submission and include, but not be limited to, the items indicated in Sections 909.4.1 through 909.4.6.

909.4.1 Stack effect. The system shall be designed such that the maximum probable normal or reverse stack effect will not adversely interfere with the system's capabilities. In determining the maximum probable stack effect, altitude, elevation, weather history and interior temperatures shall be used.

909.4.2 Temperature effect of fire. Buoyancy and expansion caused by the design fire in accordance with Section 909.9 shall be analyzed. The system shall be designed such that these effects do not adversely interfere with the system's capabilities.

909.4.3 Wind effect. The design shall consider the adverse effects of wind. Such consideration shall be consistent with the wind-loading provisions of the *International Building Code*.

909.4.4 Systems. The design shall consider the effects of the heating, ventilating and air-conditioning (HVAC) systems on both smoke and fire transport. The analysis shall include all permutations of systems status. The design shall consider the effects of the fire on the heating, ventilating and air-conditioning systems.

909.4.5 Climate. The design shall consider the effects of low temperatures on systems, property and occupants. Air inlets and exhausts shall be located so as to prevent snow or ice blockage.

residential care/assisted living facilities in accordance with Section 907.2.10.1.

Exceptions:

1. Where there are interconnected smoke alarms meeting the requirements of Section 907.2.11 and there is at least one manual fire alarm box per floor arranged to continuously sound the smoke alarms.
2. Other manually activated, continuously sounding alarms *approved* by the *fire code official*.

1103.8 Single- and multiple-station smoke alarms. Single- and multiple-station smoke alarms shall be installed in existing Group I-1 and R occupancies in accordance with Sections 1103.8.1 through 1103.8.3.

1103.8.1 Where required. Existing Group I-1 and R occupancies shall be provided with single-station smoke alarms in accordance with Section 907.2.11, except as provided in Sections 1103.8.2 and 1103.8.3.

Exceptions:

1. Where the code that was in effect at the time of construction required smoke alarms and smoke alarms complying with those requirements are already provided.
2. Where smoke alarms have been installed in occupancies and dwellings that were not required to have them at the time of construction, additional smoke alarms shall not be required provided that the existing smoke alarms comply with requirements that were in effect at the time of installation.
3. Where smoke detectors connected to a fire alarm system have been installed as a substitute for smoke alarms.

1103.8.2 Interconnection. Where more than one smoke alarm is required to be installed within an individual *dwelling* or *sleeping unit*, the smoke alarms shall be interconnected in such a manner that the activation of one alarm will activate all of the alarms in the individual unit. Physical interconnection of smoke alarms shall not be required where listed wireless alarms are installed and all alarms sound upon activation of one alarm. The alarm shall be clearly audible in all bedrooms over background noise levels with all intervening doors closed.

Exceptions:

1. Interconnection is not required in buildings that are not undergoing *alterations*, repairs or construction of any kind.
2. Smoke alarms in existing areas are not required to be interconnected where *alterations* or repairs do not result in the removal of interior wall or ceiling finishes exposing the structure, unless there is an attic, crawl space or *basement* available which could provide access for interconnection without the removal of interior finishes.

1103.8.3 Power source. Single-station smoke alarms shall receive their primary power from the building wiring provided that such wiring is served from a commercial source and shall be equipped with a battery backup. Smoke alarms with integral strobes that are not equipped with battery backup shall be connected to an emergency electrical system. Smoke alarms shall emit a signal when the batteries are low. Wiring shall be permanent and without a disconnecting switch other than as required for overcurrent protection.

Exceptions:

1. Smoke alarms are permitted to be solely battery operated in existing buildings where no construction is taking place.
2. Smoke alarms are permitted to be solely battery operated in buildings that are not served from a commercial power source.
3. Smoke alarms are permitted to be solely battery operated in existing areas of buildings undergoing *alterations* or repairs that do not result in the removal of interior walls or ceiling finishes exposing the structure, unless there is an attic, crawl space or *basement* available which could provide access for building wiring without the removal of interior finishes.

1103.9 Carbon monoxide alarms. Existing Group I or R occupancies located in a building containing a fuel-burning appliance or a building which has an attached garage shall be equipped with single-station carbon monoxide alarms. The carbon monoxide alarms shall be listed as complying with UL 2034, and be installed and maintained in accordance with NFPA 720 and the manufacturer's instructions. An open parking garage, as defined in the *International Building Code*, or an enclosed parking garage ventilated in accordance with Section 404 of the *International Mechanical Code* shall not be deemed to be an attached garage.

Exception: *Sleeping units* or *dwelling units* which do not themselves contain a fuel-burning appliance or have an attached garage, but which are located in a building with a fuel-burning appliance or an attached garage, need not be equipped with single-station carbon monoxide alarms provided that:

1. The *sleeping unit* or *dwelling unit* is located more than one story above or below any story that contains a fuel-burning appliance or an attached garage;
2. The *sleeping unit* or *dwelling unit* is not connected by duct work or ventilation shafts to any room containing a fuel-burning appliance or to an attached garage; and
3. The building is provided with a common area carbon monoxide alarm system.

Attachment 12

Photos courtesy of System Sensor

New Code Requirements Expand Carbon Monoxide Detection

Richard Roberts, Industry Affairs Manager, Honeywell Life Safety

Carbon monoxide (CO), often referred to as "the silent killer," claims hundreds of lives and sickens thousands of individuals every year. It is a colorless, odorless, and poisonous gas that results from the incomplete burning of common fuels such as natural or liquefied petroleum, gas, oil, wood, or coal. When inhaled, CO enters the bloodstream and reduces the ability of the blood to carry oxygen to vital organs, such as the heart and brain.

Legislation, codes, and standards continue to evolve in an effort to reduce non-fire related deaths and injuries.

The 2012 edition of the *International Fire Code*® (*IFC*) and the *International Building Code*® (*IBC*) contain new requirements that are the result of the International Code Council membership approval of a proposal to require the installation of CO detection in new and existing Group-R and Group-I occupancies. These would include hotels, dormitories, apartment buildings, hospitals, and nursing homes.

Section 908.7 of the 2012 *IFC* and *IBC* requires CO detection to be installed in newly constructed Group-R and Group-I occupancies if the building contains a fuel-burning appliance or has an attached garage. An open parking garage, as defined in the *IBC*, or an enclosed parking garage ventilated in accordance with Section 404 of the *International Mechanical Code*®, is not deemed an attached garage.

It also stipulates that CO alarms shall be installed and maintained in accordance with NFPA 720 *Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment*® as well as the manufacturer's instructions. Section 1103.9 of the *IFC* covers the requirements for existing Group-R and Group-I occupancies, equivalent to the requirements in 908.7 for newly constructed occupancies.

As with most codes and standards, there are exceptions to the mandatory CO requirements. Exceptions may apply to sleeping or dwelling units that do not contain a fuel-burning appliance or do have an attached garage, but are located in a building with a fuel-burning appliance or an attached garage.

CO detection is not required if:

- a sleeping unit or dwelling unit is located more than one story above or below any story that contains a fuel-burning appliance or an attached garage;

- a sleeping unit or dwelling unit is not connected by duct work or ventilation shafts to any room containing a fuel-burning appliance or to an attached garage;
- a building is provided with a "common area CO system," a vague and undefined term in the I-Codes and NFPA 720[1].

Section 908.7.1 clearly permits system-connected CO detectors to be installed as a primary form of protection if they are installed and maintained in accordance with NFPA 720 and listed as complying with ANSI/UL 2075.

NFPA 720 permits either CO alarms complying with ANSI/UL 2034 *Single and Multiple Station Carbon Monoxide Alarms* or CO detectors complying with ANSI/UL 2075 *Gas and Vapor Detectors and Sensors* to be installed.

NEMA representatives championed the new CO detection requirements in the 2012 edition of NFPA 101 *Life Safety Code*® and NFPA 1 *Fire Code*®. The 2012 *Life Safety Code* was published in October 2011 and requires that CO detection be installed in accordance with NFPA 720 in newly constructed daycare occupancies, one- and two-family dwellings, lodging or rooming houses, hotels and dormitories, and apartment buildings.

CO detection is required in these occupancies when they contain a permanently installed fuel-burning appliance or when they have a "communicating attached garage," a term that is not defined in the code or explained in the annex. The committee's intended definition of "communicating" is a garage with a door or entryway between the garage and the dwelling unit or building.

For each occupancy, CO alarms or detectors shall be installed 1) outside of each separate sleeping area, in the immediate vicinity of the sleeping rooms; and 2) on every occupiable level, including basements, but excluding attics and crawl spaces.

NFPA 720 also requires the audible alarm notification signal to be at least 75dBA (decibels adjusted) at the pillow in sleeping areas. If the detector installed outside the sleeping area is unable to produce 75dBA at the pillow, with the door closed, a CO detector or a mini horn should be installed in the sleeping room.

For hotels, dormitories, and apartment buildings, NFPA 101 requires alarms or detectors to be installed in certain non-sleeping locations, including

- on the ceiling in rooms containing a permanently installed fuel-burning appliance and
- centrally located within occupiable spaces served by the first supply air register from a fuel-burning HVAC system.

This requirement is different from the NFPA 720 requirement for CO detectors to be installed on every occupiable level and centrally located in every HVAC zone of the building. The committee felt the 720 requirement was excessive to require all HVAC zones to have CO detection if they are not connected by duct work or ventilation shafts.

There are specific locations where CO detection is prohibited. These include garages and within dwellings, dwelling units, guest rooms, guest suites, lodging houses, or rooming houses with communicating attached garages that are open parking structures as defined by the building code or with communicating attached garages that are mechanically ventilated in accordance with the mechanical code.

Regarding NFPA 1 *Fire Code*, the Technical Committee accepted a proposal to incorporate the same NFPA 101 CO detection provisions into the 2012 edition of the *Fire Code*, thereby requiring CO detection in lodging houses, rooming houses, hotels, dormitories, apartment buildings, one- and two-family dwellings, and daycare homes that have a permanently installed fuel-burning appliance or contain a communicating attached garage. The location requirements are the same as in NFPA 101.

The total number of states with some form of CO mandate now stands at 36. NEMA actively engages state legislative and code-making bodies to procure these requirements, which primarily cover one- and two family dwellings, but in some cases extend to commercial sleeping occupancies such as hotels, dormitories, apartment buildings, hospitals, nursing homes, and assisted living facilities. With CO requirements in the model building codes, the number of states requiring the installation of CO detection devices will only increase in the next three to five years.

For details on specific state CO requirements, visit *www.lifesafetysolutionsonline.com*.

Mr. Roberts, co-chair of NEMA 3SB Smoke/CO Group, has more than 20 years of experience in all phases of the life safety market. Other industry affiliations include several NFPA committees and the UL Standards Technical Panel for Carbon Monoxide Alarms and Gas Detectors.

[1] A change proposal currently being considered for the 2015 edition of *IFC* and *IBC* would clarify this term. The proposed text defines the term as "a CO detector to be provided in the common area between the attached garage and the dwelling units and it will activate an audible alarm at a constantly attended location."

Carbon Monoxide Detectors for Schools
Task Force
Subcommittee of Estimated Costs
Members: Bill Clark, Martin Hoover, Bill Lusk
Submitted 18APR13

Task:
Determine the cost of labor and materials to install Carbon Detectors in schools.

Challenge:
There is no standard building structure throughout the State. The Georgia Department of Education lists 12ea. K-12, 1,325 Elementary, 488 Middle and 450 High Schools, statewide. Additionally, there are privately owned Day Care Centers, private Pre-Schools, private Pre-Kindergarten, and alternative schools. No one specific cost estimate would cover these 8,000+ facilities. The amount of existing fuel burning equipment present along with other factors, will determine the needs.

Considerations:
Sources of Carbon Monoxide
- Buses-One of the biggest sources of CO
  - Idling- Look at where they are idling and check for proper ventilation
- Idling cars at drop off and pick up areas
- Natural Gas Appliances
  - Boilers
  - Furnaces
  - Water Heaters
  - Stoves
  - Gas Dryers
- Propane Appliances
- Propane Powered Floor Polishers
- Generators- Diesel and Natural Gas

Chemistry/Biology Labs
Automotive Shops

Not every school has all of these facilities or conditions, therefore, requirements will vary with each structure.

Approach:

The predominance of cases will involve retrofitting existing structures. Each structure must be evaluated individually to determine the need for proper monitoring. The design of new structures will incorporate the proper monitoring, but installation costs most likely will be less since the installation will be part of the total construction process and cost.

For the purpose of analysis and comparison, we have costed out two possible scenarios:

I) Proposal for the installation of standalone carbon monoxide detectors in existing school building. The existing fire alarm control panel will not support connectivity of detectors to system.

1. Install battery operated CO detectors in all areas of school that contain permanently installed fuel-burning equipment. (120vac circuits provided by others). For this demonstration we have identified (20) areas that would require detection.
2. Provide and install signs at the entrance of all spaces indicating that CO detectors are located inside the space.
3. Install detectors per manufacturer listed instructions and NFPA720.
4. Provide location drawing of all permanently installed detectors, along with end-user training and proper maintenance.

Proposal includes all material, labor and supervision necessary for the installation of carbon monoxide detectors. **TOTAL $3,360**
UNIT COST $ 168

II) Proposal for the installation of system monitored carbon monoxide detectors in existing school building. Carbon monoxide detectors will be supervised by existing fire alarm control panel.

1. Install CO detectors in all areas of school that contain permanently installed fuel-burning equipment . For the purpose of demonstration, we have identified (20) areas that would require detection.
2. Install hard wired detectors with monitoring modules to report to existing fire alarm control panel.
3. Install program panel for supervision of detectors. The detectors shall not activate the building evacuation system.
4. Provide and install signs at the entrance of all spaces indicating that CO detectors are located inside the space.
5. Install detectors per manufacturers listed instructions and NFPA720.
6. Provide location drawing of all permanently installed detectors, along with end-user training and proper maintenance.

Proposal includes all material, labor and supervision necessary for the installation of carbon monoxide detectors. **TOTAL $7,500**
UNIT COST $375

This assumes that the existing control panel will accept the module to monitor the CO detectors. It is conceivable that costs to modify a panel to accept this module could cost in the range of **ADD $10,000**

Conclusion:

Each school structure stands on its own as to the requirements for CO detection. The numbers of fuel burning equipment along with other exposures will determine the need for detection. The requirement for central monitoring will affect cost. The need for an individual power supply will also affect cost. A Registered Professional Engineer should make those decisions based on Life Safety and sound engineering practices.

Nathan Deal
Governor

Georgia™
Department of
Community Affairs

Gretchen Corbin
Commissioner

Memorandum

To: Georgia School Superintendents

From: Commissioner Gretchen Corbin, Georgia Department of Community Affairs
Commissioner Ralph Hudgens, Office of Insurance and Safety Fire Commissioner
Superintendent Dr. John Barge, Georgia Department of Education

Re: Voluntary Guidelines for Carbon Monoxide Detectors for New and Existing Schools

Date: September 9, 2013

The State Codes Advisory Committee (SCAC) of the Georgia Department of Community Affairs (DCA) in conjunction with the Office of the Insurance and Safety Fire Commissioner and the Georgia Department of Education, have developed the following voluntary guidelines for public and private school systems concerning carbon monoxide detectors in existing and new educational facilities.

These voluntary guidelines are intended to supplement the previous Carbon Monoxide Advisory Memorandum issued to all Local School Superintendents on December 17, 2012.

It is strongly recommended that assessments be made of each new and existing facility as well as facilities currently in the design phase to recognize and evaluate the potential sources of Carbon Monoxide (CO). A list of potential sources of CO developed by the SCAC Task Force on Carbon Monoxide Detectors in Schools is available at the following link: DCA Carbon Monoxide Detectors for Schools Related Information.
Where the assessment indicates potential issues related to CO, a plan of action should be developed to resolve the areas of concern. Assessment resolutions could include equipment replacement, equipment relocation or even installation of CO detection.

If CO detection is part of the resolution, consideration should be given to the type and location of detection devices to be used to achieve the desired coverage results. CO detection types with design consideration items are defined at the following link: DCA Carbon Monoxide Detectors for Schools Related Information.

Regardless of the assessment outcome, school systems should:

- Ensure all fuel burning boilers have been inspected annually as required by law.
- Ensure all other fuel burning equipment is inspected and serviced regularly as recommended by the manufacturer.
- Provide training for school system service personnel on proper maintenance and equipment operation.
- Review existing emergency procedures for building evacuation.
- Ensure school personnel are familiar with the symptoms of CO poisoning. Visit CDC website.
- Ensure school personnel are familiar with and aware of the emergency plan of action when symptoms of CO poisoning are observed.

Although not required by code, if a determination is made by the local school district, whether public or private, to install a carbon monoxide detection system or individual alarms, the following guidelines should be used:

- Use appropriate CO equipment for the application. There is a difference between residential and commercial detectors.
- CO warning equipment (detectors and/or alarms) should be commercial type and installed by qualified persons.
- CO warning equipment (detectors and/or alarms) are listed as complying with Underwriters Laboratories Standards UL 2034 – *Standard for Single and Multiple Station Carbon Monoxide Alarms* and UL 2075 – *Gas and Vapor Detectors and Sensors* or other approved equal.
- NFPA 720 – *Standard for the Installation of Carbon Monoxide (CO) Detection and Warning Equipment* is an adopted standard by the Safety Fire Commissioner to provide design criteria, installation, testing and maintenance standards.
- If CO equipment is installed, it must be tested, inspected and maintained in accordance with the manufacturer's instructions and the applicable standard.
- Consideration should also be given to the following:
    - Having CO Detection installed in the same room containing permanently installed fuel-fired equipment including but not limited to furnaces and boilers.
    - Having a remote alarm located outside rooms containing CO detectors near the primary entrance door.
    - Having a warning sign posted at all entrances to the rooms containing fuel-fired equipment indicating that a CO detector is in-use and located inside the space.
    - Having a means for notification of detection of CO given as prescribed by the applicable codes and standards.

If CO is suspected in a building, contact your local gas provider and request testing the air for carbon monoxide emissions. You may also want to contact your local fire department to perform a safety inspection.

If you have any questions you may contact the Georgia State Fire Marshal's Office at 800-656-2298 or by e-mail at engineering@sfm.ga.gov. You may also contact DCA's Construction Codes Program at 404-679-3118 or by e-mail at constructioncodes@dca.ga.gov. You may also contact the Facilities Services Unit of the Georgia Department of Education at 404-656-2454 or by e-mail at mrowland@doe.k12.ga.us.